

## A stronger miter

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There are many good ways to join two pieces of wood—mortise-and-tenon joints, bridle joints, lap joints, dovetails—and they all have a place in a woodworker's repertoire. Aside from their structural suitability to the job at hand, each visible joint imparts a particular character to a piece of furniture.

Aesthetically, sometimes the miter joint is the best choice. For example, when you have two pieces of wood coming together at a right angle, the simple

miter joint is as close as you can come to not having a visible joint at all. So if you are working, say, in a clean, contemporary style, you will find the mitered look indispensable. The miter joint also is commonly associated with Scandinavian, Japanese, and Chinese furniture.

### Why add a tenon to a miter?

Construction-wise, the miter is one of the weakest joints because there is no mechanical interlock of members to add strength, and because the glue joint is basically end grain to end grain. Also, it often is difficult to clamp the assembly perfectly in position and keep it there while the glue sets up.

The tenoned miter joint solves these problems. Adding a mortise-and-tenon to the joint—visible or not—increases strength and causes the parts to lock in perfect position while being glued.

If you want to make Japanese- or Chinese-style furniture, you will be called upon to cut a tenoned miter. If you will be working in a modern style, you can use a variation where the tenon is not visible in the finished joint.

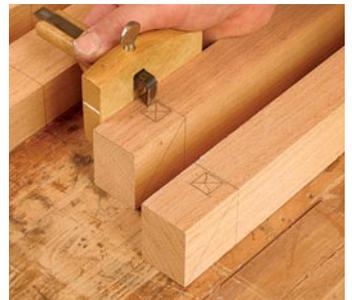
The tenoned miter joint can be made by hand or by machine. I usually find that the most efficient and accurate method is a hybrid of the two: I cut as much of the joinery as possible on

### STEP ONE

## Precise layout is essential



**Lay out the miters.** Draw the 45° miter and then scribe a baseline around the workpiece.

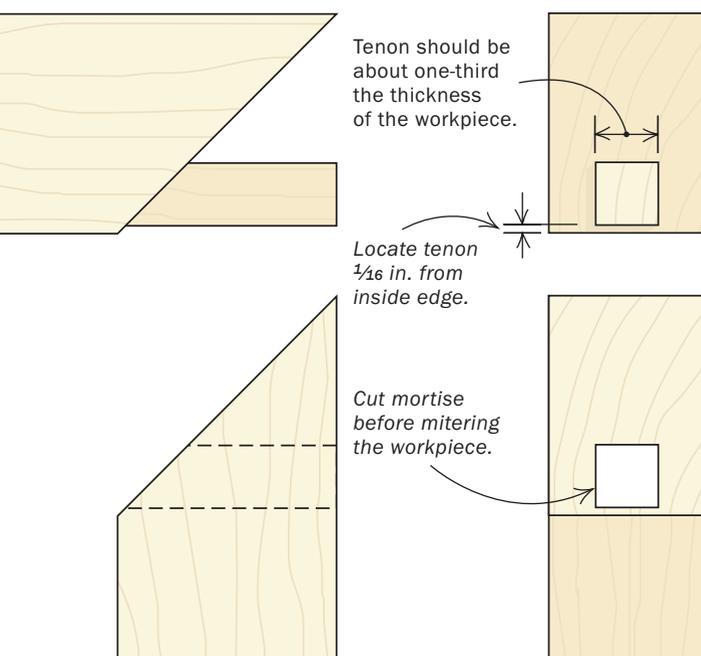


**Lay out the mortises on both sides of the workpiece.** Locate the mortise  $\frac{1}{16}$  in. up from the inside edge of the joint.



**Lay out the tenons.** Locate them so they will align precisely with the mortises. Also, lay out all sides of the sawcuts that will form the cheeks of the tenon.

### GEOMETRY OF A TENONED MITER



## STEP TWO Cut the mortises in two steps



**Cut most of the mortise from the inside out.** Do not drill and chop all the way through the workpiece; stop  $\frac{1}{4}$  in. short of the outside. Then finish the outer portion by hand. Drill through from the other side with a slightly undersize bit and square the outside of the mortise with a chisel (right).

the tablesaw and finish up with precise handwork.

### Accurate layout is critical

To make a tenoned miter, first mill the stock squarely and cut the pieces to their exact lengths. Then mark all of the parts precisely. I use a machinist's square, a miter (45°) square, and a sharp pencil, starting with the miters and including each face of the mortises and tenons. Because of the miters, you can't transfer the mortise location to the tenoned piece accurately, so the finished joint depends on accurate layout beforehand.

The mortises and tenons should be neither too big nor too small. A good rule of thumb is about one-third of the total thickness of the parts. Locate the mortises and tenons as close to the inside of the frame as possible, about  $\frac{1}{16}$  in. This places the tenon as far as possible from the outer corner of the joint for strength, while leaving a small shoulder at the inside of the joint for tidiness.

### The mortised pieces are easy

Before cutting the miters, I use a hollow-chisel mortiser to cut the

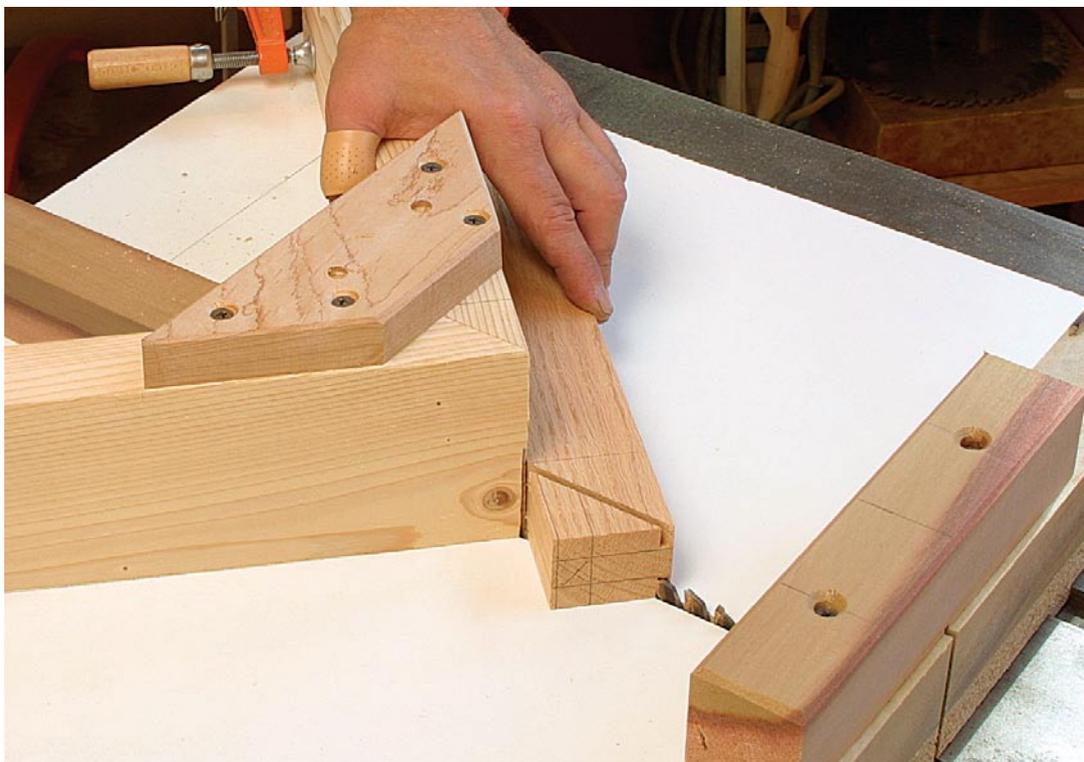


mortises, working from the inside face of the pieces. If it's a through-mortise in fine work, the outside of the joint (the visible part) should be precise, so set the depth stop on the mortiser to  $\frac{1}{4}$  in. short of the outer face, drill through the leftover stock carefully afterward with a slightly smaller drill, and then square up the remaining part

**Miter the mortised pieces.** To cut clean miters, build a miter sled for the tablesaw. Make the two-sided fence exactly square and center it on the sled. Make these cuts carefully, or the mortise won't line up with the tenon. Keep your hands clear of the blade's path.

## STEP THREE

## Tenons require some handwork



**The tenoned pieces are mitered in stages.** First, use the tablesaw sled to miter the side shoulders. Set the blade height to just reach the layout lines on each side of the tenon.

of the mortise carefully by hand. For a blind tenon, simply set the depth stop where you need it.

To cut the miters on the mortised pieces, use a miter sled on the tablesaw (see the photo above).

### **The tenoned pieces take more work**

Because the miter cuts stop at the tenon, the pieces must be flipped over to cut each shoulder from opposite sides, and the miter sled must be accurate on both sides of the blade. In other words, the 90° fence on the sled must be perfectly square, and the blade must bisect it exactly, so each side of the fence measures 45°.

Use the layout lines on the pieces to set the blade height. After using the tablesaw to cut the side shoulders, return to handwork to complete the tenoned pieces.

With the workpieces clamped upright in the bench vise, saw down the two

outside cheeks of the tenon with a fine Japanese saw or backsaw, cutting right to the line. Next, with the waste on either side of the tenon gone, you must redraw the other two cheeks of the tenon before sawing them. The last sawcut removes the outside part of the mitered shoulder. For this cut, stay a little shy of the tablesawn shoulders, leaving a tiny piece to pare away with a sharp chisel. Then carefully trim away the waste on the inside face of the tenon, too, defining the little bit of miter there.

### **Assembly should be a breeze**

In theory, you should have a perfect-fitting, strong joint, ready to clamp and glue up. Dry-fit the joint first. The miter should come together cleanly as the tenon fills the mortise. Be careful not to break out the end of the mortise as you push the tenon through. Trim the tenon, if necessary. □



**Cut the tenon cheeks first.** Use a handsaw, cutting right to the layout lines.



**Lay out and saw the last two sides of the tenon.** Then saw a little shy of the mitered face to remove the waste.



**Finish the mitered faces with a chisel.** Pare away the small step left behind from sawing.

