

Fillet

All tools are round and therefore can not cut internal corners. For components which fit together fillets are used to address this problem allowing for the correct fit of parts.

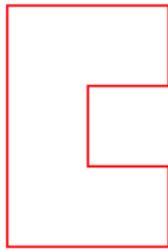


Fig.1
Original C shape to be milled internally

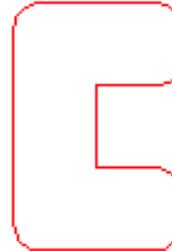


Fig.2
Resulting internal radius using CNC

As you can see from Fig.2, the C shaped part will not fit inside the milled area. To allow the correct fit, we can fillet the corners of the design before cutting.

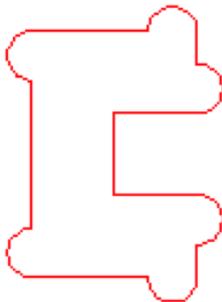


Fig.3
T-bone fillets inserted into corners which will allow the positive C part to fit.

The example in Fig.3 is a good example of the flexibility with the T-bone type of fillet. On one corner, the T-bone can be placed in two positions, either for stability in the end product, or purely aesthetic reasons.

Below are some examples using an internally milled rectangle with different fillet style applied.

CNC 2D Design Guidelines



Fig.4
Original rectangle



Fig.5
Standard fillets



Fig.6
Dog-Bone

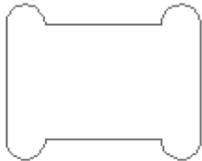


Fig.7a
T-Bone



Fig.7b
T-Bone

Fillets are also essential for the corresponding part to fit into the above slots, as shown in the examples below.



Fig.8
Standard



Fig.9
Dog-Bone



Fig.10.a
T-Bone



Fig.10.b
T-Bone

Fillets are one of the first things to consider when a cut is to be made on the inside of a corner or angle. They are not necessary when cutting on the outside of an angle as you can see on the top of the parts from Fig.8-10.

Work Area and Hold Down

The ShopBot is setup to cut standard sheet material which from most UK suppliers is 2440x1220mm. We work on artwork in landscape format, with our X axis being 2440mm and the Y axis 1220mm.

To perform any cutting job we screw down the material to a sacrificial board below it, this holds it in place stopping any movement whilst cutting and is required for safety reasons. We normally screw the material around the outside edge of the material so advise any parts are kept 30mm away from the edges of the material (so the 'workable' area is actually 2410x1190mm).

Part Nesting Tolerances and Tabs

When parts are cut out, we use tabs to hold the parts in place whilst the CNC is still cutting. Tabs are tiny thin strips of material left by the machining that keep the part attached to the main sheet material until the cutting is finished. After machining, the operator will remove the small tabs in order to remove the part from the main sheet. We endeavour to de-tab closest to the part to save time later, however in cases where we are not sanding or finishing the components post machining, there may be a tiny sliver left which will need to be sanded or filed off.

Our basic machining charges only account for the cutting and removal of parts from the sheet, the sanding/filing of edges and tabs is considered a finishing process and therefore will likely incur an additional charge if requested.

Because of the requirement for tabs, some material allowance must be made between parts to give the tabs something to attach to. For this we ask that at least a 20mm gap is left between parts. This distance is based on the use of our smallest cutter (6mm). If use of a 12mm cutter is requested (usually to speed up the machining process) the gap will need to be increased to 30mm between parts.

To summarise;

- All parts to be kept 30mm from edge of the material.
- All parts to be kept a minimum of 20mm apart from each other.

Efficiency through Design

Anything machined on the ShopBot is costed by time and tools which are larger in diameter cut material faster, therefore designing with tooling in mind can help increase efficiency for cutting and keep your costs low.

As standard, for cutting out parts from a sheet we use either a 6mm or 12mm tool. The 12mm tools can cut material faster than the 6mm meaning machine time is decreased. If your design allows for a 12mm tool to be used (also see Work Area and Hold Down) it will most likely decrease the cost to you. However, larger tools require more tolerance between parts and around the edge of the sheet.

Another factor for efficiency is the material itself. At the root of which is if the parts require two clean cut edges (i.e. front and back). For the majority of furniture, having clean edges on both sides is essential, but in some instances for parts is not necessary as sanding and finishing can happen later. In our case, if you require clean edges on both the front and back of the parts/sheet, we must use two tools to do one line of cutting. This increases time and has some impact on costs. Please specify if you require clean edges on one side or both when sending a job to us.

Design Files

We accept files in either DXF (preferable), DWG or Vector PDF formats, which most vector drawing programs are capable of exporting. However, there are some things to consider when preparing the file itself.

Our software will only work for programming toolpaths if objects are closed using polylines. When exporting you may have this option and using it will ensure all sides of an object are treated as a whole object (e.g. all sides of a square are joined rather than treating the sides as individual lines, which our software can not read correctly).

When creating vector paths from artwork, ensure that options such as 'Stroke to Path' are not used for single lines. This option will convert what appears to be a single line to two paths running parallel, spaced according to the width of the stroke. This again will interfere with our software for toolpath programming.

If you require different processes, cut's and cut depths, it is good to separate the vectors for each into separate layers and naming according to what needs to be achieved by that toolpath.

Examples;

2 squares need to be pocketed (all internal material removed) to a depth of 3mm
Add those squares on the same layer
Name the layer - POCKET_3mm

2 squares need to be cut out of 18mm thick material
Add those squares on the same layer
Name the layer - PROFILE_OUTSIDE_18mm

Some 5mm holes are required through the 18mm material
Use circles the same diameter as the holes you need cut, add circles on one layer
Name the layer - 5mm_DRILL_18mm

You can upload your files via our enquiry form at <https://machinesroom.co.uk/fabrication-enquiry/>