Week3 Actual

In week 2 we learned some things about working with a laser and using vectors, and we made some very valuable tools including:

- A speed/power grid for determining fill settings with different materials
- A settings library to store our best settings per machine/material

We also learned a lot about the basic shape and node editing tools available in Lightburn. And we covered the align/distribute tools for doing layout.

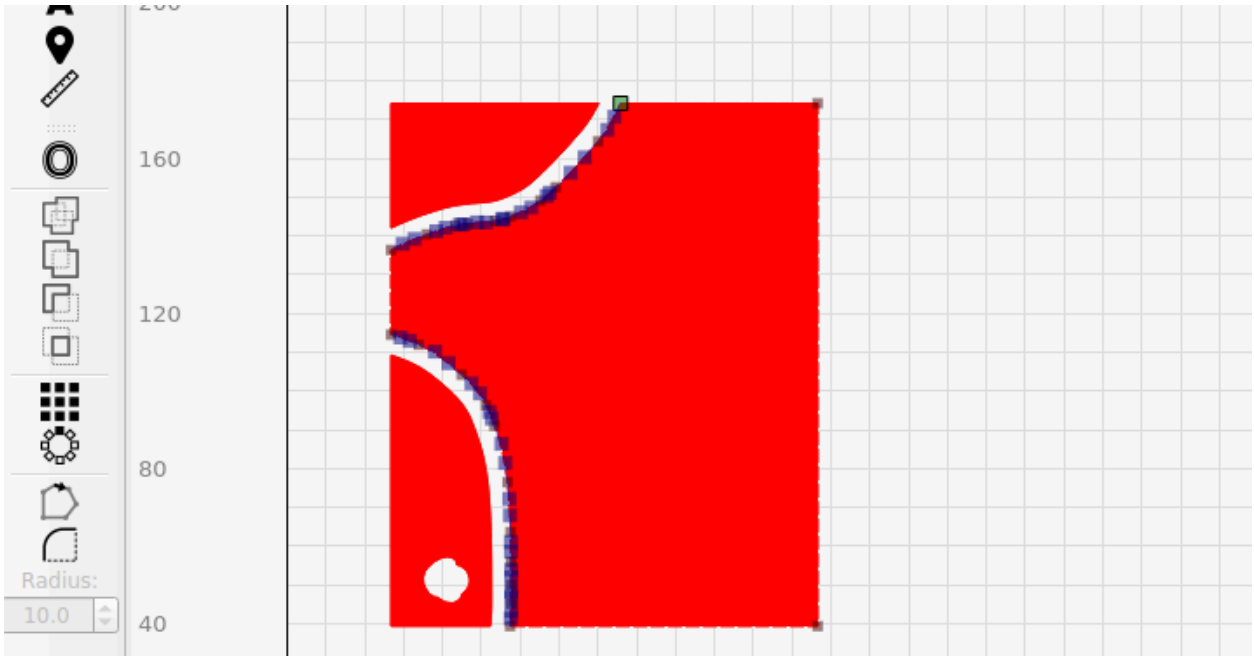
While capable software, there are many design tasks that Lightburn is not capable of doing. This week we will do a couple of practical projects to see how to make use of additional tools, including Inkscape and FreeCAD.

Why Use Inkscape for Design

Given how much we have been able to do in Lightburn, you may wonder why we would ever use another tool - and indeed designing outside of a dedicated laser design tool can introduce some real difficulties for you. But these difficulties can largely be avoided, and the design features we get access to may be worth it.

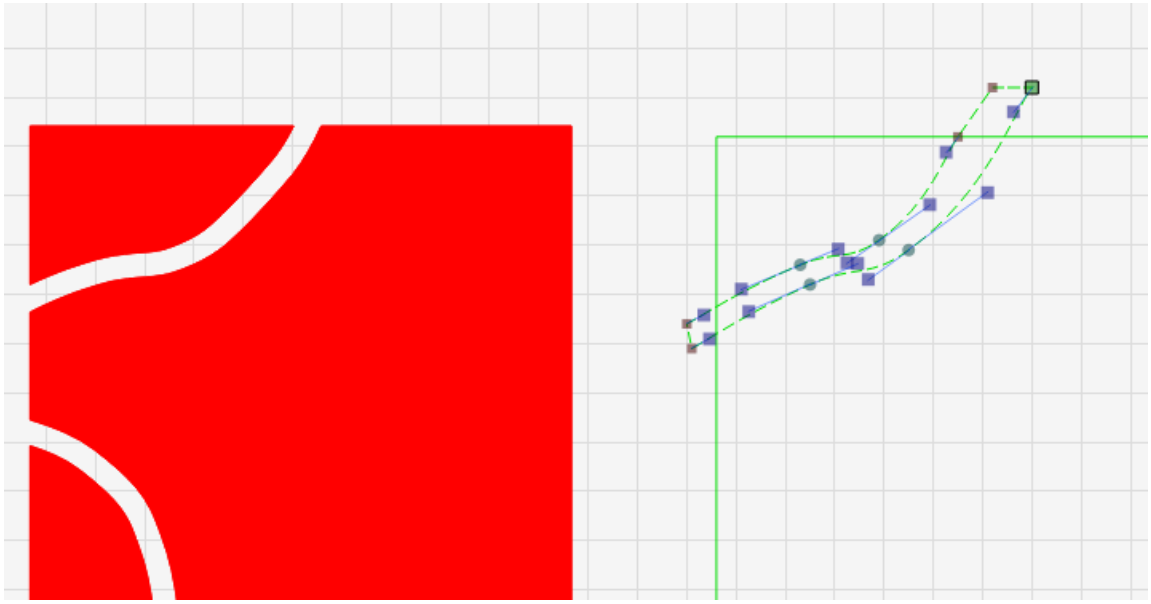
Example: Eraser Tool

In Inkscape, the eraser tool allows you to very easily subtract parts of a vector shape, and it does a very good job of creating the paths necessary for the resulting shapes. The same object exported to SVG and imported to Lightburn:

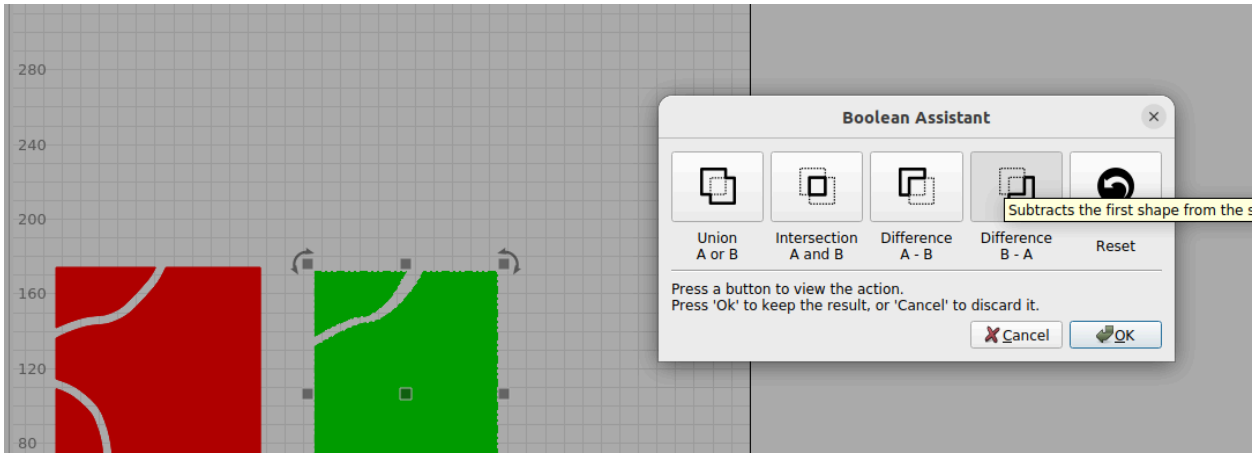


As you can see, all the paths are intact - although they do have a LOT of vector points. We could create this shape in Lightburn, but to do so we would have to actually draw out the lines, then use a boolean subtract to cut them from the square. This may be more efficient, using fewer vector points, but it is also much more difficult to do.

Redrawing the same shape in Lightburn:



Then doing a boolean intersection:



From this simple example, we might learn that Lightburn is an outstanding tool for arranging graphics and organizing our laser operations - but it does not have all the features one might expect from a fully featured design software.

Still, going from Lightburn to a design package like Inkscape does not come without some significant gotchas that we can learn to work around. Below is a list of the techniques we will be covering.

1. Use a limited palette
2. Calibrate your document to the bed of the machine you're working with
3. Save a template
4. Do not use stroke, only fills
5. Use opacity for organizing fill layers
6. Do masks inside Lightburn - know their limits
7. Do clipping the way Lightburn expects it

Bonus knowledge:

1. Trace images in Lightburn, export for use elsewhere
2. Understand fill intersection in Lightburn

Inkscape - Design a Coaster

Files Needed:

- Parametric_box_coasters.FCSTD
- TTL_Coasters.svg
- Various vector graphics

Inkscape has much more powerful node editing tools than Lightburn. In this project we will look at a few of them.

If you are coming from Graphic Design…. Get used to discarding any workflow involving layers. Forget about opacity. Don't think of gradients. Instead think only about paths, and fully formed outlines.

A few terms in Inkscape:

- Path - a collection of nodes
- Object - a collection of paths
- Shape - an enclosed path, where the starting node is joined with the final node
- Stroke - pixels applied to a path
- Fill - pixels applied to the inside of a shape

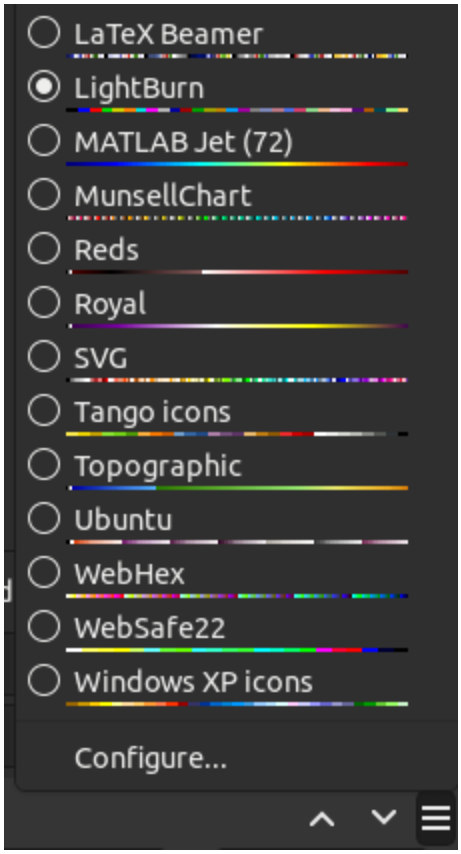
It is fundamental to understand that the laser can only see paths!
Any stroke you use must be converted to paths!
Any path you wish to fill should be indicated by color! (That color will be used to indicate the speed/power of the fill)

Another Inkscape Protip: Use shapes with no stroke ([X] colour, zero thickness), and a solid colour fill with transparency set to around half (to see behind it). Now when you set dimensions they will be exact and not dimension + line thickness, and import into LB with these exact dimensions (and colour) intact.

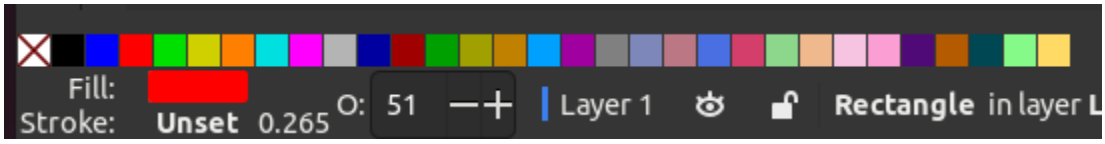
Inkscape's Path > Union is the same as the "weld" in Lightburn, which combines objects together keeping only the outer paths.

Step One: Set up the environment

Install the Lightburn colour pallet



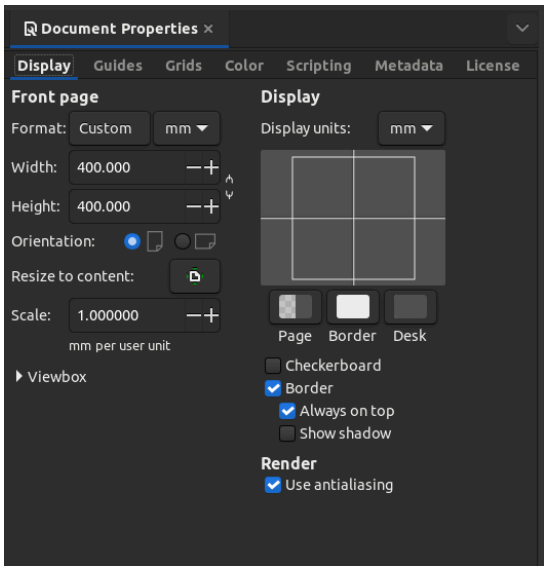
This matches exactly the colours used to distinguish speed/power settings in Lightburn, and will be preserved as “layers” when brought over into that software.



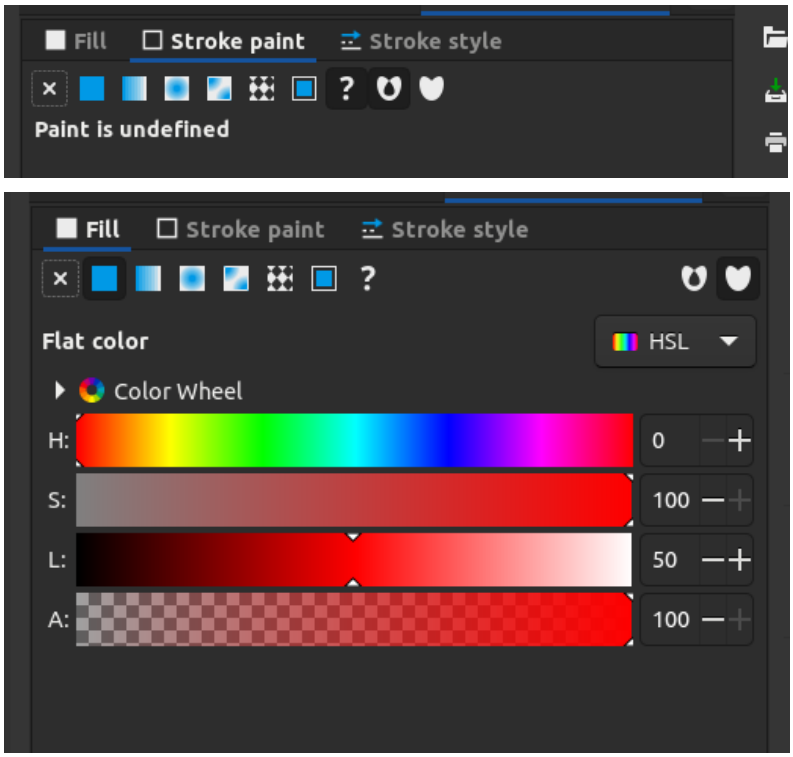
Step Two: Create a document that matches the bed size of the laser you will be working on. Set the unit of measurement to millimeters.

File > Document Properties

- For the Ortur, 400 x 400mm
- For the Omni 600 x 900mm
- For the Thunder 600x400mm

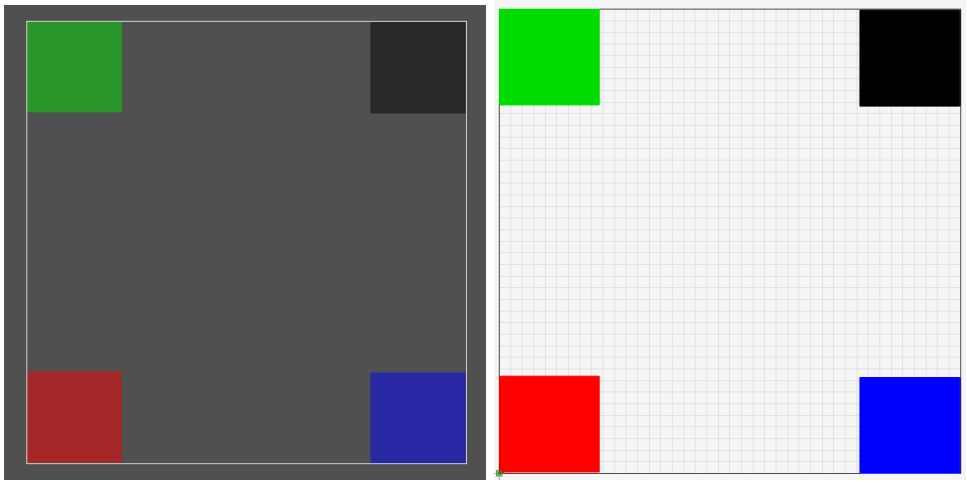


Step Three: Set the Drawing Options
Disable the stroke, and set the fill to be slightly transparent.



We now have an environment in Inkscape that matches perfectly our environment in Lightburn, and we can export a simple test to prove this.

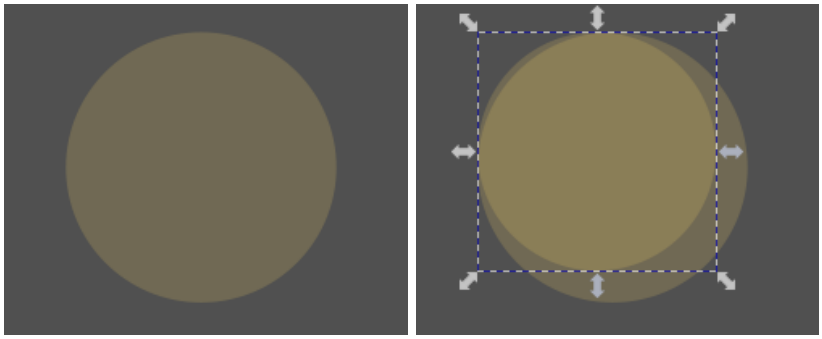
Inkscape Lightburn



If you wish you can save this document as a template, so that you'll be able to work quickly the next time you're doing a design.

We are now ready to flex some of the tools in Inkscape.

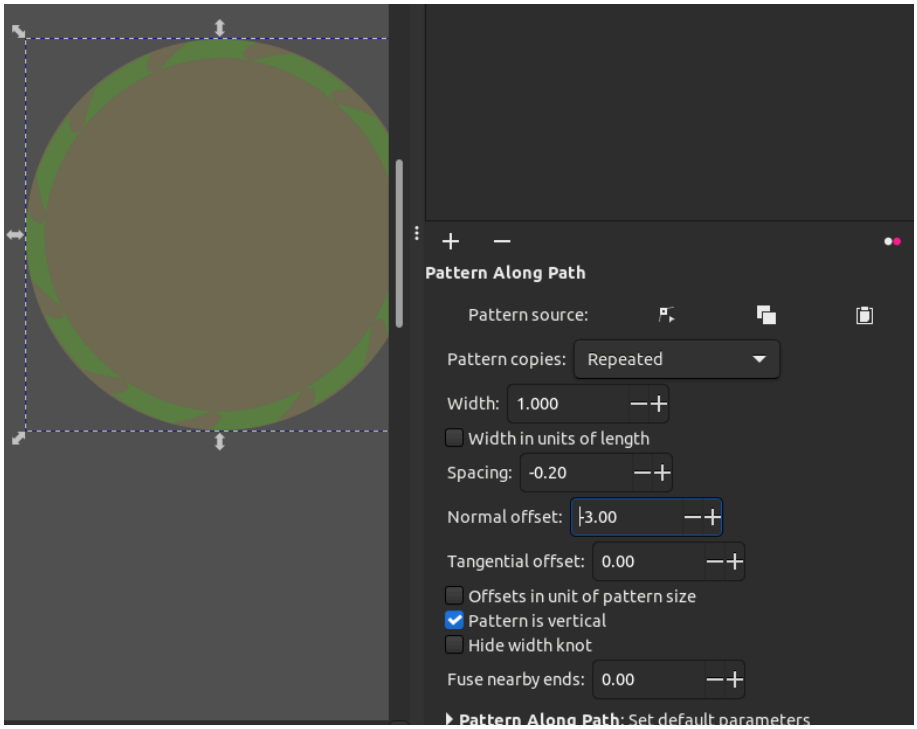
Exercise - Create the TTL annual gift membership!



Start with a simple circle, 85mm in diameter. Duplicate it, reduce to 75mm diameter. Center them using alignment tools, and change the smaller circle to green (our cut layer).

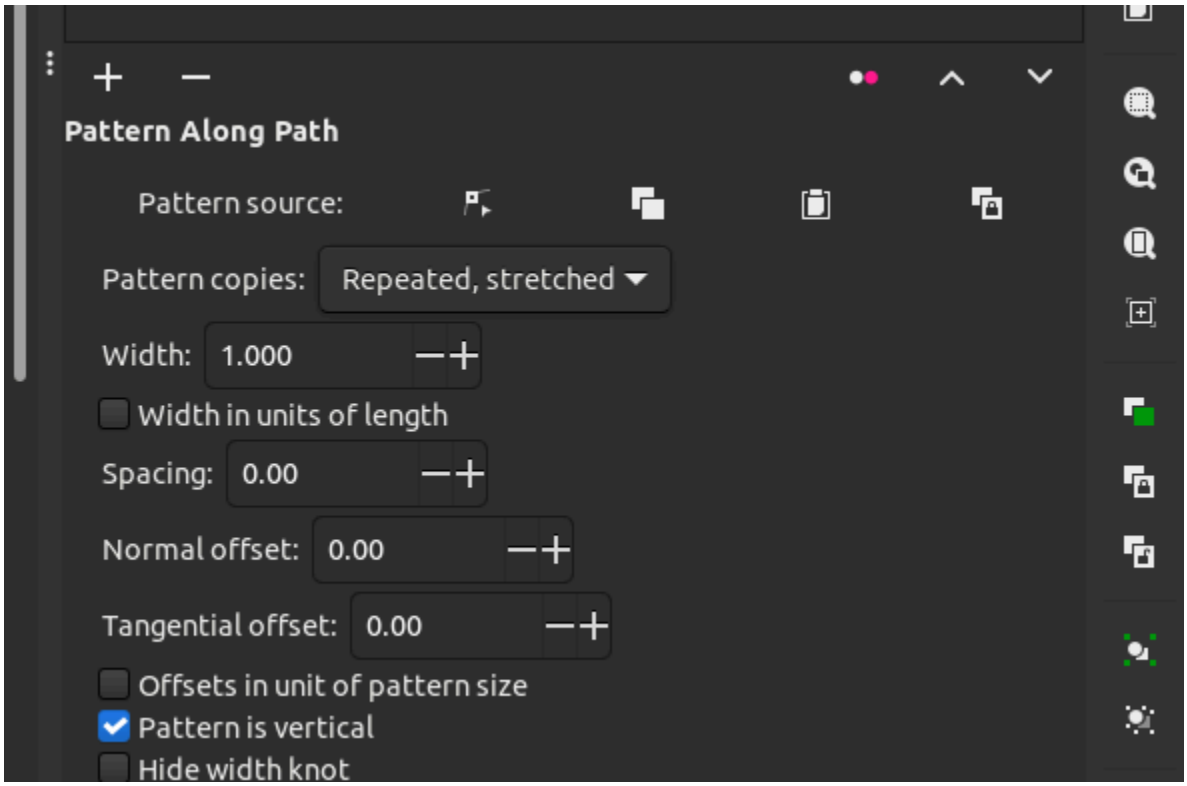
Draw a small rectangle, approx 5mm x 14mm to use as our saw blade tooth. Path>Object To Path to convert it. Use the node editor to draw the box into the tooth. Double clicking any line will add a node to it with the node editor. You can also smooth a node using the smoothing icon.

Next, copy the tooth by duplicating it - this puts the graphic into the copy/paste memory. Select the green circle and use Path Effects to add the “Pattern along Path” to the circle.

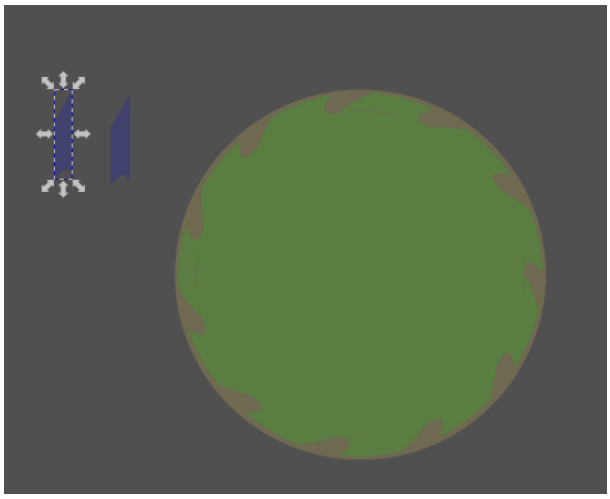


Use Pattern Source > Link to clipboard

To ensure that the teeth of the saw blade form a complete circle with no gaps, you can use the “Repeated,Stretched” option:

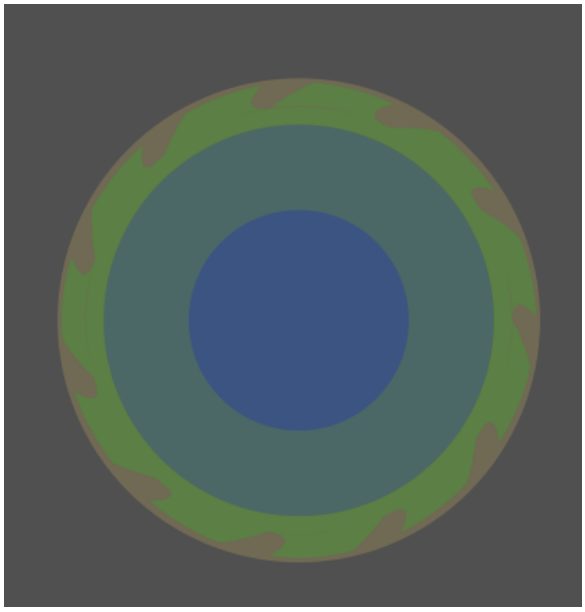


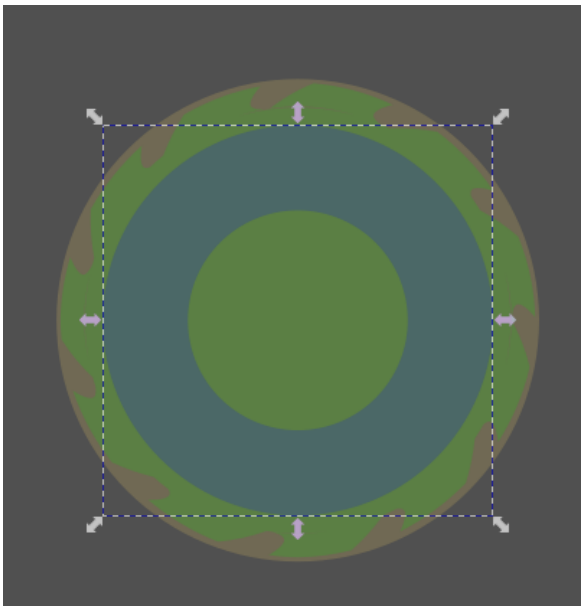
Put a circle in the middle, use alignment to line them up. Now combine them with Path > Union.



Use lock selected objects to pin the outline in place.

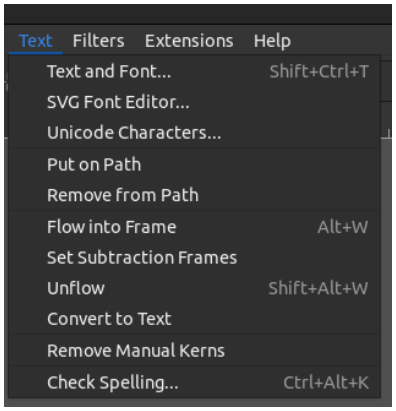
Make two circles, size the second one down. Align them to center them. Use Path > Difference to cut out the middle one. This is now our “fill” color.





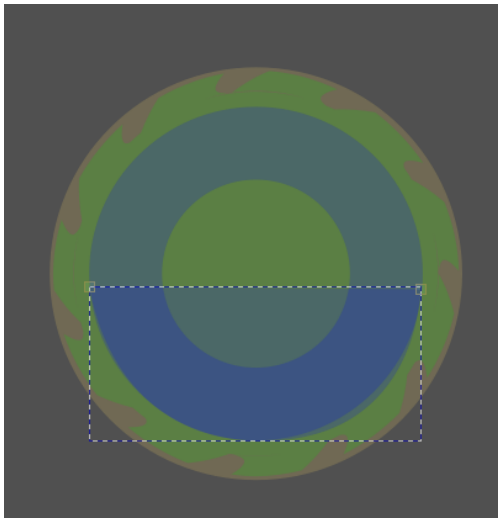
Text On A Path

Text on path in Inkscape is achieved by creating your text, then selecting it along with a path then, using Text > Put On Path



The rule here is that the text will start at the beginning node of the path, and will follow the path as a baseline. So using circles as paths can be weird because it is hard to know where the origin node is.

It may be worth using the Bezier tool to draw out your own path. After that you can convert the text to paths (using Path > Object to Path) and positioning it. You can then delete the original bezier path you used to curve the text.



The other thing to note is that the text will always appear above the path you have drawn, so plan accordingly.

Clipping and Masking

Up to now we have looked at some best practices for designing for laser, including using primarily fills, disabling stroke, and limiting our color palette. But there remains one major feature of design software that can trip you up.

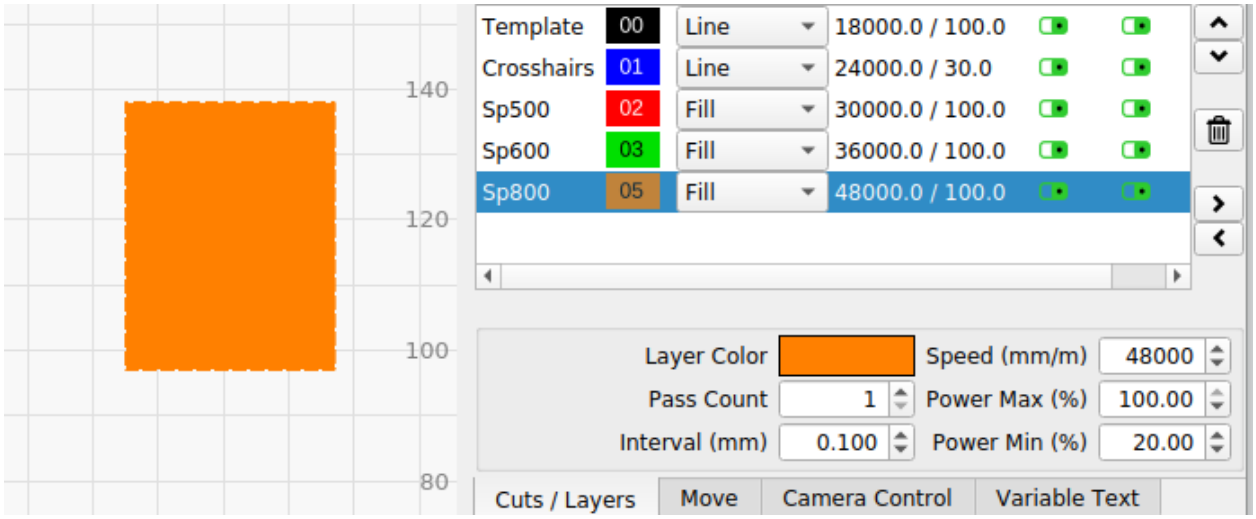
Clipping and masking are methods for hiding/showing graphics based on a shape. The difference between them is that masking shows items based on the opacity of the masking object, whereas clipping strictly uses the path of the clipping object to hide/show items.

Design software like Inkscape includes support for both masks and clipping - but laser control software like Lightburn does not, and supports only masks, and only for images.

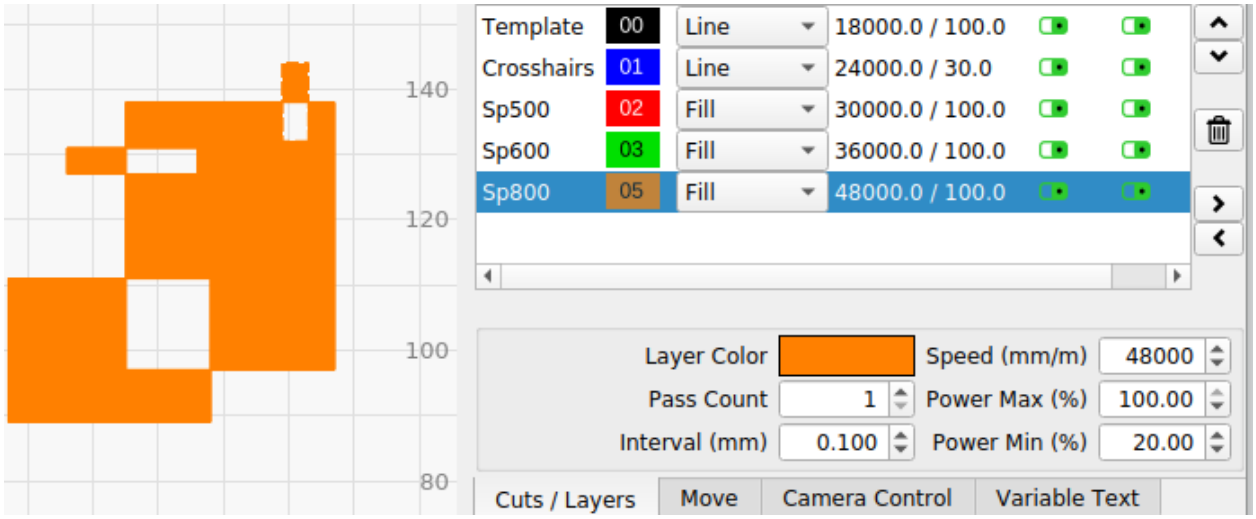
Show how image masks work in Lightburn

So then how is one expected to clip vector paths in Lightburn? Typically this is done using a boolean subtract operation, rather than a clipping path. This can be complicated by the fact that overlapping fills automatically subtract from each other. Let's see how Lightburn handles clipping.

Draw a filled box:



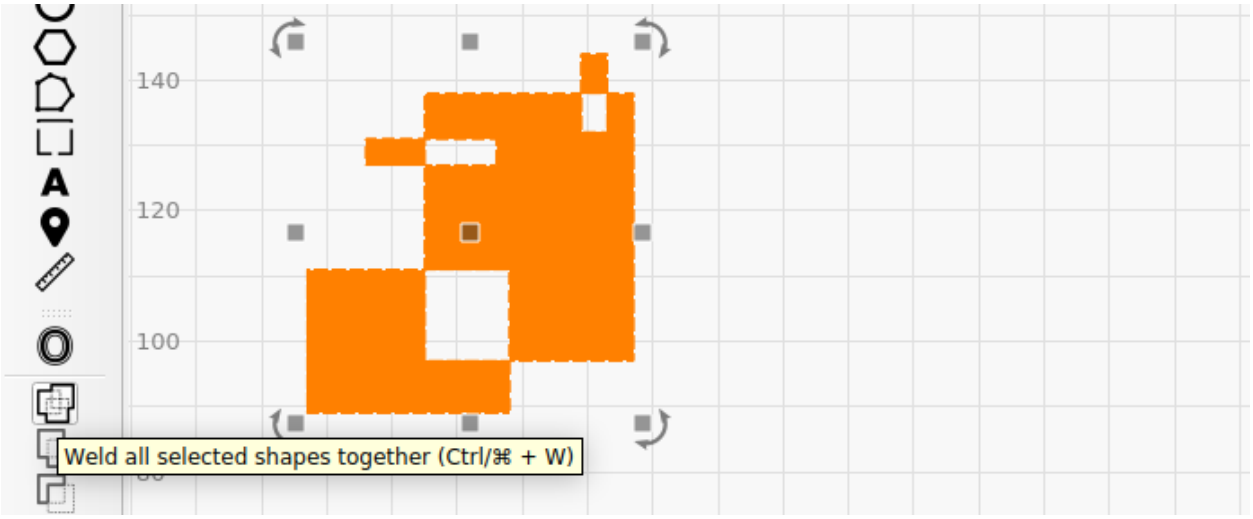
Now, with the same color layer selected, draw some intersecting boxes.



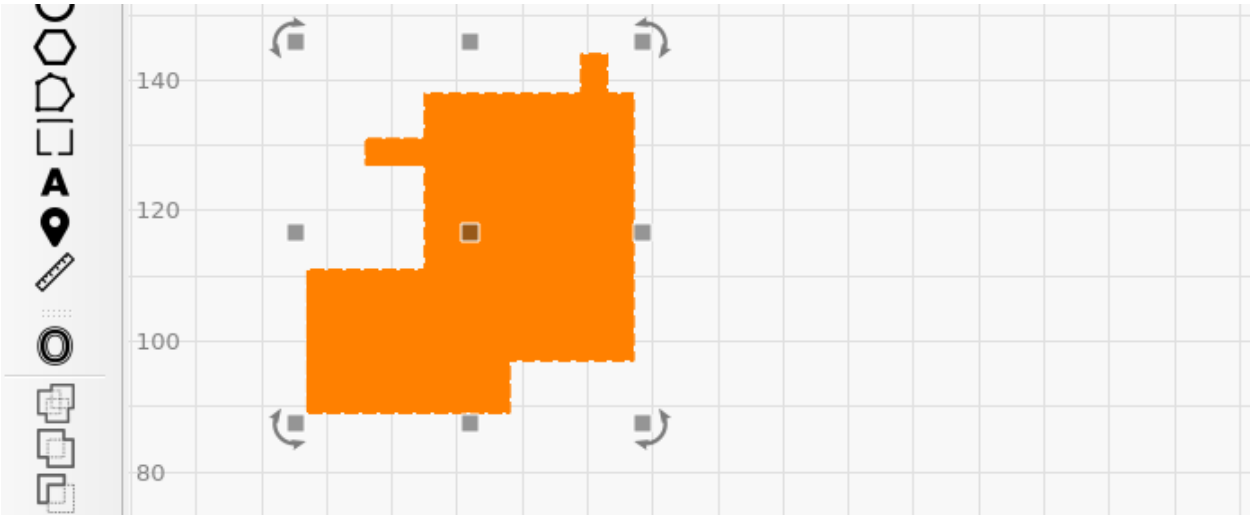
You will notice that anywhere the fills overlap, a subtraction is automatically created. This can cause some very unexpected problems if the source of our design is a separate tool like Inkscape or Illustrator.

Applying a boolean subtraction over this shape will not solve the problem.
To turn the design into a solid shape, we can use the weld tool, which will basically create a single fill by outlining the outside of all the shapes.

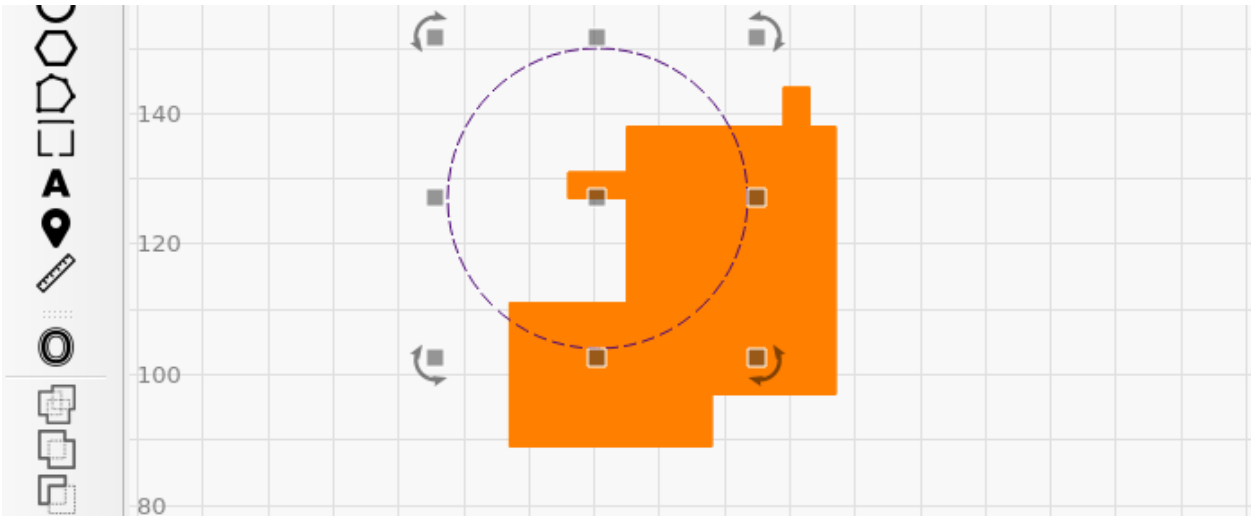
Apply the weld tool by first selecting all the shapes to be welded (note these must be on the same color layer)



Once applied the combined shapes will be one single fill.

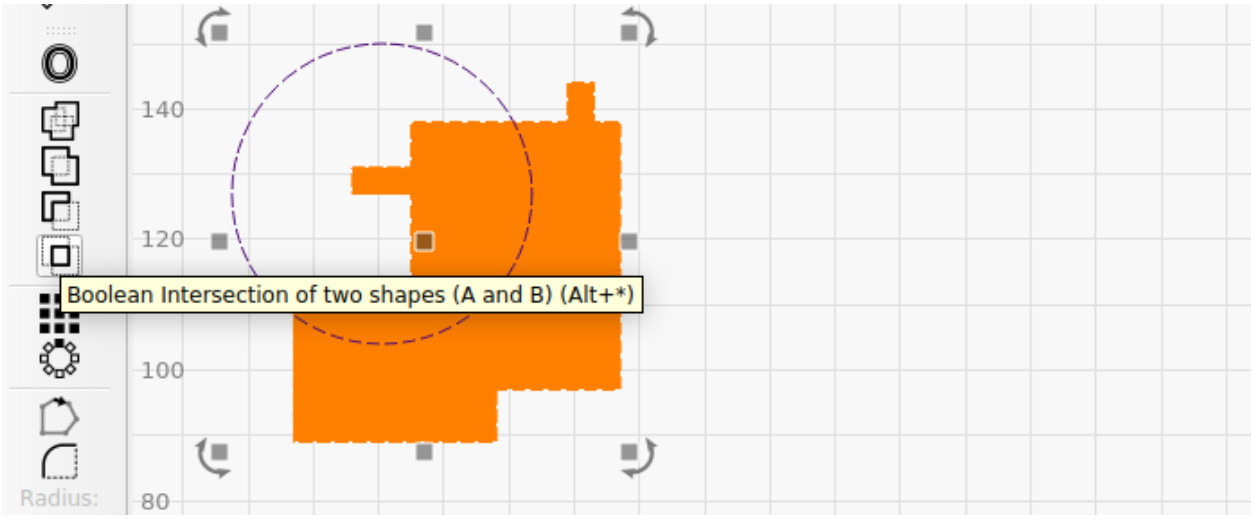


We can now apply a shape to use as a clipping path.

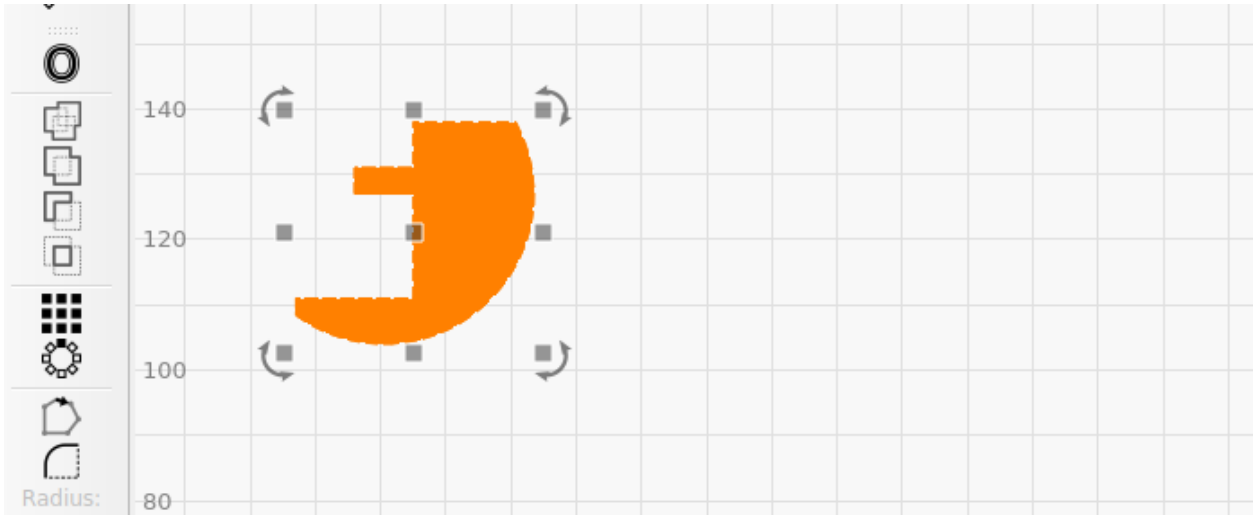


Note that this needs to be done on a new layer. And in Lightburn there is no clipping path - instead we perform a boolean subtraction, specifically an intersection.

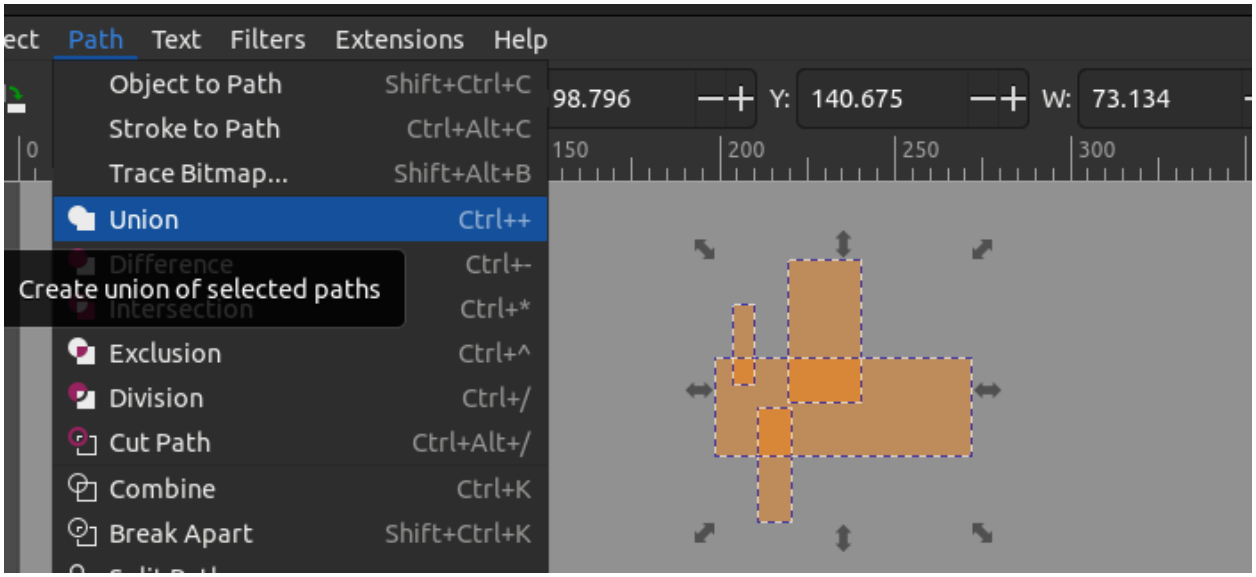
Keeping in mind the way Lightburn needs to use vectors and clipping paths, we need to work in a very similar way in any other design software if we want to get the expected results. This can feel strange, because design software may have a lot of sophisticated ways of doing clipping and masking - but most of these are not helpful for laser and are not supported.



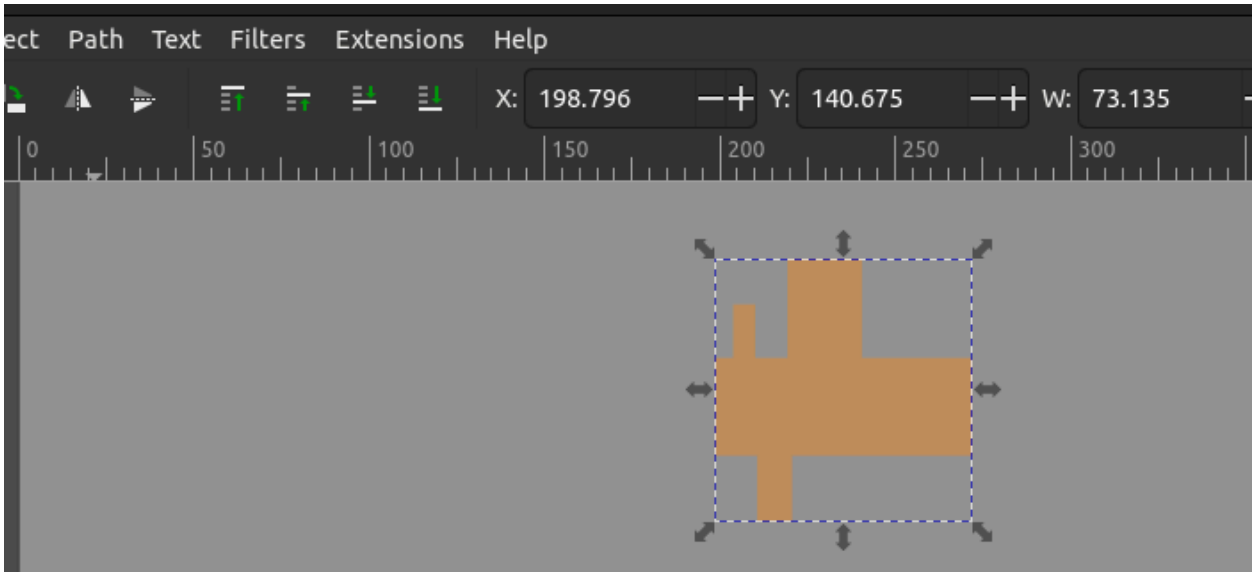
The result is a clipped vector - but note that this clip is destructive - there is no way to un-apply it other than to undo.



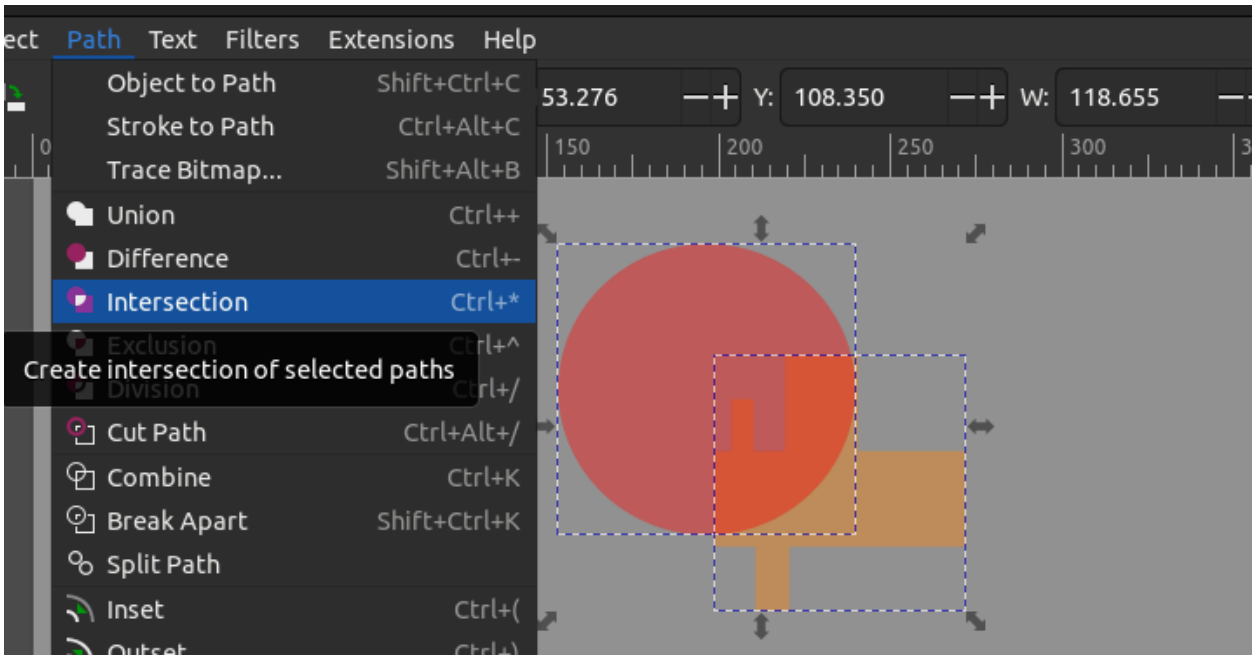
To recreate this workflow in Inkscape, we can draw our shapes overlapping - notice that they will not subtract as they do in Inkscape. Then we can select all our drawn shapes and use Path>Union to join them together just as we did with the Weld tool in Lightburn



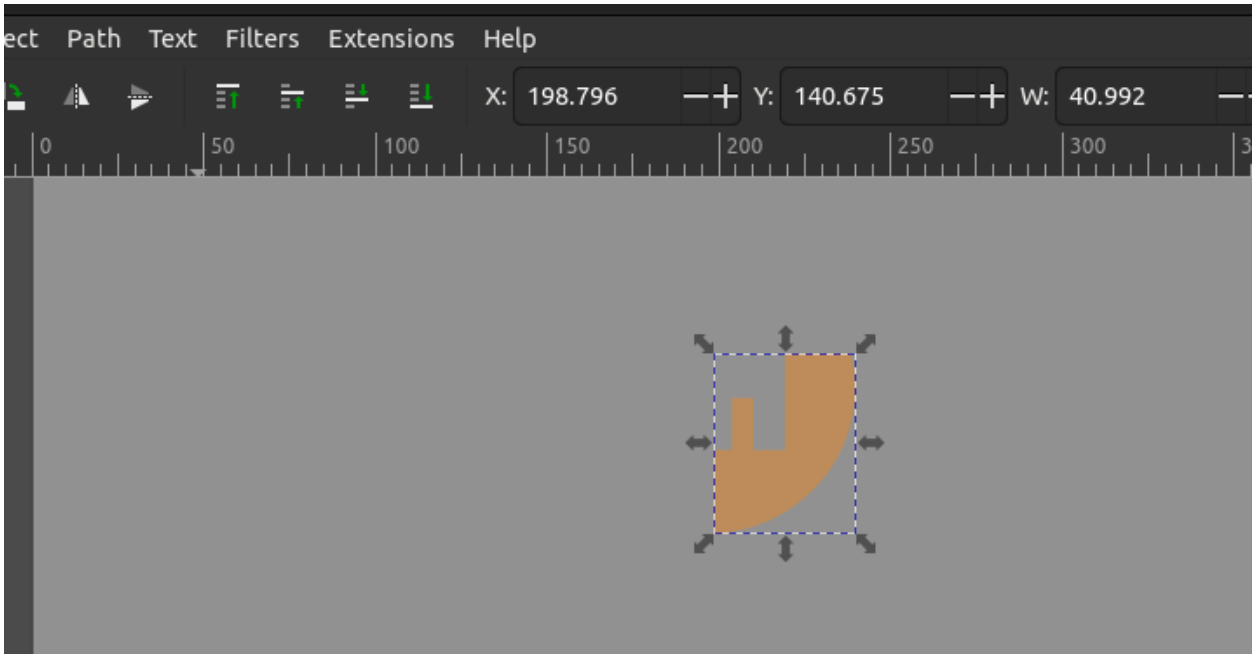
The result is a solid combined shape.



We can now apply a clipping path to that shape. We must make sure our clipping path object is on the highest layer.



The result will port very predictably into Lightburn as a single path.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Path
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Filters
Extensions
Help
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Y: 140.675
W: 40.992
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