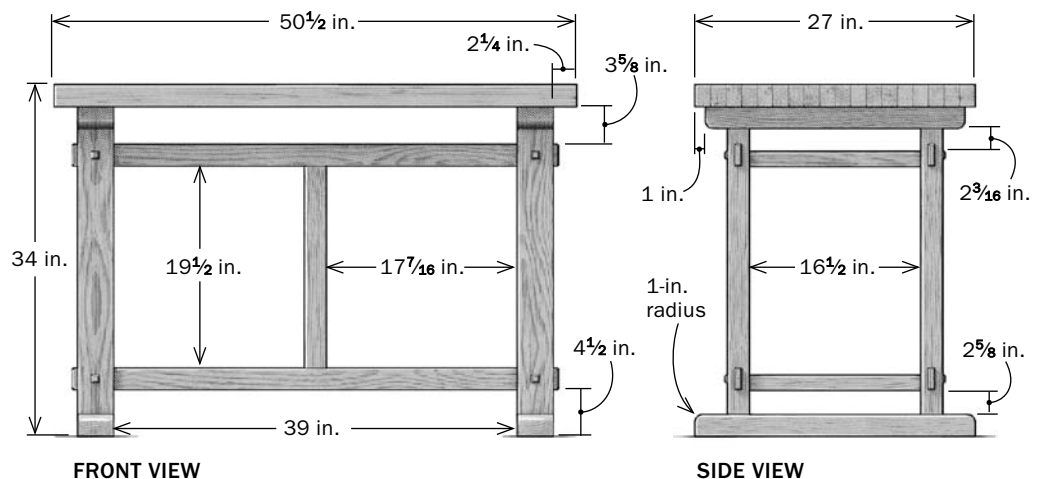




A Small, Sturdy Workbench

Compact design gets its strength and rigidity from clever interlocking joinery

BY MATT KENNEY



When we received this workbench proposal from Eric Tan, it was quickly accepted by the staff. Tan, who specializes in Ming dynasty furniture, incorporated interlocking joinery—a signature detail of that era—into the bench, creating a strong, rigid construction without the need for glue or hardware. The unique design is brilliant, a no-brainer for a shop project.

But there was a problem: For the vast majority of articles, one of our editors travels to the author's shop to take photographs. Tan lives in Taiwan, and I did my best—on several occasions—to convince my editor to send me there to photograph him making the bench. Alas, due to expense and time constraints, my arguments did not prevail. So, instead of flying to Taiwan, I drove a few miles down the road to the shop of Kelly Dunton, who agreed to help us show readers how to make the bench.

Aside from working in imperial rather than metric units of measurement, Dunton made the bench exactly as Tan designed it. There is more to this bench than its ingenious self-locking joinery. When assembled, it's rigid and heavy, making it well-suited for handwork like planing, sawing, and chopping mortises. It's also compact, making it perfect for anyone with limited shop space.

JOINERY, NOT GLUE, HOLDS THIS BENCH TOGETHER

Interlocking joints borrowed from Ming dynasty furniture eliminate the need for glue. We chose ash—heavy and strong—for this bench.

Top, 2⅝ in. thick by 27 in. wide by 50½ in. long

Side rail, 1½ in. thick by 2⅝ in. wide by 21¼ in. long

Trestle top, 2⅝ in. thick by 3½ in. wide by 25 in. long

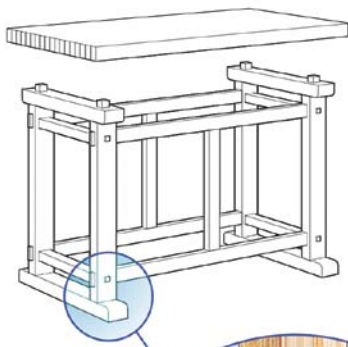
Tenon, ½ in. thick by 2⅝ in. wide by 1 in. long

Middle post, 1⅝ in. thick by 2⅝ in. wide by 21½ in. long

Post, 2⅝ in. thick by 3½ in. wide by 32¼ in. long

Front rail, 1⅝ in. thick by 2⅝ in. wide by 47 in. long

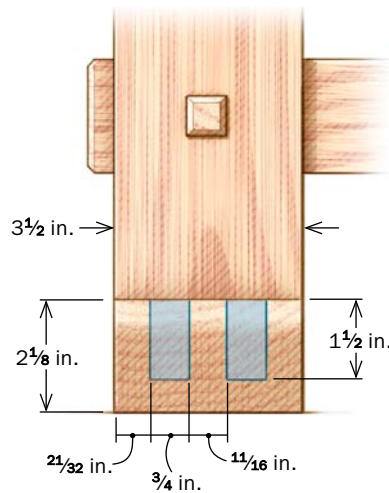
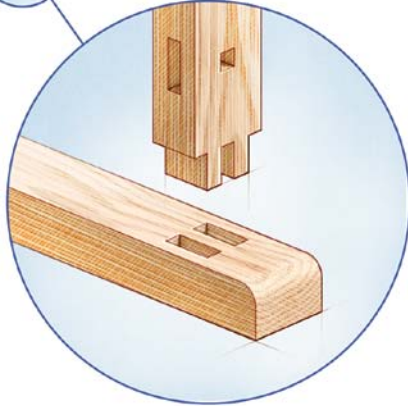
Trestle foot, 2⅝ in. thick by 3½ in. wide by 27 in. long



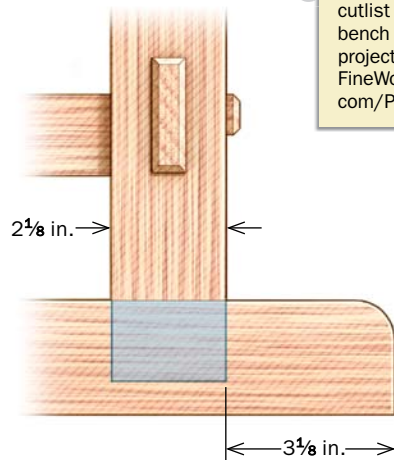
Post and foot are double-jointed

Two tenons are stronger and resist racking better than a single tenon. Fortunately, cutting a double mortise-and-tenon isn't much harder than cutting a single one.

To purchase expanded plans and a complete cutlist for this bench and other projects, go to FineWoodworking.com/PlanStore.



FRONT VIEW



SIDE VIEW



Double setup. For the foot's double mortise, set the fence to cut the outside wall. Spin the foot, and do the same for the second mortise. Repeat the process for the inside wall (above).

A dizzying bunch of mortises

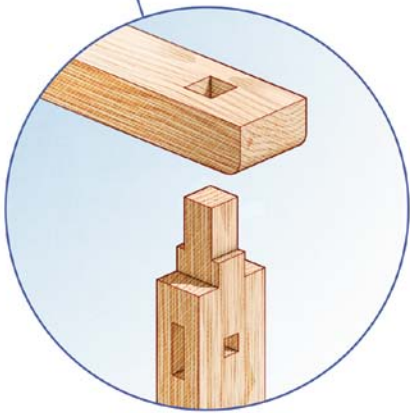
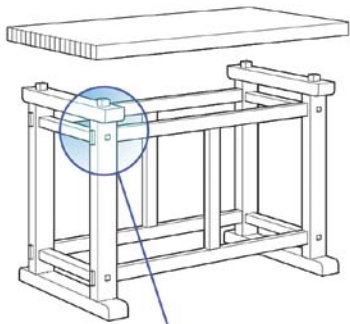
All the joinery was done with a hollow-chisel mortiser and tablesaw. This bench has 28 mortises, ranging from dead-simple to fairly complex, combining a stopped mortise with a smaller through-mortise. Fortunately, none of them are difficult to cut.

After milling the parts to their final dimensions, go to work on the mortises, starting with the most straightforward: those that connect the middle post to the front and back rails. Dunton cut them in two passes with a ¼-in. bit. Set the mortiser's fence to cut the inside wall first, then flip the stretcher around and cut the second wall without moving the fence.



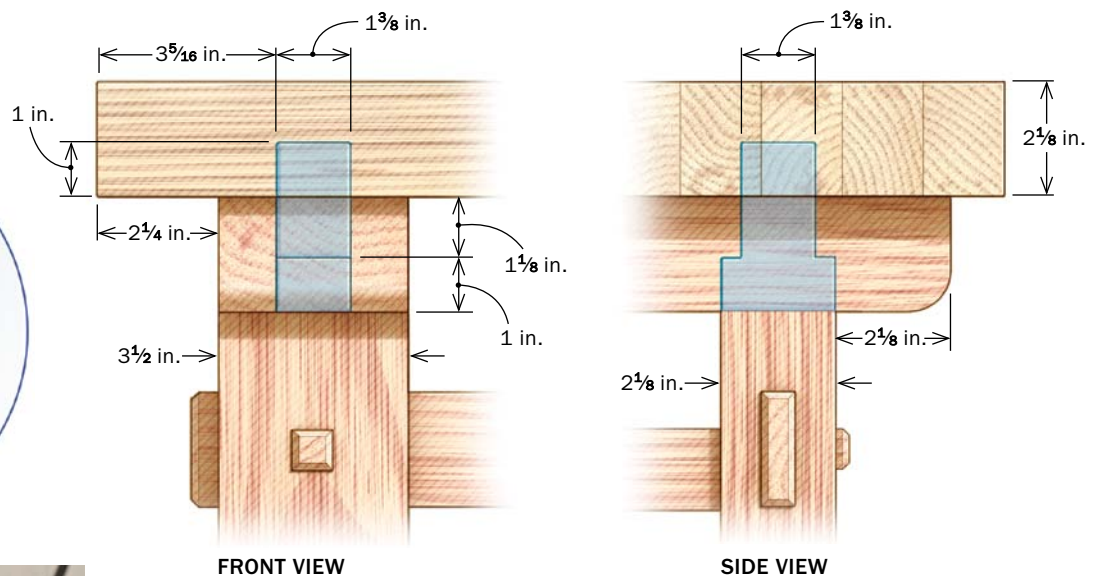
One blade for the cheeks and shoulders. Use a blade that cuts a flat-bottom kerf. For perfectly centered tenons, cut one outside cheek, rotate the post, and cut the other. Adjust the fence and cut both inside cheeks (left). Then shift the fence to nibble away the waste between them. Replace the tenoning jig with a miter gauge and cut the shoulders. A stop block ensures they are aligned (below).





Stepped tenon does twice the work

The tenon on the top of the post extends through the trestle top and into the benchtop. The lower part acts as a shoulder for the upper tenon, creating a stronger joint.



Two mortises in one. First cut the smaller through-mortise from the other side. Then cut the larger, stepped one on the underside.

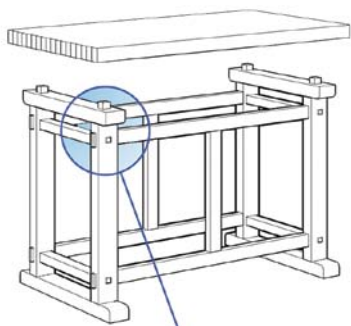
The posts are attached to the trestle feet with double tenons. Dunton used a $\frac{3}{8}$ -in. bit for these (and all of the remaining mortises). Set the fence for the outside walls of the mortises. Cut the first pair, then flip the foot around to cut the outside wall for the second pair of mortises. Adjust the fence for the inside wall and repeat the process.

The joint that connects the posts to the trestle tops is a bit more complex. The mortise in the trestle top has a large, rectangular stopped section and a smaller, square through section. Begin with the through-mortise, cutting in from the top to just over $1\frac{1}{8}$ in. deep. Flip the trestle top over to cut the rectangular section and



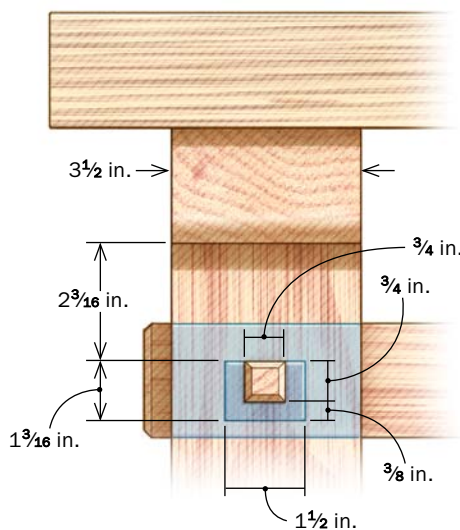
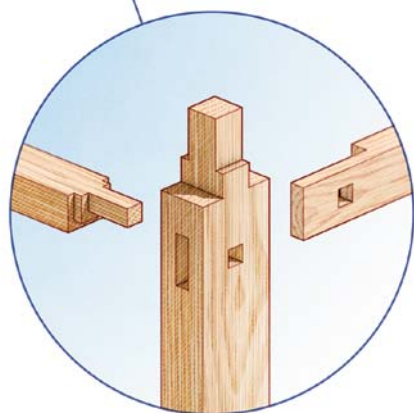
Cut the mating tenon with a dado set. With the blades set to cut the tenon's small shoulders, remove waste from the front and back of the post (left). Then raise the dado set and cut the long, thin tenon (below).



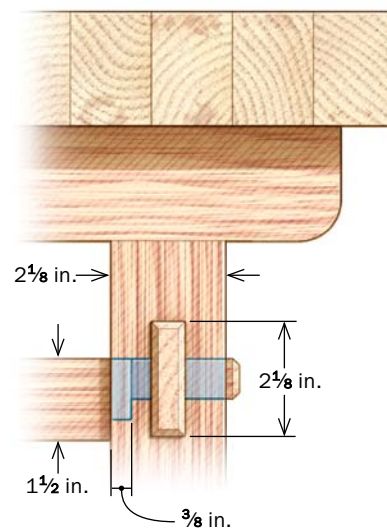


Rails lock together

The tenons on the side rails pass through the tenon on the front rails, tying the posts to the rails.



FRONT VIEW



SIDE VIEW



Start with the side rail mortise. Cut the through-mortise from the outside face first, then cut the larger, stopped mortise on the inside.



Then cut one for the front rail. Turn the post on edge and cut halfway through. Flip the post and complete the mortise from the other edge.



Side rail tenon is less complicated than it looks. Start with the large, lower section, cutting the sides and bottom of the rail to create the three shoulders (left). Raise the blade and cut the thin top half (right).



connect it to the square portion. Each post has two pairs of intersecting mortises that connect the front and side rails. Cut the stepped mortise for the side rail first. It consists of a larger stopped mortise and a small through-mortise. Again, start with the through-mortise, cutting in from the outside face. Then flip the post and cut the stopped mortise from the inside face. Next cut the through-mortises for the front and back rails. Because of the post's thickness, you'll need to come in from one face and then flip the post and complete the mortise from the other side.

The last four mortises are in the underside of the top, but you can't cut them until you've cut the post tenons and assembled the base. All of the tenons are cut at the tablesaw. Start with the simple tenons in the posts and front and back rails, using a dado set and miter gauge. Cut the tenons in the side rails and the top of the posts. Cut the biggest part of the tenon first, then raise the dado blade and cut the smaller part.

To cut the double tenon at the bottom of the post, use a blade that cuts a flat-bottom kerf, like a rip blade. Using a tenoning jig, cut the two outside cheeks: Cut one of them, flip the post in the jig, and then cut the second. A second setup gets you both inside cheeks, using the same cut, flip, cut process. Nibble out the waste between the inside cheeks by adjusting the jig between cuts so that you work across the waste.

After all of the tenons have been cut, it's time to mortise the tenons in the front and back rails to accommodate the tenon on the side rail. This creates an interlocking joint. Fit one front or back rail tenon at a time. When it's snug in its mortise, lay the post and rail down, so that the mortise for the side rail is facing up. Use a Forstner bit to drill through the tenon where it intersects the mortise. Square up the corners with a chisel. Pull out the rail and move on to the next tenon. After all of the tenons have been mortised, clean up all of the parts, getting them ready for a finish. After this, you can assemble the base.

A glue-up with no glue

As you put the base together, each new joint assembly locks the previous joint together, so there is only one way to assemble it. Begin by assembling the middle post and the top and bottom front rails. Next, connect the posts to the front rails. The middle post is now locked in place.

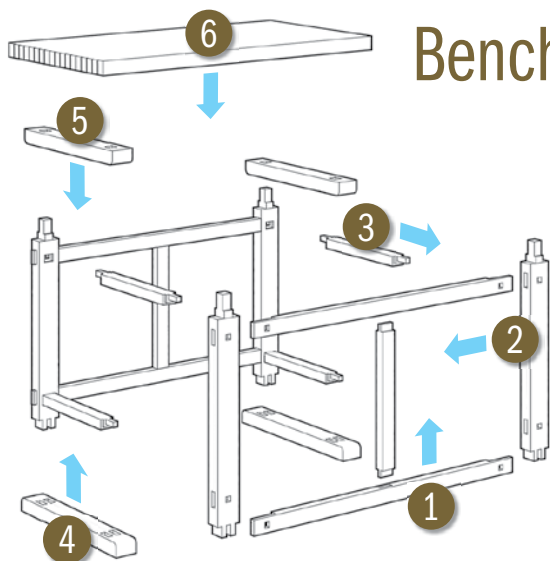
DRY-FIT FOR THE FINAL MORTISE

Fit the side rail.

Because the tenon is shaped like a half-lap, make adjustments by planing the side of the tenon with no shoulder.



Drill a mortise through the tenon. Use a Forstner bit to remove the waste (left), and then square up the corners with a chisel (right).



Bench assemblies without glue and clamps

ORDER OF ASSEMBLY IS IMPORTANT

The interlocking joinery requires a specific order of assembly. Once you settle the top onto the base, all of the joints will lock tight.



Start with the middle post. It fits between the front rails and adds rigidity to the base. Once you put the posts in place, the front rails are locked to the middle post.



Slide in the side rails. The tenon runs through the front rail and the post, which prevents the post from coming loose from the front rail.



Lower the back onto the side rails. Rest the back assembly on the ends of the tenons and then adjust each tenon until all four are in their mortises. Then the back should slide down (left). The trestle top and foot are next (above). They lock the posts in place, and now the base is a rigid, single unit.

Online Extra

To see how the interlocking joinery allows this bench to break down for transport, go to FineWoodworking.com/258.

Repeat this process to assemble the back of the base.

Next, lay down the front assembly and install the four side rails. The tenons on the side rails pass through the tenons on the front rails, locking the posts to the front rails. Lower the back assembly onto the side rails. Now, turn the base upright and lower it onto the feet. Drop the trestle tops into place to complete the base.

Next up is the top. Start with wide boards, ripping them into narrow strips. Flip the

strips on edge and glue them together to create the top. This creates a strong top from rift- and quartersawn boards.

Now it's time to mortise the top for the legs. You'll use a template, router, and straight bits for this. Turn the top upside down and put the base on it. The template is made up of three pieces of MDF that are set around the tenon and then clamped in place. Remove the base and you have a perfectly sized template for the mortise. With a spiral bit in your router, remove

most of the waste from the mortise, taking care not to rout into the template. Now use a flush-trimming bit to clean up the mortise, following the template. Finally, square up the corners, using the template as a chisel guide. Repeat this process for the other three tenons.

After the mortises are done, turn the base upright and put the top on it. You now have a rigid bench ready for work. □

Matt Kenney is the special projects editor.



Make a mortising template around the tenons. Working one mortise at a time, Dunton used three pieces of MDF, one of them with a notched corner, to build the router template in place, guaranteeing that the mortise would be located accurately.

MORTISE THE TOP



Rout the waste. Dunton first used a plunging spiral bit freehand to remove most of the waste, then came back with a pattern bit to flush the sides to the template (top). When squaring the corners (above), the template serves as a guide for the chisel.

A vise is optional

A cast-iron vise is a good, proven choice. You'll need to add an apron to the front edge of the top and a spacer block.

