

Laser Cutter Safety/Policies

Safety

- **ALWAYS** turn the Vent Switch on while running the Laser
- **NEVER** leave the Laser unattended
- **NEVER** set anything on top of the Laser
- **NEVER** open the Laser while it is running
- **NEVER** use unapproved materials in the Laser
- **NEVER** engrave a shiny metal or mirror. The Laser will reflect and could create a hazard.

In Case of Fire:

1. Press STOP
2. Lift the lid
3. Quickly blow out the flame (or use fire extinguisher for serious flames)
4. Notify Fab Lab staff immediately

Policies

- You can only reserve 2-hours of Laser Cutter machine time per day
- Do not start a Laser job that will exceed your reservation period

Laser Cutter Design

Thoroughly check over your design before reserving machine time to reduce the need for troubleshooting.

Design Software Recommendations

- Inkscape: Lab-Supported; Free Download
- Adobe Illustrator
- Corel Draw

File Format

Export files into the PDF file format. Bring PDF for laser cutting along with original file format (for additional editing)

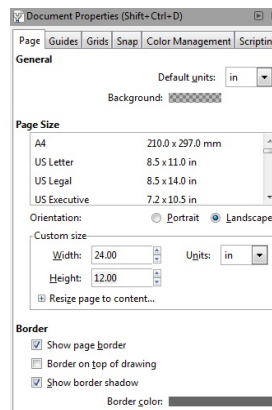
2D Design Rules:

Instructions below are for Inkscape although principles are the same across all 2D vector graphics softwares

Digital Document Size

Rule: Your document should be 12" high by 24" wide and oriented in landscape. This is the size of the laser's cutting surface. Be sure that your design is constrained within the 12" x 24" document size and at least 0.10" from the edge.

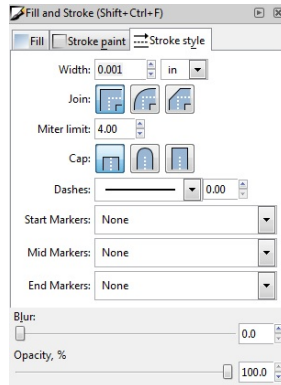
Solution: Go to File > Document Properties > Page tab > [Custom Size: Width=24", Height=12"]



Vector Cutting

Rule: To generate a line that will cut, set your line width to .001"

Solution: Select your line(s) and go to Object > Fill and Stroke > Stroke Style > [Width=0.001"]



Non Vector Text

Rule: All text should be converted to paths

Solution: Select your text and go to Path > Object to Path

Non Vector Images

Rule: Any shapes/designs placed into your file should be converted into vector lines and/or fills

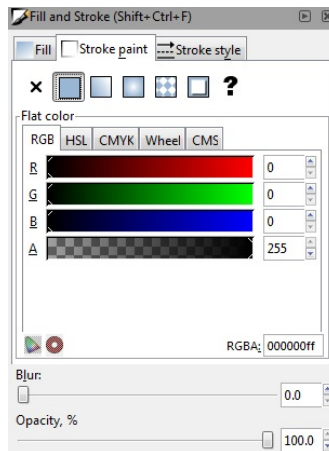
Solution: Select your shape/design and go to Path > Object to Path

Raster Engraving

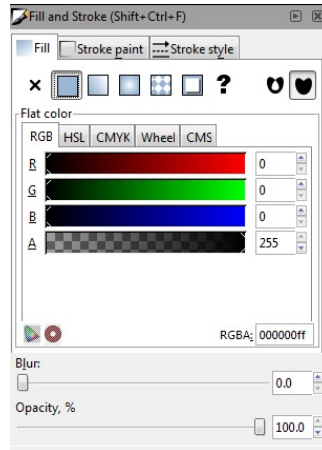
Rule: To generate lines, shapes, graphics/photos that will engrave, the lines should be thicker than 0.007" and everything should generally be a solid fill of either black or an even shade of gray.

Solution:

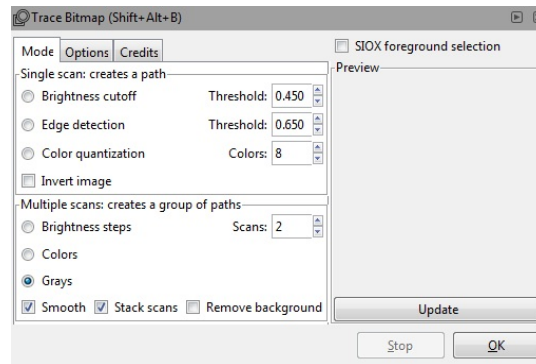
- To generate lines that will engrave: **(1)** Select the line(s) and go to Object > Fill and Stroke > Stroke Style > [Width=(>0.007")]; **(2)** Select the line(s) and go to Object > Fill and Stroke > Stroke Stroke Paint > [Set consistent RGB values (such as R:128, G:128, B:128 or R:230, G:230, B:230)]



- To generate shapes that will engrave, select the shape(s) and go to Object > Fill and Stroke > Fill > [Set consistent RGB values]



- To convert an imported image into an editable format for engraving: **(1)** Select your imported image and go to Path > Trace Bitmap > Mode tab > Multiple Scans > [Select *Gray*, *Smooth*, *Stack Scans*. Input 2 (or more) for *Scans*]. **(2)** The updated copy of your image will overlay the original. Delete the original and keep the updated image. **(3)** Select the update image go to Object > Fill and Stroke > Fill > [Set consistent RGB values]



2D Design Tips:

Print Out Your Designs On Paper

Print out your design on paper. This is the ideal way to spot sizing errors, to see whether you have made holes big enough, and to get a visual of your final result. To make this process even more useful, adjust the width/weight of your stroke lines to match the thickness of the laser cut.

Prototype Your Designs

It is unlikely that you will create a perfect product on your first try. It usually takes a couple of prototypes to perfect your design. We suggest cardboard as your starting material. It is an easy/cheap material on which you can perfect your design. Then you can shift to a more costly material. It's also good to start small. Work out the elements that are most important and then try those out before making your whole design (especially if you're using interlocking parts). After a couple of tries, you will be familiar with the design process and the design needs for certain materials and projects.

Optimize Your Designs and Lower Cost

The laser cuts different materials at different speeds. It usually takes longer to cut thicker materials than thinner ones. The laser is faster at cutting straight lines than it is at cutting curves. One way to reduce cost is by sharing cutting lines.

If you have two or more objects with parallel lines, lay them side by side and remove one of the now-overlapping lines. This means effectively cutting out two pieces at once. When using raster fill engraving, it is best to keep all of the raster fill engraved areas as close together as possible. This is so the laser head will not have to pass over gaps between engraved areas many times before the job is done, which unnecessarily increases fabrication time and cost.

Avoid Overly Detailed Cutting

The laser burns away about 0.008" each time it makes a cut. This means any areas in your design where cutting lines come closer together than 0.016" could be burned away entirely, and any gaps narrower than .050" are likely to be fragile.

Improve Your Engraving Results

There are so many options for engraving. It can be hard to know which setting will work best for your design. Nothing beats prototyping a few different options.

Laser Cutter Operation

A step-by-step guide with illustrations is setup at the Laser Cutter Work Station

Step 1: Turn on the Laser Cutter using the switch on the left side of the machine

Step 2: Choose a material. This what we recommend:

- Start with cardboard to perfect your design
- Next, use your own material or utilize the material in the recycle bin
- If you must, use a new piece of material
- ALWAYS check the "Acceptable Materials List" if bringing in your own materials.

Step 3:

- Open the glass lid of the Laser Cutter
- Place your material in the upper left corner of the platform against the side rulers
- Measure the material using the side rulers
- Close the lid

Step 4:

- Open the PDF format of your design in Adobe Reader
- Select printer icon
- Make sure your settings match the window pictured to the left
- Select Properties

Step 5:

- Select the Advanced tab
- Select your material from the list and then Load
- If your material isn't listed, please ask staff

Step 6:

- Return to the General tab
- Make sure Auto Focus is enabled if using sheet material. Consult staff regarding manual focus.
- Enter the Horizontal/Vertical size of workpiece
- Press OK on Epilog Properties Window and on the Print Dialog Window

Step 7: Your file name will appear on the Laser Cutter's interface screen. DO NOT PUSH GO!!!

Step 8: TURN ON THE EXHAUST VENT SWITCH!!!

Step 9: Push Go and DO NOT LEAVE THE MACHINE!!!

Step 10:

- After job is complete, turn off the Exhaust Vent Switch
- Open the Laser Cutter lid and remove your design and all scraps
- Recycle usable scrap and throw away what is left
- Place everything back in their proper places
- Turn off the machine
- Leave the workstation better than you found it!

Laser Cutter Materials

Fab Lab Tulsa will have limited quantities of the “Lab Materials” listed below. You are welcome to use these materials at no cost as long as you use them within reason. You are also welcome to bring in your own materials. If your material is not listed within the “Other Acceptable Materials” listed below, please provide Fab Lab staff with an MSDS (Material Data Safety Sheet) in advance. Staff will then determine if your material is acceptable.

Lab Materials:

All materials are 24” x 12” sheets (width x height).

- Cardboard (1/8” thickness; single-layer corrugated)
- Acrylic (1/8” and 1/4” cast acrylic)
- Hardboard (1/8” masonite)

Other Acceptable Materials:

Maximum material area is 24” x 12” (width x height). Maximum material height for the lab is 1/2”.

- Wood
- Corian or Avonite
- Delrin
- Plastic
- Leather
- Matte Board
- Rubber, Rubber Stamps
- Cloth
- Paper
- Mylar
- Pressboard
- Wood Veneer
- Fiberglass
- Cork
- Glass
- Ceramic
- Marble
- Anodized Aluminum
- Stainless Steel (Cerdec Coated)
- Painted Metals, Coated Metals

- Tile
- Melamine
- AlumaMark

Unacceptable Materials

- Vinyl
- Lexan
- Polycarbonate
- PVC
- Any synthetic materials that may have chloride in them
- Uncoated Metals
- Mirrors