



Powerful new joint

HOUSED DOUBLE TENONS ARE STRONG AND SIMPLE TO MAKE

BY BRIAN BOGGS

When I began building outdoor chairs 10 years ago, I searched for a strong, weather-tight joint. The traditional mortise-and-tenon works well for interior pieces, but outdoors, moisture can wick into the end grain of the tenon shoulders, undermining the joint. I designed this U-joint, with its only shoulder hidden between twin tenons and set below the surface of the mortise, to solve the moisture issue. But I soon realized that the joint delivered a bundle of other benefits. With four wide tenon cheeks instead of the standard two, it had far greater glue surface, and so greater strength. The joint also made for a stronger rail, since there were no exterior shoulders to reduce the width and thickness of the rail at either end. And it was very well adapted to joining rails to shaped legs, since there were no external shoulders that had to



BETTER JOINT FOR CHAIRS

Boggs developed the U-joint (a double tenon without shoulders) as a weather-tight connection for use on outdoor furniture like his settee (left). But because of its strength and the way it simplifies joining curved and shaped parts, he favors it for many indoor chairs as well (right).



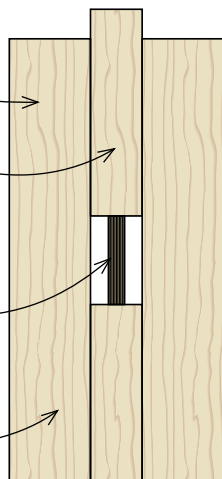
Router template for mortises

Flatten template with a handplane after glue-up.

Center strips cut to desired width of guide slot

Spacer determines length of guide slot.

Baltic-birch plywood, 3/4 in. thick



An accurate, durable guide slot. Boggs makes the template by ripping a piece of plywood and reassembling it. He coats the edges of the guide slot with cyanoacrylate glue and sands them.



TWO WAYS TO LOCATE THE TEMPLATE

Screwed to the workpiece. The mortising template can be affixed to the workpiece with screws driven into a waste area. Boggs uses centerlines on the template and the workpiece to locate the mortise.

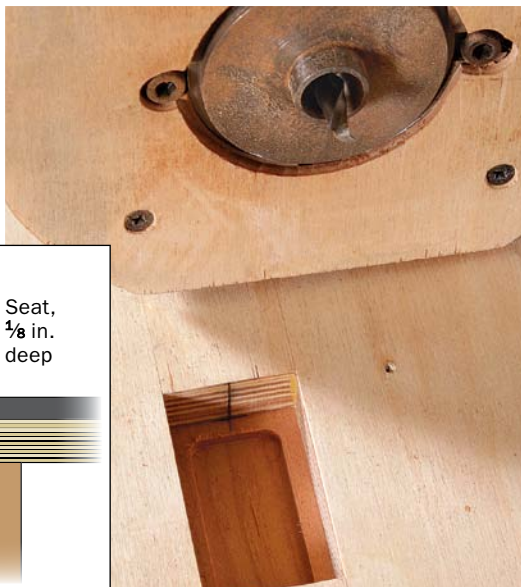


Clamped with a fence. When there are multiple mortises to cut, or when it's not practical to screw the template to the workpiece, you can attach a fence to the template and clamp it to the workpiece.

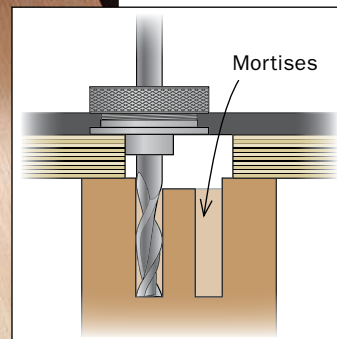
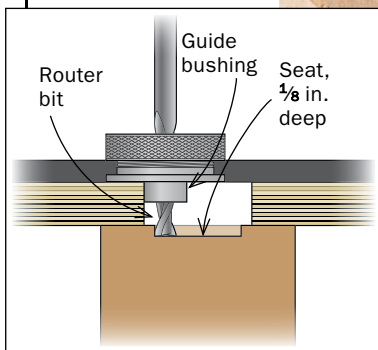
ROUT THE MORTISE IN TWO STEPS

Make a seat.

With the bit set to cut 1/8 in. into the workpiece, rout the whole area of the mortise. This first cut creates the seat for the tenon shoulder.

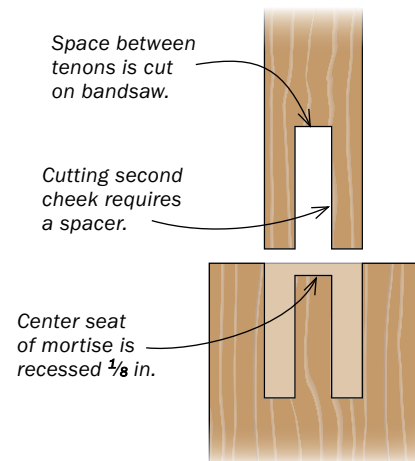


Then go deep. Set the bit deeper for the twin mortises. Run the guide bushing along one side of the slot, then the other, making the cuts in several passes.



Twin tenons

A precisely milled spacer is the key to cutting the two tenons perfectly. The thickness of the spacer must equal the gap between the tenons minus one bandsaw kerf.



Measure a kerf. To find the width of the bandsaw kerf, use a micrometer to measure a scrap before and after it's been sawn down the middle.

be coped to fit. And while the shoulders of traditional tenons can pull away when they shrink in dry weather, reducing the joint's rack-resistance, the U-joint's shoulder remains locked between two tenons. The joint succeeded so well that I also use it on indoor chairs and tables.

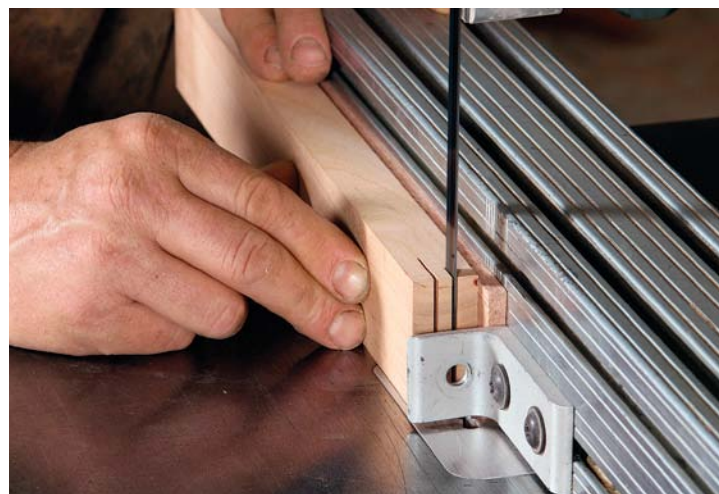
Routing twin mortises

Using a plunge router with a guide bushing and a simple plywood template, cutting the double mortise is not difficult. The U-joint mortise has three sections—the twin deep mortises and the seat between them that receives the tenon's shoulder—but the cuts for all three are guided by the single slot in the template.

Switch on the router—With the leg blank still square, I start the mortise by milling the entire area within the guide slot to about $\frac{1}{8}$ in. deep. This creates the



First cheek. Cut the cheek of the far tenon with the workpiece riding against the bandsaw fence. A stop controls the depth of cut.



Second cheek. With the bandsaw fence in the same position, insert the spacer and cut the cheek of the near tenon.

Stop and slide. After removing most of the waste with angled cuts, Boggs slides the workpiece back and forth against the stop to create a smooth shoulder between the tenons.



seat for the shoulder between the tenons. I want the seat deep enough that it won't be exposed when I shape the leg.

Then I reset the plunge depth and cut the twin mortises. One side of the slot guides the router bushing for the first mortise, then I slide the router to the other side and change the feed direction for the second. Cut to full depth in a series of passes, and use compressed air to clear the mortises periodically.

Tenons on the bandsaw

I cut the tenons at the bandsaw, making two stopped cuts for the cheeks, a series of angled cuts to remove the waste, and

a scraping, side-to-side cut to establish the shoulder. Because I will shave the outsides of the tenon to a very slight angle to aid assembly, the rail should be a hair thicker (maybe 0.010 in.) than the overall width of the U-joint mortise.

I reference both cheek cuts off one face of the workpiece and use a stop block to limit the depth of the cut. First, I set the fence to cut the cheek of the far tenon. For the cheek of the near tenon, I leave the fence at the same setting and insert a spacer between the fence and the workpiece. The spacer must be very precise. Its thickness should equal the space between the tenons minus one bandsaw kerf. To determine the width of your bandsaw kerf, first mill a scrap about $\frac{1}{2}$ in. thick and measure its exact thickness with a micrometer. Then resaw the scrap, stack the halves back together, and check their combined thickness with the micrometer. The difference in the measurements is the width of your kerf.

Keep good pressure against the fence and feed slowly and steadily for an accurate, smooth glue surface on both cheeks. I use a $\frac{1}{2}$ -in., 4-tpi, skip-tooth blade, which gives the smoothest cut of all the non-carbide blades I've used.

Fitting the joint

I taper the tenons just a couple of thousandths of an inch so they enter the mortise easily and pinch the opening tightly closed when assembled. A few block plane strokes on each side tapers the tenons to an easy fit. Alternately, you could do the tapering with sandpaper. Adhere a sheet of 120-grit paper to a piece of MDF and take a few strokes against it. To generate the slight taper, tape a card scraper to the workpiece 10 in. or so from the end to be sanded.

For tenons $\frac{3}{8}$ in. and thinner, the corners can be chamfered with a chisel. Press the joint together and let the mortises squeeze the tenon corners round. Larger tenons will need more rounding. You can use a combination of routing and chiseling, or use heavy sandpaper with a shoe-shine stroke to create rounded corners. □

Brian Boggs makes chairs in Asheville, N.C.

FITTING THE U-JOINT



Tiny taper. A few fine shavings with a block plane create a subtle taper on the ever-so-slightly oversize rail. The taper makes insertion easier and ensures a seamless glue line.



Round the tenons. Sandpaper used with a shoeshine stroke makes quick work of knocking the corners off the tenons so they fit the rounded corners of the routed mortises.



Expando-sander. If he needs to widen the gap a trifle, Boggs makes a special sander with a strip of foam sandwiched between two strips of wood. He makes it a tight fit between the tenons so the foam will exert outward pressure as he sands.



Fit, then shape. After dry-fitting the joint, Boggs will disassemble it and shape the parts before final glue-up.