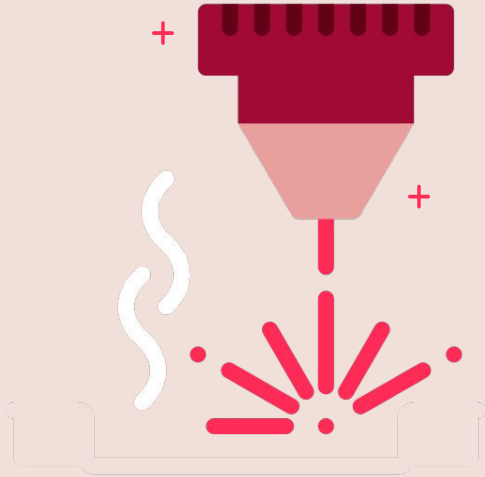




# Mini Testudo Laser Cutting Workshop



Students please sign in  
for the TW Workshop!

SCAN THE QR CODE →

<https://go.umd.edu/TWSP25>



# AGENDA



**01**  
**TW Overview**

**03**  
**Laser  
Safety**

**02**  
**Laser  
Introduction**

**04**  
**Testudo Card Kit**

# Terrapin Works Overview

Terrapin Works is home to an expansive collection of additive and subtractive manufacturing resources that enable rapid prototyping in the A. James Clark School of Engineering, University of Maryland campus, and surrounding community.

Our MISSION is to empower the members of the community to reach their highest creative and technical potential by connecting them with cutting edge fabrication equipment, safe spaces, and knowledgeable personnel.

Our VISION is to accelerate the adoption of advanced manufacturing methods, engineering design processes, and experiential learning by the campus community.



To learn more about our capabilities, services, or FAQ, visit our website here!

# Rapid Prototyping Center (RPC)

More  
Information  
on the RPC

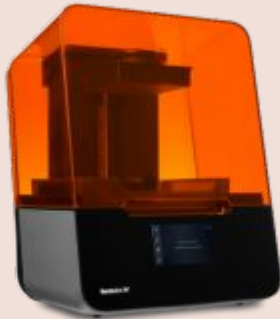


The Angel P. Bezos Rapid Prototyping Lab is a state of the art makerspace in the E.A. Fernandez IDEA Factory.

Here, students will have a safe environment where they can learn how to operate a variety of manufacturing tools that can be used to make any design come to life.

The capabilities of this lab include 3D printing, laser cutting, 3D scanning, water jetting, and basic electronics. If you are already trained, make a reservation on our calendar to get making!

First time users come stop by the lab for a tour and learn how to reserve machines!



# What Is a Laser Cutter?

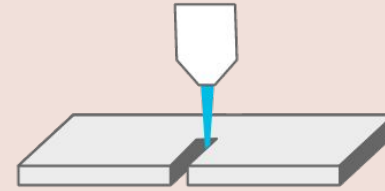
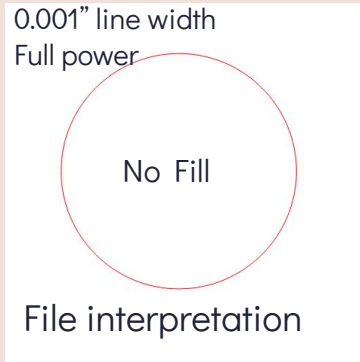


- Laser cutters use lasers to cut or engrave materials through ablation/vaporization of material
- Computer controlled machine
- Used in engineering, automotive, medical, jewelry, etc... industries

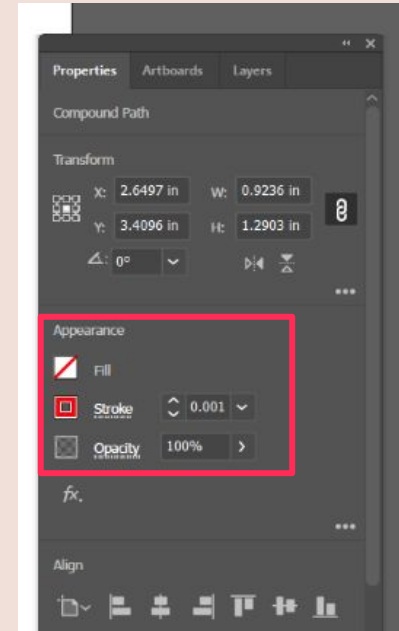
# What Can a Laser Cutter Do?

- A cut operation that traces a path and uses a focused light beam that penetrates completely through the material.
- This mode of operation may also be used for “vector engraving” which is essentially a cut that does not fully penetrate the material.

(vector operation)

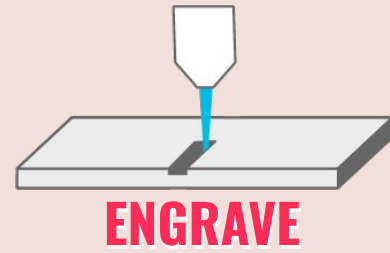


**CUT**

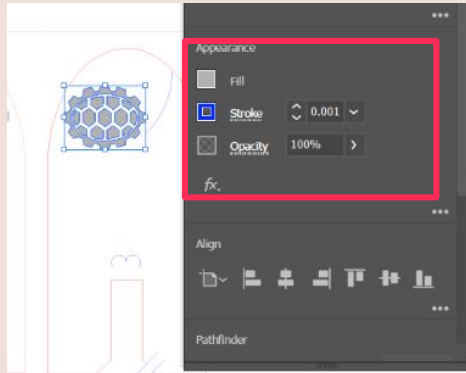


This is the interface for Adobe Illustrator

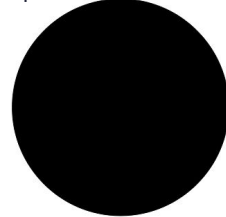
# What Can a Laser Cutter Do?



- Engravings are much less aggressive— only penetrating the top layers of the surface, resulting in an etched design.
- The main difference between a raster engraving and a vector engraving is how the laser moves.
  - Raster engraving breaks an image up into lines and simply engraves line-by-line until the full image is produced.
  - Vector engravings just follow a particular path at a low power to trace out a logo or letter.



No line width  
Shape is filled

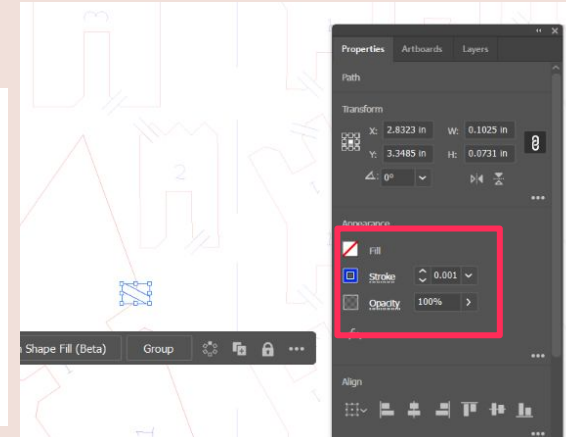


File interpretation

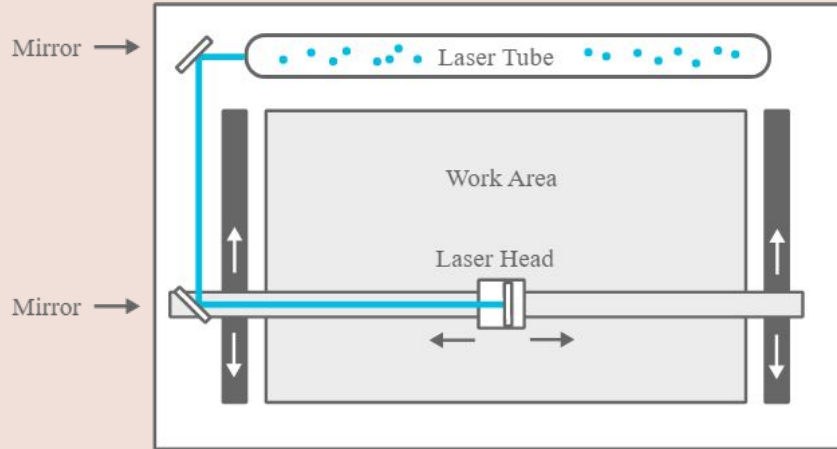
0.001" line width  
Low power



File interpretation



# How Does a Laser Cutter Work?

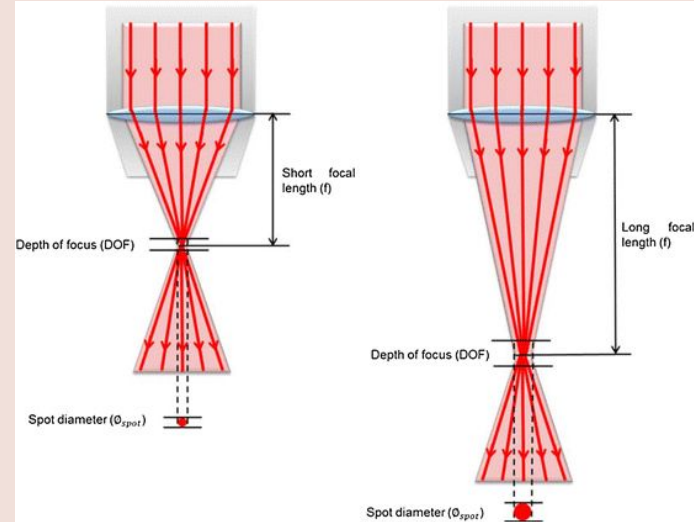


01

Laser beam forms in Laser Tube after voltage is applied

02

Laser is directed to the Laser Head using mirrors, then focused into a small area with a lens



03

Laser Head moves depending on file





<https://terrapinworks.umd.edu/equipment/epilog-fusion-pro-36>

# Epilog Laser System Overview

- The Epilog is a 75W **Class 2** CO2 laser when all the safety features are working. Everyday examples of these types of lasers include laser pointers and range finding equipment
- People typically use it to cut out enclosure parts, engrave gifts or jewelry, or create awards
- Operates similarly to a CNC router, except instead of a drill bit, it uses high energy focused light to vaporize material in localized areas (the laser beam has approx. diameter of 2 human hairs at its thinnest point! It's like an incredibly sharp and thin knife)



# + Epilog Laser System Workflow



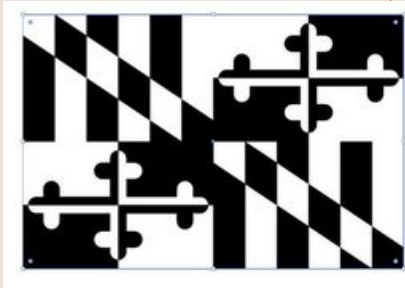
**Power On**  
Check Exhaust &  
Air Assist, Turn  
on Laser

**Markup**  
Set Fill & Stroke  
Properties in  
Adobe Illustrator  
(AI)

**Print**  
Send file from AI  
to Epilog job  
manager

**Set**  
Position File, Set  
Focus & Adjust  
Laser Settings

**Laze**  
Send Prepared  
File to Laser



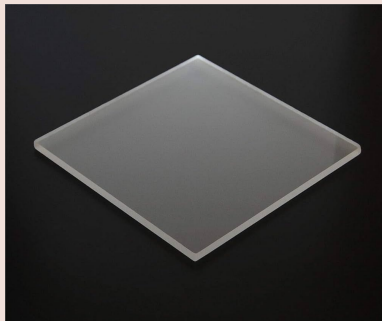
Autofocus  
is usually  
sufficient





# Materials

**CAN CUT:**



Acrylic



Wood



Natural Leather



Cork

**CAN ENGRAVE:**



Ceramic



Glass



Certain Metals (Like Anodized Aluminum, or reflective metals when using a fiber laser)



# Materials

**CANNOT CUT:**



PVC

Emits chlorine gas



ABS

Emits hydrogen cyanide gas



Metal

Epilog power (75W) is insufficient to cut metal - only laser marking/engraving is possible





List of Prohibited Laser Cutter  
Materials:



# Laser Safety

## Fumes from Unsafe Materials

- As the laser vaporizes material, dangerous gasses can be produced by an unsafe material.
- Always check with staff before cutting a material not supplied by TW
- Some commonly forbidden materials are: PVC, ABS, Fiberglass

## Fire

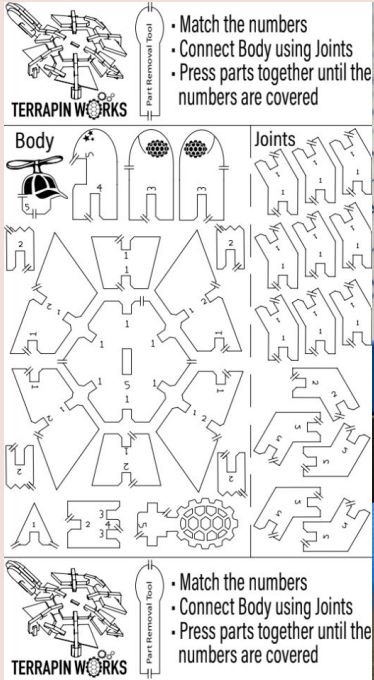
- During usage of the machine, the cutting process poses a fire risk. **WHENEVER YOU ARE CUTTING, YOU ARE REQUIRED TO STAY WITH THE LASER.** Never operate the laser system while unattended.
- The air assist system and ventilation system work together to clear combustion gasses from the tool.
  - Small flare ups may occur, If you see spreading flames pause the job and open the lid.
  - Alert staff immediately and do not turn off the ventilation system.
- If you see smoke collecting without spreading flames:
  - Pause the job and double check the ventilation system is on.
  - Keep the lid closed.

## Laser Radiation

- The polycarbonate windows block infrared radiation from the laser itself, however the combustion of the material produces a bright light in the visible spectrum that can damage your eyesight if stared at.



# Testudo Card Kit Info



Sheet cutting and forming are some of the oldest and most commonly used methods of manufacturing. They are most commonly used to create hollow structures like car chassis, microwaves, and more!

This card kit was designed by one of our staff and is an example of what can be produced with laser cutting. It is a Testudo "card kit" that can be assembled by hand. As you build, pay attention to the ways that flat sheets can be used to create unique volumes.



# + Exploded View of Part Arrangements

