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Arts and Crafts
Side Chair

With templates for
curves and joinery,
you can make a
roomful of chairs

BY KEVIN RODEL

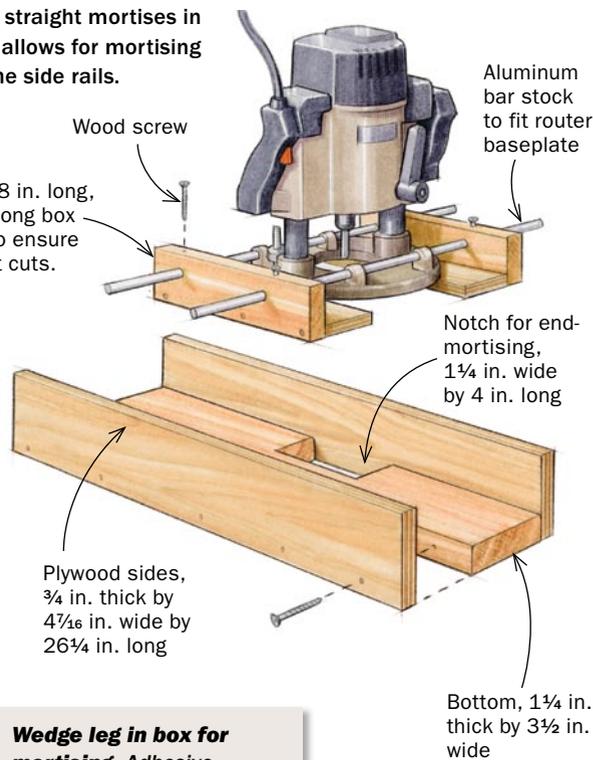
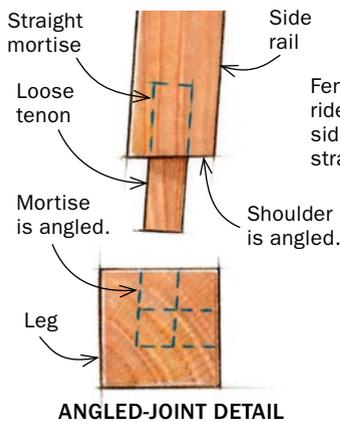


I designed this chair in 1993 for a design competition sponsored by the Maine Arts Commission. My intention was to design a chair that would be sturdy, comfortable, and clearly derivative of Arts and Crafts styling, but still compatible with contemporary interiors. Since then I have made many of these chairs with very little design change, including one set ordered by Disney Films in 1999 for the movie "Bicentennial Man." This version is made of white oak, though I've made the same chair in cherry and walnut.

Because I wanted the chair to function either as a dining chair for long, leisurely meals or as a reading chair for a desk or library table, an upholstered seat was a must. The degree of back slope, depth of seat area, arch or curvature of the back rest, and other critical dimensions also contribute to the comfort. I use jigs to duplicate curved and angled parts, as well as to

Router box simplifies mortising

This jig allows you to cut angled and straight mortises in the legs with a plunge router. It also allows for mortising for the loose tenons in the ends of the side rails.



Wedge leg in box for mortising. Adhesive-backed sandpaper prevents the wedges from slipping.

create accurate angled joinery. These jigs will come in handy if you decide to build a set of chairs.

Shape the back legs using a template

First, trace the back legs on the stock using a full-size template made from 1/4-in.-thick Masonite. Rough-cut the legs to shape using a jigsaw or bandsaw, being careful to leave the line. The only cuts that should be exactly to the line at this point are the top and bottom cross-grain cuts.

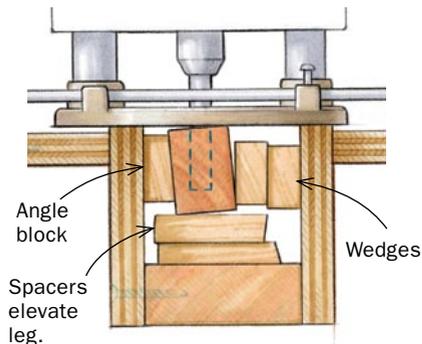
For final shaping, mount the back legs in a template-routing jig (see photos and drawing, p. 51) that works with both legs. Use a large-diameter, bearing-guided straight bit (1/2 in. or more). Amana makes a 1 1/8-in.-dia. by 1 1/2-in.-long bit with a top-mounted ball-bearing guide (part No. 45468) that allows you to shape the leg in one pass.

Once you have both rear legs shaped, cut the front legs to length. Now you're ready to lay out and cut the mortises.

USE AN ANGLE BLOCK FOR SIDE-RAIL MORTISES



Angle block orients the leg at 85.5°. Set the block against one side of the leg before adding the wedges. Then cut the mortise with a plunge router.



USE THE BOX FOR END GRAIN, TOO

The front and back rails meet the legs at 90° and have standard tenons. But the side rails meet the legs at an angle. Instead of cutting angled tenons, mortise for slip tenons.



Start by angling the ends of the rails. Cut the side rails to length at 85.5°, paying careful attention to the orientation of the angle cuts.

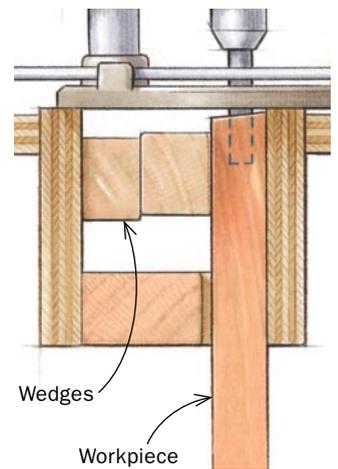
Angled mortises made easy

It is certainly easier to cut right-angled, 90° mortises and tenons. But to conform to the body, the chair must have some angled joinery. I've limited the angled joints to the side rails and the lower side stretchers.

The easiest and most consistent way to cut the angled joint is to bore the mortise in the leg at the required angle. Then you can simply crosscut the ends of the adjoining rails at the same angle, cut a straight mortise into the end grain of the rails, and glue in a slip tenon.



Square up the mortises. Use a chisel and mallet and pare to the line.



Mortise the ends of the rails. These mortises are easily cut by wedging the rail vertically in the router box.

The angled mortises in the front and rear legs can be cut using a plunge router and a router mortising box (see photos and drawings, facing page). You can use the mortising box, a mortiser, or chisels to cut the straight mortises.

Now add the decorative details on the rear legs. Taper the outside faces on the bandsaw and plane to the line. Cut the shallow pyramid heads on both the front and rear legs. Finally, cut the mortises for the square pegs in the crest rail.

Side rails meet the legs at an angle

With the legs complete, begin working on the seat rails—front, back, and side. The rail-and-seat structure takes the brunt of the load, so use care when fitting the tenons.

The front and back rails meet the legs at 90° and have standard tenons. The side rails, which are angled into the front and back legs, are attached with slip tenons.

Cut the side rails to length at 85.5° at the shoulder line (left photo, above). The rail should look like a long, thin parallelogram, not a trapezoid. Next, lay out and cut the mortises on the ends for the slip tenons (see photos and drawing, this page) using the router box. After mortising, fit and glue the loose tenons into the side rails.

Template ensures consistent curves in all of the chair rails

You want the arches in the rails to be consistent, so cut them to shape using templates made of ¼-in. Masonite. You'll need three templates for the seat-rail arches: one



Glue the loose tenons in the side rails. The tenon should fit with a bit of hand pressure. If you have to beat on it with a mallet, the fit is too tight; if it drops out, it is too loose.

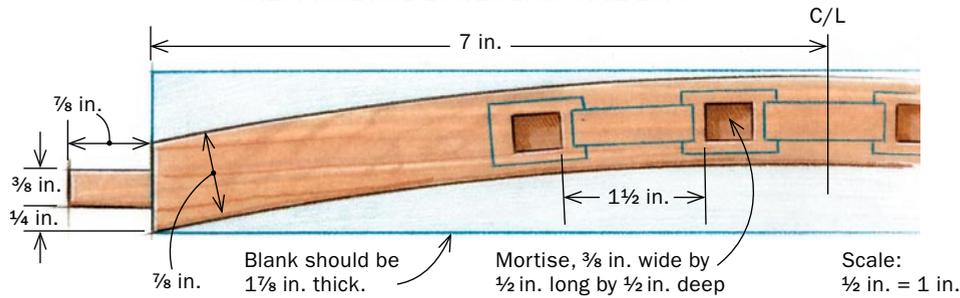


Now rout the side-rail arches. Rough-cut the curve on the bandsaw. For consistency, screw a router template to the tenons, and secure the assembly to the bench for routing.

Make the back-rest assembly

The rails of the back rest are curved on the front and back faces, and the crest rail is arched on its top edge. Both rails are mortised to hold the back splat, a curved assembly of narrow strips.

CREST RAIL AND LOWER BACK RAIL LAYOUT



CUT THE JOINERY BEFORE SHAPING THE UPPER RAILS



Cut the tenons and the inside curve of the rails before mortising. Mark the locations of the back-splat mortises using a template and drill them out on the drill press (left). A curved fence helps support the tall workpiece. Next, following the lines marked from the template, square up the mortises (right).



Arch the top of the crest rail next. Re-use the rear seat rail template to trace the arch along the top of the crest rail, then rough out the shape on the bandsaw.

each for the front, sides, and back. Use the templates to draw the arch on the seat rails, then use a bandsaw to remove most of the waste. Now use a bearing-guided straight bit to template-rout the arches.

The two curved back rails require a few more steps than the seat rails. Mill up extra-thick blanks and cut the offset tenons on the ends. For consistency, it helps to make a template showing both the inside and outside curves of the rail (see drawing, left). Trace the concave curve first, then remove the waste with a bandsaw, and clean up the surface using a spokeshave or sandpaper. If you prefer, you can use the template to make a jig to clean up the surfaces using either a router or shaper. Now use a marking gauge to scribe the 7/8-in. thickness of these rails, referencing off the just-milled front faces.

Before shaping the crest and bottom rails further, lay out and cut the four small mortises for the back splat (see photos, left).

The next operation is to arch the top of the crest rail using the same method and template used to shape the back seat rail (save the cutoff). Finally, cut the convex curves of the crest and bottom rails on the bandsaw, just leaving the line. Clean up these faces with a disk or belt sander.

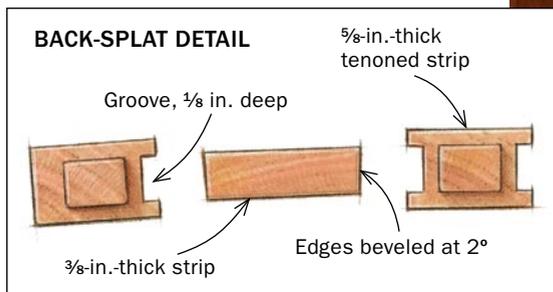
Back splat serves as the focal point

The back splat is a curved assembly of 1-in.-wide strips, with three 1-in.-sq.



Finally, cut the curves on the backs of the top rails. Leave the scribe line, and clean up the surfaces with a belt or disk sander.

MILL AND GLUE UP THE BACK SPLAT



Tenoned strips are grooved on both sides. Cut and fit the 5/8-in.-thick strips into the mortises in the rails, then rout the 3/8-in.-wide groove, 1/8 in. deep, into their edges. The outside strips are grooved only on the inside edge.



Bevel the thin strips. After ripping the 3/8-in.-thick strips to width, joint a 2° bevel on their edges to allow the splat to curve.

openings at the top, that conforms to the shape of the crest rail and the back rail. For this element, you'll need two blanks, 3/8 in. and 5/8 in. thick and wide enough to cut the required number of strips.

Dry-fit the crest rail and the back rail into the legs and measure vertically between them. Add 1 in. to that measurement for the 1/2-in. tenons, and cut the 5/8-in.-thick blank to length. Now cut 3/8-in.-thick tenons on each end, rip the board into four 1-in.-wide strips, and then cut the remaining tenon shoulders on the strips. Next, cut the grooves for the 3/8-in.-thick strips, beginning 1 in. from the top shoulder line, and square up the top edge with a chisel.



Use the crest rail and the bottom rail to guide the glue-up. Apply glue with a syringe to avoid squeeze-out. Do not glue the splat to the rails yet. Once the back splat has dried, go ahead and glue it to the crest and bottom rails, then assemble the rest of the chair back.

Now cut the 3/8-in.-thick blank to the same length as the grooves, rip it into strips, and joint a 2° bevel along each edge of the thin strips. Sand all the parts to P220-grit, and glue up the back splat using the crest rail and bottom rail as glue-up jigs. To avoid squeeze-out, use a glue syringe to apply the glue.

Glue up the front and rear assemblies

While the back-rest assembly is drying, glue up the two front legs and the front

seat rail. Notch the tenon on the front rail to give clearance for the side-rail tenons. Be sure the legs are parallel with no toe-in or splay as you clamp up the assembly. Reinforce the joints with a 3/16-in.-dia. dowel hidden on the inside face.

When the glued-up back splat has cured, remove the crest and back rails, apply glue to the mortises, and glue these parts together. To help with the clamp-up, use the arch cutoff as a caul.

Allow this assembly to dry, then glue it and the back seat rail to the rear legs. Again, reinforce the rear seat tenons on the inside with a 3/16-in.-dia. dowel. While you are at it, install the 3/16-in. pegs in the tops of the rear legs through the 1/4-in.-sq. peg

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Watch Rodel mill and assemble the back-splat elements for this chair.

Fit the lower stretchers

The lower stretchers help stabilize the chair against racking forces. The side stretchers attach to the legs with slip tenons, and the cross stretchers connect to the side stretchers via half-lapped dovetails.



Cut the rear shoulders first. The rear shoulders of the stretchers are angled 85.5° horizontally. In addition, they must be angled vertically to match the leg taper. Start by dry-clamping the chair, and set a bevel gauge to the vertical angle (left). To cut the rear shoulder on the tablesaw (right), tilt the blade to 85.5° , then use the bevel gauge to set the angle of the miter gauge.



Creep up on the fit. Reset the miter gauge to 90° , leaving the blade tilted to 85.5° , and cut the front shoulders. Leave each stretcher a little long and take light cuts until the ends align with the mortise locations.



Install the cross stretchers after glue-up. Cut the half-lapped dovetails on the cross stretchers, then scribe them onto the side stretchers.



Screw in the corner blocks. The blocks help reinforce the corner joints and serve as anchors for the seat frame.

holes to reinforce the crest rail mortise-and-tenon joint.

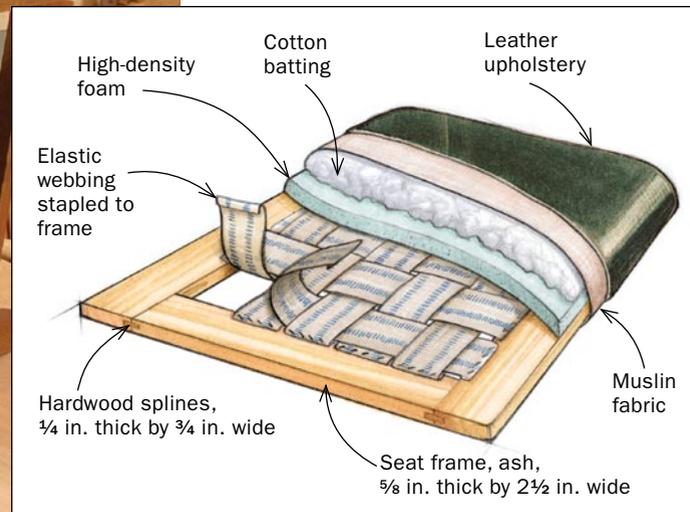
Install the lower stretcher assembly

The lower stretcher assembly not only helps stabilize the lower part of the chair against racking forces, but the exposed dovetail joints also add a decorative twist. The side stretchers connect to the legs with slip tenons, and the cross stretchers are attached to the side stretchers with half-lapped dovetails.

With the chair dry-fitted and clamped together on a flat surface, measure and cut the lower stretchers to width and thickness. The side stretchers meet the legs at compound angles with slip-tenon joinery. The mortises are already cut. To cut the compound angle on the ends of the stretchers, set a bevel square to the angle formed where the inside face of the rear leg and

SLIP SEAT COMPLETES THE CHAIR

The chair has a leather-upholstered seat, installed after the chair has been fumed and finished. The frame is screwed to the corner blocks between the rails.



the flat surface meet. Set the tablesaw's miter gauge to that angle, set the blade to 85.5° (double-check that angle with another bevel gauge), and cut the compound angle on the rear end of one stretcher. To cut the opposite stretcher, reset the miter gauge past 90° to the same angle in the other direction. Now cut the forward ends of the stretchers at 90°—with the miter gauge at 90° and the blade still at 85.5°—sneaking up on the length until they just fit.

Next, cut a 3/8-in.-wide mortise, centered in the end grain of each stretcher and about 3/4 in. deep. Dry-fit the slip tenons. When the fit is perfect, glue up the chair.

While this glue is setting, you can mill up the two cross stretchers. Once the stock is milled to width and thickness, locate where each cross stretcher will meet the side stretchers. Cut each one to length, leaving them about 1/8 in. extralong on both ends.

Hold a cross stretcher in place, and locate the shoulder cut by scribing a line on the underside where it meets the side stretcher. Cut a half-lapped dovetail on each end of each cross stretcher. Set the cross stretchers in place, then scribe and cut out the

dovetail slots in the side stretchers using a handsaw and chisels. Once the dovetail sockets have been cleaned out, glue the cross stretchers in place.

After the glue has set, sand all the stretchers flush on their upper faces, and go over the chair thoroughly for any residual glue squeeze-out and touch-up sanding. Finally, make up the corner blocks and screw them to the inside corners, flush with the upper edges of the front and rear seat rails. Add an additional screw hole up through the body of the corner blocks before attaching them. This will be used to attach the upholstered slip seat to the chair.

The very last item before finishing is installing the pyramid-shaped decorative pegs in the crest rail. I use ebony, but any hardwood species will work.

This white-oak chair is fumed (for more on fuming, see my article in *FWW* #126, pp. 46-49) with a topcoat of Tried & True linseed oil. The seat is upholstered in leather purchased from Dualoy Inc. (www.dualoy.com). □

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