ShopBot – Quilt Rack Project

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This project will show you how to cut and assemble a self standing quilt rack (shown below). There are a couple of different versions of the design to show how it can be made simply from Plywood or how the design can be modified to include 3D carvings, to work with different thicknesses of wood and even add some other decorative elements.

Project Overview

This project is designed to be cut on a piece of material 24" x 32" so it is suitable for use on a standard Buddy machine as well as any other ShopBot Tool. As well as this document there is a short video, two PartWorks files and a V3M file which will be used and referenced in this document and the video.

We will split the document into several sections first is this introduction and overview of the project, what is contained in the supplied files and a list of the supplies you will need to carve it. Second is a description of setting up, cutting and assembling the Plywood version as this covers the basics of the project. Then the final section will discuss the alternate 0.75" version with the 3D decoration and ideas for variations on the design.

What you will need
- A sheet of flat material 24" x 32"
    - There are two setups but they can be customized to fit other thicknesses, one setup is for 0.7" thick Plywood, the other setup is for solid wood which has been glued and planed into a board exactly 0.75" thick.
- Some standard tooling which comes standard in the ShopBot Starter Bit Set
    - 1/4" (0.25") End Mill
    - 60 Degree V-Bit
    - 1/8" (0.125") Ball Nose
- Enough 0.75" doweling in a suitable material to match your main board material to make at least 5 x 30" lengths
- General woodworking supplies such as sanding tools, glue and any finish you want to apply to your project.

    Read the full project instructions and watch before ordering any of the things you will need, this will ensure you get what you need for the particular version/material you want to work with.

What's in each file
- "Quilt-Rack-0-70-2D.crv" – PartWorks design file for use with 0.7" material
- "Quilt-Rack-0-75-3D.crv" – PartWorks design file for use with 0.75" material
- "Circle-Lilly-B.v3m" – Vector Art 3D file for use in creating the 3D toolpaths
- "Quilt-Rack-Video.exe" – Self executing video file showing how the project is setup
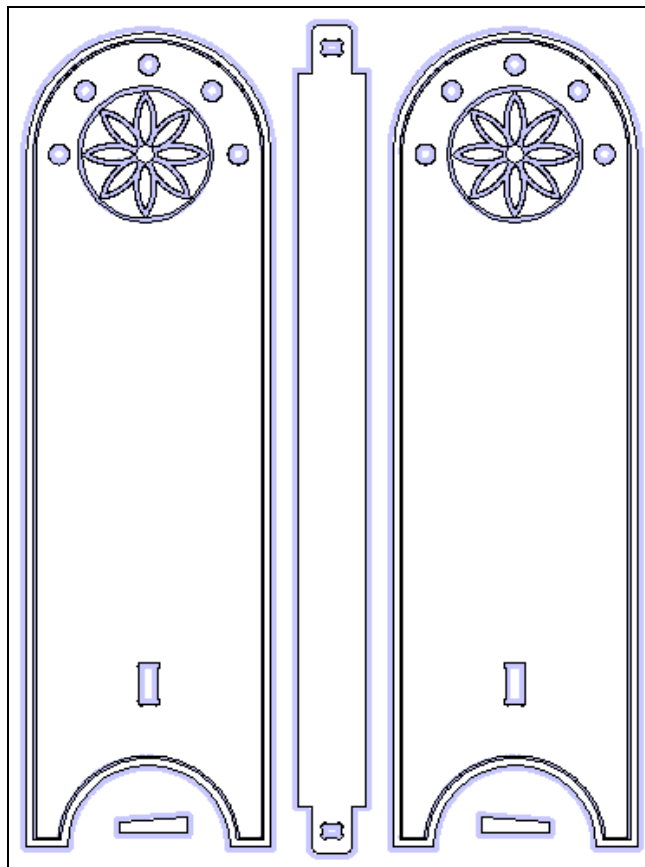- "Quilt-Rack-Instructions.pdf" – this document

We would recommend that you read this document first and then watch the video, you should then be ready to create your own version of the quilt rack.

Making the Plywood version

Even if you plan to make a version of this project in solid wood, it is well worth cutting this plywood version as it can be done quickly at low cost and will enable you to see how the project works before committing to more expensive material. It also makes a nice finished product in its own right. The Plywood version as supplied is setup specifically for use with material that measures 0.7" in thickness. If your Plywood is a different size (even if it's only 0.01" different) then you should watch the video to see how you would edit the file for different material thicknesses.

Assuming your material is 0.7" thick then you can use the supplied PartWorks file called: "Quilt-Rack-0-70-2D.crv". Open the file and you can see how the file is laid out and the toolpaths that have been calculated. There are 3 toolpaths, the first uses a 60 degree V-bit to VCarve the flower decoration and a decorative groove around the main side shapes. The second uses a 0.25" end mill to cut out the inside shapes, the last toolpath uses the same 0.25" tool to cut the parts out of the sheet.

The cutout toolpaths include tabs which will keep the parts connected to the material so as long as the sheet is held down around its edges the parts will stay in place. The image below shows the parts on the sheet with the areas that will be cut shown in gray. As long as your material is exactly 24" x 32" then you have ½ inch of clearance all around the edge of the part where the board can be attached to your spoil board that will stay clear of the cutter.

Save the separate files from PartWorks with the suitable postprocessor for you ShopBot. Run the V-Carve toolpath first, then the Inside Profile and finally the Outside Profile making sure to use the correct tool with each toolpath and to zero them all in the same place off the top of the material.

Once you have cut all the files you will need to carefully remove the tabs from the parts and give them a quick sand to remove any rough edges or splinters. There are a number of ways to remove tabs; a sharp chisel, a flushcut saw. One of the quickest methods is a multi-saw or jig saw. Carefully cut the tabs as close to the piece as possible and sand it flush.

After you have cut all the parts needed for the Quilt Rack it is time to start the assembly. The instructions below go through this assembly but it's worth noting its good practice to assemble just the sides and stretcher first and then to measure the width of your top of your Quilt rack to check the length you will need to cut the dowels (for the standard Plywood version this should be 28.4"). Once you have the dowels cut to length you can follow these steps:

1. Take one side of the quilt rack and the long stretcher. Insert the tenon of the stretcher into the mortise of the quilt rack. A rubber mallet will help in tapping the tenon into the mortise. Make sure the tenon is seated all the way in.

2. Lay the one side on your assembly table with the tenon hanging off so that the side lays flat. At this point we can insert the dowels into the one side of the rack. Again a mallet might be helpful but you should be able to twist them into their slots. If you want to glue the dowels you should apply this carefully to the ends before you insert them and immediately wipe off the excess.

3. Now the tricky part, getting the other side on. As in previous steps, the tenon goes into the mortise and dowels into their slots. They just now have to be done at the same time. Tap the side with your mallet until tenon has been seated and the dowels are flush with the outside of the quilt rack. If some of the dowels are a little long, you can easily sand them down.

4. Now you can tap your wedges in place to lock the stretcher and you're done.

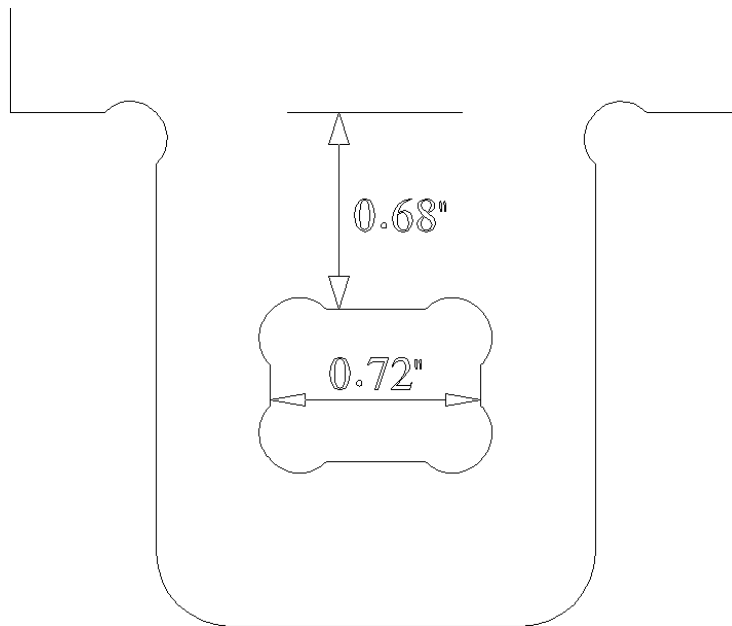**Notes on editing the files for material thickness**

There are some areas of this file which have crucial measurements on them because they have to fit together with other components. This includes the dowel holes, the wedges and the holes where the tenon inserts and where the wedges are driven in. Another critical dimension is the distance of the wedge hole from the end of the stretcher as this corresponds to the thickness of the material.

The mortis, tenon and wedge holes have been set up with the new Bone Filleting option (available in PartWorks 2, VCarve Pro 5) to allow the parts to slot together tightly.

All the holes which have a part inserted into them have been drawn to size then offset outwards by 0.01" this ensures the parts will actually fit together but still fit tightly.

Example: Where the slot was set to accept the 0.7" material being inserted that means the actual size of the hole will be 0.72" (+0.1" on each side) see image below for an example of this. The Dowel holes are also offset to be oversized but only 0.05" to make a hole 0.76" to accept 0.75" dowel.

The gap between the wedge hole and where the side of the quilt rack will be is made slightly smaller to ensure a tight fit when the wedge is knocked in. This was done by moving the hole closer to the joint by 0.01" after it was offset. These measurements are shown on the stretcher's tenon below (this is the 0.7" thick material version).

As have been noted both the PartWorks files are set up for particular thicknesses of material. The files can be edited for other thicknesses if you have PartWorks V2. Making edits to the files for sizing and positioning of the parts will be covered in the videos in detail.

The Alternate Version – 3D

There is another PartWorks file which is included with this project. This is set up for material which is exactly 0.75" thick. This also has 3D decoration instead of v-carving. We used this to make a version of the quilt rack using solid Oak but it could be done with any suitable solid wood. This file is called "Quilt-Rack-0-75-3D.crv", you can see a preview of the toolpaths below let and a photo of the finished part to the right.

You would save the cut the files in the same way as the Plywood version but the first 3 toolpaths (Profile2, Lilly1 1-8 BN, Lilly2 1-8 BN) are all cut with a 1/8" diameter Ball Nose tool. Inside and Outside are Profile cuts are still with the 0.25" End Mill. The assembly process is the same as the plywood version except the dowels will need to be slightly longer (28.5") again pre-assembly and measurement are advised to confirm dowel length.

The 3D file is a Vector Art 3D model www.vectorart3d.com this is a modification of one of their free sample files specially edited (made into a circular dish) for this project. The file is included with the project as a V3M file which will work with PartWorks 3D, Cut3D or VA3D Machinist.

For this project the toolpath for the 3D portion was created in VA3D Machinist, the file then saved and imported into PartWorks. To do this you calculate the 3D toolpath then instead of saving it through the postprocessor you go up to "File" – "Save As…" then save the V3M file, this will include the toolpaths. In PartWorks this file can be imported using the "Import Vectors" function, this imports the toolpaths into the list and also grayscale previews which can be moved and mirrored (which is how we created the left and right facing version of the Lilly). This process is also covered in the accompanying video.

A big thanks goes to Oscar Garcia for the help and inspiration for this project. His original design was made slightly differently as can be seen in the images shown below.

Rather than use the slot-together wedge Oscar made the Mortis and Tenon fit exactly the thickness of material. Then for both that and the dowels he used decorative wedges to help the fit and provide a nice finished look to the part.