

Laser Cutting Reference Guide

Fall 2026

The
Creative
School

**Design +
Technology LAB**

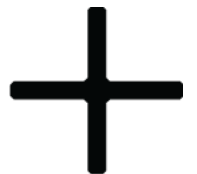


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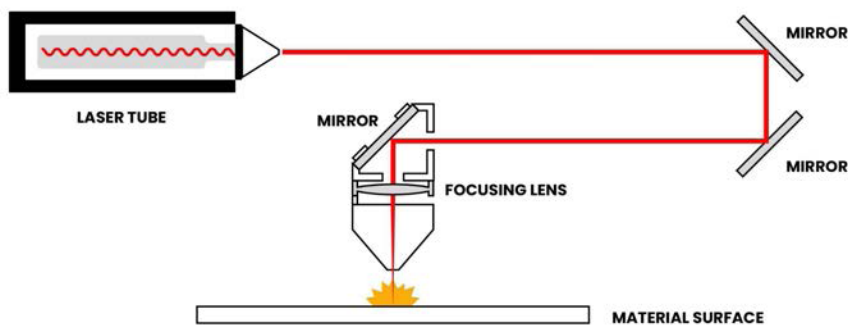
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Laser Cutting General Overview

It's laser time! Woohoo! In this document, you will find information about **laser file preparation**, **material specifications** and **best practices**. Let's go!

What is Laser Cutting?

Laser cutting is a process that uses a high power laser to mark the surface of or cut through a **flat material accurately and quickly**. A laser beam is emitted from a laser tube and is reflected off a series of mirrors, until it is directed perpendicularly to the surface of your material by a mirror in the laser head (pictured below).



Simplified diagram of the components of a laser cutter.

Before reaching the material, the laser beam passes through a focusing lens in the head that concentrates the laser beam's power a set distance from the lens. This requires that the laser be focused to each material in order to guarantee clean cuts and crisp rasters. This focusing is done at the start of each job and is the reason that **a laser cutter cannot process uneven materials**.



This sample shows the three different techniques on the same material.

Laser Cutting Processes

There are three main laser cutting techniques:

1. Cutting

- a. Cuts through the material

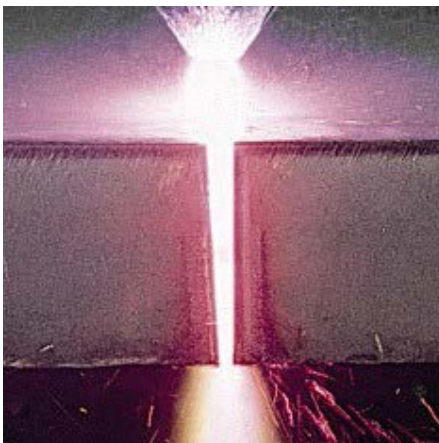
2. Linear Engraving

- a. Scores vector lines on the surface of the material

3. Rastering

- a. Burns away the surface of the material

These processes are indicated by their unique graphic attributes when preparing a vector file.



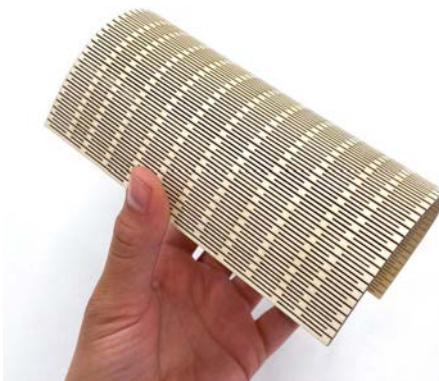
Close-up profile of a laser kerf.

Laser Kerf

The **kerf** is the amount of material removed by the laser cutter as it burns through the material. Thicker material requires a slower speed and a higher power and as a result, will burn away more material, making the kerf wider.

The LAB always recommends prototyping a portion of your design, taking into account the kerf and tweaking if necessary. Read [this article](#) to learn more about compensating for kerf and designing with material tolerance.

The kerf of a laser can also work in your favour! Rigid materials like wood or acrylic can be made flexible by cutting “kerf cuts” into them. There are many different shapes and designs that each give distinct bending behaviours.

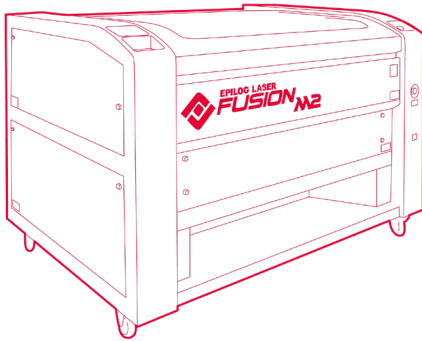


Kerf cuts make plywood more malleable.

Laser Cutters at the D+T LAB

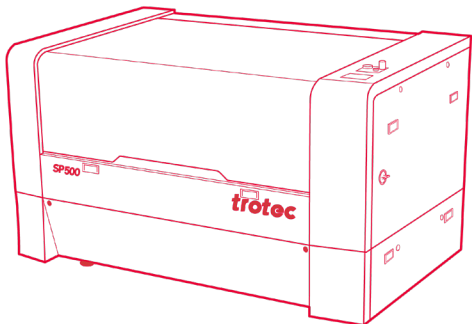
Each of our laser cutters has a different laser bed size. It is important to **keep in mind what these maximum sizes are when planning** your projects.

Epilog Fusion M2



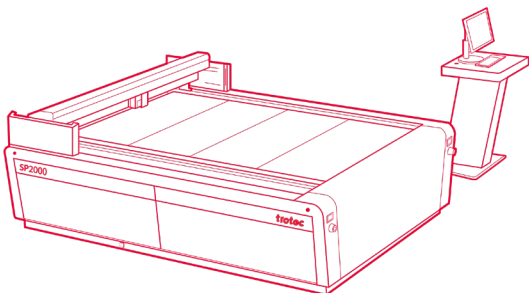
- Maximum cut size: **39.5" x 27.5"**
- Maximum cut depth: **0.125"** (3mm)
- The Epilog Fusion is an enclosed 75 watt CO2 laser with a 2" lens.

Trotec SP500



- Maximum cut size: **48.5" x 27.5"**
- Maximum cut depth: **0.25"** (6mm)
- The Trotec SP500 is an enclosed 120 watt CO2 laser with a 2" lens.

Trotec SP2000



- Maximum cut size: **65.5" x 98.5"**
- Maximum cut depth: **0.25"** (6mm)
- The Trotec SP2000 is an open-air 200 watt CO2 laser with a 5" lens.

What materials can be laser cut?

The LAB offers a selection of **in-house materials** available as part of our Service Bureau:

- Illustration Board
- Cardboard
- Baltic Birch Plywood
- Clear, White, and Black Acrylics

As of Fall 2025, the D+T LAB **no longer sells or accepts MDF** as a material we laser cut!



Materials That CAN Be Laser Cut

- Softwood and Hardwood
- PET-G and acetate
- Natural fabrics and some synthetic fabrics
- Real and organic leathers
- Felt (wool and polyester)
- Cork and rubber
- Uncoated paper and cardboard
- Mylar and oilboard
- Silicone, linoleum, and softoleum

Materials That CANNOT Be Laser Cut

Toxic Fumes

- Medium-density fibreboard (MDF)
- Acrylonitrile butadiene styrene (ABS)
- Foam-core/Polystyrene presentation board
- Pleather/fake leather
- Bonded leather
- Vinyl
- PVC (Polyvinyl Chloride)
- Styrene

Fire Hazards

- Polycarbonate/ Lexan
- Double Wall Corrugated Cardboard
- Warped materials

Unable to Cut

- Materials thicker than 0.25"
- Metal
- Corian
- Glass
- Stone
- Tile

File Setup For Laser Cutting



Laser cutters are operated by computer software that interpret vector paths and image data as a set of instructions. The designer (you) **needs to make a vector line file** that instructs the laser what to cut.

1. Use our template or start a fresh new file

Either download the [LAB's laser template files](#) (sized for D+TL in-house materials), or make a new file in your vector design software of choice.

- The LAB offers templates for Illustrator, Rhino, AutoCAD, and Vectorworks.
 - Note that the D+T LAB does not accept Vectorworks files – see [our detailed guide](#) on how to convert .vwx to .ai files for Service Bureau

2. Scale and size requirements

Files for laser cutting **need to be designed at 1:1 scale in imperial units**. The LAB requires that your artboard matches the size of your material (see [this video](#) for more info on designing your vector file to meet laser cutter criteria). Double-check to make sure your design fits [within the laser cutter's maximum cut size](#).

- Always provide a 0.25" margin around the perimeter of the artboard to account for material size variability (the LAB's templates already include this).

3. Constructing your cut shapes

The laser will try to cut every path/geometry that exists in your file, even if it's not visible to the designer (you). Because of this, we recommend against adding a "fill" to your geometries until your design is nearly ready, to avoid accidentally hiding anything beneath other shapes.

- Always check your drawings for double lines! Every line in your file will be cut. **Duplicate lines pose a potential fire hazard!**



Example of a laser cut.



Example of a laser linear engraving.



Example of a laser raster.

4. Vector and raster graphic attributes

Once you are satisfied with your file, adjust the properties of your 2D graphics to the appropriate settings for **Laser Cutting**, **Linear Engraving**, or **Rastering**.

Laser Cutting

- For **cutting** set *vector graphics* to:
 - Fill Colour: [None]
 - Stroke Colour: RGB Red (255, 0, 0)
 - Stroke Weight: **0.01 pt** / *hairline*.

Linear Engraving

- For **linear engraving** set *vector graphics* to:
 - Fill Colour: [None]
 - Stroke Colour: RGB Blue (0, 0, 255)
 - Stroke Weight: **0.01 pt** / *hairline*.

Rastering

- For **rastering** set *vector graphics* to:
 - Fill Colour: Black (0, 0, 0)
 - Stroke Colour: [None]
 - Stroke Weight: **0.00 pt**
 - Note that any grayscale elements in your file will be rasterized including strokes.

If you are using the LAB's templates and depending on the software, moving your vector graphics to the appropriate process layer will automatically change them to the correct graphic attribute.

5. Preparing raster graphics

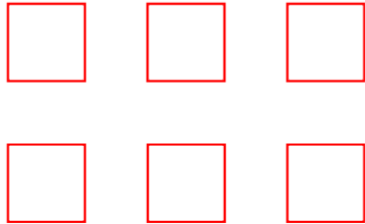
Ensure that all **raster graphics** are monochrome black & white images (.jpeg, .png, .bitmap).

- These **images should be embedded** into your file!

6. Saving your file

Save your file as .ai, .3dm, or .dwg (per your software). When saving, make sure that your document is in imperial units and at 1:1 scale.

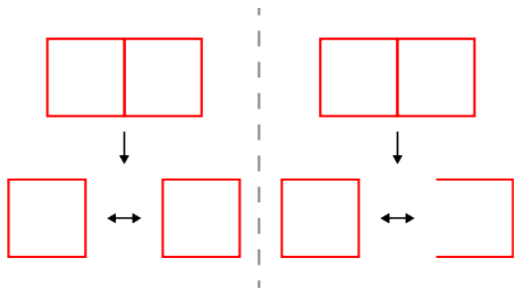
Designing for Laser Cutting



Example of a laser cut file that is not optimized for material use or cut time



Example of a well nested file that reduces material waste and saves time



Best use of your material

Nesting

- Nesting is the practice of laying out laser cutting files to minimize material waste and save time.
- It is recommended that you layout the pieces as close as possible or even have pieces share the same lines.
- Having shapes share cut lines will reduce your overall processing time and material.
- Keep in mind that having shapes share cut lines may affect their final size since the laser kerf will remove some amount of material.

Cutting down your cut material

- A good habit when laser cutting is to cut down your material when submitting a laser cutting file so that the offcuts are much more manageable
 - We recommend adding an additional cut line around the bounds of the laser cutting objects in your file, typically making square or rectangular offcuts

Avoid overlapping lines

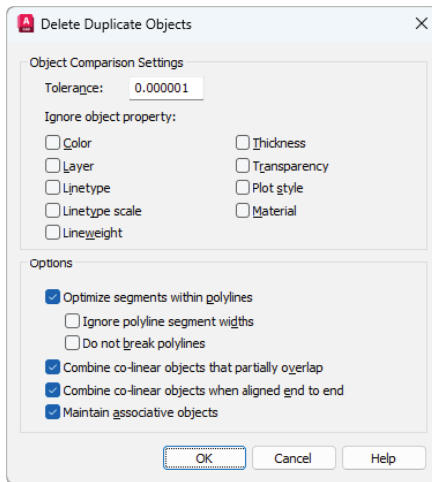
When nesting pieces together, do not simply place them beside one another like the example on the left. In that case, there is an overlapping line in the centre where the two squares meet. Take the time to trim and delete any overlapping lines to not only save time but eliminate a potential fire hazard!

Before submitting your laser cutting file to the Service Bureau, you should always double-check for overlapping lines in your submission.

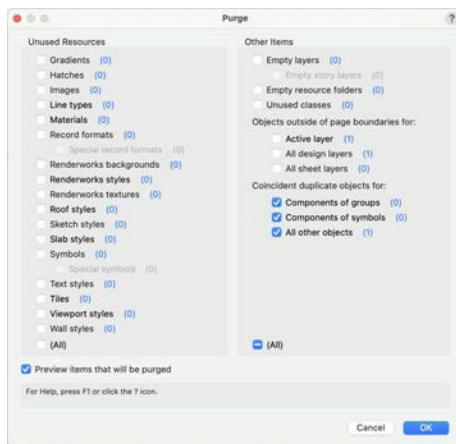
How to quickly check for overlapping lines

Illustrator

- There is unfortunately no quick way to check for overlapping lines in Illustrator. The method for finding duplicate lines is a manual process by examining all of your linework one by one.



The OVERKILL dialog box in AutoCAD



The Purge dialog box in Vectorworks

Rhino

- The command **SelDup** will detect and select all duplicate geometry. Once selected, these duplicates can be deleted.
 - Do not use SelDupAll as that will select duplicates and the original geometry!

AutoCAD

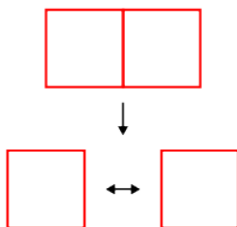
- The command **OVERKILL** will detect and remove any duplicate and overlapping geometry, as well as combine any partially overlapping geometry.

Vectorworks

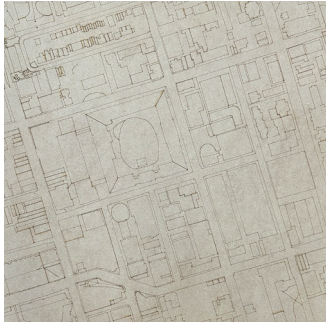
- The command **Purge** detects and removes specified items based on the selections in the dialog box. Only select the boxes under "Coincident Duplicate Object for:" to delete any duplicates.

Always double-check for duplicate lines

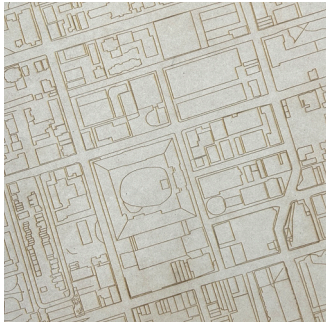
The methods above only detect exact duplicate lines. If there are any partial lines hidden within the linework they will go undetected.



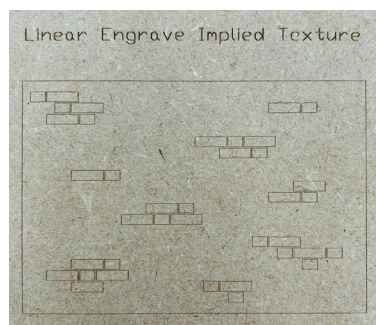
This diagram of a duplicate centre line is a good example of an overlapping line that would be undetected as only one edge of the shapes is overlapping. Checking for duplicate lines requires patience and due diligence to ensure that there are no overlapping lines in your file.



Linear engraved map



Rastered map



Minimizing laser cutting time

Linear engraving VS Rastering

Depending on the desired application, linear engraving or rastering may be the better option for conveying the information in your laser cutting file.

These two maps are the same design, the first was linear engraved while the second was rastered.

Despite having the exact same linework, the differences in cut time are substantial. Linear engraving is able to quickly trace the vector lines, this file was processed in 11 minutes. The rastering example required the laser to travel back and forth across the full surface of the file. To raster the full map took 65 minutes – a big difference in time and final cost.

When deciding between linear engraving and rastering it is important to keep these tips in mind:

- Linear engraving is a set hairline thickness
- Rastering large areas is much more time consuming and expensive

How much detail is too much detail?

When designing your file, you should be mindful of the amount of detail that you want to capture through linear engraving and rastering. Both processes can quickly become quite lengthy, and as a result expensive.

To the left are three examples of laser cutting a brick texture onto the surface of a material.

Rather than rastering or linear engraving the full surface of the material, texture can artfully be implied through minimal engraving or rastering.

Implying the texture of a surface will take less time to process and conveys the same meaning if the material were fully engraved or rastered.



Simple line with stroke weight in *Normal Mode vs Outline Mode.*



Outlined stroke in *Normal Mode vs Outline Mode.*

Converting text to vector lines

When submitting laser cutting files to the Service Bureau, ensure that all text has been converted to vector lines. If these text elements are not converted to vectors, they will not be read or processed correctly on the laser cutter.

Below are the steps to convert text to vectors in the LAB accepted software:

Illustrator

- Type > **Create Outlines** (shift+ctrl+O)
 - **TIP:** When using Illustrator, view your design in **Outline mode**. It allows you to see how the laser will interpret your design elements. The **Outline mode** does not display colours or images. Toggle Outline mode using ctrl+Y.

Rhino

- Use the **TextObject** command to create text vectors
 - **TIP:** If you created text using the Text command, you can use **Explode** to turn them into curves.

AutoCAD

- Use the **TXTEXP** command to explode the text element into vector lines
 - This command is **not available for MacOS** versions of AutoCAD.

Vectorworks

- Text > **Convert Text to Polylines**

Using tabs in your design

When designing with text and/or small pieces, it is beneficial to design these elements with tabs to avoid losing pieces during the laser cutting process – especially for lightweight materials.

The LAB recommends that the minimum size for any laser cut elements that you want to retrieve should be **0.5" x 0.5"**. If there are smaller pieces, they will most likely be lost during in the cutting process.



Laser Cutting File Checklist

- ☐ Is the document set in RGB colour mode?
- ☐ Is the artboard the exact size of the material you're cutting?
- ☐ Are all lines and fills coloured correctly?
- ☐ Is the stroke width correct?
- ☐ Are there any double/overlapping lines?
- ☐ Are the images properly embedded (if any)?
- ☐ Have you nested your linework to avoid material waste?

The design is now ready to be processed by the laser cutter.

D+T LAB Laser Cutting Resources

Patron-Supplied Material Laser Cutting Guide

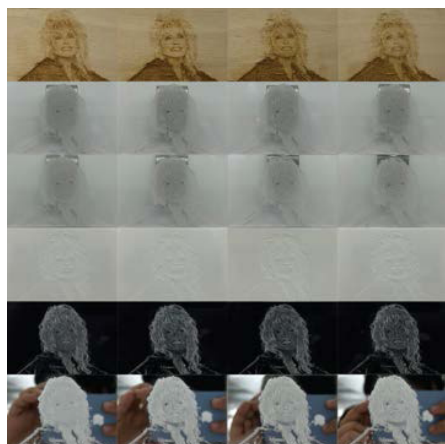
For patrons interested in either reusing in-house LAB material or supplying their own material, we created a guide that details the process.

This guide details the steps of preparing your material, determining whether the LAB can laser cut it, setting up and submitting your file.

Laser Photo Rastering Best Practices

Laser photo rastering is not an exact science but the LAB has compiled a best practices guide on how to successfully prepare your file to achieve your desired result.

We've detailed the steps of preparing your image in Photoshop, explaining how the laser cutter raster algorithms work, and photo rastering examples on some of our in-house material.



Laser photo rastering on some of our in-house materials

Vectorworks Laser Cutting Workflow Guide

For patrons working in Vectorworks wanting to do laser cutting, we have prepared a workflow guide on how to translate your files to Illustrator so that the LAB can process your submissions.

- **NOTE:** Adobe Illustrator is required and is accessible to students/staff/faculty in The Creative School. Information on how to access the Adobe Suite can be found [here](#).

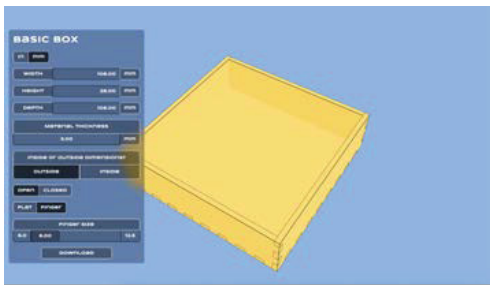


Additional Laser Cutting Resources

Deepnest.io

An open source nesting software that can pack all of your laser cut pieces into a more material and time efficient layout.

- Deepnest.io can **only read and write DXF and SVG** files so you will need to import these files into an accepted file format for our Service Bureau.



Makercase

A web-based application for designing laser cut files for custom boxes with finger joints. There is a great degree of customisability in picking the box's dimensions, material thickness, and finger joint size. Once satisfied with the box design, Makercase then produces an SVG or DXF laser cutting file to cut the box.

- Makercase can **only write DXF and SVG** files so you will need to import these files into an accepted file format for our Service Bureau.

Laser Kerf Templates

For more information on laser kerf techniques and templates, Trotec has a great resource that details different cutting techniques and offers free templates.

