

FEBRUARY 2014 DEMONSTRATION

THE 3 LEGGED STOOL BY CHAD DAWSON

At the February meeting, Chad Dawson talked about making 3-leg stools and showed three examples of 18" tall stools and several approaches to creating a tenon on the stool leg for solid connections. His demo was based on reading about stool construction and trying many different techniques. He selected the 3-leg stool as a project because it is the most basic piece of furniture that can be made entirely on a lathe and was a challenge to make three legs the same. The following list of instructions is based on reading about stool making and the three stools he made. The stools were made of red oak or a combination of maple and black cherry. Hardwood species like maple, birch, oak, cherry, and walnut are often used in stool construction.

MATERIALS:

- Seat: One piece of hardwood about 14" by 14" by 2" rough or 1 ½" thick if surfaced. Seats are from 12" to 14" in diameter when completed and about 1 ½" thick. Wood can be glued up from two or more pieces to achieve the circumference wanted.
- Legs: Three hardwood pieces 19" long and 2" by 2" for the legs on an 18" tall stool.
- Optional stretchers (T-shape design): Two hardwood pieces 14" long and 1 ½" by 1 ½" for stretchers (rungs) if desired. Stretchers are not required in an 18" tall stool, but are needed for any stool taller than 18".

TURNING THE SEAT:

- Glue a waste block on the top of the stool seat and attach a faceplate to the waste block. Mount on lathe.
- True up the seat bottom and edge. Turn the seat edge with a bowl gouge to the desired shape. Cut a recess into the bottom of the stool seat to accept a scroll chuck. Sand as needed.
- Take the seat off the lathe, remove the faceplate, and mount the seat using the recess on a scroll chuck.
- Turn the top of the seat with a 1/8" to ¼" curve to give it a slightly concave look. Sand and complete the seat top.
- Take the seat off the scroll chuck and turn it around one more time to remove the recess

on the bottom. Hold the top with a vacuum chuck, giant jaws, or other safe method. Sand and complete the seat. Mark a very light pencil line 1 ½" to 1 ¾" from the outer edge of the seat to help locate the leg mortise center on the bottom of the seat and a pencil dot to mark the bottom center (find with tail stock center). Remove seat from chuck.

DRILLING THE TENON HOLES:

- Locate 3 tenon hole centers equidistant on the pencil circle marked on the seat bottom. Use either a divider to get the same distance between each leg center or use a protractor from the center mark and use 120 degrees to place three marks on the very light pencil line 1 ½" to 1 ¾" from the outer edge of the seat (check accuracy between the three points with a divider).
- Build a simple jig for drilling the leg mortises using 2 pieces of ¾" plywood that are approximately 18" by 18". Hinge the two pieces together and then add a spacer block (opposite the hinges) that makes the angle between the two pieces as 10 or 12 degrees – the same angle that you want the legs to be when installed. Mark center lines on the top plywood piece to help you visually align your seat top when on the drill press. Clamp your drilling jig to your drill press stand.
- Put the seat on your drilling jig and align the center mark for the mortise with the drill point and also visually align the center of the seat with the central line of the drilling jig. The mortise for recessed tenons is first drilled using a 1 ¼" Forstner bit so that the entire bit has cut wood creating a shoulder for the leg to sit on. Then the same hole is drilled with a 1" Forstner bit to a depth of 1". Repeat for each leg mortise.



- If you wish to have a through tenon that shows on the top of the seat, back up the top of the seat with cardboard or other scrap material that will help keep the drill bit from chipping out as it comes through the top. When you have the 1" drill bit in place, keep drilling through the top. Go slowly as you reach the point of coming through the top so as to reduce any chip out. The mortise hole is at an angle so back up the seat with a 3/4" piece of scrap wood so you do not drill through your jig.



TURNING THE LEGS:

- Think through your design of a leg that has a 1" long and 1" wide tenon (or 2" long for through tenon design) and a shoulder that will sit in the recess that is 1 1/4" wide and about 1/4" long. The bottom of the leg should be about 7/8" wide. The leg from bottom to shoulder should be about 16 1/2" long. The rest of the leg design is up to your creativity. If you plan to add stretchers, then there should be enough material thickness in the leg at the joint (6" from bottom of leg) to accommodate a 5/8" mortise that is 5/8" deep.
- Turn the first leg and sand it completely. Before parting it off, use a 1 or 2" wide board placed along the leg to make a record (story stick) of the leg thickness at various distances from the bottom so that you can replicate two more legs that look similar. This story stick can be used along with your caliper or mechanical wrench to test the diameter of your tenon and various places on your next two legs while turning.
- As you complete each leg and part it off the lathe, test it in a leg hole and sand the tenon, if necessary, to get a smooth but firm fit. Then mark each hole and leg with a number on blue masking tape so that you can get the same leg matched up with the same mortise again.



OPTIONAL STRETCHERS (RUNGS) FOR 18" TALL STOOLS, BUT REQUIRED FOR 24" TALL OR HIGHER STOOLS:

- If you choose to add stretchers to your design, I suggest making two stretchers that "T" into each other so that each leg has only one stretcher mortise to drill.
- Mark each leg about 6" above the bottom of the leg in the center of the leg for the mortise hole. Make a "V" cut in a scrap board or 2" by 4" so that it will hold the leg on your drilling jig in a stable manner for accurate drilling. Carefully line up each leg on the drilling jig (same angle as used to drill the seat mortises) and drill a mortise with a 5/8" Forstner bit to a depth of 5/8".
- With all three legs dry fitted in place, use two pieces of 1/4" dowel next to each other to extend into the mortise hole and measure the distance between the two legs that will be linked together by the stretcher. Mark or tape the two pieces together and then remove one of the legs and measure both dowels still together to get the total stretcher length.
- Turn the stretcher to the length measured and with 5/8" diameter tenon on each end for approximately 1" of the length on each end. Stretchers do not have tenon *shoulders* like legs. There should be enough material thickness in the first stretcher at the midpoint to accommodate a 5/8" mortise that is 5/8" deep to attach the second stretcher.
- Finish the first stretcher and part it off to the length you measured.
- Put all three legs back into the stool and add the first stretcher as you reassemble and dry fit the parts together. Make sure the stretcher is the correct length and does not push the legs out of alignment (too long) or require you to pull them together too much (too short). Adjust the length or remake the stretcher as needed to get a correct fit. When you feel that the stretcher is the correct length, disassemble the parts. Mark the center of the first stretcher (length and width) and drill a 5/8" hole that is 5/8" deep that is perpendicular to the center of the stretcher. Do not use the angled drilling jig but do use the "V" cradle to hold the stretcher while drilling.
- Reassemble the legs and stretcher. Now do a length measurement between the remaining stool leg and the center of the first stretcher. Make a second stretcher for that length and similar to the design of your first stretcher. Each tenon end needs to be 5/8" in diameter for about 1" of its length to fit in the mortises. Finish the stretcher and part it off to your measured length. Dry fit all pieces together to final test all parts at once. Make sure all pieces are marked as needed to get them all back to the same place for glue up.

THROUGH SEAT TENONS (OPTIONAL):

- If you drilled your seat to have mortises that go through the top and are exposed, then you need to prepare the tenon prior to glue up. First, with all three legs in place orient the grain of the tenon to be in line with the grain of

the top. Second, mark a line around each tenon where it comes through the seat top. Third, remove all legs and carefully cut them off at those marks allowing about 1/16" to 1/8" more of the tenon to come through the top (to be sanded down later).

- Reassemble the three legs and reorient as above. Now mark the lines in the top of the tenon, perpendicular to the grain where you will place the wedge to tighten the tenon. You could make them form a pattern or not. Remove the legs and cut them with a narrow blade saw down the length of the tenon and almost up to the tenon shoulder.
- Cut and sand down wedges of wood that are the width and length of the tenon. The idea is to make them only 1/16" thicker than the tenon cut so they will be tight but not split the wood. Select the same wood species or a contrasting color wood to set off the exposed tenon.

GLUE UP:

- Before putting any glue on any parts, cut or carve one or two small notches down the tenon length (not necessary for tenons through the seat top) to allow excess glue to escape during the assembly.
- For blind tenons (not through the seat top), place the seat top down, put glue in the entire mortise and on the tenon, then insert into the mortise until it seats on the leg shoulder and any excess glue has escaped. After assembling all three legs, put a heavy weight (about 40 to 50 lbs) that is balanced on top of all three legs. Remove excess glue.
- For stools with stretchers and blind tenons, place the seat top down, put glue in the entire mortise and on the leg tenon for the two legs connected by a stretcher. Put glue on the stretcher mortises and tenons. Assemble these two legs and stretcher together into the seat top. Carefully seat the two legs up to the shoulder in the mortise and let the excess glue escape. Next put glue on and assemble the remaining leg and second stretcher that goes into the first stretcher. After assembling all three legs, put a heavy rubber band (13" super rubber bands from www.amazon.com) around the three legs at the stretcher mortise to pull them together and then place a heavy weight (about 40 to 50 lbs) that is balanced on top of all three legs. Remove excess glue.
- For through tenons, put glue in mortises and on tenons. Assemble all legs with seat up. Put glue on wedges and insert them in tenon slots and drive home with hammer very carefully and directly so they do not bend and break off. Once all wedges are firmly in place, no further weight or clamps are necessary.
- Complete any final sanding and add protective finish.
- If a through tenon was used, carefully cut off with a hand saw any excess wedge protruding above the tenon. Then sand the exposed tenon ends until they are even with the seat surface. Add protective finish.



Try different seat and leg designs or use contrasting wood on the seat and legs to achieve different effects. Try building 12" tall stools for small children. Try building a 24" tall stool with a "T" stretcher for a workbench. Just HAVE FUN!

Submitted by *Chad Dawson*

FEBRUARY 2014 WORKSHOP

Just a few people joined *Chad Dawson* at the 8 Acres Event Center for the workshop on making stools.

