

PROTOTYPING FACILITY @ QUALCOMM INSTITUTE (CALIT2)

MACHINE SAFETY GUIDELINES

3D PRINTING - DIMENSION SST 1200ES / DIMENSION SST1200 / MAKERBOT

- Before starting a print, keep in mind that the printer needs to warm up if it has been off. Turn the Dimension printers on 30 to 45 minutes before running a printing job.
- Keep in mind the amount of material in the printer when starting your job. Verify that there is enough material for your print, and if not, contact a staff member to change out the cartridge.
- Safety glasses are not required to use the printer.

DRILL PRESS

- Eye protection must be used on this machine.
- No open toed shoes are allowed near this machine.
- Do not wear anything on your hands, fingers, or forearms (including long sleeves and gloves) while operating the machine.
- Gloves may be used only while handling sharp bits or material and should always be removed before any machine is started in your area.
- Make all drill press adjustments with the power shut off.
- Do not exceed the recommended speeds for the type and size of drill bit being used or composition of the stock being drilled.
- Never start the machine without the table clear of everything except the stock you are drilling.
- Keep hands and fingers at least 3" from rotating drill bits.
- When drilling deep holes, frequently raise the drill bit from the hole to remove cuttings and cool the bit.
- If a drill bit binds, turn off the drill press and carefully turn drill chuck backwards by hand to free the drill bit.
- Never reach around or under a rotating drill bit or grab the chuck to stop a drill press. This can result in hand puncture or other serious injury.
- Turn the drill press off before looking up or walking away from the machine.
- Never stop the rotation of the drill chuck, spindle, or stock rotating on bit with your hands or fingers.
- Don't touch the drill bit and shavings since they are hot immediately after drilling.
- Always clean the drill press table and work area upon completion of the drilling task. Do not use your hands or blow the drill shavings, use a bench brush.

LASER CUTTING AND ENGRAVING - RABBIT LASER ENGRAVING/CUTTING MACHINE RL-100-1290

- Room 1422 of Atkinson Hall contains equipment not belonging to the Prototyping Facility that represents specific dangers. Users should follow all safety procedures and regulations as they relate to this room and its equipment, including evacuation. Unless specifically authorized otherwise by the owner/operator of the machine, you are not allowed to operate any machine in this room other than the laser cutter.
- Familiarize yourself with the proper emergency shutdown protocol and the location of the CO2 fire extinguisher.
- The laser cutter uses intense heat and compressed air to remove material. There is always the potential for fire and the laser cutter should never be left unattended while in operation.
- The following support equipment must be operating to safely run the laser: compressed air line, exhaust blower, and laser chiller unit.
- Only cut approved materials such as acrylic, wood, paper, foam core. Avoid reflective materials and those which release toxic fumes when burned (i.e. PVC).
- The entire honeycomb bed should be covered to ensure proper airflow through the active cutting area which keeps flames at bay and vaporized particles off of the optics. Cover the unused space on the cutting bed with

safe disposable material (cardstock, foam-core, acrylic, etc.) to ensure air flow at the active cutting site for optimal fume exhaust (minimal fume build up within the hood).

- Wait 30 seconds after the cutting is complete before opening the cover to allow for a complete fume exhaust. Leave the chiller on to keep the laser cool.
- Be gentle when placing and moving your parts around on the delicate honeycomb bed.
- The start/stop button will shut down the laser and return the cutting head to its starting position.
- Be sure the honeycomb bed is clean before placing and after removing your part.
- Properly focusing the laser by moving the bed up and down will ensure a clean cut with the least amount of power necessary.
- Always close the laser cutter hood before making a cut or using the LASER function to focus the laser (safety switches ensure that the laser will not turn on if the hood is open).

ALL CNC MACHINES (INCLUDING THE TORMACH PERSONAL CNC 1100, HURCO VM1 VERTICAL MACHINING CENTER, TECHNO GANTRY ROUTER LCX)

- Wear safety glasses or goggles at all times in the shop.
- Ear protection is available and should be used for high sound levels.
- The shop floor should be kept clean and any fluids such as coolant or oil should be cleaned up immediately.
- Do not wear anything on your hands, fingers, or forearms (including long sleeves and gloves) while operating the machine.
- Gloves may be used only while handling sharp cutters or material and should always be removed before any machine is started in your area.
- Long hair, long sleeves and necklaces must be well secured. Loose clothing should not be worn.
- It is recommended that an apron be used to keep your clothing clean and secured.
- A milling machine presents an open cutter and can cause harm even if the machine is off. Stay clear from the cutter and always turn it off when clearing chips or taking measurements.
- The spindle should come to a complete stop before loading or unloading a part.
- When removing a cutting tool from the spindle, be sure to secure it from dropping onto your part or your hand.
- There should only be one person operating machine controls.
- Never leave a running machine unattended.
- Chip removal should be done by brush and/or vacuum. Compressed air should not be used within the envelope of the machine.
- Do not use your hands to remove chips.

TORMACH PERSONAL CNC 1100

- Before beginning any work on the machine, the operator and all those observing must put on safety glasses.
- In order to start the machine, the stop button must be out. Turn the red knob in the direction of the arrows (to the right). After this is done, pressing the green button in will turn the machine on. To turn the machine off, simply press the red button.
- The key next to the stop button is the spindle lockout key. When turned to the right, the spindle is free to move. When turned to the left, the spindle lock is on and the key can be removed. Set the spindle control button to manual.
- When shutting down the machine, the Z axis spindle assembly will drop slowly once the power is cut. Be sure to insert a resting block to prevent collision with the chuck, table, or parts.
- When starting up the machine, use the reference all command to reset the Z-axis position, which is lost upon shutdown.
- NEVER leave the machine running unattended.
- Before cutting, verify the proper spindle speed and feed rate for your material.

HURCO VM1 VERTICAL MACHINING CENTER

- Operators and nearby personnel must comply with machining safety requirements.
- For the machine to start and the spindle to move, the emergency stops on both the spindle and the WinMax module must be disengaged.
- To activate the servos, follow the instructions as directed by the screen.
- Prior to using the machine, you must warm up the spindle if the machine has not been run in over 8 hours. This will take a few minutes and will be done automatically once the warm up has been initiated by the user.
- Do not leave the vice tool attached to the vice while the machine is in operation.
- Before cutting, verify that you are using the proper spindle speed and feed rate for your material.
- The website www.hurconotes.com has manuals and instructions about how to run specific functions. We suggest that the user become familiar with the functions they wish to use before using the machine.
- On the hurconotes website, please go to the videos section and watch the DXF demo video, the tool setup video, the part setup video, and the machine shutdown video.

TECHNO GANTRY ROUTER LCX

- Before beginning any work on the machine, the operator and all those observing must put on safety glasses.
- The entire table should be clear of obstructions before power up.
- NEVER leave the machine unattended while it is running.
- Ensure that your part is secured and that you are cutting with a proper feed rate and spindle speed.

POWER TOOLS

NOTE: There are several circuits in the lab that share the electrical load for the power tools. Be sure that no more than 2 devices are running on the same circuit. When in doubt, reference the information board or ask for assistance.

TABLE SAWS, 10 INCH CRAFTSMAN MODEL, 10 INCH BOSCH 4100

- Wear eye and ear protection when operating the table saws. If necessary, ask for a dust mask.
- Do not make any cuts alone! Have a shop staff member assist you, especially if you are cutting a large sheet.
- Do not cut metal on the table saws. These saws are meant for wood and plastic only!
- Be sure that all clamps and control levers are set and secured.
- Disconnect power to the saw if you are going to be doing any servicing (ex: changing a blade)

JET VERTICAL BAND SAW MODEL J-8201K

- Eye protection must be used on this machine. Ear protection and a dust mask may be used if desired.
- This machine is on caster wheels for easy movement. Ensure that these wheels are in their locked position before operating the machine.
- Use a miter gauge (included on the machine) for any extremely small cuts.
- When cutting, keep one hand on each side of the blade, and well away from the material. Do NOT cross your hands or have both hands on one side of the blade if you are directly facing the blade.
- When cutting curved paths, shift the material so your hands remain in the same place the entire time, except for a slight forward motion. Your hands should not change position too much and should remain away from the blade.
- Avoid cutting circular stock on this machine. Instead, use the horizontal band saw.

WILTON HORIZONTAL BAND SAW MODEL 3410

- Eye protection must be worn when operating this equipment.
- This machine is relatively hands-free. Hydraulic control of the feed rate is the only intervention the user should perform while the machine is cutting.
- Review the safety and instruction manual before operation, or ask a staff member for assistance, especially when setting up the saw.

BOSCH CIRCULAR MITER SAW MODEL 4212L

- Safety glasses are required to operate this machine.
- The user is encouraged to use ear protection as well, and a dust mask if necessary.
- When cutting long pieces, at least two people must assist with the cut.
- Material handlers may be used on either side of the table to assist with holding material
- This cutter is primarily for wood and plastic.