

SAFETY INSTRUCTIONS FOR THE USE OF MACHINE TOOLS

1. STATIONARY POWER TOOLS SAFETY

Many of the safety practices used for portable tools apply to stationary power tools. However, stationary tools tend to be larger, more powerful, and more complex. These factors can lead to serious injuries. These are reviewed below, followed by specific safety measures for a variety of stationary power tools:

1. Safety devices and guards must always be in place. These devices were designed by the manufacturer to be used with the tool.
2. Always keep blades and cutting edges sharp!
3. Perform maintenance, accessory changes, and adjustments only when the tool is off and unplugged.
4. Don't wear loose fitting clothing. High-powered stationary tools can catch clothing and draw the operator's body into the tool.
5. When using any type of stationary saw, never use gloves. They can get caught in the saw.
6. Never put your fingers and hands in front of saw blades and other cutting tools.
7. Never turn or feed the material or work piece at excessive speed. This increases stress on both the work piece and the machine.
8. Because stationary tools tend to be complex, tools from different manufacturers can vary in safety and operation procedures and precautions. Read the owner's manual and safety precautions before using.
9. Many stationary tools are equipped with emergency- off switches. Know the location of these switches and the tool power switch.
10. Make sure that blades, bits, and accessories are properly mounted. In addition, make sure all locking handles and clamps are tight before using a tool.
11. Watch for flying objects. Keep unnecessary personnel away from machines when in use.

2. TABLE SAW.

The circular blade of a table saw moves at very high speed. Employ the following precautions when using this tool:

1. Use the saw guard at all times. No operation shall be done with the guards removed.
2. Never reach over the saw blade to remove scraps, or to provide support to the work piece. If you are off- balance, you could fall into the saw.
3. Always stand to the side of the saw, and never directly in line with the blade. If the saw catches the material you are working on, the saw will throw it in line with the blade.
4. To prevent kickback never use a dull blade and never cut without the guide and splitter guard in place. In addition, don't drop wood on top of the saw blade.
5. When cutting, NEVER PULL the work piece through the saw. Start and finish the cut from the front of the saw.
6. Never feed the work piece from the back of the saw.
7. When crosscutting, hold the work piece firmly against the miter gauge. Make sure that the miter gauge works freely in the slot and that it will clear both sides of the blade when tilted. Note that on some saws the miter gauge can be used only on one side when the blade is tilted.
8. Use a push stick according to the manufacturer's guidelines. In general, when using a push stick or push block, the trailing end of the board must be square. A push stick against an uneven end could slip off or push the work away from the fence. The fence is the stop plate or barrier used to guide the work piece.

3. RADIAL ARM SAW

The radial arm- saw is a very versatile tool and is one of the most used tools in the shop. Because of its ability to cut a variety of ways, it presents a variety of hazards. However, if used properly it can be one of the safest tools in the shop. Follow these precautions when using a radial arm saw:

1. Never stand directly behind or in- line with the saw. Stand to either side of the saw.
2. The motor/ saw assembly must be returned to the rear of the table (against the column) after each cut. Never remove the work piece from the table until the saw has been returned to the rear.
3. When crosscutting, make sure the work piece is held against the guide fence. This will virtually eliminate kickback.
4. It's easy to overload the motor of a radial arm saw. If the motor overloads, check the motor and blades. Don't feed the work piece too quickly.
5. To minimize vibration, the saw should be maintained in good alignment and adjustment.
6. When lowering the blade, keep your hands and arms out of the way of the blade!

7. When ripping, make sure that the blade rotates toward you and always feed the work piece under the safety guard from the side opposite to the anti- kickback fingers. When ripping narrow stock, use a push stick to complete the cut.

4. BAND SAW AND JIG SAW.

A main safety concern with the band saw is the breakage of the blade. In addition, because both the band saw and jig saw allow for intricate cuts, the fingers can come close to the saw blade. The following rules can minimize injuries from these hazards:

Band Saw:

1. Always stand to the left of the band saw. In the event of a broken blade, the blade will fly off to the right. If the blade breaks, shut- off the power and stay away from the saw until it stops.
2. Care should be taken in uncoiling, removing, and installing the band saw blade. Use gloves. The blade shall be adjusted and tensioned properly.
3. The blade guard is very important when using the band saw and jig saw. Keep your fingers away from exposed parts of the blade.
4. Follow the manufacturer's guidelines for adjustment of the sliding bar or post. If the guide is too high, the blade will not have the proper support.
5. Avoid backing out of the cut. This could push the blade off the wheels.
6. Never cut a small radius with a wide blade unless you make relief cuts first.

Jig Saw:

1. Always install the blade with the teeth pointing down.
2. Adjust the tension according to the manufacturer's guidelines. Turn the pulley over by hand to make sure that the blade operates properly before turning on the power.
3. Do not place excess force on the jigsaw blade. It can easily break and fly off.
4. Adjust the blade guide and hold down properly.

5. WHEEL GRINDERS, BENCH GRINDERS.

The chief hazards from wheel grinders are flying pieces of a shattered grinding wheel and being cut by the grinding wheel. Follow these precautions to avoid these hazards:

5. Before each use, inspect the grinder to ensure that the grinding wheels are firmly attached and that the work rests are tight.
6. Because some grinders can be converted to buffers, guards are often removed. When using the unit as a grinder, always have a guard in-place.
7. Always inspect the grinding wheel before use. The wheel should be free of cracks. All grinding wheels shall be ring-tested prior to installation.
8. Too much pressure on the wheel can cause it to fracture. Spend more time at lighter pressure. Always use grinding discs that are marked with a rating speed above the maximum speed of the grinder. Never use an unmarked grinding wheel. Check the spindle speed before mounting the wheel.

6. LATHES

The lathe is different from some of the tools presented thus far. While most tools rotate or move a blade or bit to cut, the lathe moves the work piece being cut. If the work piece is not fastened to the lathe properly or is defective, it can fly off or break apart, causing injury.

To minimize this and others, follow these safety rules:

1. Stand to the side of the lathe. This will also minimize the chance of being hit by a tool if it catches.
2. The work piece (especially wood) should be free of cracks, knots, and other defects. Check for weak glue joints.
3. Watch out for flying chips and shavings. Always wear safety glasses with side shields. Make sure that anyone in close proximity to the lathe is doing the same.
4. Adjust the tool rest as close as possible to the work piece. Then revolve the stock by hand to make sure that it clears the rest.
5. Avoid long nods projecting from the rear of the headstock at high speeds. The whipping action can cause serious injuries.
6. Always run the lathe at low speed until the work piece is rounded.
7. Check to make sure that the chuck is secured before turning the lathe on.

8. **DANGER!** Lathe chips are sharp; do **NOT** remove them with your hands. An air hose should **NEVER** be used to remove chips. The flying particles might injure you or a nearby person.
9. No attempt should be made to operate a lathe until you know the proper procedures and have been checked out on its safe operation by your instructor.
10. Dress appropriately! Remove necktie, necklace, wrist watch, rings and other jewelry, and loose fitting sweaters. Wear an apron or a properly fitted shop coat. Safety glasses are a must!
11. Clamp all work solidly! Use the correct size tool and work holding device for the job. Get help when handling large sections of metal and heavy chucks and attachments.
12. Check work frequently when it is being machined between centers. The work expands as it heats up and could damage the tailstock center.
13. Be sure all guards are in place before attempting to operate the machine.
14. Turn the faceplate or chuck by hand to be sure there is **NO** binding or danger of the work striking any part of the lathe.
15. Keep the machine clear of tools!
16. Stop the machine before making measurements and adjustments.
17. Remember--chips are sharp! Do **NOT** try to remove them with your hands when they become "stringy" and build up on the tool post. Stop the machine and remove them with pliers.
18. Do **NOT** permit small diameter work to project too far from the chuck without support from the tailstock. Without support, the work will be tapered, or worse, spring, up over the cutting tool and/or break.
19. Be careful **NOT** to run the cutting tool into the chuck. Check any readjustment of work or tool for ample clearance when the cutter has been moved left to the farthest point that will be machined.
20. Stop the machine before attempting to wipe down, a machine surface.
21. Before repositioning or removing work from the lathe, move the cutting tool clear of the work area. This will prevent accidental cuts from the cutter bit.
22. Avoid talking to anyone while running a lathe! Do **NOT** permit anyone to fool around with the machine while you are operating it. You are the only one who should turn the machine on or off, or make adjustments to the lathe.
23. If the lathe has a threaded spindle nose, never attempt to run the chuck on or off the spindle using power. It is also dangerous- practice to stop such a lathe by reversing the direction of rotation. The chuck could spin off and cause serious injury to you. There is also the danger of damaging the machine.
24. You should always be aware of the direction of travel and speed of the carriage before engaging the half-nuts or automatic feed.
25. Always remove the key from the chuck. Make it a habit **NEVER** to let go of the key until it is out of the chuck and clear of the work area.
26. Tools must **NOT** be placed on the lathe ways. Use a tool board or place them on the lathe tray.
27. When filing on the lathe, be sure the file has a securely fitting handle.
28. Stop the machine immediately if some off sounding noise or vibration develops during operation. If you cannot locate the trouble, get help from your instructor. Under no condition should the machine be operated until the trouble has been corrected.
29. Remove sharp edges and burrs from work before removing it from the machine.
30. Plan your work thoroughly before starting. Have all needed tools on hand.

Use care when cleaning the lathe. Chips sometimes stick in recesses. Remove them with a brush or short stick. **NEVER** clean a machine tool with compressed air.

DANGER! Stop the machine before making measurements or cleaning out chips.

SAFETY NOTE! **NEVER** turn on the lathe until checking that you did **NOT** accidentally leave the chuck key in the chuck.

7. **BENDING MACHINE OR BRAKE**

Though the bender is powered by human force alone, the long push arm, counterweight can generate a great deal of force. If body parts get caught in the brake, they can be easily broken or amputated. It's easy to prevent this and other injuries from occurring. Follow these safety rules when using the brake:

1. Never place any body part in the blade area.
2. Always check the work area around the brake. Be sure that the area is free from people.
3. Before using the brake, check the counterweight rods and counterweights to make sure they are secure.
4. Never place material in the brake, which is too rigid for the capacity of the brake. Overstraining the brake can cause the arm and other parts to break and possibly cause injury.

8. WELDING MACHINE

The high-energy arc of even the smallest welding machine can cause severe burns. When welding, the following precautions must be observed:

1. Ideally, welding should be performed in a separate, well-ventilated room with a fire-resistant flooring material. If welding is to be conducted in other areas, the area must be free of flammable materials.
2. Non-flammable clothing, eye, and hand protection must be worn to protect from molten metal and hot sparks. Eye protection must provide appropriate shading according to the guidelines of the American National Standards Institute (ANSI).
3. Consult your safety representative for help in determining the appropriate eye protection, and other protective equipment, for your operation.

9. SHEET METALS SHEARS

When using shears, follow these precautions:

1. Keep fingers away from the cutting blade.
2. Wear leather gloves when handling sheet metal to avoid cuts from sharp edges.
3. Keep objects other than the piece being cut away from the blade.

10. TAPS

Hand threading safety:

1. If a tap or threaded piece must be cleaned of chips with compressed air, protect your eyes from flying chips by wearing goggles. Take care **NOT** to endanger persons working in the area near you!
2. Chips produced by hand threading are sharp. Use a brush or piece of cloth, **NOT** your hand, to remove them!
3. Newly cut external threads are very sharp. Again, use a brush or cloth to clean them.
4. Wash your hands after using cutting fluids or oils! Some cause skin rash. This can develop into a serious skin disorder if the oils are left on hands for extended periods.
5. Have cuts treated by a qualified person. Infections can occur when cuts and other injuries are NOT properly treated.

11. DRILL PRESS AND MILLING SAFETY

Many of the safety rules of the portable drill apply to the drill press. In addition, follow these rules:

1. Always secure the material being drilled.
2. When lowering the press, keep your hands out of the way of the bit.
3. Never use a hand bit or auger bit. Use bits designed only for the drill press.
4. Never try to stop the machine by taking hold of the chuck after the power is off.
5. Check to make sure the chuck is secured before turning the drill press on.
6. Remove neckties and tuck in loose clothing so there is no chance of them becoming entangled in the rotating drill!
7. Check out the machine! Are all guards in place? Do switches work? Does the machine operate properly? Are the tools sharpened for the material being worked?
8. Clamp the work solidly. Do NOT hold work with your hand. A "merry-go-round" can inflict serious and painful injuries.
9. Wear goggles!
10. Place a piece of wood under drills being removed from the machine. Small drills can be damaged when dropped and the larger tools can injure you if dropped.
11. Use sharp tools
12. Clean chips from the work with a brush, NOT your hands!
13. Treat cuts and scratches immediately!
14. Always remove the key from the chuck **BEFORE** turning on the power.
15. Let the drill spindle stop on its own after turning off the power. Do NOT attempt to stop it with your hand!
16. Keep the work area clear of chips.
17. Wipe up all cutting fluid that spills on the floor right away.
18. Avoid trying to clean the tapered opening in the spindle while it is rotating.
19. After using a drill, wipe it clean of chips and cutting fluid. Replace the tool to proper storage.
20. Never start a cut until you are sure there is adequate clearance on all moving parts!

DRILLS

- **SAFETY NOTE!** NEVER attempt to operate a drilling machine while your senses are impaired by medication or other substances.
- **DANGER!** Always remove the key from the chuck before turning on the drill press. It could hit something or fly out with considerable force.
- **DANGER!** Serious injury can result from work that becomes loose and spins about on a drill press or milling machine. This dangerous situation is nicknamed a "merry-go-round".
- **DANGER!** NEVER insert a tap into the drill chuck and attempt to use drill press POWER to run the tap into the work. The tap will shatter when power is applied. Turn the tap by hand!

12. MILLING MACHINE

Milling machines present similar hazards as drill presses and lathes. Follow these general safety rules when using the milling machine:

1. Become thoroughly familiar with the milling machine before attempting to operate it. When in doubt, obtain additional instructions.
2. Wear appropriate clothing and approved safety glasses!
3. Stop the machine before attempting to make adjustments or measurements!
4. Get help to move any heavy machine attachment, such as a vise, dividing head, rotary table or large work.
5. Stop the machine before trying to -remove accumulated chips.
6. Never reach over or near a rotating cutter!
7. Be sure the work holding device is mounted solidly to the table, and the work is held firmly. Spring or vibration in the work can cause thin cutters to jam and shatter!
8. Avoid talking with anyone while operating a machine tool, nor allow anyone to turn your machine on for you.
9. Keep the floor around your machine clear of chips and wipe up spilled cutting fluid immediately!
10. Be thoroughly familiar with the placement of the machine's STOP switch or lever.
11. Treat any small cuts and skin punctures as potential infections! Clean them thoroughly. Apply antiseptic and cover injury with a bandage. Report any injury, no matter how minor, to your instructor or supervisor.
12. Never "fool around" when operating a milling machine! Keep your mind on the job and be ready for any emergency!
13. Be sure all power to the machine is turned off before opening or removing guards and covers.
14. Secure the work piece in a vice or clamp to the table.
15. Maintain cutting fluids properly. Prevent coolant from getting on the floor.
16. Keep fingers from rotating cutters.
17. Use appropriate feeds and speeds for the material machined.
18. Avoid performing a machining operation on the milling machine until you are thoroughly familiar with how it should be done.
19. Some materials that are machined produce chips, dust and fumes that are dangerous to your health. NEVER machine materials that contain asbestos, Fiberglass, beryllium and beryllium copper unless you are fully aware of the precautions that must be taken.
20. Be sure the cutter rotates in the proper direction. Expensive cutters can be quickly ruined.
21. Carefully store milling cutters, arbors, collets, adapters, etc., after use. They can be damaged if not stored properly.

MILLS

- **WARNING!** Never activate rapid traverse with the cutter in a cut.
- **DANGER!** Make sure the machine has come to a complete stop before attempting to adjust V-belts.
- **CHIPS are RAZOR SHARP;** do NOT use your hands to remove them. NEVER remove chips with compressed air. The flying chips may injure you or a nearby person.
- If cutting oil was used, the oily mist produced by the compressed air is highly flammable. If ignited by an open flame, it can produce explosive results. Finish by wiping down the machine with a soft cloth.