



# APRIL Machine Shop

## *Rules and Operating Procedures*

### **IN AN EMERGENCY DIAL 911**

*Phone is Located on Grinding Bench to the Right of the Door*

**Never operate equipment if you are not authorized for use and trained on that equipment. The following is meant as minimum operating standards for the listed equipment. If you feel uncomfortable at any time operating the listed equipment, contact the Machine Shop Responsible Person (MSRP) for further instruction.**

#### **Machine Shop Responsible Person**

Justin Tesmer  
jtesmer@umich.edu  
734-274-1148

#### **General Shop Attire and Personal Protective Equipment (PPE) Rules:**

1. Safety glasses with side shields (ANSI Z87.1 approved) must be worn at all times.
2. Rings, watches, bracelets, and large earrings may not be worn in the shop. Necklaces may be worn if securely contained inside the shirt. Remember: remove or secure any item that may be caught in moving/rotating machinery.
3. Long, loose hairstyles must be restrained in a cap, bonnet or other appropriate manner to no longer than chin-length. Bangs must also be restrained tight to the forehead.
4. Facial hair that might become entangled in rotating equipment must be securely restrained.
5. Only close-fitting clothing made of smooth, close-woven fabrics may be worn in the shop. Neckties, sweaters, and bulky shirts may not be worn. Full length pants are required when operating shop equipment that may generate hot or sharp debris
6. Long sleeves on shirts must be rolled up, and maintained, above the elbows.
7. Leather, closed-toe, shoes should be worn in the shop. Thin fabric shoes, sandals, open-toed shoes, and high-heeled shoes are prohibited., and high-heeled shoes are prohibited.

#### **General Shop Safety Rules - The list of “NEVER”s:**

1. **NEVER** operate equipment until you have been given instruction in its operation, and permission to use it, from the MSRP. If you are in doubt about its safe operation ask the MSRP before proceeding.
2. **NEVER** work alone. (Implement the “buddy” system.) Two people must be present in the shop at ALL times.

3. **NEVER** operate a machine unless you are in complete control of your physical and emotional faculties. You may not operate a machine if you are sick, tired, intoxicated/ drugged, stressed or angry.
4. **NEVER** use your hands to stop a moving machine part such as a drill press or lathe chuck. Always keep hands, and other body parts, a safe distance from moving machine parts, work pieces, and cutters.
5. **NEVER** clean, oil, adjust, or change gears or belt pulleys unless a machine has completely stopped. When making repairs or accessory changes, such as changing a lathe chuck, shut-off power to the machine at its electrical box or pull its power plug so that it cannot be accidentally powered on. Follow OSEH Guideline, [Lock-out/Tag-out – Control of Hazardous Energy Sources](#).
6. **NEVER** allow more than one person to operate a machine at any time.
7. **NEVER** be distracted by day-dreaming or conversation while running a machine.
8. **NEVER** walk away from a machine that is powered and operational.
9. **NEVER** startle anyone who is operating a machine. If it is necessary to get the machine operator's attention, do so in a careful manner.
10. **NEVER** sit or lean on a machine – keep your hands off unless you are operating it! a. Maintain an upright, well-balanced stance while operating a machine.
11. **NEVER** allow large quantities of chips or debris to accumulate around a work piece.
12. **NEVER** move metal chips with bare hands a. Use a brush, stick, pliers or other mechanical method.
13. **NEVER** attempt to take measurements on a work piece while the machine is running.
14. **NEVER** engage in any form of horseplay, or pranks, in the shop.
15. **NEVER** use damaged hand tools such as a hammer with a loose head or a file without a handle.
16. **NEVER** remove or deactivate guards or other safety devices from machinery and equipment except when necessary for servicing.
17. **NEVER** use hand tools for work other than their designed purposes only. For example, never use a scribe as a center punch or a file as a hammer.
18. **NEVER** leave the shop messy. Vacuum clean all machining chips and dust and sweep the floor below the area you were working.

## **Vertical Mill Safety Guidelines:**

1. You must obtain basic shop safety training and equipment specific training before using this tool. Must wear appropriate PPE and follow all shop rules. Refer to the manufacturer's operating manual for all operating procedures
2. While operating the milling machine allow no one else to touch it
3. Keep hands away from moving cutting tools.
4. Do not make measurements of the stock while the milling machine is powered.
5. Do not allow large quantities of chips to accumulate around the work piece or machine table. Stopping the machine, use a brush, or vacuum to remove all excess chips from the mill bed and stock
6. Always use cutters which are sharp and in good condition.
7. Cutting tools must be securely fastened in the machine spindle with the proper accessory. tighten cutting bits or tools by hand.
8. Make sure the cutting tool is clear of the work piece and vise before starting the machine.
9. Make sure cutter is rotating in the proper direction before cutting material.
10. Do not power the machine to tighten or loosen cutting bits or tools.
11. Work pieces and stock must be rigidly fastened to the mill bed with clamps, a vise, or special fixtures.
12. Use appropriate speeds and feeds for the type and size of cutter being used and the material being machined.
13. If cutting fluid is required, always use the proper cutting fluid for the material being cut.
14. Always stay at the machine while it is running.
15. Use the milling machine spindle brake to stop the spindle after the power has been turned off.
16. Before cleaning the mill, remove cutting tools from the spindle to avoid cutting yourself.
17. Follow OSEH Guideline, [Lock-out/Tag-out – Control of Hazardous Energy Sources](#) if making repairs or servicing.

## ShopBot CNC Router Safety Guidelines:

1. You must obtain basic shop safety training and equipment specific training before using this tool. Must wear appropriate PPE and follow all shop rules. Refer to the manufacturer's operating manual for all operating procedures.
2. The ShopBot can produce upwards of 90dB of noise. Always wear hearing protection.
3. While the ShopBot is operating, stand clear of the moving table. The table extents are marked in caution tape on the ground
4. Keep hands away from moving cutting tools.
5. Do not make measurements of the stock while the milling machine is powered.
6. Excess wood chips are a fire hazard! Always operate dust collection when ShopBot is cutting. Do not allow large quantities of chips to accumulate around the work piece or machine table.
7. Always use cutters which are sharp and in good condition.
8. Cutting tools must be securely fastened in the machine spindle with the proper accessory. Tighten cutting bits or tools by hand.
9. Securely mount stock to a spoil board (not the deck) before cutting. Be sure that and mount screws or fixtures do not lie in the intended tool path.
10. Make sure that the intended cutting path does not disengage cut parts from your supports. Add addition supports or tabbing where necessary.
11. Always check your spindle (z-axis) zero point before running a part file. A poor spindle zero can ruin tabbing and cause unsupported pieces to fly from machine.
12. Always stay at the machine while it is running.
13. Be aware of the location of **both** emergency stop buttons before starting machine.
14. When creating tool paths, be sure to cut and pockets, holes, or enclosed features before cutting external features or profiles.
15. Follow OSEH Guideline, [Lock-out/Tag-out – Control of Hazardous Energy Sources](#) if making repairs or servicing.

## **Lathe Safety Guidelines:**

1. You must obtain basic shop safety training and equipment specific training before using this tool. Must wear appropriate PPE and follow all shop rules. Refer to the manufacturer's operating manual for all operating procedures
2. While operating the lathe allow no one else to touch it
3. Know the location of the Start, Stop, and speed adjustment switches
4. Keep hands away from part being machined.
5. Do not make measurements of the stock while the lathe is powered.
6. Do not allow large quantities of chips to accumulate around the work piece or in the lathe bed. Stopping the machine, use a brush, or vacuum to remove all excess chips from the work area and lathe bed.
7. All stock must be properly secured in the lathe chuck or collet prior to the machining process taking place. Use the correct sized collet for the stock being machined.
8. Prior to first start, turn the chuck or faceplate by hand to ensure there is no binding or danger of the work striking any part of the lathe.
9. Prior to starting the lathe, ensure that small diameter stock does not project too far from the chuck without support from the tail stock center. Convention is to cantilever stock no more than 3 times its diameter.
10. Make sure spindle is rotating in the proper direction before cutting material.
11. The operator must always be aware of the direction and speed of the carriage or cross-feed prior to engaging the automatic feed.
12. Use appropriate speeds and feeds for the type and size of cutter being used and the material being machined.
13. If cutting fluid is required, always use the proper cutting fluid for the material being cut.
14. Always stay at the machine while it is running.
15. Only properly sharpened drill bits and cutting tools in good condition should be used. Dull drill bits and chipped or broken cutting tools must be removed from service.
16. Follow OSEH Guideline, [Lock-out/Tag-out – Control of Hazardous Energy Sources](#) if making repairs or servicing.

## **Drill Press Safety Guidelines:**

1. You must obtain basic shop safety training and equipment specific training before using this tool. Must wear appropriate PPE and follow all shop rules. Refer to the manufacturer's operating manual for all operating procedures
2. Ensure belt cover is in place before operation.
3. Know the location of the Start/Stop switch
4. Use only properly sharpened drill bits, sockets and chucks in good condition. Remove dull drill bits, battered tangs, or sockets from service.
5. Do not remove by hand metal or wood chips from the table or stock. Use brushes or other tools to properly remove chips.
6. Do not place tapered 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.
7. Always clean drill shank and/or drill sleeve, and, spindle hole before mounting.
8. Do not attempt to oil the machine or make adjustments to the work while the drill press is in motion.
9. Do not insert a drill chuck key into the chuck or loosen the drill chuck until the power is shut off and the machine has come to a complete stop.
10. All stock must be properly secured with a vise or clamps prior to a machining process.
11. If the stock slips in the vise or clamp, the operator must not attempt to hold the work with his/her hand or try to tighten the vise/clamp while the machine is in motion. Shutdown the power to the machine prior to re-tightening the loose stock.
12. Use the correct speed and drill for the type of stock being machined.
13. The drill bit should be mounted the full depth and in the center of the chuck.
14. Position the table, adjust the feed stroke, and/or use a wood back-up to eliminate the possibility of the bit striking the table.
15. If cutting fluid is required, use the proper cutting fluid for the materials being drilled.
16. Feed the bit smoothly into the work. If the hole being drilled is deep, withdraw the bit frequently to remove shaving on the bit.
17. If the bit binds, stop the machine and turn the spindle backwards by hand to release the bit.
18. Ease up on drilling pressure as the drill starts to break through the bottom of the material.
19. Follow OSEH Guideline, [Lock-out/Tag-out – Control of Hazardous Energy Sources](#) if making repairs or servicing.

## **Bandsaw Safely Guidelines:**

1. You must obtain basic shop safety training and equipment specific training before using this tool. Must wear appropriate PPE and follow all shop rules. Refer to the manufacturer's operating manual for all operating procedures
2. Ensure the guard doors are closed and the blade is properly adjusted prior to turning on the machine.
3. Know the location of the Start/Stop switch
4. Adjust the upper guard assembly to within 1/4 inch of the stock prior to starting the machine.
5. Check to ensure the band saw blade is sharpened.
6. Use the wheel indicator on the bandsaw to select the appropriate cutting speed for the size and material of the stock being cut. Adjust speed only when the band saw is powered on and moving.
7. 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.
8. Check to ensure the band saw is correct for the type of stock and correct speed being used.
9. Allow the saw to reach full set speed prior to cutting stock.
10. Make "release" cuts before cutting long curves.
11. Plan saw cuts to avoid backing out of curves in the stock.
12. Never push a piece of stock with hands in line with the saw blade. Use a sacrificial push piece to cut small or awkwardly shaped parts.
13. All round stock must be secured in a tabletop vise or clamp prior to starting the cut.
14. If the saw blade binds on a piece of stock, turn the saw off and wait until it comes to a complete stop before attempting to remove the blade from the stock.
15. If the band breaks, immediately shut off the power and stand clear until the machine has stopped.
16. Follow OSEH Guideline, [Lock-out/Tag-out – Control of Hazardous Energy Sources](#) if making repairs or servicing.

## **Bench Grinder Safety Guidelines:**

1. You must obtain basic shop safety training and equipment specific training before using this tool. Must wear appropriate PPE and follow all shop rules. Refer to the manufacturer's operating manual for all operating procedures
2. Abrasive wheel machinery should not be operated without the appropriate guards in place.
3. Know the location of the Start/Stop switch
4. Inspect the wheels before turning on the power. Do not use wheels that are chipped or cracked.
5. Check to ensure the band saw blade is sharpened.
6. Stand to one side of the wheel when turning on the power. Damaged wheels will sometimes fly apart, and this is most likely to happen upon startup.
7. Prior to adjusting the work rest or tang, ensure machine is powered off and wheel has come to a full stop.
8. Keep the tool rest as close to the grinding wheel as possible without touching it. The tool rest must be minimally within 1/8 of an inch of the grinding wheel, and ideally the gap should be smaller than the thinnest dimension of the part you are grinding.
9. Prior to starting the grinder, ensure the tang at the top of the wheel opening is located within 1/4 inch of the wheel.
10. Be alert and cautious when a grinding operation requires locating fingers close to the wheel.
11. Feed the stock into the wheel with light to medium pressure. Do not force the piece.
12. Do not use the side of the grinding wheel to shape stock.
13. Stand erect in front of the grinder with both legs straight and slightly apart. Avoid stooping or leaning into the machine.
14. 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.
15. Hold work securely while grinding, use the tool rest to support the work when off-hand grinding on bench or pedestal grinders.
16. Do not grind aluminum. Aluminum dust is explosive.
17. Follow OSEH Guideline, [Lock-out/Tag-out – Control of Hazardous Energy Sources](#) if making repairs or servicing.