



Laser Cutting Job Requests

During the school year the laser cutter is staffed by a student worker who will laser cut jobs requests for students, faculty or staff members. These hours are limited and will change each semester based on the student workers schedule. The hours can be seen on the Maker Arts Space page on the Haverford.edu website. They will also be poste outside the Maker Space.

This document explains the steps a job requester must take to get a job laser cut. Please read this document prior to submitting a laser cut job for approval.

Job requests will be approved by the Maker Arts Space Tech after a meeting and the jobs will be completed by a student technician during their scheduled shift. We ask that you make an appointment with the student tech in addition to making an appointment with Kent Watson so that you and the student worker can laser cut the job together. We do this so you understand the process of laser cutting and so that we can ensure you get the finished product you were hoping to get.

It is not the responsibility of the Maker Arts Space Tech or the student workers to design a laser cut job for the requester. Designing a job can be a difficult task and will require CAD/Graphic Design knowledge. If you wish to learn more about how to design a file for a job there are regularly scheduled workshops geared towards learning this. Please see the website for a schedule of available workshops or contact Kent Watson.

How Requests A Laser Cut Job

1. Schedule an appointment with lab technician by emailing dwatson1@haverford.edu come prepared to meeting with what you want to cut. Ideally, bring with you the laser cut file.
2. If you have not already done so, prepare laser cut file on your own time or fix issues spotted by tech.

Use Fusion 360, Illustrator, or some other CAD software.

You can come in for help during Open Studio Hours (hours posted on website) if you need help with your design.

3. Schedule an appointment. Laser cutter hours change each semester and are posted on the website. You must schedule a time to cut your project during these hours. If your schedule does not work with those hours let us know and we will attempt to accommodate.

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 a laser cut business cards.

There are lots more acceptable requests.

Job requests will not be granted just for fun, memorabilia, favors for friends, or trinkets.

The Maker Arts Space reserves the right to deny certain requests if they are offensive, will not work or are too time consuming.

Is it Free?

It is a free service to run the machine, however materials are limited and depending on the time of the year we might be out. To insure a job can be done we suggest that materials are supplied by students, faculty and staff members.

General Rules For The Laser Cutter:

- Students may not operate the laser cutters. Only trained personnel may operate these machines. Any student who attempts to operate these machines 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 in order to answer any questions that may arise, or to be advised of any remedial CAD work that may be required.
- 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
- Students must supply all materials. Maker Arts Space materials are for courses and workshops.
- 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 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. Once your job is approved you will be given an appointment time. You must be present at that time in order for the job to be processed.

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"

Suitable Materials For Laser Cutter

Cutting and Etching

- Acrylic
- Wood-Consult laser room charts for species-specific thicknesses.
- Paper
- Leather
- Mylar
- Matte Board
- MDF (1/8" thick only)

Etching Only

- Glass
- Stone
- Anodized Metals
- Corian

Banned Materials

- Rubber (All Forms)
- Casting Resins
- Polypropylene
- Polycarbonate
- Any material in the chloride/chlorine family (e.g. PVC-polyvinylchloride)
- Felt
- FoamCore
- Polystyrene

<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? These decisions have to be made in your design file and you must also convey this information to the laser cutter operator.

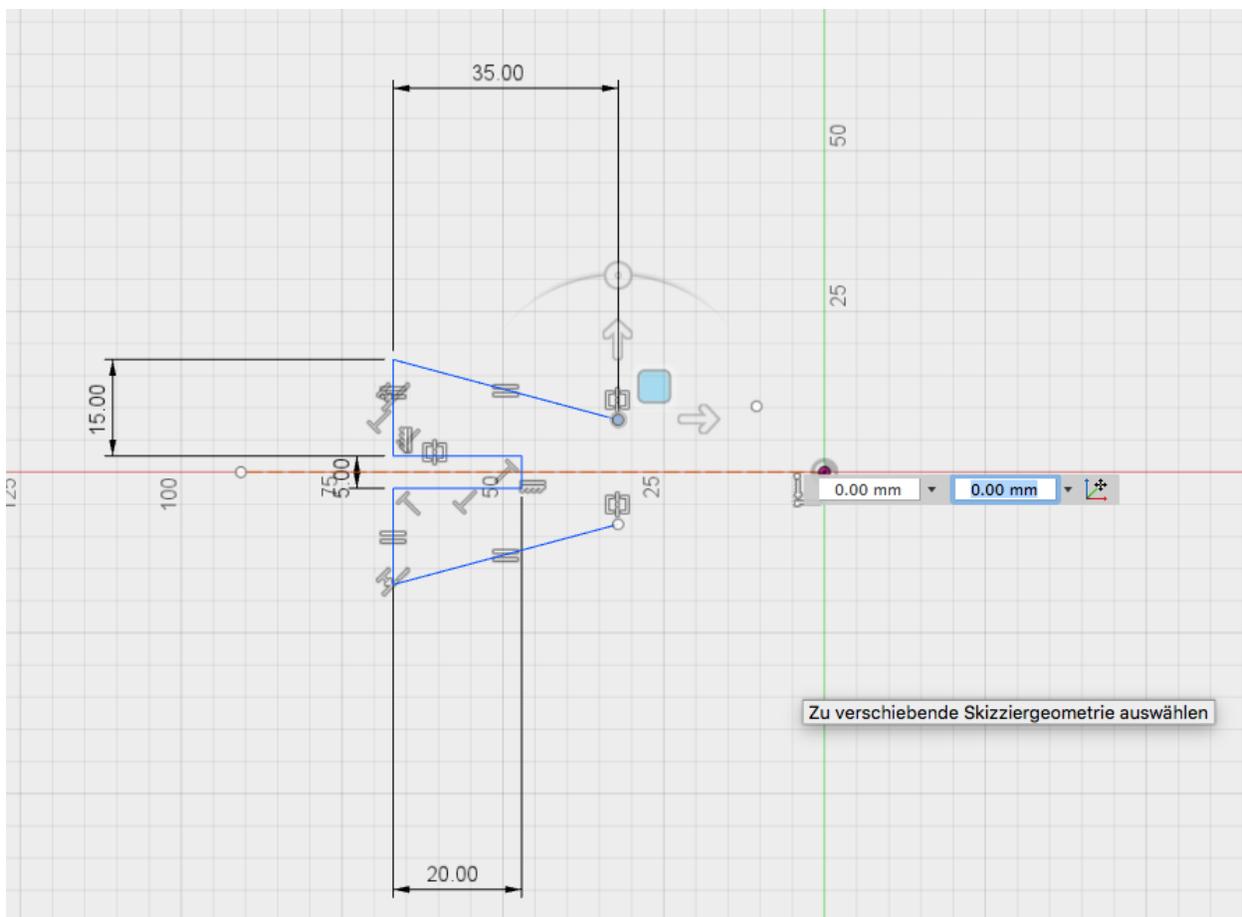
There are lots of ways to prepare a file for a laser cut, some of which might not be covered in this document. If you do not know or are unsure please ask someone in the Maker Arts Space.

There is also lots of information on how to create a file for a laser cutter. Someone on Youtube has probably already done what you want to do and made a tutorial.

This document will briefly mention CAD, raster and vector lines, Engraving, Laser vector cuts, and Illustrator.

CAD

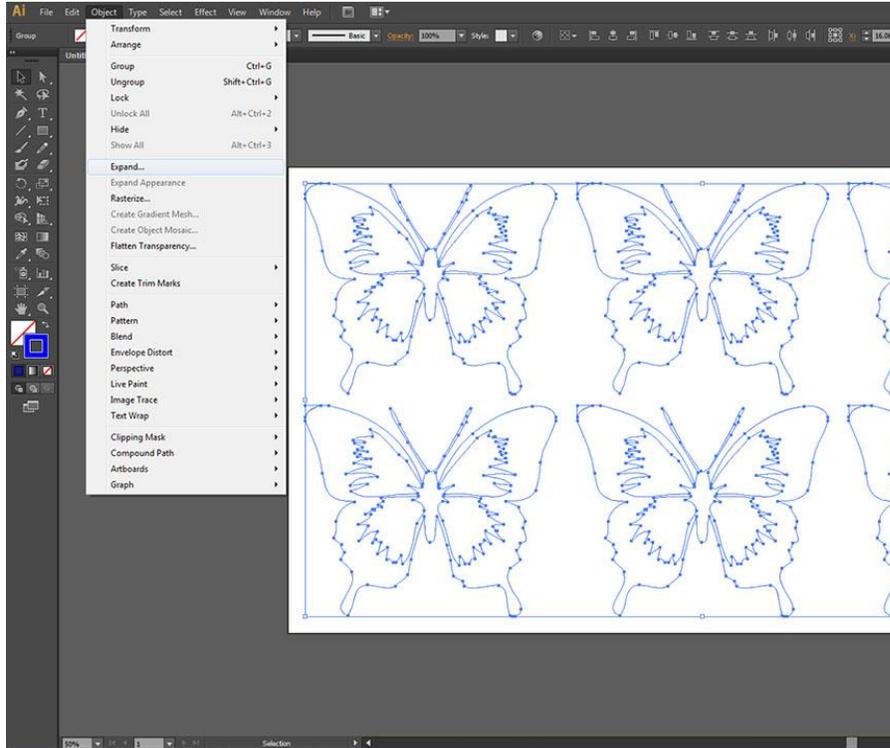
CAD stands for Computer Aided Design. It is a term that has come to be used to mean precision designing where dimensions matter and the goal is to translate the design into the real world. Some common examples of CAD programs are AutoCAD, Fusion 360, Rhino, SolidWorks. Below is a screen grab from Fusion 360. Notice that the exact dimensions are stated next to the vector lines.



On the lab computers in the Maker Space we currently have Fusion 360 and AutoCAD, Illustrator 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.



Engraving and Laser/vector Cutting

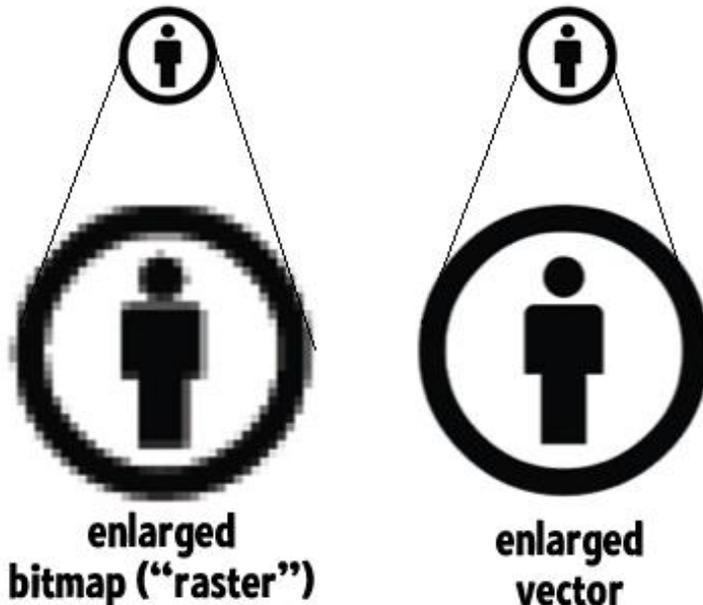
A **laser cut** or a **vector cut operation** is when the laser head follows the path of the created vector lines. When the laser is performing an **engraving operation** it travels back and forth horizontally burning some areas and skipping over others. There are advantages and disadvantages to both 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 images like pictures. 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 effect 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's actually just a vector cut set at less power so 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 may start to see a lot of little 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.



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 and speed and frequency of the laser so it cuts through the material or just into it.

Is That Everything?

Definitely not. There is a lot to learn. These are just the basics. Practice makes perfect and the more you work with vector lines and the laser cutter the better at it you will become.