# The Laser Cutter

Here in MCAD's Digital Lab, we have two laser cutters.
- A Universal Laser Systems VLS6.60 with a 18" x 32" cutting bed.  The maximum depth of the cutting area is 8".  The maximum thickness of material you can cut all the way through is ¼".
- A Universal Laser Systems ILS 9 Series with a 24" x 36" cutting bed.  The maximum depth of the cutting area is 12".  The maximum thickness of material you can cut all the way through is ⅜".

## Before using the laser cutter:

- You must have your finished file saved as an .ai or .pdf on a thumb drive, Google Drive or emailed to yourself prior to your appointment.
- Materials must be pre-cut to fit on the laser cutter bed.  It is always good to bring extra material for testing.
- You must sign up for an appointment at least 24 hours in advance online via the **3D Shop Appointments** link which can be found on the MCAD intranet homepage.  Go to the **Digital Lab** dropdown menu.

## Time and Cost:

**Time**  You are allowed a maximum of 3 hours per week for use of the laser cutter.  Please schedule yourself enough time to set up, test and run your entire part.  If you are unsure of how long your part will take to run, bring your file to the shop and we can give you an accurate time estimate.

**Cost**  $0.75 per minute of machine run time

Always ask for assistance with material choices.  Never start the laser cutter without a shop technician present.

## File Settings:

The laser cutter operates in two modes:
1. **Raster** mode results in the etching or engraving of a material for left to right (just like an inkjet printer.)  To raster, your file must be in pure RGB black or grayscale.  The black areas will be etched at full strength while white areas will remain untouched.  Any areas of grey will be etched according to their greyscale value in relation to your power and speed settings.  The higher the contrast of a grayscale image, the more readable of an image the laser cutter will produce.

Raster:
Fill = RGB Black
Sroke = None
Weight = N/A
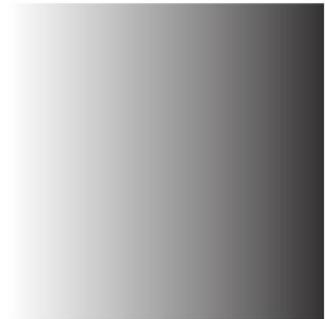
2. *Vector* mode follows a two-dimensional path to cut through or engrave a shape into a material. Only lines and curves with a stroke weight of .001 or less will be interpreted as *vector* objects (cut through or scoring lines.) A file may carry both *vector* and **raster** information. Elements of the image that are not a stroke weight of .001 will be interpreted as **raster** objects.
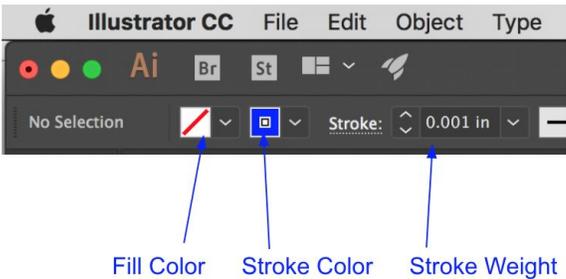
   To cut all the way through a material, *vector* lines must be **RGB Red**.



Vector Cut:
Fill = None
Stroke = RGB Red
R=255, G=0, B=0
Weight = .001

Fill Color    Stroke Color    Stroke Weight
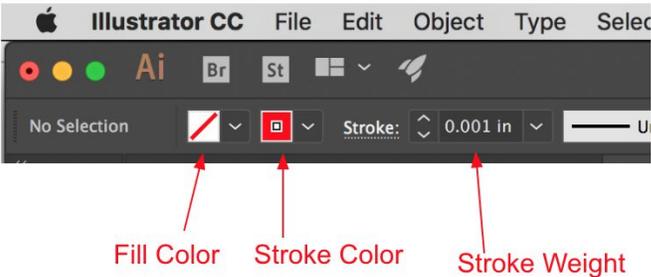
   To score into a material *vector* lines must be **RGB Blue**.



Vector Cut:
Fill = None
Stroke = RGB Blue
R=0, G=0, B=255
Weight = .001

Fill Color    Stroke Color    Stroke Weight

# Material Choices

There is no limit to the thinness of the material, however the thickest you can cut through is ¼" on the VLS6.60 and ⅜" on the ILS 9 Series.  As with any material brought in, please bring in more than what you need.  It is helpful to run a test first and determine settings on a sample piece.  Please check with shop staff that your material is appropriate for the laser cutters.

Known materials we can laser cut:

    Plastics

- ABS (acrylonitrile butadiene styrene)
- Acrylic (also known as Plexiglas, Lucite, PMMA)
- Delrin (POM, acetal) - available at [www.mcmaster.com](www.mcmaster.com)
- Kapton tape (Polyimide)
- Mylar (polyester)
- Nylon - melts badly
- PETG (polyethylene terephthalate glycol)
- Polyethylene (PE) - melts badly
- Polypropylene (PP) - melts somewhat
- Styrene
- Two-tone acrylic

    Foam

- Depron foam - often used for RC planes
- EPM
- Gator foam

    Other

- Cloths (leather, suede, felt, hemp, cotton, etc.) - check synthetic blends that it doesn't contain **do not** cut materials below
- Magnetic sheets
- Papers
- Rubber (neoprene) - for rubber stamps check that it is laserable rubber
- Teflon (PTFE, Polytetrafluoroethylene)
- Woods (MDF, balsa, birch, poplar, oak, cherry, walnut, etc.)

We **DO NOT** cut the following materials:

- Metals - steel, aluminum, brass, copper
- Polycarbonate (PC, Lexan)
- Any material containing chlorine
    - PVC (CIntra)
    - Vinyl
- Glass - we can engrave glass, but cannot cut it
- Fiberglass
- Printed circuit board (FR4 and other material types)
- Carbon fiber

**Please check with shop staff if you have any materials other than these.**

# Making Files

A special Illustrator template designed for the laser cutters is available for you to download from the 3D Shop Intranet site and use for the creation of your files.  This template's artboard is the same dimensions as the bed of the laser cutter.  It is also in RGB color mode and has preset swatches in true RGB colors, which are what the laser cutter reads.

1. Download the Laser Cutter Template from the 3D Shop Intranet site.

2. Create your image within the template's artboard using RGB vectors, RGB black shapes and/or grayscale images.  Working in layers is useful for the laser cutter because you can set up an order of operations for projects that involve more than one cut.  If your material is smaller than the laser cutter bed, it can be useful to draw a rectangle of your material to it's exact size for positioning of your design.

3. Make sure to turn all text into outlines!  Select your text and in the **Type** dropdown menu select **Create Outlines.**

4. When you are done, go to **File** and **Save As** to save your finished files as a PDF (.pdf) or Illustrator (.ai) file.  Make sure your file is labeled with your first and last name.  Place your file onto a thumb drive, online drive or email it to yourself to open on the laser cutter PC desktop.

# Sending Files to the Laser Cutter

1. Upload your file onto the PC desktop.  Make sure it is labeled with your first and last name.

2. Open your file with Adobe Illustrator.

   **You are now ready to check in with a Shop Technician.  They will assist with sending your file to the laser cutter.**