The Hive | Laser-Cut Suncatcher Design Tutorial

How to make a stained-glass design ready for laser cutting!

Recommended wood thickness is 1/8” and recommended metal thickness is at least 1/16”

For the provided designs, I went with the following dimensions.

- 1/16" thick frame (line thickness)
    - The thickness can be reduced, but thicker frames yield better results when pouring resin
- Resized to fit within a 4”x4” piece of material

To change either parameter, start from the original vector paths (stroke w/o offset). Resize the path dimensions and/or adjust the line thickness.

Part 1: Initial Setup and Tracing the Image

Two approaches to drawing lines*

- Pen tool (smooth and adjustable lines)
- Pencil tool (wobblier lines but can then simplify and edit)

*Third option that won’t be covered in this guide: Raster drawing via tablet and running auto-trace

Since understanding the pen tool helps you understand the pencil tool, let’s start with explaining how it works.

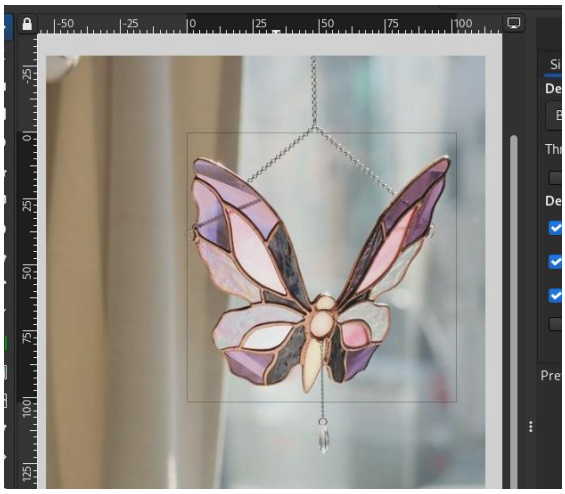
Find a reference image of stained glass you would like to recreate. Create a new document on Inkscape and import the image onto the document. Continue with the default import settings.

For this guide, I will be using this butterfly design as reference!

I have resized the canvas to my target design size (4” x 4”) through the document properties panel. Alternatively, you can draw a 4”x4” rectangle without resizing the canvas and use that as a reference.

As a side note, I changed the document units to inches. This is optional of course, as you may work in any unit you like :)

Resize the image to fit within the canvas. Hold down Ctrl while dragging to maintain the aspect ratio.



The faint canvas outline can be seen through the imported image. Since we are using the image as a reference, having a low-quality or pixelated image is no problem at all.

From here, we can start tracing the image. With the pen tool (hotkey B), I can draw with a combination of straight and curved lines.

- For straight lines and sharp corners, click to place a node (also called anchor point).
- For curved lines, click and drag to place a node with a curve handle.

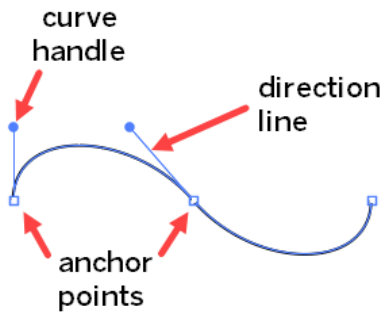
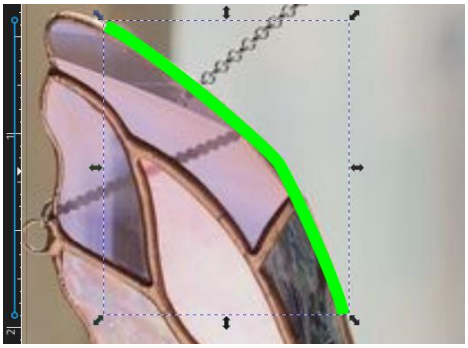


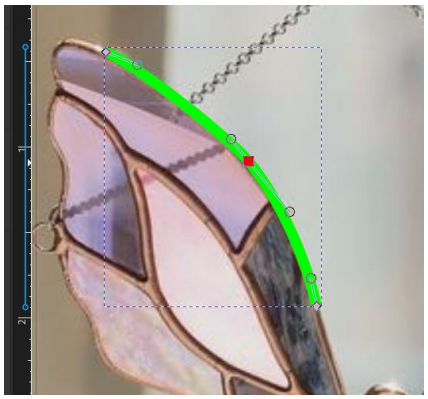
Image credit: https://ittrainingcontent.iu.edu/training/illbs/files/pc/using-the-pen-tool.html

For the pen tool, set line properties to “no fill” and a stroke thickness of 1/16”. These options are located in the bottom toolbar and sometimes only appear once you start drawing. For better visibility, I recommend making the stroke color something bright.



Starting to draw the line. You can optionally reduce the opacity of the stroke for easier comparison with the original bitmap image.

Now for fine adjustments. Double-click a path to view the individual nodes within the path. From here, you can click and drag to move the individual parts of the path.

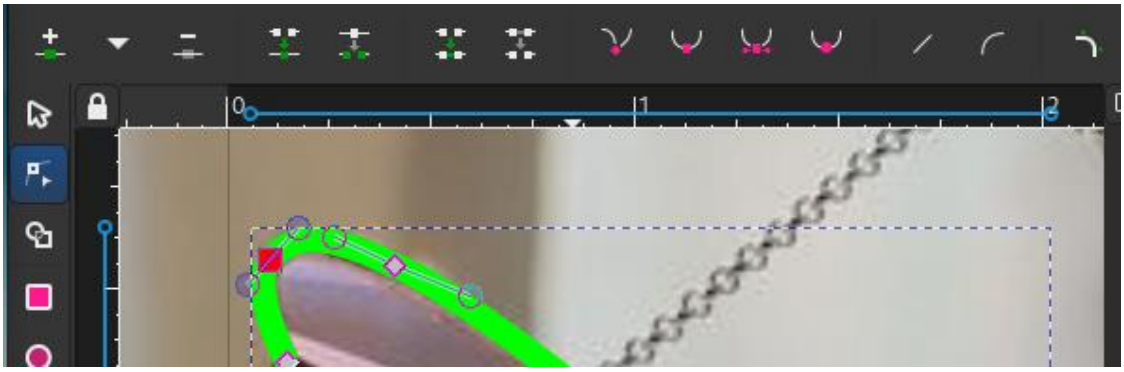


Node view of the selected path. By moving some nodes and adjusting the curve handles, the path better matches the reference image!

For demonstration purposes, I've only worked on a small segment instead of outlining the entire design. As a side note, although I have clicked out of drawing the path, I can resume drawing the line by selecting it and using the pen tool to restart the line from an endpoint. Neat!

Tip: Do not spend too much time on getting the curves completely accurate on the first pass! It is easier to adjust all in one go after all the lines are put in place.

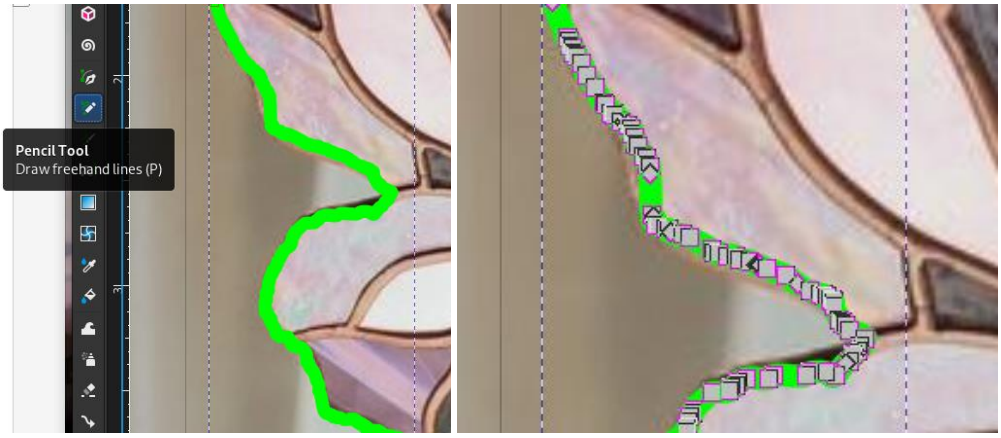
There are lots of handy options that you can use. I recommend going through and seeing what each icon on the toolbar does, as well as options located under the Path dropdown menu.



There are tons of useful built-in tools located in the top toolbar to help manipulate anchor points on a path. The ones of note in magenta, from left to right, are: Make selected nodes corner, Make selected nodes smooth, Make selected nodes symmetric, and Make selected nodes auto-smooth

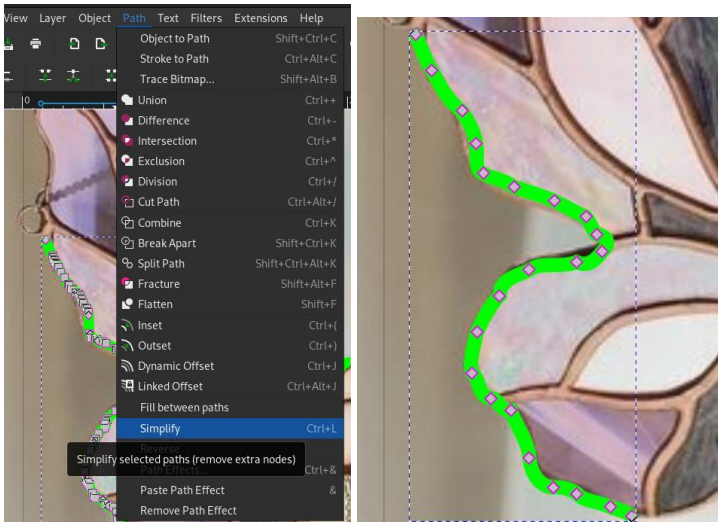
Part 1.5: Pencil tool time

If you prefer not to deal with the learning *curve* for the pen tool, you can try approaching it freehand using the pencil tool (hotkey P). With the tool active, simply click and drag in any direction to create a line. Inkscape automatically translates your freehand line into a path.



Result of a segment done via pencil tool. Perhaps too many nodes?

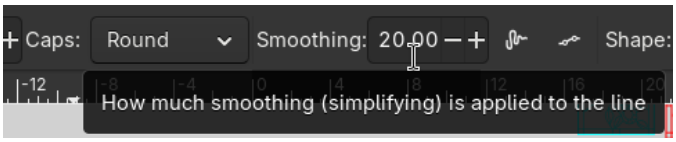
Quite bumpy, but there is a quick way to fix this! Under the Path menu dropdown, there is an option to simplify.



Much more manageable.

However, the line is still not as smooth as it could be. In general, less nodes equals smoother lines. From here, you can either manually select and delete the unwanted nodes or repeat the “Simplify” operation multiple times (shortcut Ctrl+L).

There’s also a way to control the number of nodes made for you. There is a “smoothing” parameter that you can adjust. Higher smoothing means less nodes.

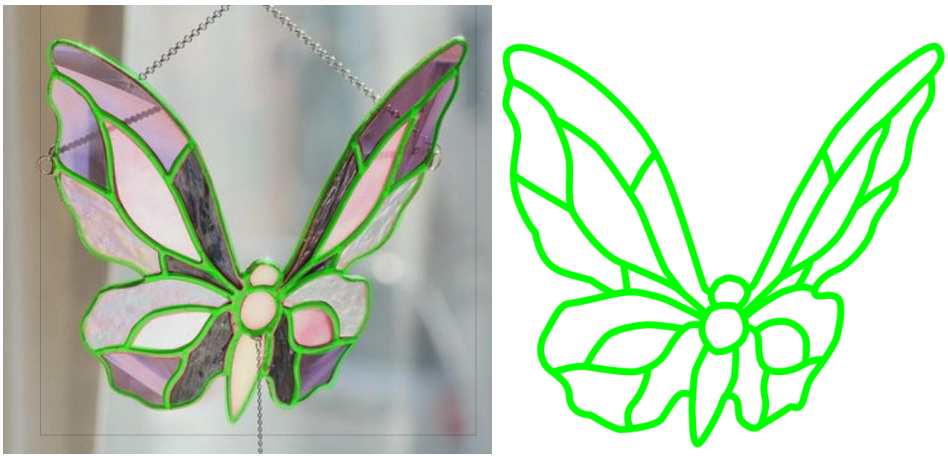


Smoothing parameter located in the top toolbar.

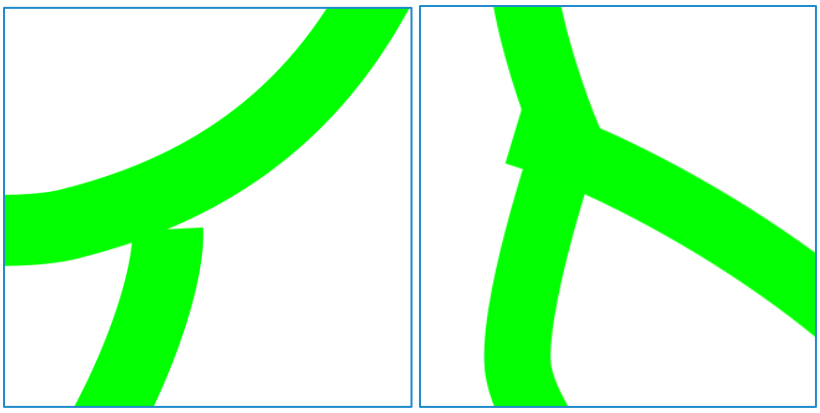
Since the result from the pencil tool is also a path, you can manipulate it the same way as described in the pen tool section!

Part 2: Creating the Cut Paths for Laser Cutting

Now let’s fast forward to after all the lines are traced! At this point, we are done using the reference image, so you can drag it off the canvas. Adjust the opacity of the lines to 100% if previously set to translucent.

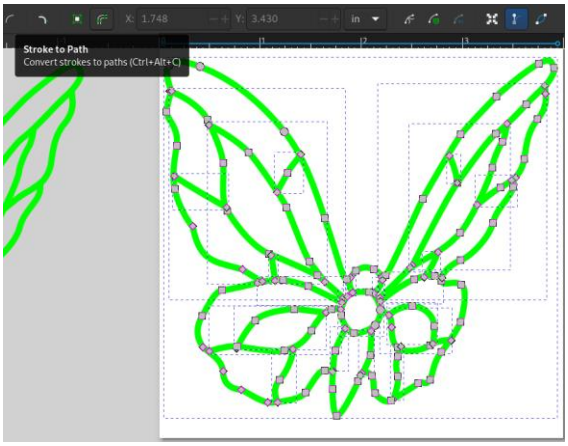


As a quality check, zoom in to see if there are any minor errors, such as paths not quite intersecting or lines that jut out too far. Adjust as needed. Everything in green represents the shape of the wooden cutout we’ll be making.



To laser cut the green shape, we need the outlines of the stroke rather than the stroke itself. We are now at a major checkpoint.

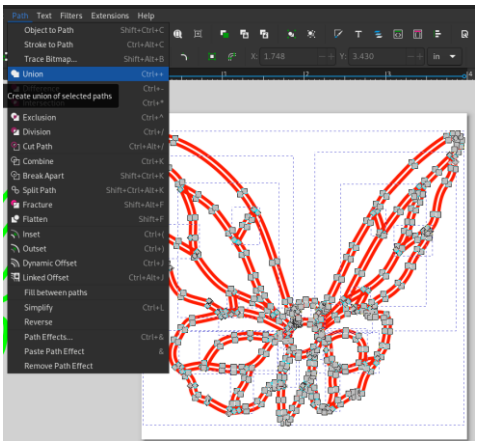
I highly highly highly recommend creating a copy before doing stroke to path, as this operation locks in the line thickness that you have chosen. Keep the non-offset lines for more flexible usage of the design you put in work to make!



This option can also be found in the top dropdown menu Path -> Stroke to Path.

Change the result by disabling fill and setting stroke to be visible. You can set the thickness to any arbitrary value that allows you to see the lines.

Once again select everything, and now navigate and find Path -> Union



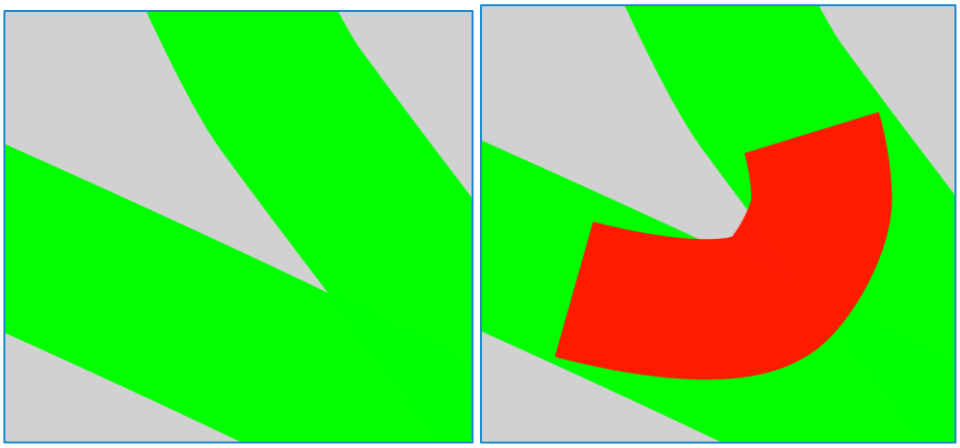
Do one last round of quality checking. Sometimes errors do happen and result in something strange looking. Smooth out any jagged lines.

There appears to be too many nodes here. Select and delete any unneeded ones from the node view.

We're all done! Last thing to do is to export the design and open the SVG file on a computer connected to a laser cutter (Illustrator is recommended for Hive laser cutters). From there, set the correct settings for vector cuts, and laser cut away.

Part 3: Some Optional Adjustments

Fillet sharp corners

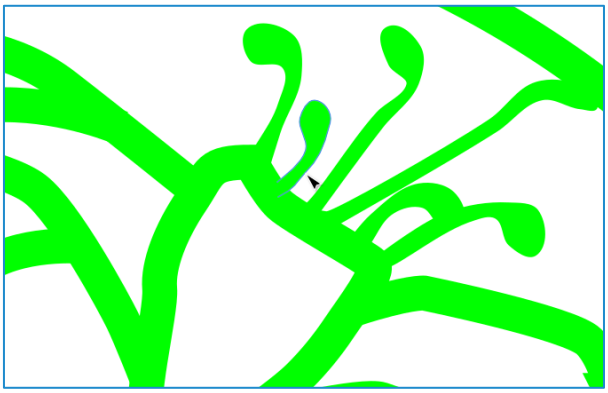


The added fillet path is drawn in red for demonstration purposes.

Do this before the stroke to path operation and then proceed as normal. Adding this fillet strengthens the wooden frame and improves overall appearance. Many stained-glass pieces have softer corners for a more organic appearance.

Small details

Once again before the stroke to path operation, you can draw in a filled path without stroke. Although drawn differently (fill instead of stroke), the paths will be merged properly after selecting everything and merging via “union.”

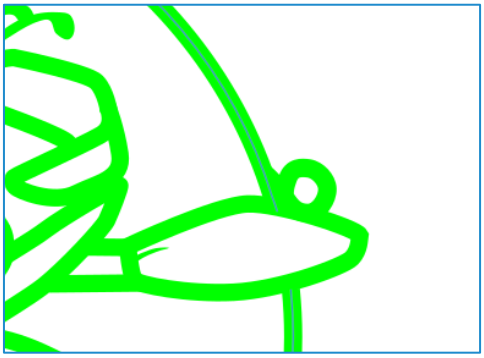


This guide’s butterfly design didn’t feature small details, but here is an example of this from an existing design.

Built-in loops for hanging

You can draw in small loops that might not have been in the original design. These loops serve as attachment points for thin jewelry chains in the final product. Suggested loop diameter is 1/4”.

Like the previous tip for adding in small details, you must add these before doing “stroke to outline.”



Loops are optional and have not been added to the butterfly design, but here is an example from an existing design.