

Equipment Specific Safety Training

Tormach PCNC 770 CNC Mill

General Safety

- Safety is an attitude, as well as specific steps. Always work carefully and within your understanding. If you are unsure, take the steps necessary to regain a sense of clarity and understanding of the operation / work you are doing.
- Seek help if needed, and do not let deadlines or timeframes push your attitude or actions into an unsafe way of working!
- Eye protection is required when working with anything that might get into your eyes, like metal swarf, chemicals, sawdust. It may also be necessary to cover your own eyes to protect from the work being done by someone ELSE nearby. Hearing protection should also be considered and addressed as needed. Ear muffs are available in tool cabinet.
- Closed-toe shoes must be worn at all times.
- Long sleeved shirts should be worn when working with chemicals, short sleeved shirts should be worn for anything with a rotary motor (saws, mills, lathes, etc.)
- Gloves may NOT be worn at any time when working around equipment with rotation, such as lathes, CNC spindles and drills/mills.
- Ensure that the floor is swept of potentially slippery items. It is possible that someone previously machined Teflon or UHMW, whose chips may not appear especially dangerous; but which can create insecure footing.
- If a School Staff member asks you to stop an operation, or otherwise questions the safety of what you are doing (or are about to do); please immediately comply with this request!

Shop Etiquette

- Never talk to anyone while they are working on a piece of equipment; but DO let others working on machines nearby know when you may be doing something which could impact their safety. This may include the start of machining, for which a simply voiced, "Cutting!" may be adequate. It might also mean letting them know that you are about to begin an operation which may throw chips their direction, and / or produce unexpected / loud noise which could startle them. (Be aware of those around you, and ensure that they are aware of your actions too!)
- If you need to get someone's attention (other than an immediate safety danger) move slowly into their field of view and wait for them to notice you. Do not call out to them, tap them on the shoulder or move up behind them quietly, which could lead them to an unsafe reflex-type reaction.
- Keep focus upon what you are doing. It is easy to make mistakes when you allow yourself to be interrupted unnecessarily. Kindly let others know of your desire to stay focused, but also be willing to hear possibly good advice relating to the safety of something you are doing.
- Leave the area you are working in cleaner than when you arrived. You wouldn't want to have your expensive balsa wood or other material dented by a previous aluminum or plastic machining operation!
- Begin final clean-up and storage of your project no later than 30 minutes before the lab coordinator is scheduled to leave. Always be ready to exit the lab when the lab coordinator leaves, having already finished clean up and project storage. (When you're at work, you probably like to leave on time too! Please do not expect the lab staff to wait for you.)

Equipment Specific Safety

- In a public workshop like the prototyping lab, you **MUST** assume responsibility for ensuring that the Machine and surrounding area is safe and configured in the manner you expect and are familiar with!
- With the shared use of machines and computers by beginners to experts, you cannot **ASSUME ANYTHING!** You will need to become aware of the “typical” look and feel of the machine and work area, and train yourself to notice changes since your last use. If changes are noted, they must be understood and accounted for **BEFORE** beginning / continuing your work at the machine or workstation.
- You **MUST** take the time to work through the steps to set up the software and machine for your own safe use. It will not be possible to list here all that may be changed by an expert user in search of advanced results, or to list all the potential ways a beginner may leave the machine, software or work area in an unconventional or perhaps unsafe manner. **YOU** are ultimately responsible for your own safety, including the setup of the machine and work area.
- Never leave a machine running and unattended. Some CNC operations may take literally hours to complete. Yes, you **DO** need to stay by the machine and monitor the operation while it is cutting for the **ENTIRE** time! Admittedly this may be difficult, but it is essential to the safe operation of the CNC machines in the public workshop environment.
- If you need to leave the work area briefly, be sure to pause the machine **AND** find someone to monitor the area in your <brief!> absence. If you must leave for a longer period of time, please suspend the operation, both for safety; and to allow another member the ability to use the machine in your absence.
- It is important to understand that a CNC machine may begin movement **AT ANY TIME**, and in unexpected directions. This may be due to incorrect programming, or perhaps machine or software failure. You must **ALWAYS** remain aware of this possibility, and be prepared for it. **KNOW** the location of the Emergency stop (ESTOP, or EPO) switch(es), and also the location to cut power entirely.
- When operating CNC Machinery, you do not have the tactile / kinesthetic feedback inherent in manually operated tool use. You must therefore rely on your other senses to keep you aware of the conditions of the operation. Sight and sound, as well as smell and even taste, may bring important information to you about the work and safety of what you are doing.
- (Be aware that some smells and tastes could be signals of potentially toxic chemicals, and take care in use of those senses!)
- In short, if it sounds or looks wrong, it probably **IS!** Continually update your experience to include the ever-growing sensory awareness you gain as you sensibly use a given tool. This careful attention to details will show up in you work in many useful ways; better tool life, improved surface finish, and safer overall operation of the machine(s)!
- Unplug the spindle (or place the spindle control in a safe state) when changing spindle tooling. It is actually a good habit to always disable the spindle in this way **AND** time you are actually placing parts of your body within the machine’s working area.
- Ensure that the spindle collet and nut are in good condition **AND** properly installed. Additionally, be sure the cutter is secured, but not overly tight. It should be neither too far out (decreasing cutter stiffness), nor too far in (providing a path for chips into the spindle and collet recesses)