



Floating-Tenon Joinery

BY LON SCHLEINING



Mortise-and-tenon joints are the building blocks of furniture making. Once you have a simple and reliable system for making them, joinery on tables, chairs and case goods is straightforward, fast and consistent, even when there are compound angles.

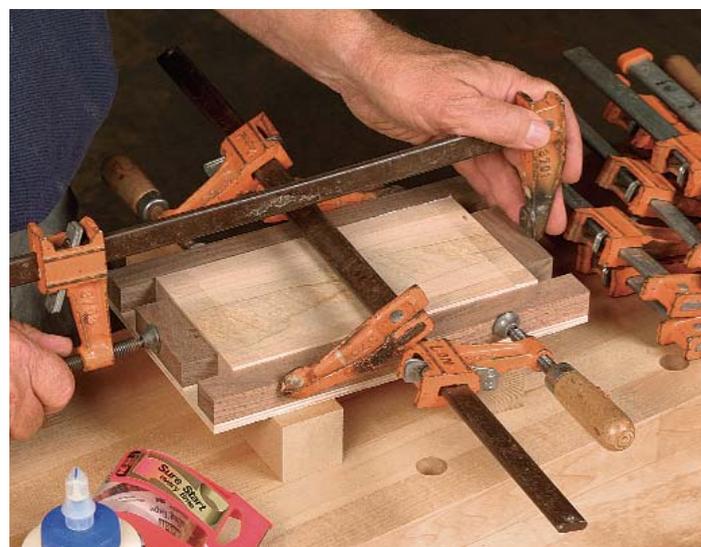
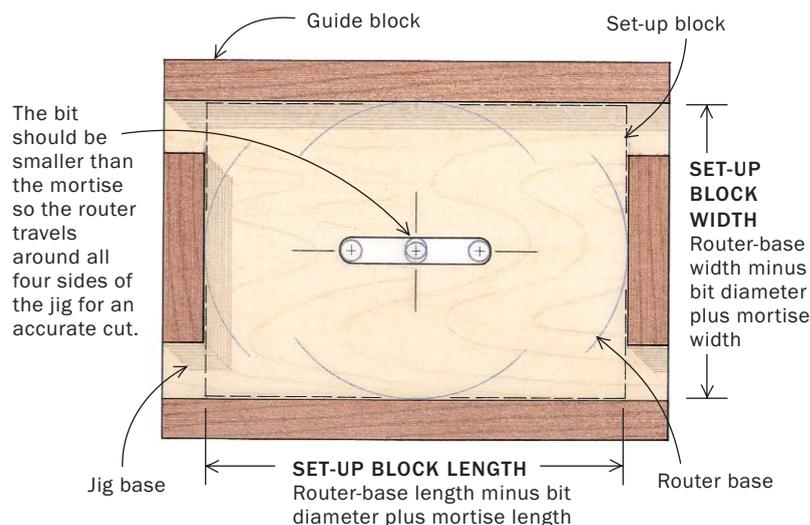
The distance between the shoulders is critical in the case of something like a table apron or a chair stretcher. One day I had cut a big pile of pieces to length, only to discover that I'd made one teensy mistake: I had forgotten to allow for the extra tenon length on both ends of the pieces. That's when I began to rethink my resistance to using floating tenons. With floating tenons, you simply cut the piece to exact length, and it's done. The shoulders fit perfectly, eliminating one of the most frustrating parts of mortise-and-tenon joinery.

Simple jig works with a plunge router to make quick, strong joints

Set-up blocks are the key to making an accurate jig

1 ATTACH THE GUIDE BLOCKS

This mortising jig relies on guide blocks to limit the travel of the router. Make a set-up block, which represents the overall travel of the router base, for gluing the guide blocks to the jig base squarely and accurately.



The guide blocks are glued to the base of the jig. Clamp the guide blocks both to the set-up block (center) and to the top face of the jig. Thin packing tape on the set-up block makes it easier to remove after glue-up.

Watch it on the web

To see the author demonstrate this jig, go to www.finewoodworking.com.

In a joint-strength test last year (*FWW* #148, pp. 74-79), floating tenons compared favorably to traditional mortise-and-tenon joints, putting to rest common doubts about their performance.

A floating tenon is a separate piece inserted into matching mortises in two mating pieces. Similar to biscuit joinery, you cut a mortise into each of the pieces to be joined—leg and apron, rail and stile. Then you mill tenon stock to fit the mortises, cut it to length and assemble the joint.

Make a router jig for this joinery

There are many ways to cut mortises, but this router jig is my favorite for floating-tenon joinery. It will create precise, matching mortises in both the sides and ends of workpieces, and it's easy to make using birch plywood, screws, glue and a few hardwood blocks.

The jig shown here will cut a mortise 1 in. from the clamping fence, meaning the mortise will be centered in 2-in.-thick stock. This large capacity adapts well to a variety of projects and joints. If your workpieces are thinner, for example, or you'd



like a reveal with a thinner member centered on a leg, post or stile, or even if you want an angled mortise, the jig is easily adapted with a few shims.

You can change the starting dimensions of this jig to suit the mortise you cut most often, or you can build several variations, as I have, each with a specific purpose.

Build it accurately or suffer later

This jig is designed to last—turning out lots of accurate joints. So take your time.

The first step in the assembly is to glue four blocks to the base of the jig. These blocks guide the router base. Note: Even round-based routers tend to be off center slightly, so it's important to keep the router facing in a single direction when you use the jig.

The easiest way to keep the guide blocks square and parallel during glue-up is to cut a set-up block the size of the area inside the guide blocks. Clamp the guide blocks to the set-up block before clamping and gluing them to the plywood base.

Once the glue cures, remove the set-up block and use a router and $\frac{3}{8}$ -in. bit to plunge-cut the mortise slot into the base. Next, draw the centerlines on both the top and bottom of the base. These lines must be drawn carefully because they'll be the reference lines for every cut you make.

Attaching the clamping fence is the other important part of the assembly. If the fence is misaligned or out of parallel even slightly, the mortise-and-tenon joint won't come together as it should.

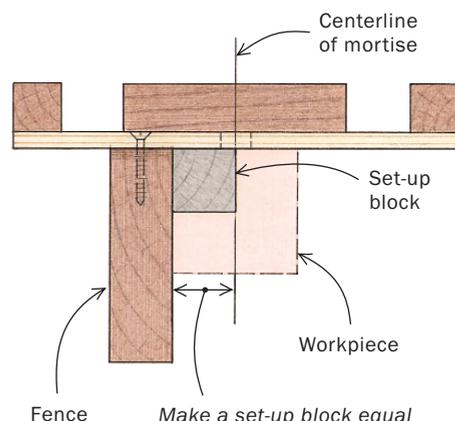
To lock in the distance between the fence and the mortise's centerline, make another

2 ATTACH THE FENCE TO THE BOTTOM

A fence on the underside of the base locates the workpiece. Use another set-up block to locate the fence accurately.



First, rout the mortise slot in the base. The blue tape on the handle and the jig records the correct orientation of the router.



Make a set-up block equal to the distance between the edge of the workpiece and the center of the mortise. Use the block to attach the fence (right).



Carefully mark the centerline of the mortise and clamp the set-up block in place. Clamp the fence to both the block and the jig when gluing it down. Add screws from above the jig base.

USING THE JIG

Schleining sized this jig to handle the thickest workpiece—a 2-in.-thick table leg—that he commonly mortises. To mortise the thinner rail, add a shim to the jig (see bottom of page).



1 Lay out the workpieces carefully. Mark the outer reference faces of each piece, and transfer the centerline of the desired mortise from one piece to the other.



2 Align the centerline with center marks on the jig. Then clamp the workpiece in place. The mark on the end grain (right) signifies the mortised sides of this table leg.



3 Rout in a few passes for a clean mortise. Clamp the jig's fence sideways in a vise to secure the setup. The bit is smaller than the mortise, so move the router clockwise around the jig for an accurate cut.



set-up block (1 in. thick for this jig). Clamp the block to the base, aligning its edge with the mortise slot's center, then clamp the fence to the block and the base and drill the pilot and clearance holes for the screws. Use 1½-in.-long screws, countersinking them so that they sit flush in the base.

Remove the fence temporarily and spread on some glue. Then clamp up everything again and tighten the screws.

Cut matching mortises

As always for mortise-and-tenon joinery, start by marking the reference faces of your workpieces—for example, the front side of stiles and the corresponding faces of rails. Whether the mortises are in a table, a chair or a frame, corresponding faces should go against the clamping fence of the jig to make sure they line up correctly later.

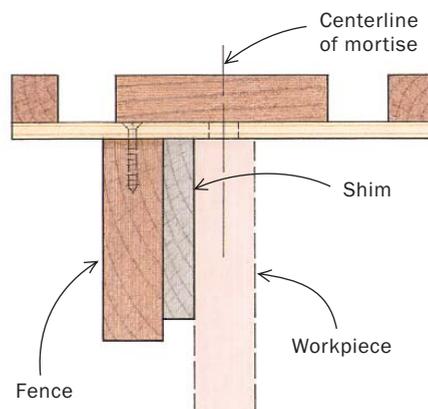
To lay out the mortises themselves, all you need to do is mark their centerlines.

Rout in several passes—It's a good idea to cut the 1-in.-deep mortises in at least two or three passes. It puts too much strain on the bit and the machine to cut it all at once. If your router has a stepped depth adjustment, now's the time to use it.

Because this jig guides the base of the router, accumulated chips and dust can change the path of the bit. If your router doesn't have dust collection built in, cut the mortise, vacuum out the jig and the mortise, then take a final pass.

Use a straight bit with a ½-in. shank, designed for plunge cutting, with a cutting

ADD A SHIM FOR THINNER STOCK



Thinner workpieces are no problem. This shim is sized to center the mortise in the rails, creating a ½-in. reveal between rail and leg.

diameter slightly smaller than the desired mortise. By making a pass around all four sides of the jig, you can better control the width of the mortise. Otherwise, the guide blocks would have to fit the router base exactly with absolutely no slop, a notion I find unrealistic.

One caution: The mortise routed into the end grain may come out at a slightly different width than the one made in the face grain. If you find a difference, add a layer or two of masking tape to the jig's guide blocks to cut one or the other.

Make tenon stock to fit

It's straightforward to mill tenon stock once you've established the size of the mortises. First, use the same material that the mortised workpieces are made of, with the grain running the same direction as it does in the rail. This will help at least one side of the floating-tenon joint expand and contract similarly. Cut the tenon board long enough to cut all of the tenons with plenty left over to trim planer snipe from the ends.

Rip the tenon board $\frac{1}{16}$ in. smaller than the length of the mortise. This does three important things: It allows a little leeway for aligning the rails and stiles during glue-up, gives excess glue a way to escape and allows for the uneven expansion and contraction of the tenon and the mortise in the leg or stile.

Using a planer, reduce the board to the thickness of the mortise. When you get close, test-fit the corner of the tenon board in the mortise, then crank down the planer a little at a time until you get a snug fit. Beware of the snipe that most planers leave on the ends of boards. Chop off this area before each test fitting.

Next, using a $\frac{3}{16}$ -in. roundover bit, round each edge of the tenon stock. This radius will match the one left by the $\frac{3}{8}$ -in.-dia. router bit used to cut the mortises. The tenon should fit into the mortises snugly—without having to be forced in and without falling out when held upside down. Last, cut the tenons to length, about $\frac{1}{8}$ in. shy of the combined depths of the mortises: for example, $1\frac{7}{8}$ in. long for two 1-in.-deep mortises. Test the fit, then glue up the joint. That's all there is to it.

Jig can be adapted to many mortises

If your workpieces are narrower than the ones this jig is set up for—maybe you're joining $\frac{3}{4}$ -in.-thick rails and stiles—simply

MILLING TENONS



Plane the tenon stock to thickness. Test often for fit, then round the edges with a roundover bit on the router table.

As always, dry-fit before glue-up. The tenons should fit snugly but not require excessive force to fit.



add a shim between the workpiece and the clamping fence (see the bottom photo and drawing on the facing page).

Another frequent adaptation you'll make is to change the mortise length. Let's say the rail on a chair is 2 in. tall; obviously, the $2\frac{3}{4}$ -in.-tall mortise would be too large. But adding blocks to the guides at each end of the jig shorten the mortise. You should adjust both ends equally, because the jig uses centerlines to position the workpiece.

If the mortise is too short for your project—let's say a table with a tall apron or a breadboard end—you can slide the jig along the workpiece to cut two or more mortises in a row. This jig even makes angled joints easier (see the photos below).

Once you get the hang of it, this is the sort of jig you'll use all the time. □

Lon Schleining, a contributing editor, teaches about woodworking throughout the country.



Cut the rail at the desired angle where it meets the post. When using the router jig to cut the mortise in the rail, just add an angled shim. Add an identical shim on the other side of the fence to keep the clamping force square. The post is mortised without angled shims.

Angled joinery made easy

