

# NNSC Machine Shop Safety Rules

**ONLY TRAINED AND AUTHORIZED OPERATORS MAY OPERATE TOOLS and EQUIPMENT** located in the NNSC Machine shop (room 241). Training may be formal (classroom, machinist union apprenticeship, etc.) or on-the-job, but it must be documented and it must include training on each piece of equipment to be used. Training documentation must be forwarded to Peter Ross prior to authorization being granted.

## KEY POINTS AND SUPPORTING INFORMATION

1. **State of Mind.** Do not operate power tools when you are ill, taking strong medications, fatigued or consuming alcoholic drinks. Do not smoke while working with tools.
2. **Wear proper clothing for the type of work being done.** Do not wear loose-fitting clothes or jewelry that can get caught in moving parts. Do not roll up long sleeves. Do not wear highly flammable clothes. Do not wear sandals, open-toed or canvas shoes. Wearing safety-toed shoes is preferable for protection of feet and toes.
3. **Protect your eyes, face, head, and scalp.** At a minimum, wear industrial-quality safety glasses with side shields. (Safety glasses must have the Z87.1 logo on them to assure they qualify as impact resistant.) Add a face shield or wear impact resistant goggles if flying particles are expected during the machining process. For welding wear eye and face protection appropriate for the kind of work being conducted. Pull back long hair in a band and tuck it under your shirt collar or a cap to keep it from getting caught in tools.
4. **Avoid distractions.** Keep your mind on your work. Talking or listening to the radio while running machinery can lead to accidents. Stop working and turn off the power tool you are working with if distracted by something or someone. Never look away from your work when operating a power tool.
5. **Keep the work area clean.** Keep the floor free of scraps and oil. Cluttered work areas invite accidents. Keeping workshop and storage spaces clean and dry can help prevent many accidents. Sparks can ignite scraps, sawdust and solvents. Water can conduct electricity. Do not stand in water, on damp floors or in the rain when working with electrical tools. Keep hands and tools dry.
6. **Use the correct tools for the job.** Do not use a tool or attachment for something it was not designed to do. Select the correct bit, cutter or grinding wheel for the material with which you are working. This saves time and improves the quality of work and reduces the risk of mishap. If necessary, consult the instructions or shop manual, or call a dealer or an expert on tool use.
7. **Metal work.** When working with metal, secure the metal materials with clamps or in a machinist's vise to keep it from moving.

## NNSC Machine Shop Safety Rules

8. **Work only at operating speed.** Do not use a power tool before it has reached operating speed or while it is coming to a stop. Never force a tool by applying too much pressure. Let each tool work at its own speed without forcing it. Once a power tool has been turned off, allow it to coast to a stop. Never force an object into moving parts to stop a machine.
9. **Keep tools clean and in good repair.** Always clean up power tools before putting them away. Avoid using tools that are or appear to be in disrepair. Use power tools only for their intended functions.
10. **Repairing and Cleaning Power Tools.** Always turn off and unplug a power tool before (1) adjusting, oiling, cleaning or repairing it; (2) attaching an accessory; or (3) changing bits, blades or grinding wheels. Unplug or lockout tools when not in use. Unplug tools by pulling directly on the plug. Jerking on the cord can cause damage to the tool. Do not leave tools, hardware and other materials out when not in use. Before making adjustments or changing bits or cutters, disconnect the power cord to avoid accidentally touching the switch and possible injury when the tool starts.
11. **Compressed Air Used for Cleaning.** OSHA regulates the use of compressed air for cleaning in 29 CFR 1910.242(b) as follows:
  - Employees shall not use compressed air for cleaning themselves or their clothing.
  - The operator shall not direct compressed air at nearby employees.
  - Compressed air used for cleaning work areas, such as work benches, table saws, and drill presses, shall not exceed 30 psi at the outlet, statically or dynamically, and shall be permitted only with effective chip guarding or personal protective equipment (as described in section 1910.133) to protect the operator and other employees from flying debris.
12. **Keep guards in place.** Safety guards cannot protect you if they are not in place and in proper working order.
13. **Do not leave a machine running unattended.** Make sure all moving parts have come to a complete stop before you leave the work area or before you make minor adjustments.
14. **Know the machine.** Before using any tool, read the operator's manual, or comparable literature as available, to learn the applications, limitations, and potential of each power tool. Never use a tool unless trained to do so. Inspect it before each use and replace or repair if parts are worn or damaged. Repair tools only if you are trained to do so. Inspect screws, nuts, bolts and movable parts to make sure they are tightened. Make sure the cord will not become caught or tangled. The cord should be flexible,

## NNSC Machine Shop Safety Rules

but not easy to knot. Clean the cord regularly and inspect the grounding connections. Use a ground fault circuit interrupter when working with power tools.

15. **Know the switch location(s).** Remember where the switch is located so you can turn off the machine quickly.
16. **Use safe blades.** Never use cracked or kinked saw blades. Keep saw blades sharp and properly set.
17. **Ventilation.** No welding, cutting or brazing may occur in the shop. Move equipment to the welding table located under the awning in the courtyard. Avoid operating power tools in locations where sparks could ignite flammable vapors. Keep the shop well ventilated and flammable materials properly stored.
18. **Rags.** Used rags, especially oily and greasy ones, should be kept in a covered, marked container. Rags should be a safe distance from the welder and other sources of ignition.
19. **Hazardous materials.** Take extra care when working with hazardous materials. Due to the extreme fire hazard, machining or grinding of magnesium is prohibited in the NNSC Machine Shop. Handle fiberglass with care. Its particles can irritate the skin, eyes and respiratory system. When soldering, remember that lead solder is toxic. The work area should be ventilated or you should wear the appropriate respirator if you have been properly trained to do so.
20. **Fires.** Shop fires can be any, or all, of three fire classes: Class A, ordinary combustibles; Class B, combustible liquids; and Class C, fires in live electrical equipment. To eliminate the need for extinguishers for all three classes, install at least one 20-pound ABC Class extinguisher in a convenient location, and possibly more, depending on the size of the shop.
21. **Storage.** Develop a system of racks, bins and tool panels to make it easy to find the right tool or materials quickly. Don't store tools, supplies or spare parts in the aisle or on the floor where they become tripping hazards. Keep other flammable materials away from heaters and welding areas to prevent fire. Grease, oil, paint and solvents should be stored in a closed metal container, preferably in metal cabinets. Gasoline or other fuels should never be stored inside the shop. Supplies and equipment should be stored in an area designed specifically for them.
22. **Personal Tools.** Personal power tools may not be brought from home for use in the NNSC machine shop. If having a personally owned power tool at work is required for a work-related project, then it should be used and stored in your lab.
23. **Housekeeping.** Each user is expected to clean up after him/herself. Good housekeeping helps ensure long tool life and a safer work area for everyone.

# NNSC Machine Shop Safety Rules

## Safety for Specific Power Tools

**Band Saws:** Keep the saw blade set evenly and with the correct tension. Push the stock through the blade with your hands on both sides of the line of cut or, **preferably**, use a push bar designed for this purpose. Do not push with excessive force as this leads to slipping or to blade failure. If excessive force is required to cut, either the blade is dull and needs to be replaced, or the material is too hard for the saw. Excessive guard clearance can lead to serious accidents with the fingers losing! **ALWAYS LOWER THE GUARD** so that it just clears the work and return it to its lowest position when you have completed your cut.

**Grinders:** Never operate a grinder without protecting your eyes with safety glasses, goggles, or a face shield. If the material being worked on will produce a lot of dust or other particles, you should wear a filtering face piece (dust mask) respirator. (**NOTE:** you must receive information from EH&S before using a dust mask for any reason.) Make sure the grinder has guard housing. Place the tool rest 1/8 from the wheel on bench-mounted units. Before starting a portable grinder, look to see where the sparks might fall. Clean the work area if necessary. When starting a grinder, stand to one side of the wheel and turn on the switch. Allow the wheel to reach full speed before stepping into the grinding position. Grind on the face of the wheel unless otherwise designed. Use a vise-grip pliers or clamp to hold small pieces. Move the workpiece slowly across the wheel face. Allow the wheel to stop naturally when turning it off. Periodically check for soundness of grinding wheels. If wheels are badly worn, cracked or out-of-round, lock the grinder out and contact Facilities for maintenance. Abrasive wheels should be stored hanging from a hook or in a vertical position to lessen the change of cracking that can occur from stacking horizontally.

**Note:** Different abrasive wheels are manufactured for different metals/uses. Never grind soft metals on a wheel designed for hard metal grinding as the soft metal fines/dusts can become incorporated within the wheel resin, causing overheating and subsequent wheel disintegration. Be sure the abrasive wheel you are using is correct for the job. (Refer to the posted chart on how to read abrasive wheel markings.)

**Lathe:** Before operation, lubricate the spindle bearings and the ways with the appropriate oil provided. Do not wear loose fitting clothing when operating the lathe. This lathe is equipped with a screw-type mount for the lathe chuck and faceplate. **DO NOT** run the lathe backwards under load, as the chuck will unscrew itself from the spindle. This is a tool room lathe, not a production lathe. Take light cuts and use low feed rates. Do not clear chips from the cutting tools with your fingers! Stop the machine before you attempt to clear chips wrapped around the tool or the work. **NEVER**, never let go of the chuck wrench, unless you have placed it back in the drawer. Do not ever take your hand off of this wrench when you are using it to tighten the chuck. A chuck wrench left in the chuck during start up of the lathe is disastrous to operator, bystanders and equipment. When you are through with the machine, put all tools back in the lathe cabinet and clean up all chips from the machine and floor. **NEVER** attempt to operate a lathe if you are unsure how to set up or how to mount your work in the machine.

**Milling Machine:** Always wear safety glasses when using the milling machine. Before starting the machine, lubricate the machine ways with way oil. Use the lowest acceptable spindle speed and feed rate to get the job done. Always ensure that there is adequate clearance of the work to the vise and the milling machine table. **DO NOT** allow the cutters to touch the vise or the table. **DO NOT** use your fingers to clear chips from the work, the vise or the milling machine while the machine is running! **NEVER** attempt to operate a mill if you are unsure how to set up or how to mount your work in the machine.

## NNSC Machine Shop Safety Rules

The following principles for personal safety relate to hand tools that are used most frequently for service work:

**Chisels and Punches.** Wear eye protection when hammering on chisels and punches or on metal objects. The hardened face of a hammer, or the end of a tool, may chip or shatter to send metal fragments flying. Grind off the "mushroomed" heads. Keep a smooth bevel on the heads of all punches and chisels. Hold the tool steadily but loosely. The best place to hold it is just below the head. If you miss and strike your hand, it is much less likely to be caught between the hammer and the object being worked on.

**Files.** A file without a handle can be extremely dangerous. Keep a handle on every file to prevent the tang from piercing the palm or wrist if the file should slip or catch.

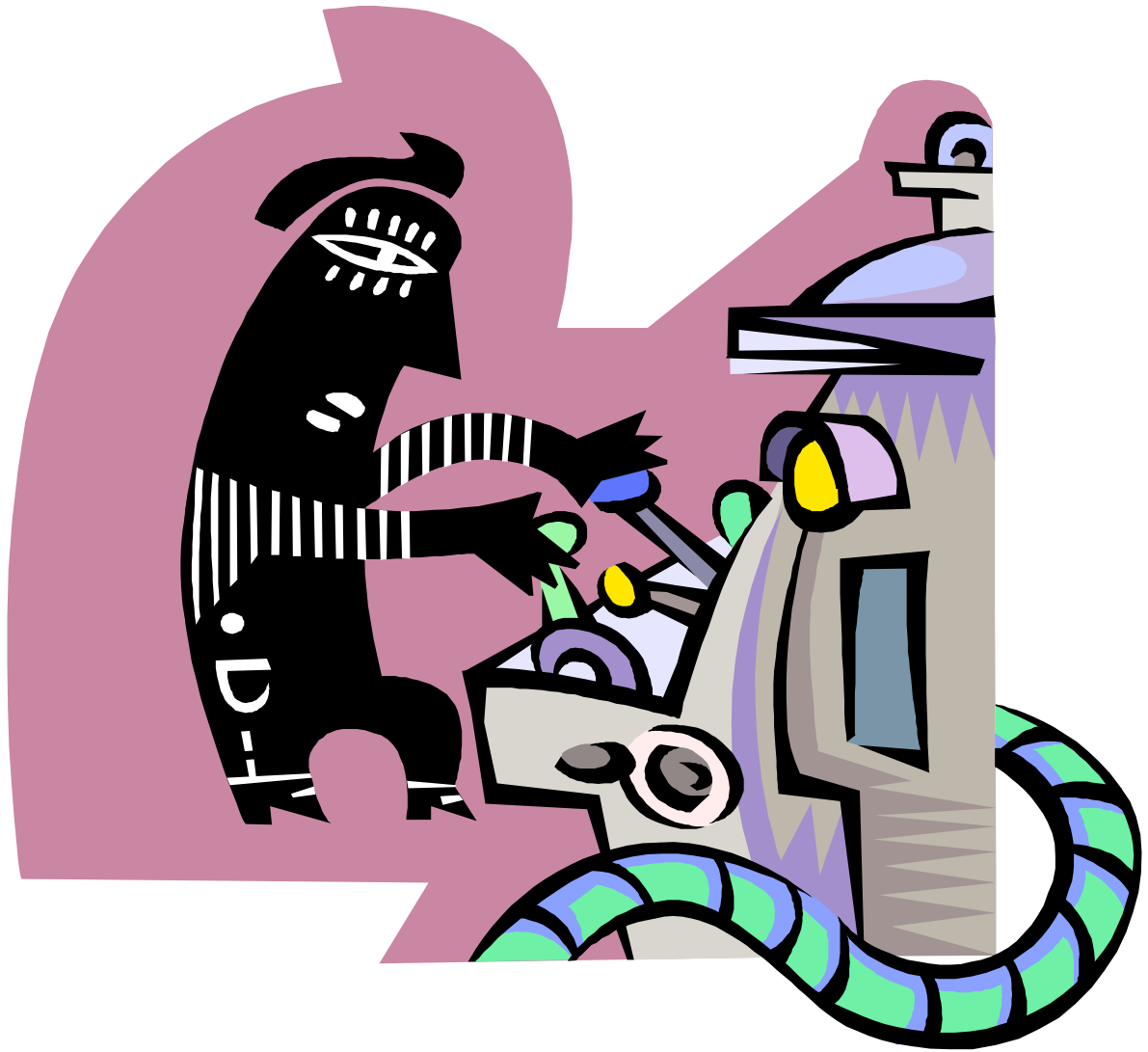
**Wrenches.** Wrenches are the cause of many cut and skinned knuckles. When possible, use the open palm of your hand to push on the wrench. When this is not possible, pull the wrench toward you. This may prevent the wrench from slipping to cut or skin your knuckles. Make sure that the wrench is the proper size for the bolt or nut.

**NOTE:** Adjustable wrenches should only be used as a last resort because they tend to round off the bolt heads if not tightly adjusted. When using adjustable wrenches, keep the open jaw of the adjustable wrench facing toward you. This forces the movable jaw onto the nut to reduce its tendency to slip. It also prevents damage to the wrench.

**Hammers.** Keep your hammers in good repair. Check the fit and condition of the handles. Keep handles tightly wedged into the heads to prevent injury to you and others nearby. Replace cracked or splintered handles. Select the right size hammer for the job. A light hammer bounces off the work. One that's too heavy is hard to control.

**Portable Grinders.** Portable grinders and brushes are difficult to handle because of their size and weight. Extra care is needed to avoid injury and to protect the grinding wheel and brushes from damage. When using a portable grinder, hold it firmly with both hands. When finished, make sure that the grinder has completely stopped turning before you lay it down.

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