Student Machine Shop Safety Guidelines

Model of Boeing JASF Program.

University of California Riverside
College of Engineering
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Shop Safety, Hours & Check In

The first step in preventing personal injury or machine damage in the shop is to make sure that you are familiar with and know how to operate the equipment correctly. **If you do not know ask the area supervisor or other shop personnel.**

How do accidents happen?

Inattention, taking chances, horseplay, bad judgment, fatigue, failure to cooperate, improper clothing, defective tools, etc. cause accidents.

How do we help to avoid accidents?

By strictly following the safety rules given in the following pages, by cooperating with, and following any additional instructions given to you by the supervisor.

Please read over this manual carefully and follow the rules described.

If you have any questions about the operation of any machine or tool ask the area supervisor for instructions.

**Shop Hours:**

A. Regular hours: M-F 8-5. Access to the student shop may be limited during scheduled classes, and holidays.
B. With special permission TA’s or other staff may supervise workers in the shop providing the following rules are observed.
   B1. Under no circumstances may any work be done in the shop after 10:00 PM.
   B2. Students wishing to use the shop after hours must check in with the supervisor before 5:00 PM.
   B3. No more than 4 machine tools may be in use at any time under TA supervision.
   B4. The shop may be used on weekends only with special permission.

**Sign-in Book**

All shop users must sign-in the logbook before beginning work! Sign out after cleaning up.
General Shop Safety Rules

1. **Safety glasses, cover goggles, or face shields** are required when in any shop area, whether working or not!!

2. Shoes must be worn in shop area. No one wearing sandals will be allowed to enter the shop area. **The minimum footwear must cover the entire foot.**

3. Do not operate any item of equipment unless you are familiar with its operation and have been authorized to operate it. If you have any question regarding the use of equipment ask the area supervisor.

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

5. Avoid excessive use of compressed air to blow dirt or chips from machinery to avoid scattering chips. **Never use compressed air guns to clean clothing, hair, or aim at another person.**

6. In case of injury, no matter how slight, report it to the shop supervisor. The campus emergency phone number is **911**.

7. **Do not attempt to remove foreign objects from eye or body.** Report to the student health service for medical treatment. If chemicals get in eye(s), wash for 15 minutes in an open flow of water before proceeding for medical treatment. **Notify campus rescue at 911.**

8. Machine **must** be shut off and not moving when you are cleaning, repairing, oiling, or when you leave the area.

9. 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.

10. Make sure to wear appropriate clothing for the job (i.e. do not wear short sleeve shirts or short pants when welding).

11. Do not work in the shop if you are **tired, upset, drugged, or in a hurry.**

12. **Never** indulge in horseplay in the shop areas.

13. All machines must be operated with all required guards and shields in place.

14. A brush, hook, or special tool is preferred for removal of chips, shavings, etc. from the work area. **Never use your hands.**

15. Keep fingers clear of the point of operation of machines by using special tool or devices, such as, push sticks, hooks, pliers, etc. **Never use a rag near moving machinery!**

16. A hard hammer should not be used to strike a hardened tool or any machine part. Use a soft-faced hammer.
17. Practice cleanliness and orderliness in the shop areas.

18. Keep the floor around the machines clean, dry, and free from trip hazards. Do not allow chips to accumulate.

19. Think through the entire job before starting.

20. 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.

21. **Do not rush or take chances, Obey all safety rules.**

22. If you have not worked with a particular material before, check the hazardous materials data sheet book for any specific precautions to be taken while working with the material in question.

23. You should perform heavy sanding and painting in a well-ventilated area, preferably outside in the crane area.

24. Follow all appropriate precautions when working with solvents, paints, adhesives, or other chemicals, **Use appropriate protective equipment.**

25. Check the power cords and plugs on portable tools for damage before using them.

26. Use equipment for its intended purpose.

27. **Never** leave a machine running unattended.

28. **Do not** talk to, or permit anyone to fool around with equipment while you are operating it.

29. Get help in lifting or moving any heavy tools, materials, attachment, or equipment.

30. **Do not** cut any Beryllium Copper without proper ventilation and permission from shop supervisor.

31. Take care not to make loud and/or sudden noises.
Drill Press Safety Rules

1. Run drill at correct RPM for diameter of drill bit and material. Ask shop personnel for the correct RPM if not listed in your information book.

2. **Always** hold work in vise or clamp it to the drill table.

3. Use a correct ground drill bit for the material being drilled. Shop personnel will help you select the correct drill configuration.

4. Use the proper cutting fluid for the material being drilled. Ask the shop supervisor about the appropriate cutting fluid for the material you are machining.

5. Remove chips with a brush. **Never by hand or with a rag.**

6. Ease up on the drilling pressure as the drill starts to break through the backside of the material.

7. Do not use a dull or cracked drill. Inspect the drill before using it.

8. Do not drill with excessive pressure.

9. Always try to support part on parallels or a backing board when drilling through material.

10. **Never** place a taper shank tool, such as large diameter drill or tapered shank reamers in drill chuck. Only straight shank tool such as standard drills can be clamped in a drill chuck.

11. Always clean the drill shank and/or drill sleeve, and spindle bore before mounting.

12. **Never** try to loosen the drill chuck while the power is on.

13. Lower the drill spindle close to the table when releasing the drill chuck or taper shank drill to reduce the risk of damage to the drill and/or machine in the event of a fall. If the drill is large place a piece of wood on the table for the drill to drop onto it.

14. **Never clean the machine while in motion!**

15. If the drill binds in a hole, stop the machine and turn the spindle backwards by **hand** to release the drill bit from the material.

16. When drilling a deep hole, withdraw the drill bit quite **frequent** to clear out the chips. If the chip sticks to the drill bit use an **acid brush** to remove it.

17. **Always remove** the drill chuck key or the drill drift from the spindle **immediately after using**.

18. **Wear safety eye protection while drilling.**

19. Let the spindle stop of its **own accord** after turning the power off. **Never try to stop the spindle with your hands.**

20. Sheet metal, Plexiglas and other brittle plastics can be difficult to drill. Ask the shop supervisor for advice on the proper ground drills and coolant selection.
Lathe Safety Rules

1. Make sure that the chuck or faceplate is securely tightened onto the lathe spindle.
2. Move the tool bit a safe distance from the Collet or chuck when inserting or removing work.
3. Don’t run the machine faster than the proper cutting speed.
4. In setting up the tool post holder, place it too the left side of the compound slide to prevent the compound slide from running into the chuck or spindle attachments.
5. Always clamp the tool bit as short as possible in the tool holder to prevent it from breaking or vibrating.
6. Always make sure that the tool bit is sharp and has the proper clearance angles. Ask for assistance in making the proper adjustment.
7. If any filing is done on work revolving in the lathe, file left handed to prevent slipping into the chuck and never use a file without a handle.
8. If work is being turned between centers, make sure that the proper adjustments are made and that the tailstock is locked in place.
9. If work is being turning between centers and expands due to heat generated from cutting, readjust the center pressure to avoid excessive fraction on the centers.
10. Do not grasp or touch chips with your fingers, but get rid of them using a blunt instrument. It is safer to turn off the lathe before clearing chips than to leave it running.
11. Set the tool bit to the proper centerline height to prevent work from climbing over the tool bit or cutting above the centerline which causes drag between the tool bit and the material.
12. Do NOT cut work completely through when turning between centers.
13. Remove chuck key from chuck immediately after using.
14. Turn chuck or face plate through by hand before turning the power on, to make sure that there is no binding or clearance issues.
15. Always stop the machine before taking measurements.
16. Before cleaning the lathe, remove tools from the tool post and tailstock.
17. Never use a rag to clean the machine or part, when it is in motion!
Milling Machine Safety Rules

1. Work must be clamped securely in a vise and the vise clamped firmly to the table or the work piece must be clamped securely to the mill table.

2. **Never use a rag to clean the machine or part, when it is in motion!**

3. Do not perform climb milling on the milling machine unless instructed to do so.

4. Make sure cutter is rotating in the proper direction before cutting the material. Normally this is a clockwise direction when looking from above.

5. Before running a machine, the spindle should be rotated by hand to make that there are no clearance issues.

6. Make sure the power is off before changing cutters.

7. Always use the proper cutting fluid for the material being cut.

8. Never run the machine faster that the correct cutting speed.

9. Make sure that the machine is fully stopped before taking any measurements.

10. Always use cutters which are sharp and in good condition.

11. Don’t place anything on the milling machine table such as wrenches, hammers, or other tools when in operation.

12. Always stay at the machine while it’s running.

13. Do NOT make heavy cuts or use the rapid feed when milling. Always refer to speed and feed tables.

14. Remove the Collet tightening wrench **immediately** after each use.

15. Rig a guard or shied to prevent chips from hitting you or other people.

16. Use the milling machine spindle brake to stop the spindle after the power has been turned off.

17. Before cleaning the mill, remove cutting tools from spindle to avoid cutting yourself.
Grinding Safety Rules

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.

3. Never use a wheel that has been dropped or has received a heavy blow, even though there may be no apparent damage. Such wheels may have internal fractures and will explode upon startup.

4. Stand to one side when starting the grinder just in case the wheel disintegrates.

5. Do not grind on the side of the grinding wheel unless that wheel is specifically designed for that purpose.

6. Do not use excessive pressure while grinding. Do not exceed .0005 inch down-feed at any time on the surface grinder.

7. Report any cracked, broken or otherwise defected wheels to the area supervisor immediately.

8. Have the area supervisor mount and balance any new wheels.

9. 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.

10. Hold work securely while grinding, use the tool rest to support your work when performing any grinding operations on a bench or pedestal grinders.

11. Do NOT grind aluminum or magnesium. Aluminum will compact into the wheel’s pores and cause it to explode and magnesium is also extremely flammable.

12. Wear goggles or face shield over safety glasses when grinding on bench or pedestal grinders.

13. If a magnetic chuck is being used on the surface grinder, make sure that it is holding the work securely before starting the grinder operation.
Band Saw Safety Rules

1. The upper guide and guard should be set within ¼ of an inch or as close to the work as possible.

2. If the blade breaks, immediately shut off the power and stand clear until the machine has come to a complete stop.

3. Examine the blade for excessive wear or cracks. Do not install a cracked blade. If blade is cracked or has excessive wear notify a supervisor immediately.

4. Use the proper pitch blade for the thickness of the material to be cut. There should be at least two teeth per material thickness 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. Always refer to the cutting speed chart on the machine except for aluminum, ask shop supervisor for details.

6. If the saw stalls in the work piece, turn the power off and reverse the blade by hand “use the drive wheel to do this” to free the blade from the work piece.
Table Saw Safety Rules

1. Stand to one side of the work being fed through the saw. Never stand directly in line of the work.

2. Use the proper blade for the material and the type of cut. Do not use a rip blade for cross cutting or a crosscut blade for rip sawing and 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 make sure the blade is sharp and free from cracks or defects.

4. Never allow your fingers to get near the blade when sawing. Use a pusher stick to rip narrow pieces of stock. Do not use a pusher stick to remove scrap. For scrap removal, shut off the saw, wait until the blade comes to a complete stop, and then remove the scrapes.

5. Appropriate guards must be in place at all times.

6. If the piece of material that you are cutting is too large for one person to handle safely, get someone to assist you in “tailing-off” the excess material. Never try to do it alone. “Tailing-off” refers to supporting a large work-piece by supporting it underneath with your hands. Do not grasp it, just support the vertical load.

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 by shoving an object, piece of work, or anything else against the blade. Make sure the saw has stopped completely before leaving work area.

10. Never make any adjustments or measurements while the saw is in motion! Always turn off the power and make sure that the saw has made a complete stop before making any necessary adjustments or measurements.

11. Do not allow material to collect on or around the table saw. Sweep up all sawdust and material scrapes regularly while working to minimize chances of slipping or stumbling.

12. Make sure that work area is cleaned up thoroughly. Unclean work areas can cause accidents.

13. The blade of the circular saw should always be set to 1/8 of an inch above the work-piece to prevent kickback.

14. Always obtain shop approval and permission before using the table and/or radial-arm saw!
Power Hand (Skill) Saw Safety Rules

1. Before using any power tool, inspect it; make sure that the power cord is not damaged in any way. This includes examining the ground pin, making sure it is intact and check to see if the saw blade is sharp and undamaged. All damages should be reported to the shop supervisor immediately.

2. Do not use the saw in or near a wet area.

3. Do not run extension cords across walkways or anywhere else where there is a danger of someone tripping over them or where the cord/s may be ran over or damaged by movable equipment and/or carts.

4. Keep your hand out of the path of particles that are thrown out by the saw blade. Always wear eye protection.

5. Disconnect the power cord before cleaning, changing blades, or making any adjustments to the saw. Never pull or yank the cord to unplug it from the wall.

6. When it is necessary to raise the guard for certain types of cuts, always use the guard lever.

7. Never wedge, wire, or otherwise jam the guard to prevent it from working. This is a particularly dangerous practice and your ability to work in the machine shop will be revoked immediately.

8. Wait until the saw stops completely before lifting the saw from the cutting area.

9. Before setting the saw down, make sure the guard is closed; the blade may still be rotating.

10. Don’t carry the saw with your fingers on the switch trigger.

11. Don’t pull the saw backward in a cut if you can avoid it.

12. Use the proper saw blade for your work.

13. Do not use the cord to move or drag the saw from one location to another.

14. Do not use the power hand saw for cuts if you cannot keep a firm and secure grip on the saw and the work being cut. A handsaw is still the best method for some kinds of work and often faster.

15. Always consult shop personal before cutting small work pieces.
Disc and Belt Sander Safety Rules

1. Do not operate sanders without the guard/s in place
2. On the disc sander always use the downward motion side of the disc to sand, never the upward motion side; this can throw your work upward with tremendous force.
3. Always attempt to place your work against the rest on the disc or belt sanders.
4. On the horizontal belt sander, always sand so that the belt motion is away from you.
5. Do not operate the sander with a torn or ripped belt/disk.
**Welding Safety Rules**

1. **Shop staff approval is required before using any welding equipment.**

2. Welders, assistants, and anyone else in the welding area must wear proper glasses or shields of recommended shades during welding operations. Proper face shielding prevents burns to the retina of the eyes that may cause blindness.

3. Welders are **prohibited** to wear any contact lens. Lens can be fused to the cornea of the eyes, which may also cause blindness.

4. A screen shall be erected around the welding area to protect other personnel in the shop from injury or accident.

5. Always inspect all welding equipment to be used, for any possible damage. Report any damage to your supervisor immediately.

6. Avoid handling oxygen bottles with greasy hands, gloves, or rags. Fatal explosions have resulted from this.

7. Always strap tanks to a welding cart or a fixed object. Never allow a gas cylinder to be freestanding. Replace the safety cap on all cylinders when not in use.

8. When arc-welding, make sure the work and/or worktable is properly grounded.

9. Do not arc, mig, or tig weld in a wet area.

10. Be alert to all possible fire hazards. Move the object to be welded to a safe location or remove all flammable materials from the work area.

11. Never weld in the same area where degreasing or other cleaning operations are being performed.

12. Keep suitable fire extinguishing equipment nearby and know how to operate it.

13. Shut off the cylinder valves when the job is completed, release pressure from the regulators by opening the torch valves momentarily and then by back out regulator adjusting valves. Never leave the torch unattended with the pressure in the hoses.

14. Utilize all protective equipment and clothing. Do not weld with any part of the body uncovered. Light from the welding equipment is an actinic light (excessive ultraviolet) and will cause **severe burns** to the skin.

15. Never weld inside drums or enclosed spaces without adequate ventilation; or the use of airline respirators of self-contained breathing apparatus.

16. 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.
17. **Never cut or weld any container that has held explosive or flammable materials.** Use prescribed methods for cleaning or flooding.

18. Never use wrenches or any other type of tools except those provided or approved by the gas cylinder manufacturer to open valves. Never use a hammer to open or close valves.

19. Abide by any other safety measures required for each particular type of welding.

20. Allows for proper ventilation when brazing or soldering. The fumes are **acidic and toxic**.

21. Do **NOT** weld on a painted, galvanized, or greasy oil metals. Not only can the fumes be **toxic**; the welds will not be satisfactory and will eventually fail in use.
Safety Rules for Working with Solvents and Resins

1. Avoid skin contact. Wear latex or other suitable gloves.
2. Work in a fume hood if possible. Respirators are available when necessary.
3. Avoid using solvents around hot metals surfaces and flames.
4. **Do not smoke or light flames** in or near any areas where solvents are used or stored.
5. Report and clean up all spills immediately.
6. Do not work with solvents in confined or unventilated areas.
7. **Do not drink alcoholic beverages** or take medications containing alcohol before or during working with solvents. Alcohol in the bloodstream can cause synergistic reactions with various solvents that can lead to the loss of consciousness and even possible **death**.
8. Report all ill effects and skin disorders to the area supervisor immediately.
9. Develop and maintain good personal hygiene habits. Remove protective equipment and wash thoroughly after contact with solvents.
10. Mix resins in small batches.
Safety Rules for Heavy Sanding of Wood and Foam

1. Sanding should be done in a well ventilated area; away from other machines (preferably outside in the crane area).

2. Use a vacuum or a dust collector to collect dust while sanding to prevent the dispersal of particulates over a larger area.

3. A dust mask may be worn if desired. Dust masks are stored in the vertical cabinet by the front door.

4. **Safety glasses must be worn at all times.**