

WSU SCHOOL OF DESIGN AND CONSTRUCTION
GUIDELINES FOR SHOPBOT PRS-STANDARD CNC ROUTER

The basics:

- Allow at least **ONE WEEK** lead time for CNC jobs. This is one week from the time we receive your clean, ready-to-cut file, plus materials (also ready for cutting).
- Check current semester shop hours for available CNC times—CNC setup, cutting, and technical assistance is not available during all shop hours.
- **You must monitor your job while it is cutting.** We will not cut jobs if you aren't there for the entire cut time. Cutting may take hours—we'll give you an estimate of the cutting time when your job is programmed for the ShopBot.
- Assume your file needs fixing. You are responsible for this. Remember: we are not Rhino, Autodesk, or Adobe tutors.

File formats:

- Rhino files strongly preferred—the ShopBot is programmed using a Rhino plugin. AutoCAD is okay for 2D files. **All other file types must be converted and cleaned up by you.**
- If you are inexperienced making files for CNC fabrication, talk to us **FIRST**. We can help you avoid common mistakes.
- Use layers to organize your files.
- We accept files on USB or portable hard drives **ONLY**. Put your file in an easy-to-find location. Give your files short descriptive names. Include your last name.

File geometry:

- **Use 2D drawings for 2D cutting** (thru cuts, engraving, dadoes, etc).
- 2D geometry should be closed or made into polylines wherever possible. Generally, points are used to program location of drilled holes. Single lines are usually (not always) used to program location of cuts or grooves.
- **Use 3D modeling for carving ONLY** (e.g., site models).
- 3D models must be a closed polysurface (watertight).
- It is **NOT** possible to cut square interior corners with a CNC router.

Stock and part setup:

- The 'part' is what you design. The 'stock' is the material that is cut to make the part.
- Site models require glued-up stock. You will have to make this before your file is cut.
- **Remember, stated material thickness is usually a nominal (not actual) dimension.** (E.g., $\frac{3}{4}$ " plywood is rarely actually $\frac{3}{4}$ " thick.) You need to know *actual* dimensions for successful CNC fabrication.
- **ShopBot limits are 96" x 48" in X and Y; 6" in Z.** In practice, it is usually impossible to cut to the full Z limit. Small parts can be difficult or impossible to cut.
- Part finish and cut time is dependent on cutter type, length, and diameter. We will select appropriate cutters (the 'tooling') for your job. 3D carving usually uses $\frac{1}{2}$ " diameter cutters. We use $\frac{1}{4}$ " diameter cutters for 2D cutting/engraving if at all possible; for small parts we will occasionally use $\frac{1}{8}$ " diameter cutters.
- Parts need a margin to edge of stock greater than 1 cutter diameter.
- Nest parts with spacing between 1.5 and 2 times the cutter diameter.
- Round holes work best when drilled. Drilling means hole diameter equals cutter diameter.
- For 3D carving, stock must be taller than the part, but shorter than the ShopBot Z limit.
- For jobs with extensive or specialty cutting, you may be asked to purchase tooling for the job.

APPROVED MATERIALS FOR USE WITH SHOPBOT PRS-STANDARD CNC ROUTER

(Note: Materials in **red** may be purchased from the shops using your Cougar Card—we keep a small inventory, so there may be a few days lead-time if we don't have the materials in stock. Samples are available for most of materials we sell.)

Materials need to be as flat as possible. Parts should be laid out with respect for grain direction (when cutting materials with a grain).

These are the most commonly cut/engraved/carved materials:

- **ACX Plywood 1/4"-3/4" nominal thickness (actual thickness usually less).** ACX has softwood plys, one good, sanded side, and few interior voids. Good water resistance. Max. sheet size: 96" x 48".
- **Baltic Birch Plywood 1/8"-3/4" nominal thickness (actual thickness usually less).** Baltic Birch has hardwood plys, two good, sanded sides, and virtually no interior voids. Fair water resistance. Max sheet size: 60" x 60" (note ShopBot max. width is 48").
- **Medium Density Fiberboard (MDF) 1/4"-3/4" thickness (actual thickness is very close to this).** MDF is smooth, uniform, and relatively inexpensive. NOT water-resistant. It tends to split into layers, making some carving operations difficult. A good choice for vacuum molds and inexpensive site models. Max sheet size: 97" x 49".
- **Doorskin 1/8" nominal thickness.** Thin, relatively inexpensive plywood. Lauan is the cheapest; hardwood veneer including birch and oak are also available. Max sheet size: 96" x 48".
- **Most other wood and wood-fiber products can be cut,** including other grades of plywood, melamine, chipboard, OSB, LVL, and strawboard, although finish may be rough in some of these. **Natural wood** (softwood/hardwood) can be cut. Finish will vary and special jigs or fixtures may be needed depending on the size/shape of the stock.
- **Many plastics can be cut,** including acrylic, polycarbonate, polypropylene, corrugated plastic, cellular pvc/abs, phenolic board, paperstone, and others. Specialty tooling may be required. At this time, we DO NOT plan to cut EPS foam (blueboard, pinkboard), or any other Styrofoam-type material.
- **We may be able to cut other materials as long as they doesn't present a hazard to human health and safety, or risk damage to the ShopBot. Talk to us if you have any ideas (well in advance). Documentation of successful use of the proposed material in university shops with similar equipment will likely be required.**

We DO NOT/ CANNOT cut/engrave/carve the following:

- Any metal, including aluminum.
- Stone, glass, masonry, concrete, or similar.
- Most foams, as outlined above.
- Fiberglas, or any other material that poses an unacceptable inhalation hazard.
- Any unacceptably abrasive material (e.g., drywall).
- Any other material that creates a safety hazard, risks damage to the ShopBot, or unnecessarily slows shop procedures. This judgment will be made by the Fabrication Labs Manager.

We plan to purchase a **drag knife in the near future. This tool allows CNC cutting of cardboard, paper, cloth, thin plastics, etc. at much larger size (but with less precision) than is possible with the laser cutters. Stay tuned.**