A Few Remarks about the Folding Stool

Robert Penoyer

Copyright © 2018

A WARNING – PLEASE READ

Woodworking can be dangerous! It's up to you to determine if you can safely use the tools and perform the tasks needed to complete this and any other woodworking project. If you are unsure, STOP! Get advice from someone knowledgeable or do some careful studying on your own. Be safe!

Always wear at least an appropriate N95 dust mask or respirator when sanding or spraying paint. For advice about dust masks and respirators, visit this link:
https://woodworkingtoolkit.com/best-dust-masks-respirators/

READ, UNDERSTAND, AND FOLLOW ALL OF THE INSTRUCTIONS AND WARNINGS THAT CAME WITH YOUR TOOLS. BE CAREFUL!

This Is Not Standard Documentation – Fill In the Blanks

I generated the original material in this ZIP package just for me, not for a general audience. This gave me the freedom to create a minimal amount of written design documentation. And it allowed the documentation to be technically incomplete. I simply carried some ideas around in my head.

Please be aware that I might not have included every detail that you need to build this project. So I suggest that if you want to build it, carefully look things over and determine ahead of time if you have enough information to go forward.

It might be sufficient to simply guess at any needed information if you can't find it in the included files.

Please be aware that there might be mistakes in the documentation that I accounted for during the build but failed to note in the documentation.

Non-standard Dimensioning

My attitude toward dimensioning is to make it "good enough." Professional mechanical designers follow certain conventions regarding dimensioning. I'm not that careful. So understand this ahead of time when you find any dimensioning that is unconventional.

The Folding Stool

The stool is a utilitarian item of a quality suitable for use in a garage, small shop, a washroom, or even a campsite. Some of its basic characteristics:

- Unfolded and ready for use: about 15 3/8" high; the seat is 14" wide by 11" deep
- Folded and ready to be put away: 18" high (standing on the tips of the legs) by 14" wide by 3" thick. See Figure 1.

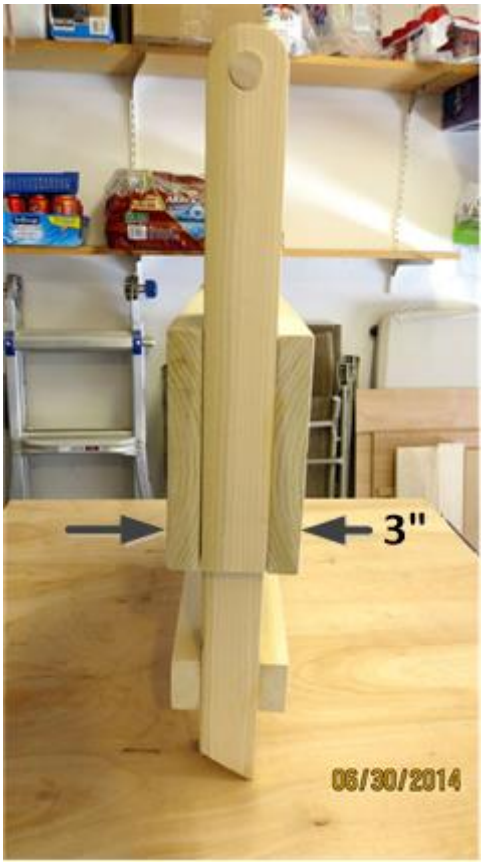

Figure 1. Folded and Ready to Be Put Away

- All of the material is poplar, or a suitable wood of your choosing
- No metal was used in my version of the stool. Everything is held together using glue and 1/4" dowel pins. However, you might find it useful to include nails or screws.
- I chose to use no finish since the stool's intended use is in a utilitarian setting like a garage, a small shop, a washroom, or a campsite

<u>A SketchUp File and an Equivalent PDF File</u>

File *Folding_Stool_03.skp* is the SketchUp design for the stool. This file is useful since I think all of the necessary details are incorporated here. So, for example, if you find a dimension or other detail missing, it can be determined by examining this file. And, you can orbit and move the model around for a better look at everything.

File *Folding_Stool_03.pdf* contains all of the images and dimensions from the SketchUp file. Use this if you're not familiar with SketchUp.

The Details

The information that follows will help to make clear the details of each component so that possible misunderstandings might be avoided. Each of the stool's components will be discussed. Use the included SKP or PDF file to follow along with these descriptions.

Complete Assembly

Look at the Complete Assembly page to see the overall nature of the stool. The image shows the stool in the *unfolded* condition. Each component type was given its own color for clarity. For example, the pieces of the seat are both a pale peach color, the legs are blue, the 5/8" dowel pins are yellow, etc.

Most of the stool's components are visible in this view. The nature of the assembly is made clearer in some of the other SketchUp/PDF images.

Outside Legs Assy

Compare the Outside Legs Assy with the Complete Assembly. This view should begin to give you a sense of how the pieces fit together.

The Outside Legs Assy view shows one half of the seat resting on two seat support pieces. The ends of the seat half are flush with the outsides of the seat supports. The edge of the seat half is flush with the ends of the supports. This half of the seat is permanently attached to the seat supports. You can simply use glue here. I chose to use glue but also reinforce the joints by adding a pair of 1/4" dowel pins through each end of the seat and into the seat supports as shown in Figure 2.

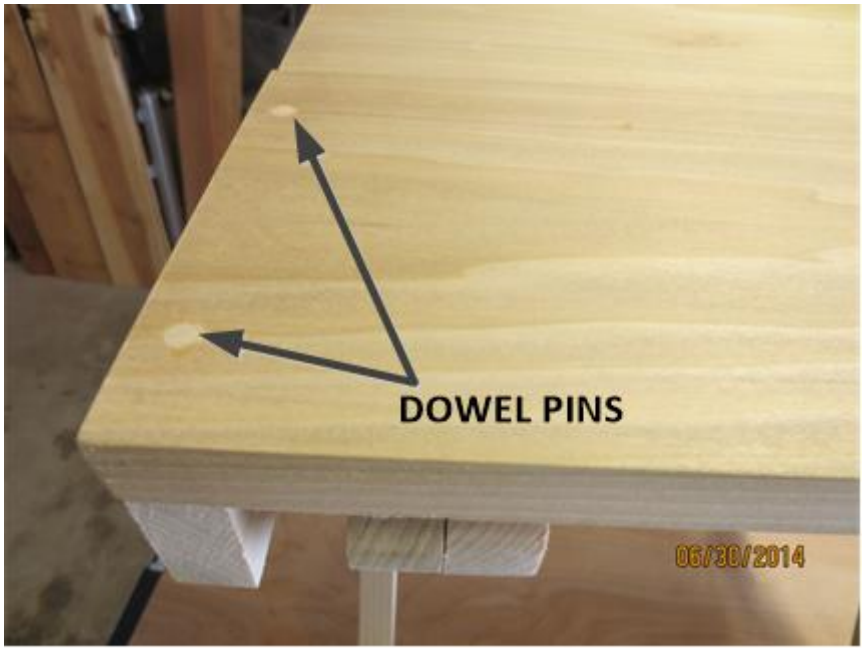

Figure 2. Dowel Pins in Seat Half of Outside Legs Assy

Also, notice in the SketchUp/PDF drawing that the ends of the cross brace are flush with the outsides of the legs.

DO NOT ASSEMBLE THE PIECES IN THIS VIEW BY THEMSELVES. The process of completing the assembly is addressed later.

Inside Legs Assy

Notice how the Inside Legs Assy complements the Outside Legs Assy. The legs in this view are located just inside the legs in the Outside Legs Assy. The yellow dowel pins near the centers of the legs join the inside and outside legs together. These dowels are pivot points for the legs.

Also, notice that, unlike the Outside Legs Assy, the ends of the cross brace are ***not*** flush with the outsides of the legs. The cross brace on the Inside Legs Assy extends 3/4" beyond the outsides of the legs.

The seat half rests on the seat supports with an offset of 2 1/4" from the outsides of the seat supports as shown in the drawing. It's not clear in this view, but the edge of the seat half is flush with the ends of the seat supports. The seat half is glued in this position. I have chosen to add a pair of 1/4" dowel pins through

each end of the seat half into the respective seat support for reinforcement as shown in Figure 3.

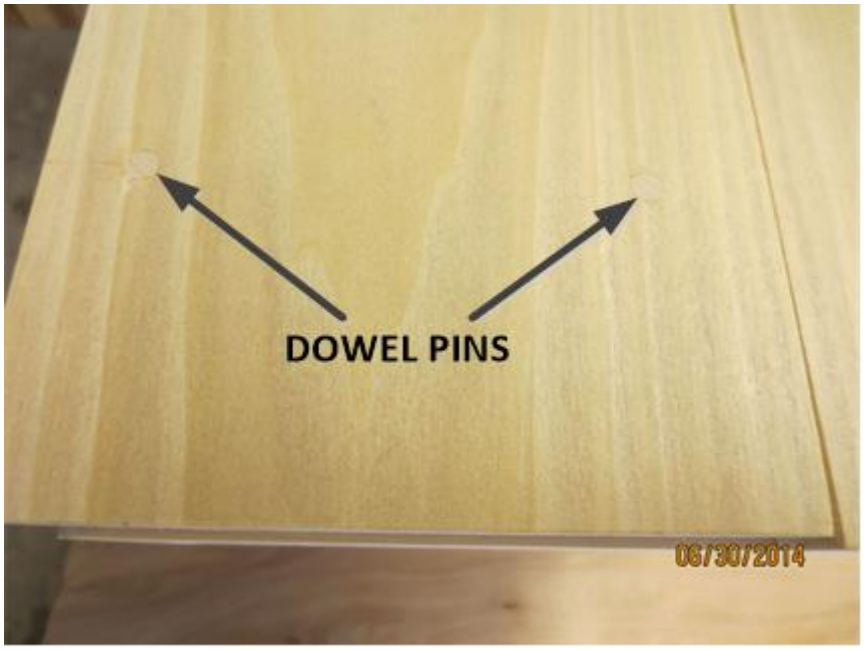

Figure 3. Dowel Pins in Seat Half of Outside Legs Assy

DO NOT ASSEMBLE THE PIECES IN THIS VIEW BY THEMSELVES. The process of completing the assembly is addressed later.

Seat Halves

The seat comprises 2 halves. Each half uses a 14" piece of 1x6 poplar (actual dimensions 3/4" by 5 1/2".)

Seat Supports

The stool uses 4 identical seat supports. Each is cut from a piece of 1x6 poplar (actual dimensions 3/4" by 1 1/2") cut to a finished length of 10 31/32". (The 10 31/32" dimension was used because it makes the SketchUp drawing more consistent. However, you can use 11" instead to make your marking and cutting simpler. If you use 11", then the distance from the end of the piece to the center of the 5/8" hole should be increased from 10 7/32" to 10 1/4".)

Legs

Four identical legs are used. Each is cut from a 1x2 piece of poplar (actual dimensions 3/4" by 1 1/2") cut to a finished length of 18".

The bottom end of the leg is cut at an angle of 56° between one edge of the leg and the bottom of the leg. Be careful not to measure or cut this angle in the wrong direction.

Cross Braces

Two identical cross braces are used. Each is cut from a 1x2 piece of poplar (actual dimensions 3/4" by 1 1/2") cut to a finished length of 12 1/2". These are glued in place as shown in the Outside Legs Assy view and the Inside Legs Assy view.

As noted elsewhere, on the Outside Legs Assy, the ends of the cross brace are flush with the outsides of the legs. One the Inside Legs Assy, the ends of the cross brace are set 3/4" past the outsides of the legs. This is demonstrated in Figure 4.

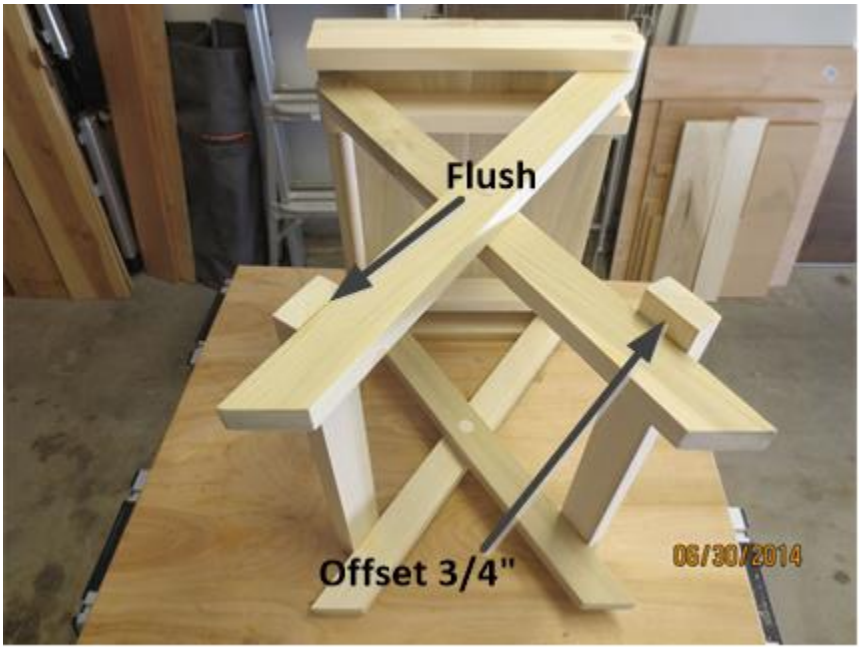

Figure 4. Cross Brace Positions

The cross braces are glued into place. I chose to add a 1/4" dowel pin for reinforcement near each end of the cross brace and into the leg as shown in Figure 5. Of course, the dowels are located slightly differently for the Inside Legs Assy.

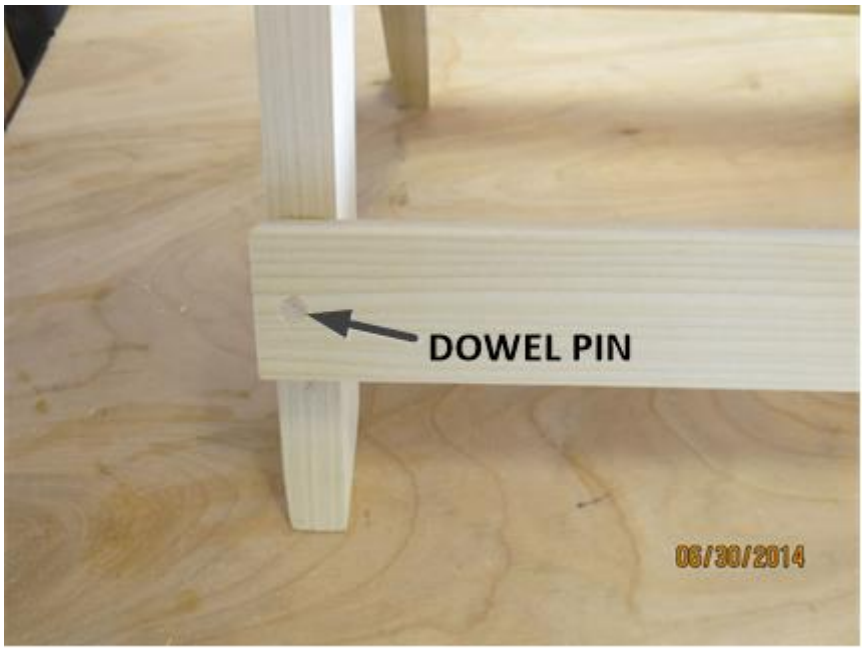

Figure 5. Cross Brace Dowel Pin

Dowels

This section addresses the 5/8" dowels used for pivots only, not the 1/4" dowels used as stakes.

Two different lengths of 5/8" diameter dowels are used. The one called the handle is cut to a length of 11". This piece is the pivot for the inside legs and the associated seat supports. This dowel can be used as a handle to carry the stool when it's folded.

In addition to the handle dowel, 4 dowels cut to a length of 1 1/2" are used as pivots. Two join the inner legs with the outer legs. The other two join the outer legs with the associated seat supports.

Glue

I used Tite Bond II but you can use any equivalent. The stool will likely be used inside so this glue or its equivalent is a good choice. Use Tite Bond III or other waterproof glue if you plan to use the stool outside or in wet conditions.

Assembly

Dry fit the pieces. It might seem like a Chinese puzzle when assembling the stool for the first time, but be patient. You'll figure it out. Figure 6 can help.

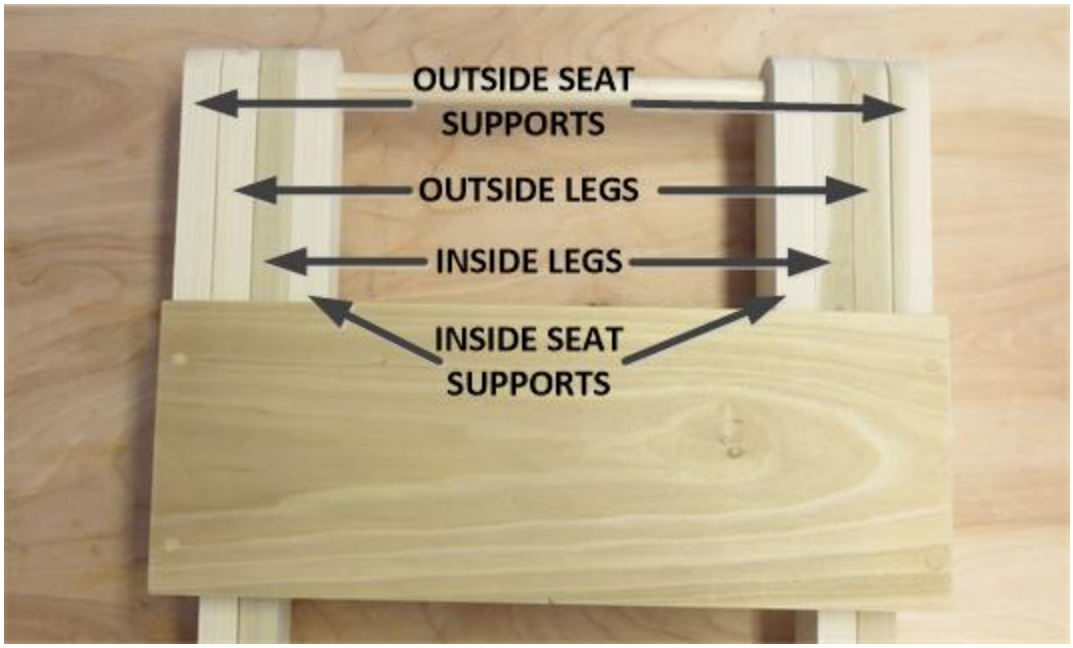

Figure 6. Parts Locations

Position the dry-fit pieces so the stool is in the folded position. Be sure that the angled bottoms of the legs are oriented correctly.

Be sure each leg and seat half is nicely positioned with all parts parallel and square as they should be. Try to ensure that nothing will bind or interfere with movement. Now glue one seat half and one cross brace into place. Be careful not to get glue on areas where it doesn't belong.

Once the glue has set, or the pieces are otherwise secured in position, turn the stool over and glue the other seat half and cross brace into position. Once again, be sure each leg and seat half is nicely positioned with all parts parallel and square as they should be before gluing the parts into place.

Adding 1/4" Dowel Pins

Once both seat halves and both cross braces are glued into position, the stool is almost assembled. However, the handle dowel and the pivot dowels might slip out of position as the stool is folded and unfolded. **Thus, the stool can conceivably fall apart and be unsafe.**

To prevent the handle and pivot dowels from slipping out of place, I added 1/4" dowel pins in strategic places. Specifically, **EVERY 5/8" dowel**—both the 1 1/2" and 11" dowels—should be pinned in place by a 1/4" dowel at **ONE LOCATION ONLY**.

As you add the 1/4" dowel pins, be sure that you don't locate them so that they lock the stool and prevent it from folding or unfolding!

Look at the pictures below for a few examples of selected locations of 1/4" dowel pins.

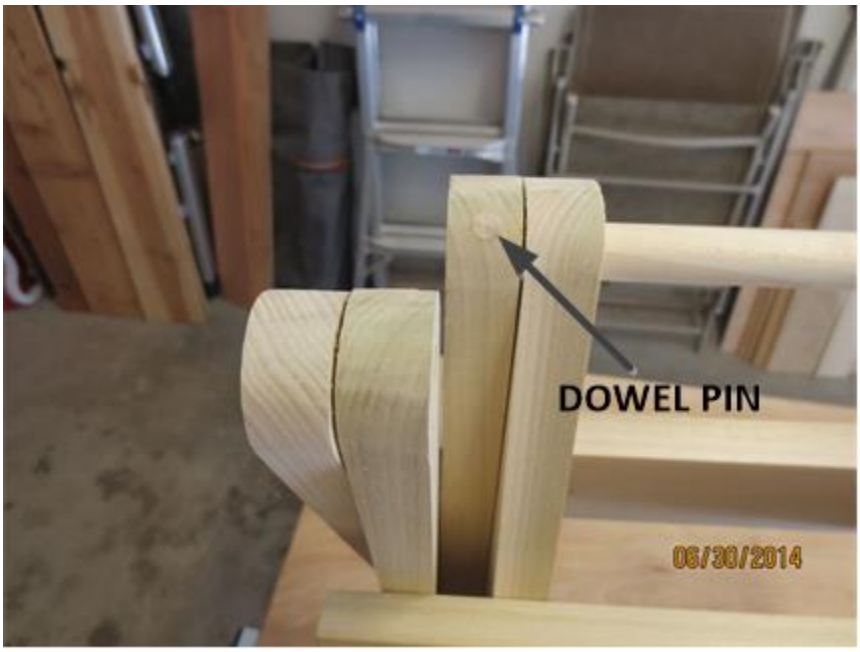

Figure 7. Dowel Pin in Handle Dowel

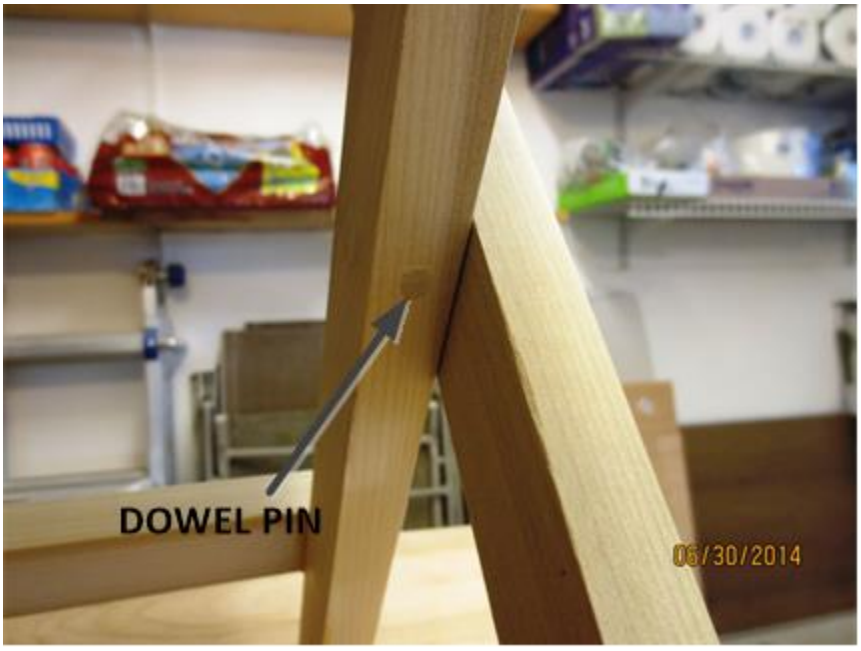

Figure 8. Dowel Pin in Leg Pivot

Figure 9. Dowel Pin in Leg-Seat Support Pivot

The images above don't show all of the 1/4" dowel pins. **Be sure to examine your stool so that you don't miss pinning one of the 5/8" dowels into place.**

Finish

I chose not to use a finish. But if you prefer using a finish, you should probably use an oil or a stain rather than paint. Because adjacent pieces pivot against each other, a painted finish could be marred or even rub off after a lot of use.

Safety Considerations

1. **DO NOT STAND ON THIS STOOL! IT IS NOT SAFE FOR STANDING.**
2. THE STOOL IS RELATIVELY STABLE AGAINST FORWARD OR BACKWARD FORCES, BUT IT IS NOT VERY STABLE AGAINST SIDE-TO-SIDE FORCES.
3. USE YOUR GOOD SENSE WHEN USING THE STOOL.
4. **DO NOT LET CHILDREN USE THE STOOL WITHOUT ADULT SUPERVISION.**