Laser Cutting Job Requests

During the school year, the laser cutter is staffed by a student worker who will laser cut job requests for students, faculty, or staff members. The staffed hours coincide with Open Studio Hours. These hours are limited and will change each semester based on the student worker's schedule. The hours can be seen on the Maker Arts Space page on the Haverford.edu website or posted outside the door of the Maker Arts Space. They are typically posted in the second week of a new semester and they tend to be evenings and weekends.

This document explains the steps a job requester must take in order to get a job laser cut. Please read this document prior to attempting to get a job laser cut. The short answer is you submit a job to dwatson1@haverford.edu and he delegates the job to a student worker.

It is not the responsibility of the Maker Arts Space Technician or the student workers to design a laser cut job for the requester. Visitors to the space must create their own file designs. Student workers and the technician can help with this process and are willing, if time permits, to give an introduction to Illustrator or Fusion 360. Illustrator and Fusion 360 are two software's compatible for the laser cutter.

Designing a job can be a difficult task but it's also fun! The more CAD/Graphic Design knowledge you have the better the job will turn out. We encourage taking some time to getting familiar using software's like Fusion 360 and Illustrator. There are also regularly scheduled workshops geared towards teaching these software's. Please visit the maker space during Open Studio Hours to inquire or see the website for a schedule of available workshops. Contact Kent Watson (dwatson1@haverford.edu) with additional questions.

Kinds Of Requests We Accept

Laser cut job requests will be granted for research and academic interests only.

Examples of acceptable kinds of job requests.

1. A student in the wood shop has made a wooden object and would like it engraved.
2. A student working on a prototype requires an 1/8 inch acrylic component to be cut out.

3. A student interested in Haverford Innovations Programs would like to create laser cut business cards.

4. A student or staff or faculty wishes to learn how to use the laser cutter.

There are many more acceptable requests. Truthfully most jobs are acceptable. We just want to avoid someone running a small engraving business out of the maker space.

The Maker Arts Space reserves the right to deny certain requests if they are offensive, will not work, might be dangerous, or are too time consuming. But, we usually say, 'Sure!' to most things.

Is It Free?

It is a free service to run the machine, however materials are limited and, depending on the time of the year, might run out. To ensure a job can be done we suggest that materials be supplied by the requester. See below for suitable materials.

General Rules For The Laser Cutter:

- Students may not operate the laser cutter. Only trained personnel may operate this machine. Any student who attempts to operate this machine will lose laser cutting privileges for the remainder of the semester.
- In order to budget time efficiently and reduce errors and re-cuts, students must be present while their files are being cut so they can answer any questions that may arise or to be advised of any CAD work that may be required.
- Visitors getting their jobs laser cut must remain next to the machine and watch the cut through the computer screen (not looking directly at the laser).
- The laser operators cannot correct or draw your files for you.
- Only materials posted on the "Laser Suitable Materials" list (below) may be cut on the lasers.
- Come prepared to your appointment(s).
- Students are required to maintain a high level of respect for the laser operators. Disrespect will result in immediate suspension of laser cutter privileges.

Laser Cutter Schedule

The schedule of the Laser Cutter (coincides with Open Studio Hours) will change every semester and is dependent on Student Worker availability. This schedule is posted on the main page of the Maker Arts Space website. As of March 2019 there are typically 20 hours a week of Open Studio time.

About The Laser Cutter

The Laser Cutter in the Maker Arts Space is a 60 Watt Epilog Fusion M2. It has a cutting bed of 32" X 20" It's a powerful machine but it can't cut through everything. It comfortably cuts through wood and acrylic at 1/8 inch and decently cuts through ¼ inch materials. Beyond that we usually recordmend a different approach.

Suitable Materials For Laser Cutter

Cutting and Etching

- Acrylic
- Wood-Consult laser room charts for species-specific thicknesses.
- Paper
- Leather
- Mylar
- Matte Board
- Glass
- Stone
- Anodized Metals
- Corian

Banned Materials

- Rubber (All Forms)
- Casting Resins
- Polypropylene
- Polypropylene foam
- Fiberglass
- Coated carbon fiber
- Pressure treated wood
- Polycarbonate
- Any material in the chloride/chlorine family (e.g. PVC-polyvinylchloride)
- Felt
- FoamCore
- Polystyrene
- Polystyrene foam
- Galvanized metal
- Mirrored surfaces
- MDF or LDF
- HDPE (milk bottle plastic)

https://www.epiloglaser.com/products/fusion-laser-series.htm (Select Materials for list of material do's and don'ts.)

Creating A File For The Laser Cutter

Creating a file for a laser cutter requires knowledge of computer design and materials. What material will you be cutting into? Is this job going to cut through the material, cut into the material or engrave the material? How thick is the material? Is the laser cutter powerful enough to cut through that thickness? These decisions have to be made in your design file and you must also convey this information to the laser cutter operator. We are not expecting you to know all this at the start and student workers and the technician will guide you through the process.

There are many ways to prepare a file for a laser cut, some of which might not be covered in this document. If you do not know or are unsure please ask someone in the Maker Arts Space. The student workers and the technician are happy to convey and reiterate this information. There is also information on how to create a file for a laser cutter online. Someone on Youtube has probably already done what you want to do and made a tutorial.

The remainder of this document will briefly mention CAD, raster and vector lines, engraving, laser vector cuts, and Illustrator.

CAD

CAD stands for Computer Aided Design. It is a term that has come to mean precision designing where dimensions matter and the goal is to translate the design into the real world, somehow. Some common examples of CAD programs are AutoCAD, Fusion 360, Rhino, SolidWorks. Some common real world applications are architecture, engineering, art, construction, prototyping. Below is a screen grab from Fusion 360. Notice that the exact dimensions are shown (in this case in mm) next to the lines.
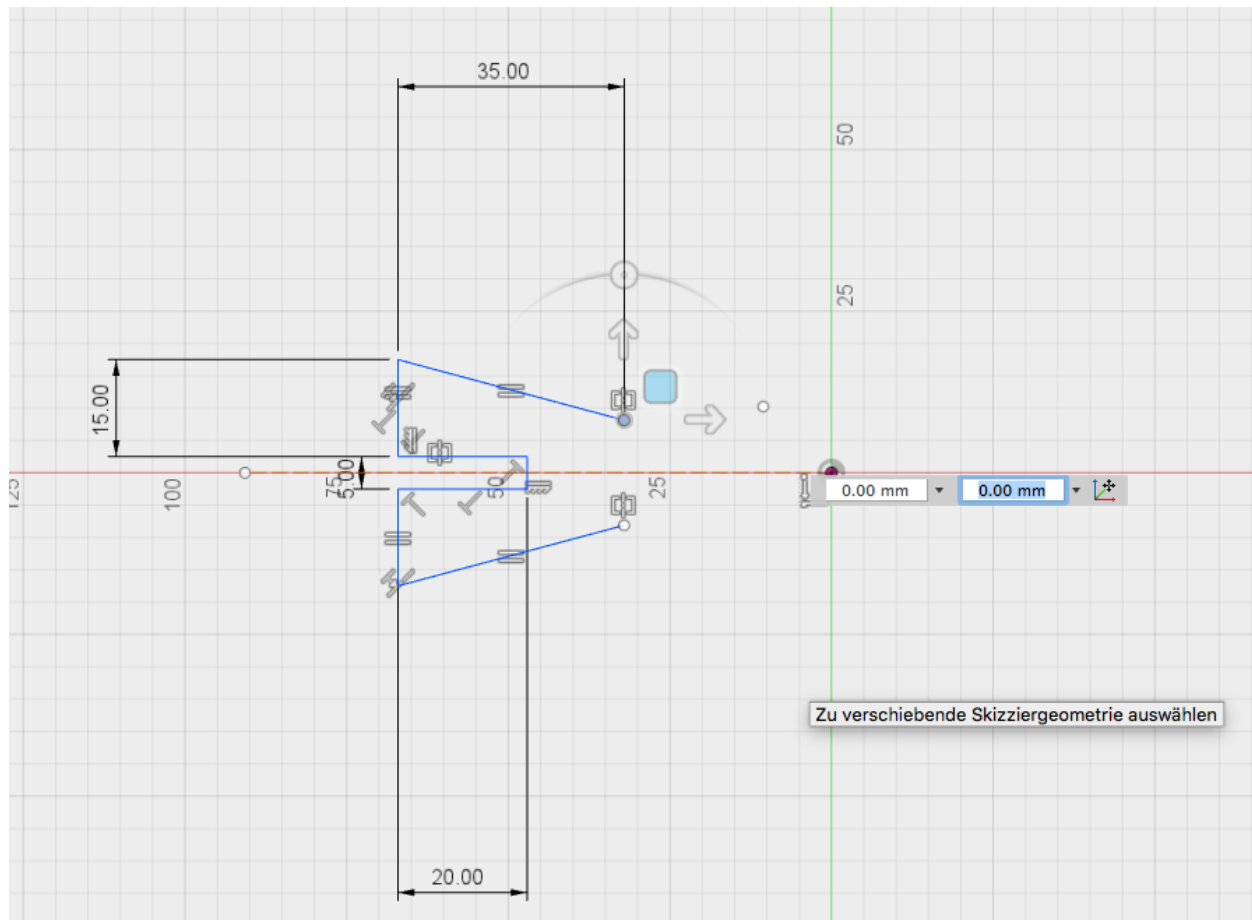
On the lab computers in the Maker Space we currently have Fusion 360, AutoCAD 2018, Illustrator, Sketch Up Pro, and Inkscape.

Illustrator

Illustrator is a software typically used for graphic design. Though it has a lot of similarities to Photoshop, a reasonable distinction between the two is that people tend to use Photoshop to edit and manipulate raster images like a jpeg, and people tend to use Illustrator to create vector images for clean graphics. More on that in a second…
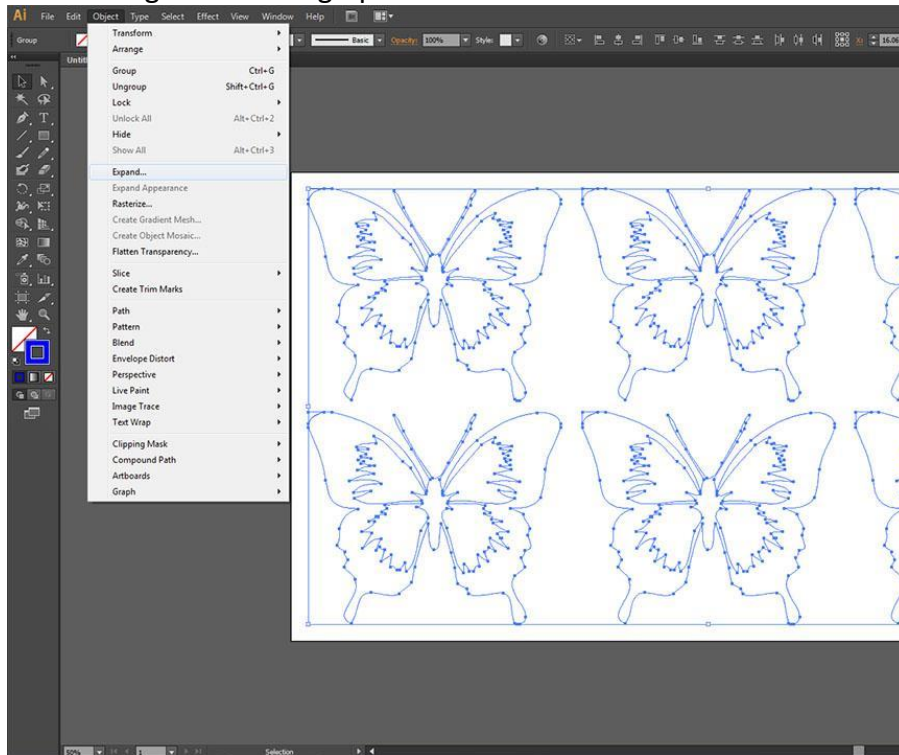
Engraving and Laser/Vector Cutting
A laser cut or a vector cut operation is when the laser head follows the path of the created vector lines (like shown above in Illustrator and Fusion). When the laser is performing **an engraving operation,** on the other hand, it travels back and forth horizontally burning some areas and skipping over others. There are advantages and disadvantages to both, and experience will help you decide what is better for a given circumstance. Please ask for our help if you are unsure. Typically, engravings take a lot longer but you can engrave detailed bitmap images. Vector lines are quicker but require more knowledge of the machine as you have to think about frequency, power, and speed and how those three variables will affect the material you are cutting into.


In the image example above there are examples of Vector cuts and engravings. Note in the middle is something called a 'vector draw' that is actually a vector cut set at lesser power so

that the cut did not go through the material. (I don't know why they named it vector draw, that is misleading.)

Raster and Vector

Raster Images are made of pixels. A pixel is a single point or the smallest single element in a display device. If you zoom into a raster image you will see tiny squares. An example of this is a jpeg image. Vector images are mathematical calculations from one point to another that form lines and shapes. If you zoom into them the quality of the image never degrades.
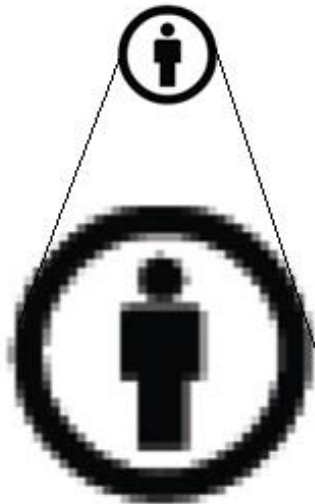

enlarged
bitmap ("raster")

enlarged
vector

This difference is important, as the laser cutter we use will automatically engrave a raster (bitmap) where you will have options when using a vector line. You can choose to have the laser follow the path of that line or engrave it. When doing this you can adjust the power, speed and frequency of the laser so it either cuts through the material or just into it some. Even with just a few variables the cut can yield dramatically different results.
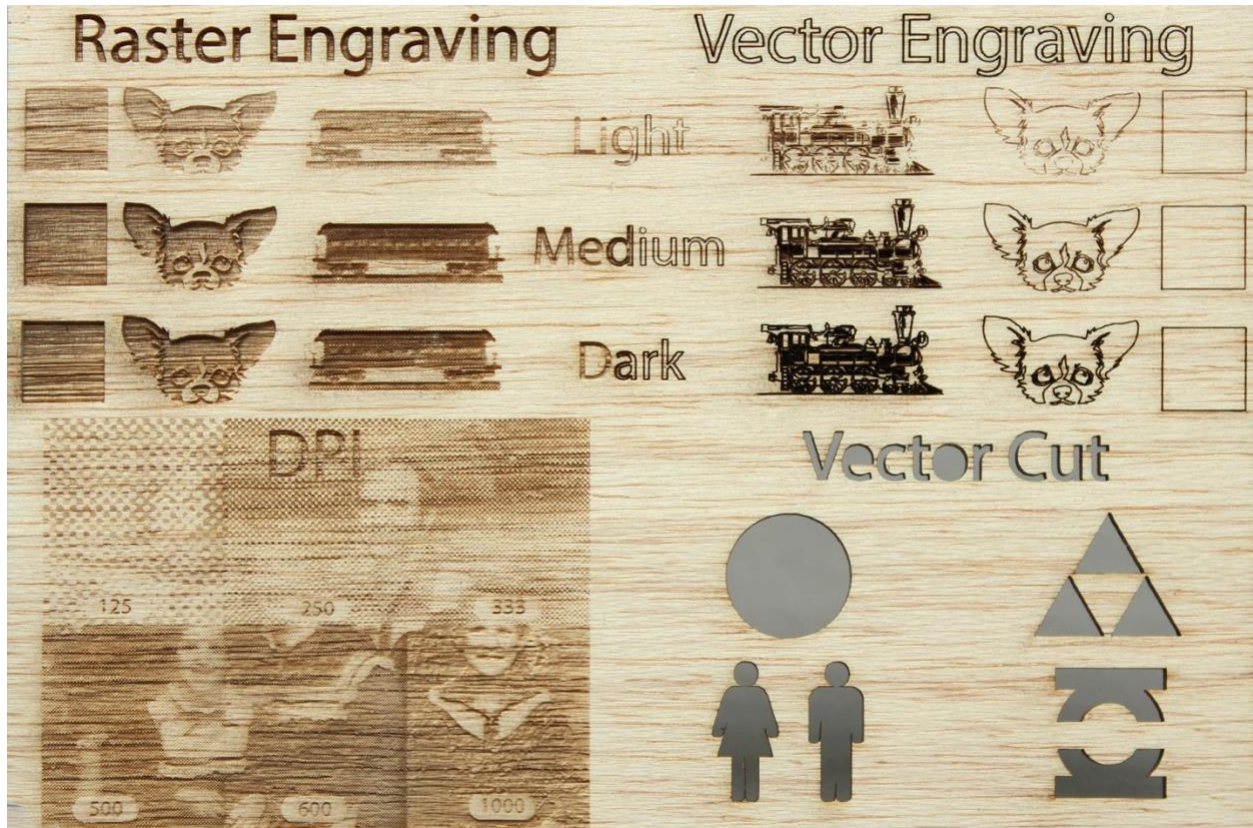
Is That Everything?
Definitely not. There is a lot to learn. These are just the basics brush strokes. Practice makes perfect and the more you work with vector lines and the laser cutter the better at it you will become. Know that throughout the process someone working in the Maker Space is willing to answer questions and work with you.