

# Comfortable Side Chair

**D**uring my apprenticeship with P.A. “Pug” Moore, he sometimes said, “If you can build a chair, you can build anything.” After all, chairmaking presents the ultimate challenge in woodworking. There’s the complexity of the construction, which almost always involves angled joinery. Plus, there’s designing a chair to be appealing from any viewpoint while, at the same time, being comfortable. Add in shaping, and it’s no wonder so few attempt making chairs of their own. But take it from me, building chairs is tremendously satisfying. It takes a certain set of skills and a particular kind of planning, but nothing that’s impossible to tackle.

This Craftsman-style side chair provides an ideal entry point. Constructed in white oak (cherry works, too), it has a straightforward, sturdy design consisting of a reclined backrest, curved crest rail, and angled mortise-and-tenon joinery. Built correctly, this chair can last 200 years or more. In this article, I focus on key strategies for building a chair—whether this chair or another—that will aid you in the process and leave you with a handsome piece of furniture.

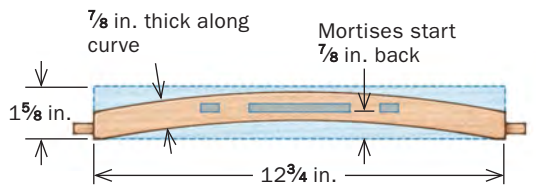
## Start with a full-size drawing and templates

You can demystify the entire chairmaking process by simply drawing the chair from three different perspectives: the side, front, and plan (top) views. With these three views, the chair’s key elements—its shapes, joinery, and dimensions—become clear and easily accessible. This benefit becomes immediately apparent when dealing with angles and

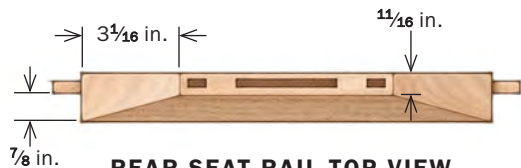
Practice the fundamentals of chairmaking while building this classic piece

BY TOM McLAUGHLIN





**CREST RAIL TOP VIEW**



**REAR SEAT RAIL TOP VIEW**

Crest rail, 1 5/8 in. thick by 2 3/8 in. wide by 14 1/2 in. long

Tenon, 1/4 in. thick by 3 1/8 in. wide by 5/8 in. long

3/16-in. pegs in crest rail

3/16-in. shoulder

Tenons on crest rail, 5/16 in. thick by 2 in. wide by 5/8 in. long

Tenon, 1/4 in. thick by 9/16 in. wide by 5/8 in. long

Rear legs, 1 5/8 in. thick by 5 1/4 in. wide by 40 in. long

Side splat, 1/2 in. thick by 11 1/16 in. wide by 19 1/4 in. long

Center splat, 1/2 in. thick by 3 1/2 in. wide by 19 1/4 in. long

Side seat rails, 7/8 in. thick by 2 3/4 in. wide by 16 1/4 in. long

Rear seat rail, 1 1/2 in. thick by 3 3/4 in. wide by 14 1/2 in. long

1/4-in. pegs in seat rails and stretchers

Tenons on front and side seat rails, 3/8 in. thick by 2 1/8 in. wide by 7/8 in. long

Front seat rail, 7/8 in. thick by 2 3/4 in. wide by 18 1/2 in. long

Stretcher tenons, 5/16 in. thick by 1 1/4 in. wide by 7/8 in. long

Rear stretcher, 9/16 in. thick by 1 7/16 in. wide by 14 1/2 in. long

Side stretchers, 9/16 in. thick by 1 7/16 in. wide by 17 3/4 in. long

**SPLAT SIDE VIEW**

Tenons on rear seat rail, 3/8 in. thick by 2 1/2 in. wide by 7/8 in. long

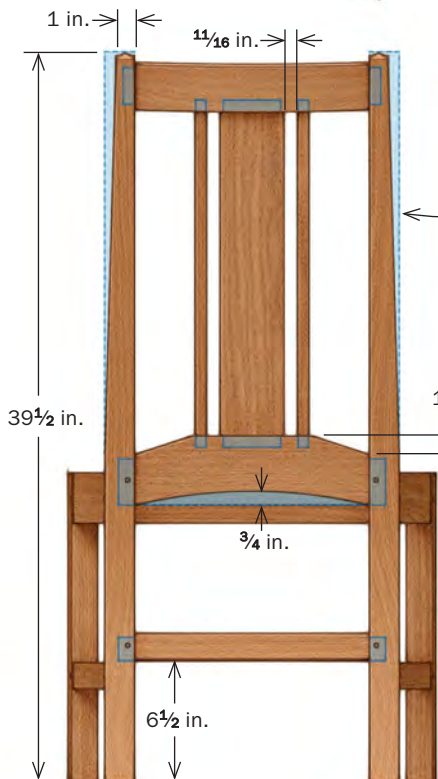
No bottom shoulder on any seat rails or stretchers.

Back legs are tapered to 1 in. on outside faces starting above seat rails.

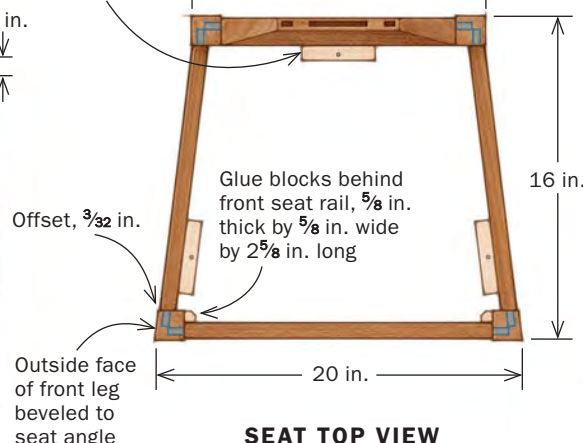
Front legs, 1 5/8 in. thick by 1 5/8 in. wide by 16 3/4 in. long

Seat attachment blocks, 13/16 in. thick by 13/16 in. wide by 4 in. long

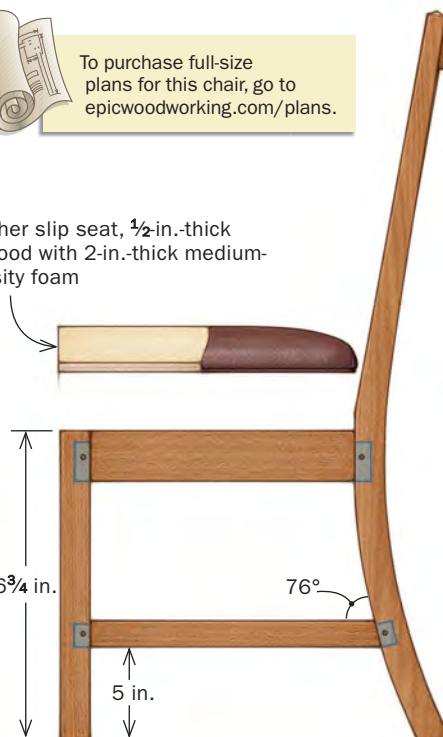
Leather slip seat, 1/2-in.-thick plywood with 2-in.-thick medium-density foam



**BACK VIEW**



**SEAT TOP VIEW**



**SIDE VIEW**



To purchase full-size plans for this chair, go to [epicwoodworking.com/plans](http://epicwoodworking.com/plans).



# Make a jig for the rear legs

## START WITH A TEMPLATE



**Template begets jig.** After making a template of the rear leg, McLaughlin tacks it to plywood, which he'll flush trim to exact shape. The jig lets him shape both the front and back profiles of the leg. He roughs out the curves at the bandsaw, leaving  $\frac{1}{16}$  in. on each side for the router to clean up.

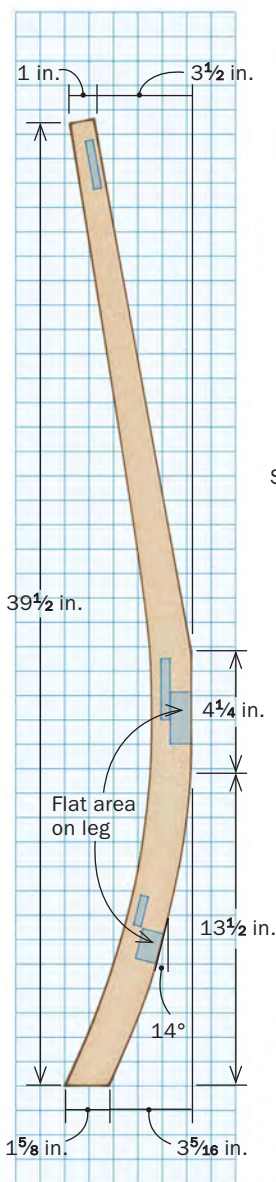


**Blocks needed for clean routing.** Blocks at the top and bottom of the template and in line with it let you smoothly enter and exit the cut. Remove the top blocks after this step.

**Trim to final shape.** By riding the template along a flush-trimming bit, McLaughlin accurately duplicates the leg's profile on the jig's plywood base. Next he'll move the template to the other edge of the jig and rout the concave curve.

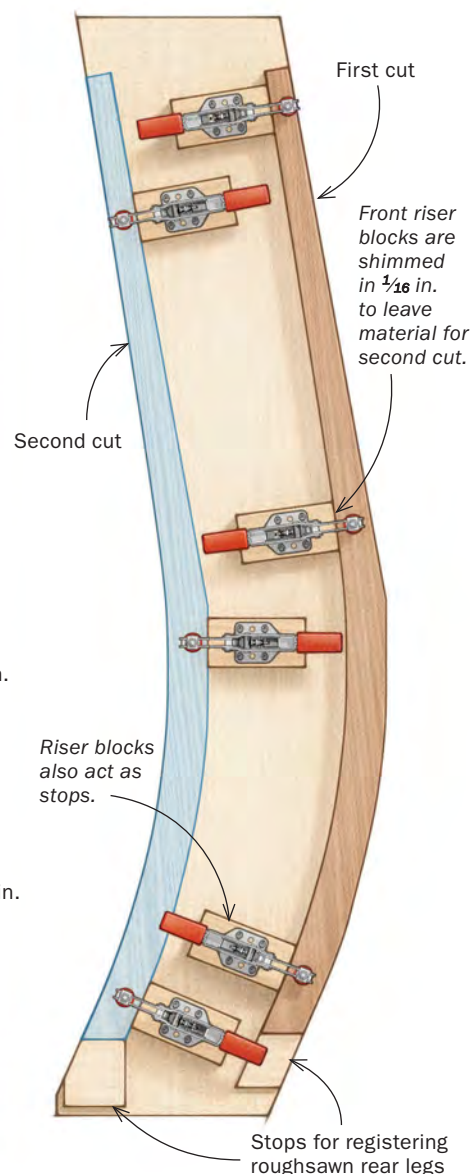


## TEMPLATE



## JIG TOP VIEW

Jig is two-sided for flush-trimming front and back of rear legs.



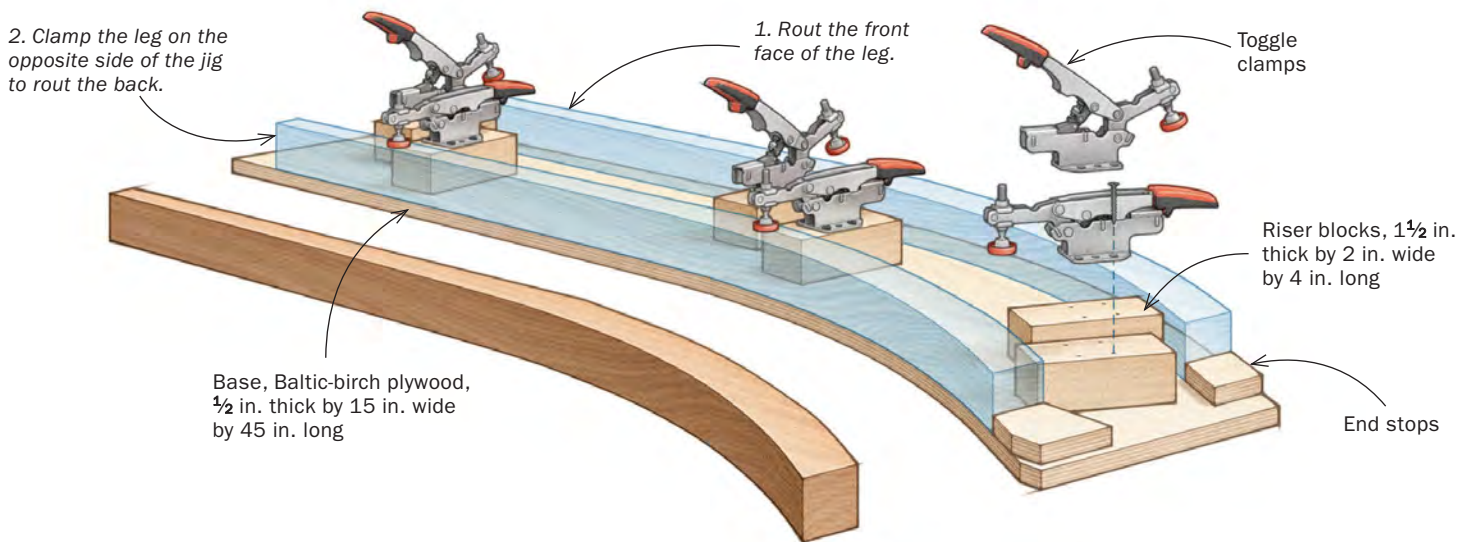
curves. Because they're drawn at full scale, there won't be any need for complex math. Whether you're laying out mortises or need to set your bevel gauge, just reference off the drawing.

For layout, it helps to have a bridge between the drawing and the actual stock. So I make templates from  $\frac{1}{4}$ -in.-thick masonite or MDF. Both are ideal because they don't deform when you cut them to

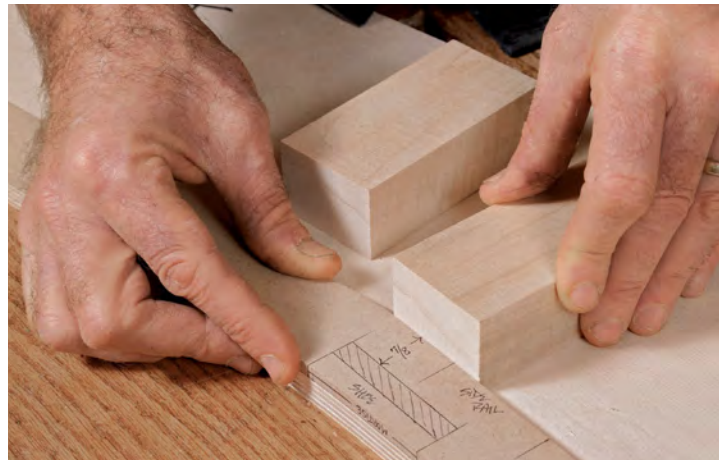
shape. They also lie flat, are easy to shape, and have consistent density without voids. Plus, the templates come in handy if you ever remake this design.

I make templates for the side view of the rear legs, the plan view of the crest rail, and the plan and front views of the rear seat rail. They include joinery locations. As a result, almost all of the mortise layout comes from the templates.

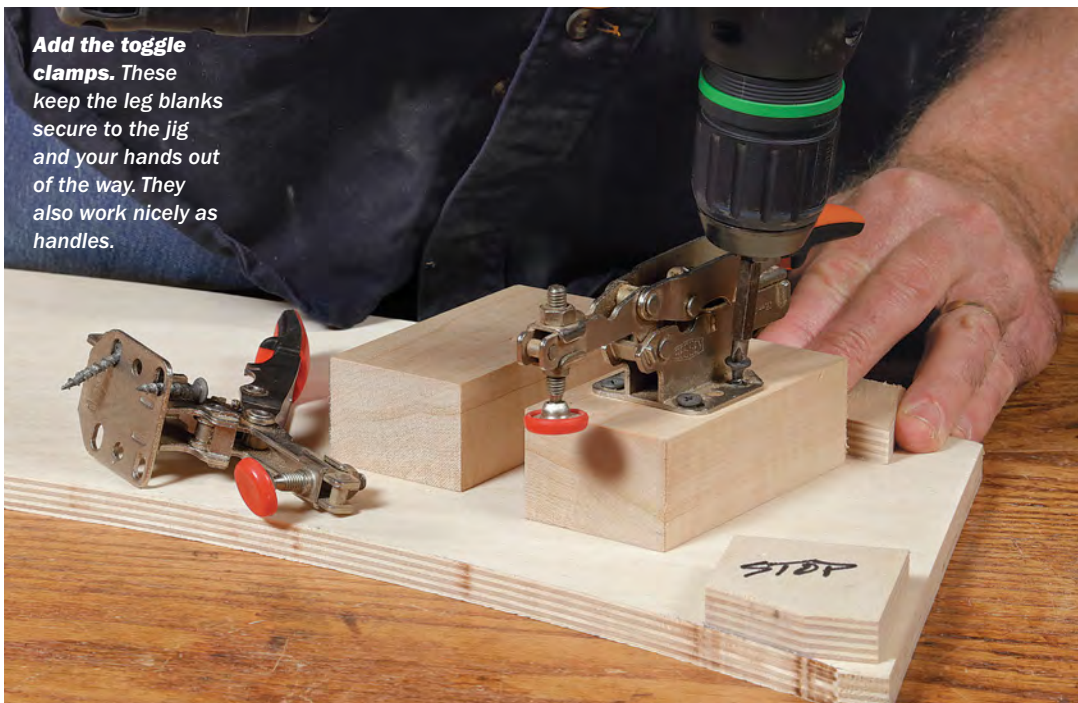




**Shim back riser blocks on the front side.** Use the template to locate the riser blocks, which also help position the leg blanks. McLaughlin flush-trims the legs' front faces first, so he shims these blocks ¼ in. back. If he didn't, there would be no waste to clean up on the rear faces.



**Rear riser blocks flush to template.** Because the back of the leg is his final pass, McLaughlin secures these blocks directly against the template. He glues the blocks in place.



**Add the toggle clamps.** These keep the leg blanks secure to the jig and your hands out of the way. They also work nicely as handles.

## Templates and jig help shape rear legs

To help with shaping, I use the rear leg template to make a two-sided jig for pattern-routing the front and back of the rear legs. Although you can shape the legs by hand, I prefer this method, especially when I'm making a set of chairs. Making the jig takes a little time, but it's worth the investment as it saves time later and greatly increases efficiency and accuracy.

The jig secures the legs with toggle clamps, which also act as handles. It has several stops for locating the legs, making repeatability simple. When roughing out the rear legs at the bandsaw, cut exactly to the





## Rear legs

**Saw out the leg blanks.** Use the bandsaw and stay about  $\frac{1}{16}$  in. off your line. McLaughlin likes to nest the rear legs in the board for the best possible yield and grain match.

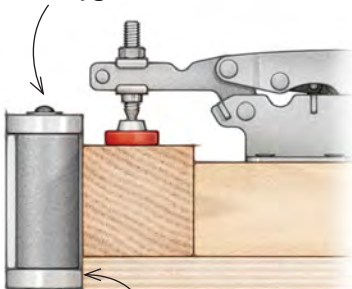
line at the bottom of the legs, since this is your reference surface for the shaping jig. Then place them in the jig and rout them to shape with a flush-trimming bit at the router table.

### Shapes and angles complicate mortising

While it's often best practice to cut mortises while parts are still square, that's not always an option, and this chair is a prime example of that. It would be impossible to cut the mortises in the rear legs before sawing and routing them to shape. The front legs are

### PATTERN-ROUT THE LEGS

Cutter trims workpiece flush to jig's base.



Jig rides on lower bearing.



**Pattern-route the legs.** These are shallow curves, so McLaughlin can rout each face in one motion. The jig registers on the bottom bearing and you'll need a bit with at least  $1\frac{3}{4}$  in. cutting capacity.



**Transfer the joinery to the rear legs.** Having laid out the joinery on the template, McLaughlin uses it to mark the mortises on the leg blanks. After marking one leg, clamp the other leg to it to transfer the marks.





**Curved leg requires curved caul.** To mate the curved surface of the rear leg at the mortiser, McLaughlin makes a shaped caul.

another reason for waiting to mortise. The angled mortises in them for the side rails are easier to cut once the outside faces of the legs have been beveled to the same angle.

Because of the angles and curves, I need to get creative with clamping when I cut the joints at the mortiser. So I rely on shaped cauls.

The support for the front legs is easy. Depending on the mortise, it's just a strip or two ripped to the seat angle. The rear legs, with their long, sweeping curve, need an arched support piece to fill the negative space.

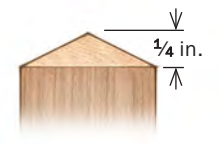
Mortising the rear seat rail and crest rail doesn't require any special cauls because they're still square blanks at this stage.



**Taper the outside faces.** Rough these out at the bandsaw before cleaning them up by hand.

## Tenons, straight and angled

The parts across the back of the chair—crest rail, rear seat rail, and rear stretcher—have straight tenons. A shopmade tenoning jig at the tablesaw helps me tackle the cheeks, where I use thickness spacers to make cutting them more efficient and consistent. To cut the shoulders, I lay the workpieces flat on the saw table, reference off the rip fence, and use my miter gauge equipped with a zero-clearance

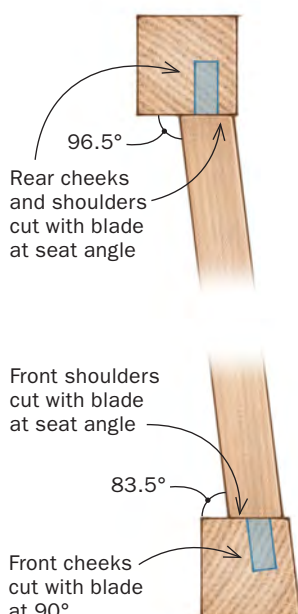


**A diamond on top.** The small details on this chair really stand out, so take your time to make sure these facets are clean and even. Light cuts with a block plane will help you dial in the shape.



## Side rails

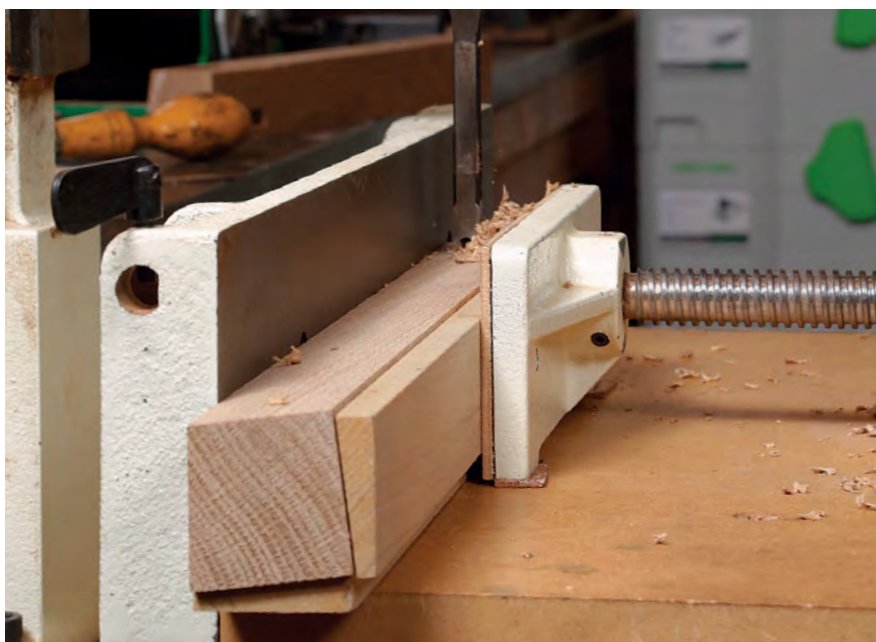
**Get the bevel angle for the front legs.** The front legs' outside faces are beveled to match the seat angle. McLaughlin gets this angle directly from his full-size drawing.



**Rip the front legs to the seat angle.** After tilting the tablesaw blade to the correct angle (above), bevel the legs' outside faces (right). Leave them a little fat, though, so you can remove the sawmarks with a handplane.



**Angled faces mean angled cauls.** Just like when he mortised the rear legs, McLaughlin uses special cauls to keep pressure even and square when mortising the front legs.



backer. The tenons on the front rail are the same size as those on the rear rail, so cut those at the same time.

The side rails and stretchers are where you need to begin thinking about angled joinery. The chair's angles aren't just there for looks; they make the piece more comfortable too. In other words, they're a necessary part of the design. Cutting these angled tenons can be tricky, but once again, the full-size drawing is there to help. The same spacers are just as

handy for cutting the angled tenons to width.

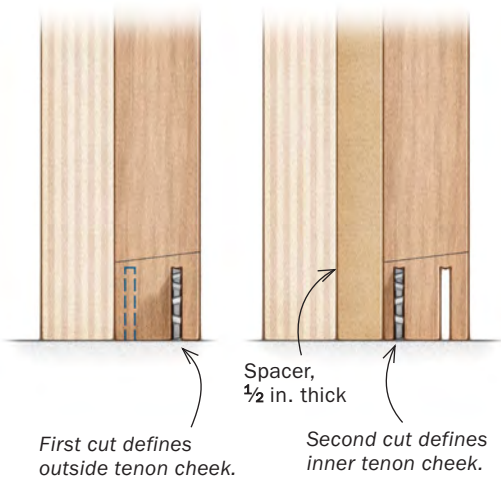
The side rails and stretchers have angled rear tenons. And their front tenons, though straight, have angled shoulders. To get the shoulder-to-shoulder distances, turn to the drawing. Because the tenon shoulders are angled, I cut on both sides of the tablesaw blade. To figure out these angles, simply set a bevel gauge directly off the drawing.

The side stretcher tenons are cut with a similar process to the side rails, but you'll first need to cut the back ends of the stretchers to match the cant of the lower back leg.



## USE A SPACER FOR THE TENONS

McLaughlin uses a thickness spacer for consistent tenons.



**Side rails' front tenon cheeks are straight.** While this joint's shoulders are angled, its cheeks are in line with the rail. So cut these with the blade at 90°, being mindful that you don't cut above the angled shoulder line.



**Rear tenon cheeks are angled.** Tip your blade to the seat angle to cut these cheeks. Keep the stock tight to the table, and use the same spacer. Keep the blade at this angle for the upcoming shoulder cuts.



**Angled shoulders mean cutting on both sides of the blade.** After cutting one angled shoulder on each end of the rail, move the rip fence to the other side of the blade to cut the second. To avoid trapping the offcut, McLaughlin crosscuts away most of the waste at the bandsaw.

The splat consists of three independent pieces. The bottom tenons are angled so the splat matches the reclining angle of the rear legs. The top tenons are straight. Once again, pull the appropriate angle from the full-size drawing.

Finish by cutting all the tenons to width and refining each joint until it comes together with hand pressure.

### Adding detail

To add a little more character and lightness to the chair, I taper the outside faces of the back legs and then cut shallow pyramids on their tops. The crest rail and rear seat rail



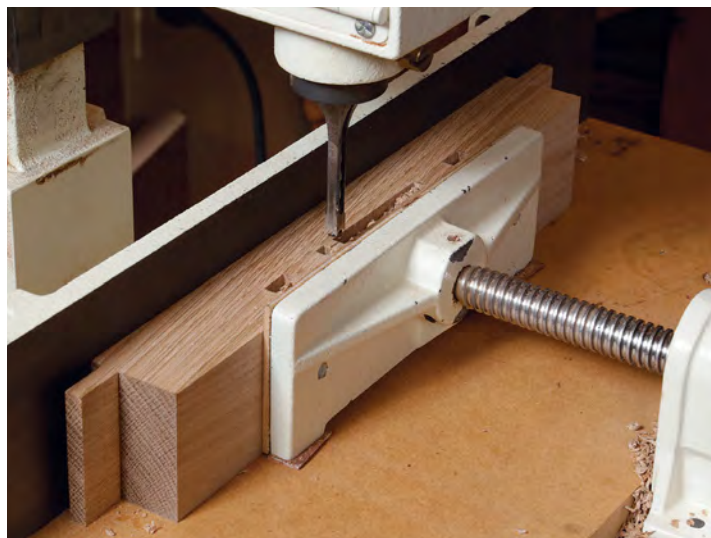
**Angled side stretcher needs wedge for cheeks.** The back end of the side stretcher is angled to match the backward slant of the rear legs. To hold that end flat against the saw table, McLaughlin supports the stretcher with a wedge in his tenon-jointing jig.



# Back rest

## MATCHING JOINERY

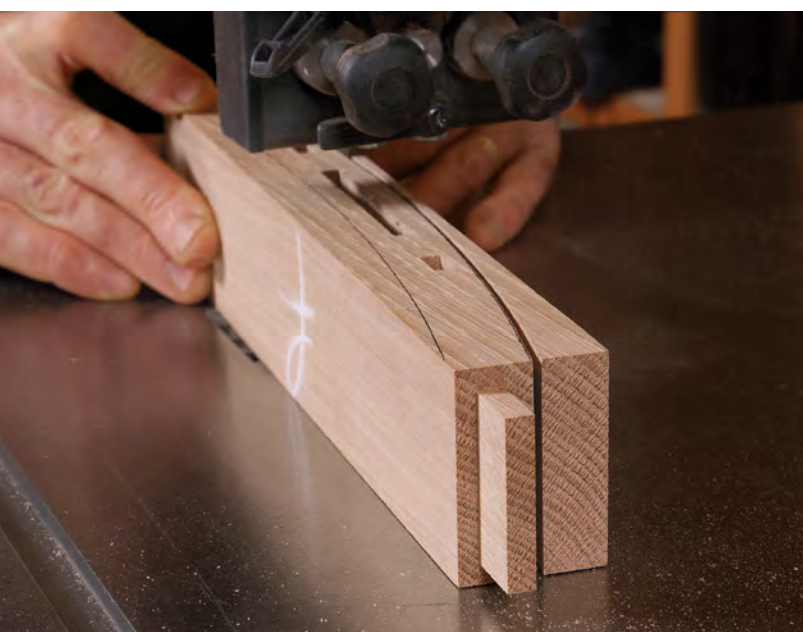
**Straight tenons on the crest rail and rear seat rail.** Cut these joints with the blade at 90°. Use the same spacer that you did for the other rails.



**Mortise the rear rail and crest rail.** It is easiest to cut this joinery while the parts are still square.

## SHAPING

**Profile the rear seat rail.** To visually lighten up the rear seat rail, McLaughlin rips a wide bevel on the front, angle-cuts the top edge, and bandsaws a curve along the bottom (right).



**Crest rail curved for comfort.** Start the inside curves approximately  $\frac{1}{4}$  in. from each shoulder to avoid creating weak short grain there.

also get shaped, with curves and facets that give the chair some of its personality.

The crest rail is curved to better conform with the shape of the human body. I start the front curve approximately  $\frac{1}{4}$  in. from the tenon shoulder to avoid creating short grain there. After laying it out, mark a parallel curved line to define the back of the crest rail. Bandsaw to the lines and clean up with a spokeshave and card scraper.

To give my rear seat rail a little more visual lift and make it less blocky, I bevel and angle cut the top edge and form an arch on the bottom whose curve complements the crest rail's.

## Assembly and glue-up

The chair has a lot of parts, so I recommend gluing up in stages instead of all at once. Begin with the back, move on to the front, and then glue the two together.

Further breaking down the rear glue-up makes the process even easier, more controlled, and less stressful. Start with the back rest—the rear seat rail, splat pieces, and crest rail. Spread a light amount of glue on the tenons and their mating mortises. Apply light clamp pressure, just enough to seat all the tenon shoulders tightly. It's helpful to use angled clamp blocks on the bottom of the rear seat rail, opposite



# Assembly



**Start with the back rest.** Glue the rear seat rail, splat pieces, and crest rail to each other. Because the splat tenons are angled, use angled cauls to direct pressure across the joints.



**Finish up gluing up the back.** Add the rear stretcher and rear legs, clamping firmly and evenly across the joints.



**Glue the front rail to the front legs.** Since the legs' outside faces are beveled, you should again use angled cauls.

and roughly equal to the splat angle, to apply pressure in line with the angled splats and reduce the tendency of the assembly to rack under clamp pressure.

Dry-fit the splat assembly into the back legs until the glue sets up. After the glue dries, glue the back-rest assembly and rear stretcher to the rear legs.

Next comes the front assembly, comprising the front rail and front legs. Again, it's helpful to use angled cauls.

Finally, attach the front to the back by gluing the side rails and side stretchers in place.

For another Craftsman detail, I peg the tenons. I trim the pegs slightly proud, simulating aged, popped pegs, and sand with 220-grit paper until they're softly domed.

Add predrilled seat blocks, one at the center of the rear rail and one on each of the side rails, and a pair of glue blocks to reinforce the front rail joints.

For a fantastic finish option for this chair, see my Finish Line in *FWW* #278, "Arts and Crafts Finish." □

New Hampshire furniture maker Tom McLaughlin teaches woodworking via [epicwoodworking.com](http://epicwoodworking.com).



**All together now.** To connect the front to the back, add the side rails and side stretchers. Once the glue dries, McLaughlin adds the screw blocks for the slip seat and glue blocks where the front legs meet the front rail.

## Online Extra

To learn how to upholster a slip seat, go to [FineWoodworking.com/282](http://FineWoodworking.com/282).