

About 20 years ago, a customer asked me to design a stool that was “comfortable, well proportioned, and graceful.” I designed and built a set of them, and the client was very pleased with the results. I had first made a prototype, with mixed woods and a painted finish, and it’s still in constant use in our kitchen and standing up well. Paint finish, a Windsor tradition, makes for a wonderfully uniform design, emphasizing the shapes and curves instead of the wood’s grain and color. But natural wood is more my style, so over the years I’ve built many of these in cherry. They’ve been sized at various heights to work with kitchen counters, bar counters, and other places.

Windsor construction and modern tooling give a timeless result

BY CHARLIE DURFEE

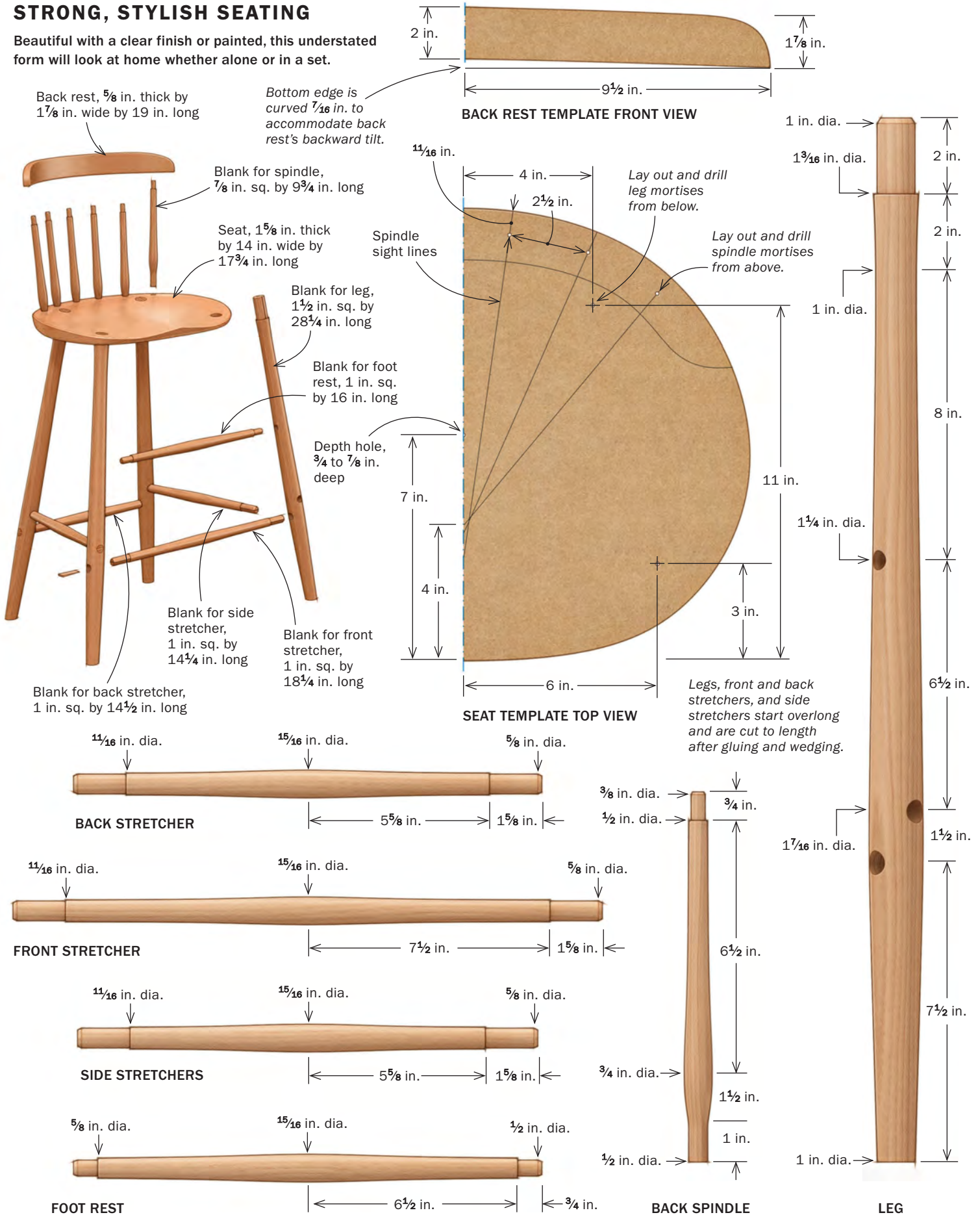
The design’s stayed about the same, but the construction process became more refined in subsequent builds. In fact, while doing another set recently, I realized the piece had remained a work in progress. Structurally, it’s a basic Windsor form: a thick plank seat with the legs and spindles tenoned into it. For comfort, the seat is well sculpted, and a curved low back gives support in just the right place. Using classic Windsor construction, the legs are attached with wedged through-tenons. The lower stretchers are similarly fastened. To avoid the straight dowel look seen on a lot of commercial stools, all the turned parts have a gentle swell and taper. The swell’s location depends on the function of the part.

Classic Kitchen Stool



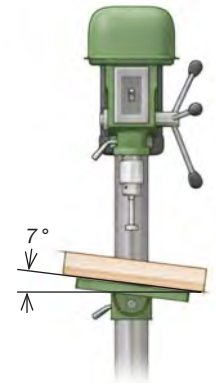
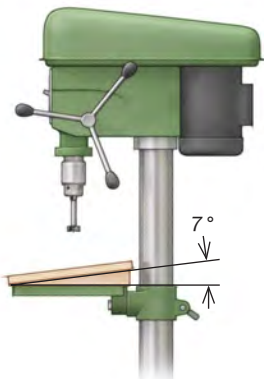
STRONG, STYLISH SEATING

Beautiful with a clear finish or painted, this understated form will look at home whether alone or in a set.



Drilling the seat

Use a template to lay out the seat. After gluing up the seat blank, Durfee grabs his template to transfer all the crucial layout information, including the depth hole (near right), joinery locations, and perimeter shape (far right). He'll drill into both faces of the blank, so he uses centerlines on both sides of it to orient the template.



Add a ramp and tilt the table to drill at the correct rake and splay angles. To tilt the seat blank to the rake angle, Durfee screws a plywood ramp to his drill-press table. He then tilts the table itself for the splay angle.

In addition to the Windsor construction, the stool offers some techniques involved in flat work, namely bent-lamination for the crest rail. While you could forgo the back altogether and just build the seat, legs, and stretchers and call the stool good to go, take the challenge. It's worth it functionally and aesthetically.

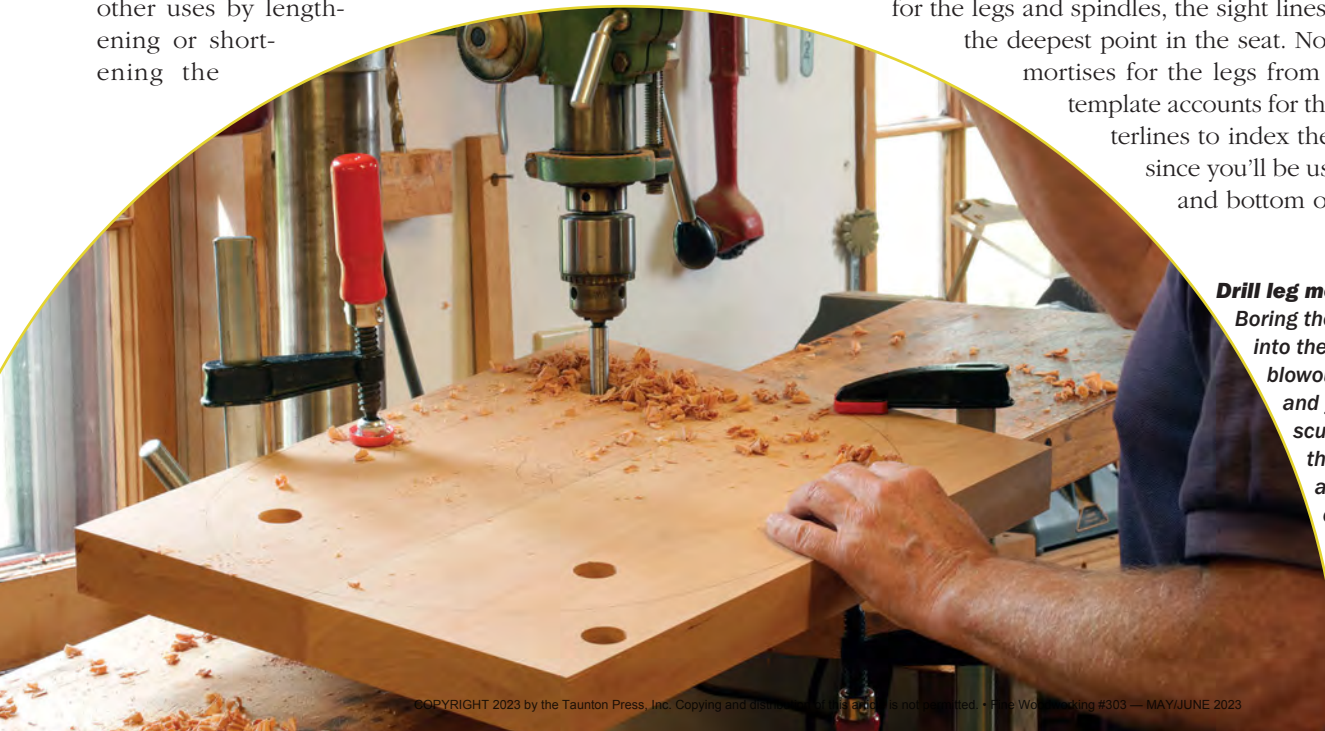
The seat height is set for use with a kitchen counter of 36 in. But that can be easily adapted to other uses by lengthening or shortening the

legs below the stretchers. A rule of thumb is to have the seat height about 9 to 10 in. below the corresponding surface height.

Start with the seat

All the other parts flow from the seat. You'll likely need to glue up a pair of boards to make the blank; I used cherry for mine. Make a seat template and use it to lay out the centerlines, the mortises for the legs and spindles, the sight lines for the spindles, and the deepest point in the seat. Note that you'll drill the mortises for the legs from the bottom, and the template accounts for their splay. Use the centerlines to index the template accurately, since you'll be using it on both the top and bottom of the blank.

Drill leg mortises from below. Boring these through-holes into the bottom face means blowout is limited to the top, and you'll remove it when sculpting the seat. Because the rake and splay angles are the same, Durfee can simply rotate the blank 90° between mortises.





Determine the spindle sight lines. On the top of the blank, connect the spindle locations to their convergence point along the centerline. You'll sight down these lines when drilling mortises for the spindles.



Reset the drill-press table but leave the ramp. The spindles tilt back, but they don't splay. So bring the table back to square without moving the ramp.

Bore these mortises on the drill press. I tackle the ones for the legs first. The rake and splay are both 7°. Then flip the blank to drill the stopped mortises for the back spindles. These angle back at 7°, so keep the ramp in place but square the table.

Next up are shaping and saddling the seat. While I cut out its oval profile on the front now, I leave the back section square to ease clamping the seat to the bench. I power-carve the seat, and I don't want the workpiece moving at all.

Drill a depth hole in the center. You could do more of these at different depths, but I rely on my eyes and fingers to achieve the saddle shape. I also occasionally check the thickness with a bowl turner's caliper to ensure the shape is symmetrical. In addition to the saddling, there's a strong roundover at the seat's front edge. This is for comfort under the sitter's thighs. Again, use your hands to test the seat as you go.

I've used a wide variety of techniques to shape the seat. The challenge has always been how to efficiently rough out the saddle. Scorpis and inshaves work well, but are slow and laborious in hardwood. Instead, I rough out the seats using a pair of power-carving disks mounted in an angle grinder. Don't be put off if you're limited to hand tools, though. They've worked just fine for centuries. Plus, I always finish shaping with spokeshaves, scrapers, and sandpaper.

The work is well worth it, as the seat will be demonstrably more comfortable than most commercial efforts. Once the saddling is complete, finish cutting out the perimeter around the back section of the seat,



Start with the two center spindles. These are stopped mortises. Set the point of the drill into the spot for the spindle hole, then rotate the seat blank so the sight line is straight toward you.



The outer spindles need a shim. The four remaining spindles need a touch higher ramp angle than the others to line up correctly. To adjust them, Durfee shims up the seat $\frac{3}{32}$ in. before drilling.

Shaping the seat

GETTING READY

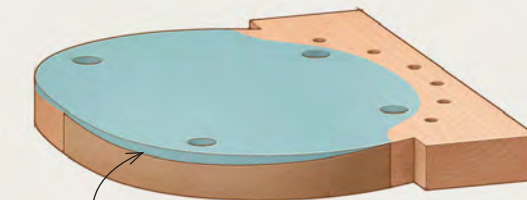
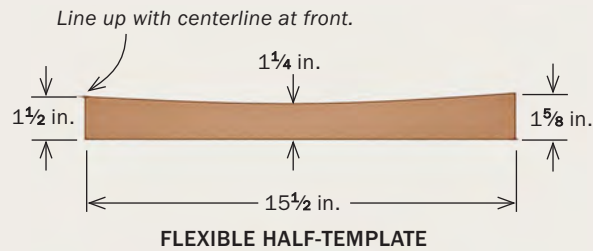


A depth hole helps when saddling. A small-diameter hole at the deepest part of the seat gives some guidance when you shape the saddle.



Bandsaw the front, but leave the back square. Shaping the front now lets you better track the saddling against the seat's shape. Keeping the back square makes clamping easier.

SADDLE THE SEAT



The template lays out the shape and depth of the saddling.



The saddling template should be flexible but firm. Durfee uses cardboard from a cereal box, which wraps around the seat well but won't deflect from the pencil's pressure.



Power-carve away most of the waste. Start with a coarse disk (left and below) before moving to something finer (bottom). Frequently check the seat's shape and depth, looking at it from all angles while taking it as close as possible with the angle grinder.



Lancelot 22-tooth carving disk by King Arthur's Tools Model #45822

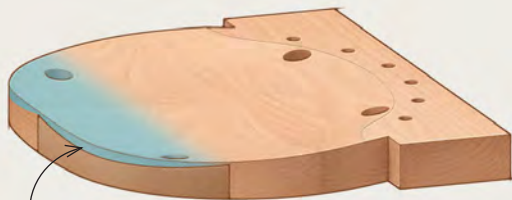
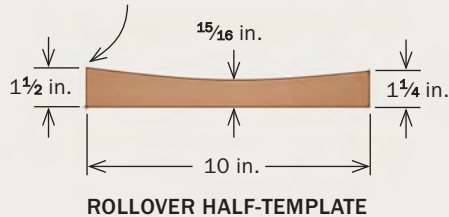


Original fine shaping disk by Kutzall Model SD4120230



ROLL OVER THE FRONT EDGE

Line up with centerline at front.



The rollover template lays out a deeper cut at the seat's front edge to accommodate the sitter's thighs.

bevel the bottom of the front edge, and give the bottom back edge a $\frac{5}{8}$ -in. roundover.

Move down to the legs and stretchers

Find some nice, straight-grained stock for the turned legs and stretchers. This stock should also be quite dry so the tenons don't shrink in their mortises. Use a story stick for consistent layout among the legs, and mark the stretcher locations in pencil.

Turn the legs but leave the tenons long, and chamfer their ends slightly to ease assembly. You'll trim their through-tenons to length afterward.

When the legs are done, dry-fit them into the chair. You need to bore angled mortises in the legs for the stretchers, and it's better to mock up the stool and pull the angles from what you've built than to rely on a plan or drawing. Especially with the through-mortises for the stretchers, it's easy for a slight difference in the angle to make for an inaccurate fit during assembly.

Drill these mortises on the drill press with the table set to the correct angle and the stretcher held in a V-block jig to secure it parallel to the table. Orient the grain of the legs uniformly, with the quartersawn edges facing front and back. Drill the mortises for the front and rear stretchers first. Drill almost through with the Forstner bit, but use a $\frac{1}{16}$ -in. bit to drill the rest of the way through. Use that small hole when aligning the Forstner bit to finish drilling the mortise from the other side of the leg. This avoids blowout.

For the foot rest, use the same drill-press table settings as for the front stretcher, but put a dowel into



FINAL SHAPING



Hand tools even out the power carving's irregular surface. Starting with a small spokeshave (top) and finishing with a scraper (above), Durfee smooths the seat. A sander with a soft fine-grit pad is the final step.



Front of the seat gets undercut at a 15° angle. Make the cut at the bandsaw with the table tilted.



Bandsaw the back to shape. With the saddling done, you no longer need the back as a clamping surface. Trim to just outside your line and clean up the cut with hand tools.

Legs, stretchers, and dry-fitting



Test the turned tenons. While turning the legs and tenons, Durfee frequently checks the latter against a test hole bored with the same bit he used to drill the leg holes in the seat.

the stretcher mortise and line that up with the drill bit. This ensures that the two mortises will lie in the same plane. This one is smaller in diameter and stopped.

The mortises for the side stretchers are drilled in the same manner, but you will need to reset the drill-press angle for both the front and back leg mortises, which are different. Again, verify the angles on your actual piece. And mark the legs with the side stretchers' center points as well.

Turning the stretchers is pretty straightforward. The swell is centered, and it gently tapers out toward the ends. Again, get the overall lengths from the piece itself. Similarly, using dowels in the existing mortises to mark off the shoulder distances is helpful when locating the tenons. As with the legs, leave the tenons long (except on the



Mock up the stool to get the drilling angles for the front and rear stretchers and foot rest. The holes for the stretchers and foot rest need to be drilled at an angle. Get this by putting the legs into the seat and clamping a straightedge across the stretcher location (above). Then adjust a bevel gauge until it sits in line with the leg. This is the angle for that hole. Repeat the process for each leg.



Support the leg while drilling. After tilting the drill press table to the correct angle, Durfee sets up a jig to stabilize the leg. Its long platform has V-blocks to cradle the workpiece, including one right under the drilling locations. Its toggle clamps ensure the leg stays put, too.



Dowels align legs for determining angle for side stretchers' holes. To make sure the legs are oriented correctly, insert a dowel through the stretcher holes you just drilled. Dowels also help when getting the shoulder-to-shoulder dimensions for the stretchers.



Mark the drilling location too. A pencil secured in a long V-block lets Durfee mark exactly where to drill. A straight stick of wood clamped to the leg ensures the block sits in the same plane as the leg.



Kerf the leg and stretcher tenons. These kerfs are for wedges. A V-block glued to a long base supports the workpiece and allows for safe, repetitive cuts.

foot rest) and slightly chamfer the ends.

The last thing to do with the legs and stretchers is to cut the wedge slots. At the bandsaw, I cut these so they'll be perpendicular to the grain direction of the seat. If they weren't, the wedges could split it.

Assemble the undercarriage

Glue-ups can be stressful, and the angled mortise-and-tenons here don't help. But the dozens of these stools I've built have taught a few lessons that keep things manageable. For one, use a glue with a long open time, such as Titebond III or Old Brown Glue. Next, get creative with clamping. Options include band clamps, rubber tubing wrapped around the joints, one-handed trigger clamps, or bar clamps with foam pads attached to the heads (which are what I use).

Assemble the undercarriage. Using glue with a long open time, coat all the mortises. Insert the stretchers into the legs, and the legs into the seat. This can take some push and pull as the angled parts work against one another.



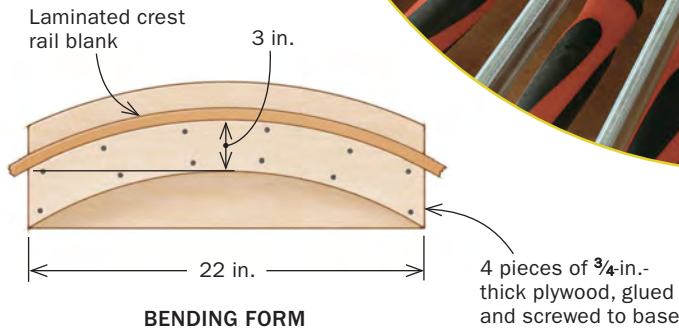
Drive the wedges. You'll know the wedge has seated when the sound it makes changes pitch. Check the piece for overall alignment once more. Trim the wedges after the glue cures.



Mark and trim the legs to length. After shimming the stool so the seat is level horizontally but tilts down slightly toward the back, use a pencil on a spacer to mark your cut lines. Saw to the lines with a handsaw.

Curved, bent-lam back

Glue up the laminations using a bending form and plenty of clamps. Start by clamping the middle before moving toward the ends. To give continuous flow to the grain, cut the laminations from a single piece of stock and keep them in order during the glue-up.



Scribe along the bottom with the crest rail tilted back. The crest rail will sit in line with the angled spindles, so its bottom edge needs to be cut to accommodate this tilt. To lay out the cut, Durfee clamps the rail to a block cut at an 83° angle and then scribes it using a compass.

Once the seat, legs, stretchers, and foot rest are clamped in place, check the leg angles for proper alignment. Don't get too caught up in degree numbers; just eyeball it. Check the alignment again after you have driven the wedges.

When the glue has set, trim off the leg tenons' protruding ends and fair up the surfaces. This is a good time to do the final sanding on the seat saddle too. Also, trim the rear legs

$\frac{3}{8}$ in. shorter than the front, giving the seat a slight backward tilt for comfort.

The back is last

At this point, you have a functioning stool, but I encourage moving ahead and adding the back. Made up of spindles and a curved back rest, it gives the design a graceful lift and offers lumbar support. I make the curved crest rail using bent lamination.

For the bending form, use layers of plywood or MDF to make a stack about 3 in. high. I glue and screw four layers of 3/4-in. plywood, lining the face with plastic wrap.

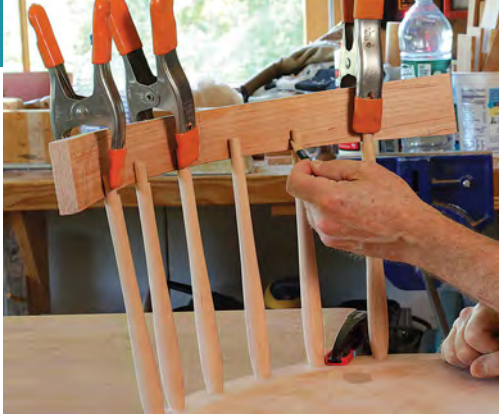
I cut the laminations from a single piece of stock for grain and color continuity. Each of the six lams should be about 22 in. long by 2 1/2 in. wide and a bit under 1/8 in. thick, making a stack about 5/8 in. thick. Mark their sequence so you can glue them back together in the order they came from the plank.

After glue-up, the crest rail's bottom edge needs to be cut to a concave curve to accommodate the back's backward tilt. I hold



Trim the bottom edge at the bandsaw. For safety while making this cut on a curved workpiece, be sure to hold it firmly to the table and rotate the crest rail as you follow the line so the contact point on the table is always right by the blade.

Mark the spindle locations. As you did with the stretchers, dry-fit the parts to lay out these joints. Durfee clamps the back to the spindles and pencils on both sides of their tenons.



Bore the mortises for the spindles. Drill each hole between the layout lines from the previous step. You may have to shim one end of the back rest to align the mortise angle with the drill bit.



Finish shaping the back. With all of the joinery done, you can wrap up the workpiece. Safely cut its top and rounded ends freehand before smoothing it with hand tools and sandpaper.



it at the correct tilt using an angled block, then scribe the curve and cut it on the bandsaw.

To lay out the mortises for the spindles, dry-fit the spindles in the seat, and clamp the crest rail to their upper tenons. Mark where those mortises will fall, and bore them on the drill press. When those are done, saw and shape the crest rail's top edge and ends to final form. Then glue the spindles to the seat and the crest rail.

I sand the stool to 150-grit. This may not seem smooth enough, but this stool will be sat on, pulled around, and hopefully put to a lot of use, so there's no need to be precious about it. I then use a couple of coats of an oil/varnish mix, namely Minwax Antique Oil. Leave it at that, or top it with a coat of clear gel varnish. □

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Put it all together. At glue-up, gentle tapping with a dead-blow mallet should prevent dents. Put the seat on a corner of your bench for support. Glue the spindles into their seat sockets, then tap the crest rail onto them until seated. As with the legs, it may involve some push and pull.