Add a Shelf to a Table

Four attractive ways to handle wood movement in a solid-wood shelf

BY PETER TURNER

I've made many tables over the years, and I often incorporate a wood shelf in the design. The shelf adds an extra layer of storage and more functionality, and it can be incorporated neatly into a night table, a hall table, or a coffee table.

Like a tabletop, a wood shelf moves with changes in humidity. And if you do not allow for that cross-grain movement in both the top and the shelf, the racking force of any expansion, when exerted on the legs, has the potential to cause the leg-to-apron joint to fail, or to damage the leg itself.

Because tabletops typically sit above the aprons and legs, movement can be controlled through the use of buttons or slotted screw holes (see "Attaching Tabletops," *FWW* #163). These methods hold the top fast to the aprons while allowing it to expand and contract freely. But the shelf is a challenge because you must accommodate the wood movement within a fixed space—between the legs.

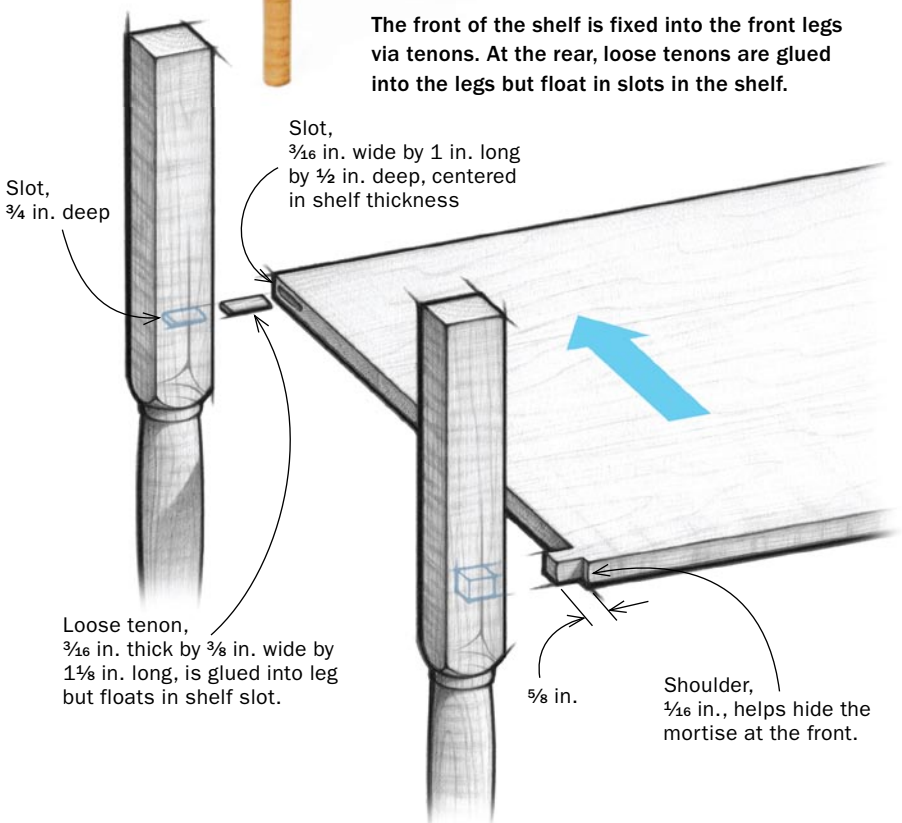
I've made shelves that connect with the legs via tenons and shelves that rest on brackets. Another option, which I have seen in other furniture makers' work, is to screw the shelf to a table's stretchers; so I consulted two other makers for variations on that method. All of these solutions give the shelf freedom to move.

Peter Turner is a furniture maker in South Portland, Maine.

Solid-wood slab is tenoned into legs

MOVEMENT DIRECTED TOWARD THE REAR

The front of the shelf is fixed into the front legs via tenons. At the rear, loose tenons are glued into the legs but float in slots in the shelf.



A solid slab is the simplest form of table shelf, and it can be incorporated easily into most designs. When I use a solid-wood shelf, I orient it so the grain runs side to side and the movement is front to back. I attach it to the front legs with fixed tenons, and at the back, I use a loose tenon that floats in an elongated slot in the shelf.

The joinery is pretty easy to cut (see photos, facing page). On the shelf stock, mark out the front tenons and the shelf width. Next, make the inside shoulder cuts on the tablesaw. Clamp the shelf vertically in a crosscut sled, and use a stop block so you can make identical cuts on both sides of the shelf.

Cut away most of the waste behind the front tenons on the bandsaw, roughly defining the shelf width and reducing the waste for the stopped tablesaw cut that follows. For the tablesaw cut, you'll need a well-made crosscut sled. Clamp a stop block in place to align the cuts and ensure consistency on both sides of the shelf. Raising the blade higher than normal will allow you to get closer to the tenon shoulder, reducing the cleanup in the corner later. Be sure to watch closely so you don't cut into the tenon. Clean up the inside corner using chisels.

Next, use a handsaw to define the front shoulder of the tenon and then pare to the line with the grain to complete the tenon. While you're at it, lightly chamfer the tips of the tenons, which makes it easier to engage the tenon and mortise during assembly.

Now place the shelf on the legs to mark its top and bottom locations. As well, trace the tenon locations on the front legs.

For the front mortises, I drill out most of the waste and pare to the line with chisels. To cut the slots in the rear legs and shelf, I use a Multi-Router. If you don't have a slot mortiser, use a router and a mortising jig to cut the slots.

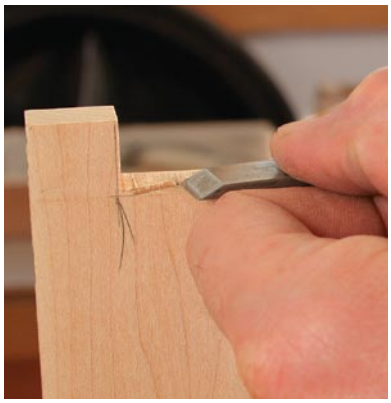
When gluing up a table with this type of shelf, glue up the side aprons first. Then glue in the shelf at the same time you glue in the front and rear aprons.

A caution here: In thin shelves, there's not much meat above and below the slot. This method would be best used in designs that limit the weight and abuse the shelf must withstand. I do this by keeping the shelf close to the apron, maybe 4 in. to 5 in. away, and by keeping the shelf (and table) fairly small, say around 16 in. deep in ½-in.-thick material.

Photos, except where noted: Thomas McKenna; this page: Dennis Griggs; drawings: Christopher Mills

1 FIXED TENONS IN FRONT

Trim the shelf to form the tenons. *Rough out this long notch on the bandsaw. Then clean it up with a stopped cut using a crosscut sled on the tablesaw. Raise the blade high to reduce the amount of waste left near the tenon.*



Clean up the corner. *The stopped cut will leave a chunk of material on the inside corner, but it's easily pared away with careful chisel work.*

Cut the front shoulder. *After defining a 1/16-in. shoulder with a handsaw, pare to the line using a chisel.*

Lay out the mortises. *Mark the top edge of the shelf on all four legs. Place the shelf on a front and rear leg and mark the bottom of the shelf on the rear leg. Then mark the mortise for the tenon on the front leg.*

Cut the mortises for the front tenons. *Drill out most of the waste, then pare to the line with a chisel. Check the fit often.*

2 LOOSE TENONS IN BACK

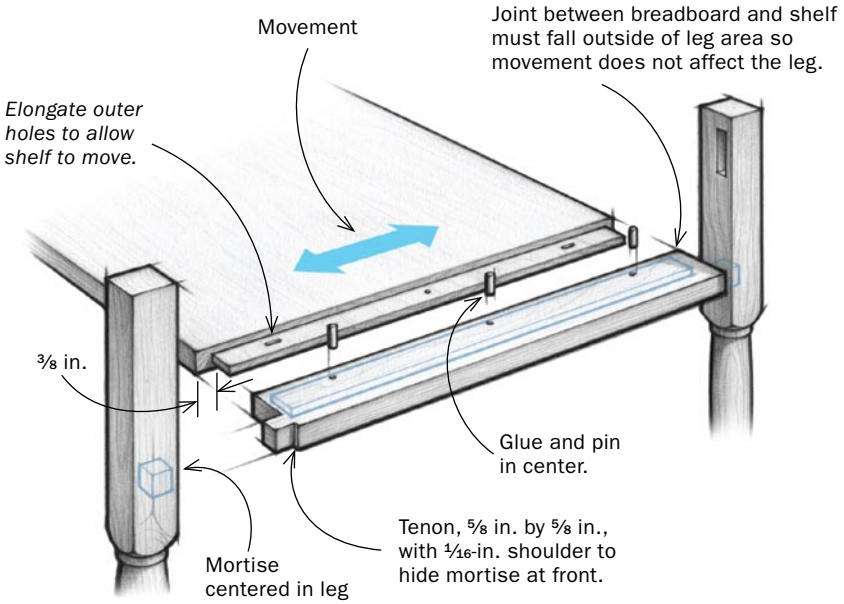
Cut the slots. *Turner cuts the narrow slots in both the shelf and legs using a slot mortiser. You could do the same job with a router mortising jig.*

A perfect fit. *The loose tenon is glued into the leg but not the shelf.*

Breadboards keep shelf flat and control its movement

BREADBOARDS FILL TWO NEEDS

This design not only allows the shelf to expand and contract, but it also helps keep the shelf flat. Breadboards are recommended for larger tables, where movement may be more severe.



Breadboard ends are often used on tabletops to keep them flat and stable as the humidity level changes, and the design offers a straightforward method of attaching the shelf to the legs. A breadboard shelf looks best with a breadboard top.

The breadboards are cut 1¼ in. longer than the shelf width to allow for ⅝-in. tenons on both ends. Cut the ¼-in.-thick shelf tenon and the corresponding stopped grooves in the breadboards. Once you have a good fit, start working on the breadboard tenons.

Mark out the tenons on the ends of the breadboard and then cut the inside shoulder on the tablesaw. Next, cut to the shoulders, removing most of the waste on the bandsaw and finishing up on the tablesaw (see photos, below). Clean up the inside corner with a chisel, then carefully pare to the line on the front to finish up the shoulder there (see top right photos, p. 57).

To lay out the mortises on the legs, dry-assemble the shelf and breadboards and the front and rear leg-to-apron assemblies. Stand the shelf in place to mark the mortise locations on the legs. Drill out most of the mortise waste using a Forstner bit, and fine-tune the fit with chisels. This is painstaking work, but that's the fun part. If you prefer, you can create shoulders on all sides of the tenons, which will help to hide any gaps.

1 MAKE THE BREADBOARDS

Cut the groove for the shelf tenon. *The ¼-in.-wide by ½-in.-deep groove should stop 1¼ in. shy of the end at this point.*

Define the tenon on the tablesaw. *Cut the inside shoulders with the board held vertically (left) and then on edge (above), using a stop block to ensure consistency. Before making the second cut, remove most of the waste on the bandsaw so the offcut doesn't get jammed between the blade and the stop block.*

Photos (bottom left and right): Michael Pekovich; top left: Peter Macomber; facing page (bottom): Dennis Griggs

2 LAY OUT MORTISES CAREFULLY

Dry-assemble to lay out the mortises. *Mark the bottom of the shelf on the legs and clamp a long straightedge along those lines. Next, while holding the shelf vertically—registered against the straightedge—transfer the tenon locations to the legs.*

The right glue-up sequence. *You must assemble the long leg-to-apron joints first, install the side aprons and the shelf, then install the other legs and apron.*

Frame and panel: breadboard's cousin

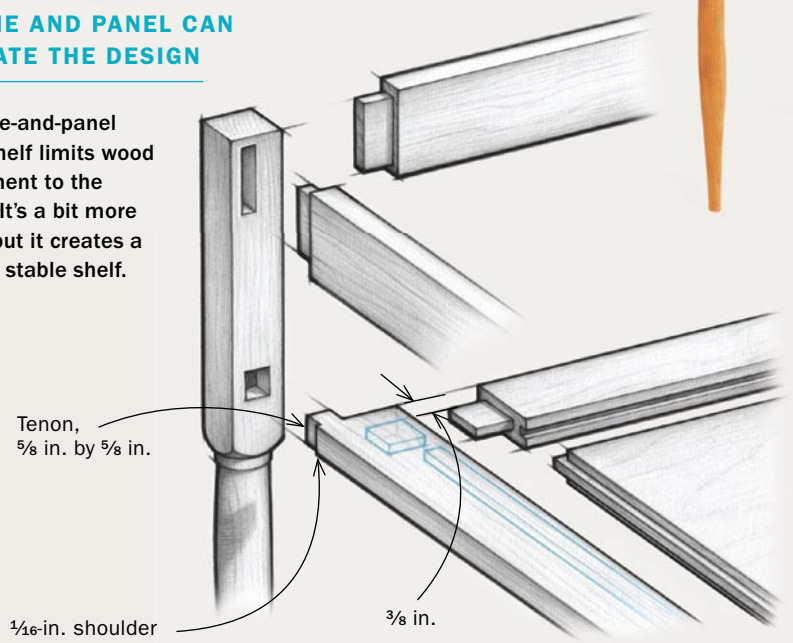
Another way to build a shelf is to use a frame-and-panel design. The frame accommodates the movement of the panel, and the construction makes for a sturdy shelf.

The panel is flush, top and bottom, within its frame. Like the breadboards, the short end stiles have integral tenons on their ends that are housed in mortises in each leg. Again, leave a 1/16-in. outer shoulder on the tenons to hide the mortise at the front of the legs. Although I haven't done it, you could use stub tenons to join the frame, instead of full-length tenons. The panel groove would serve as the mortise, so this method will save some time.

Of course, you do need to allow for movement where the solid panel meets the frame. Also, as with the breadboard example, during assembly you must glue the long sections of the table first.

FRAME AND PANEL CAN ELEVATE THE DESIGN

A frame-and-panel style shelf limits wood movement to the panel. It's a bit more work, but it creates a strong, stable shelf.



Brackets for circular shelves

When I made this table five years ago, my daughter Morrigan liked it so much that she named it Lucy. Lucy's circular shelf ruled out the use of breadboards and tenons. So I supported it by means of four small arms, or brackets. Each bracket has a tenon that joins it to its corresponding leg. Screws attach the shelf to the brackets. If the shelf were a clock face, with the grain running from 6 to 12, the arms at these points would hold the shelf fixed. The arms at 3 and 9 must accommodate seasonal movement, so their screw holes are slotted.

Begin by cutting the leg mortises for the brackets. Next, rip the bracket blank to width, but leave it long so you can cut the tenons on these small parts safely on the tablesaw. Check the fit of the tenons, then cut the brackets to length. Repeat for the other pair of brackets.

After tracing the bracket profile onto each blank, cut them out on the bandsaw and smooth the rough cuts on a spindle sander. Please be careful cutting and sanding these small parts. Finally, cut the recesses and slots in two of the brackets (see photos, right), and drill a countersunk hole for a screw in the other two.

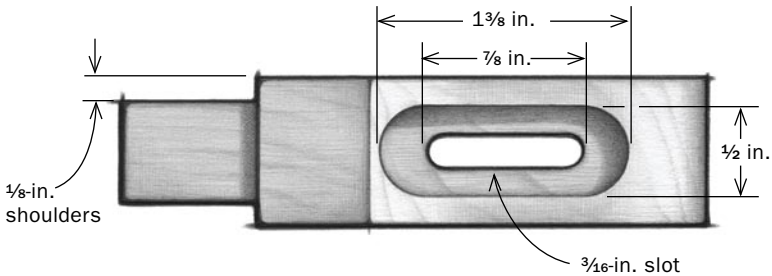
When assembling this irregular-shaped table, I needed to glue up the aprons and legs, install the brackets, then lay the shelf into place before installing the top.

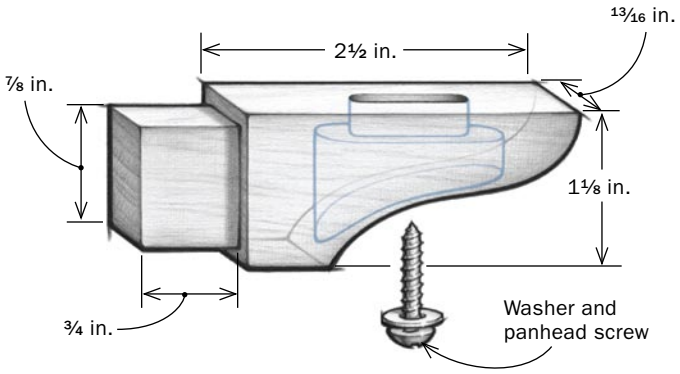
Trace the profile. *After cutting the tenons on the bracket blanks, trace the profile using a template and then cut it on the bandsaw.*

Slotted brackets get special treatment. *First use a ½-in. Forstner bit to hog out the wide area of the recess that will hold the washer (top left). Use a 3⁄16-in. bit to rough out the slot (bottom left). Finally, clean up both cuts with a chisel (right).*

SMALL BRACKETS CARRY A HEAVY LOAD

Turner used brackets to support the round shelf in this low table. One pair is slotted to allow movement (below and right); the other pair simply has one fixed screw.





Photos, this page (top left): Dennis Griggs; facing page: John DeGirolamo (top); Hank Gilpin (bottom)

Sit a shelf on stretchers

Like many pros, my woodworking training came on the job. So I'm never afraid to ask a friend for a solution when I have a question.

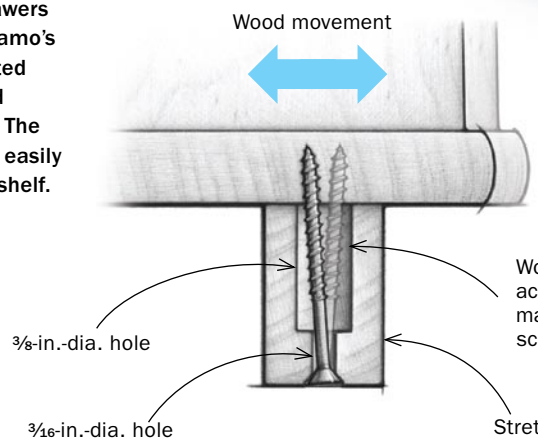
To bring more variety to this article, I consulted a couple of fellow furniture makers, John DeGirolamo (www.jovanni.com) and Hank Gilpin, to see how they install shelves in tables. Both offered examples in which the shelf is supported on stretchers.

For DeGirolamo's Emily side table (right), stretchers support a whole bank of drawers, adding a new design layer to the table. He uses the same approach with shelves. The drawer case is secured to the table with four countersunk screws that travel up through the stretchers and fasten into the box. John accommodates movement in the case by giving the last two-thirds of each screw some breathing room in an oversize hole.

Gilpin offered an end table (below) in curly hickory as an example of how to attach a shelf. The orientation of the small shelf makes predicting movement tricky. It helps that the shelf is small and will move relatively little. Just to be safe, Hank slightly enlarges each screw hole at the top of the stretcher. This way the shelf can move in any direction it wants.

ADD A LOW BANK OF DRAWERS TO A TABLE

The bank of drawers in John DeGirolamo's table is supported by the front and rear stretchers. The arrangement is easily adaptable to a shelf.



NO-NONSENSE APPROACH TO MOVEMENT

Hank Gilpin allows for movement in the shelf by elongating all the holes, simply by wiggling the drill bit. This way, the shelf can move in any direction.