Making Stub-tenon Doors

The stub-tenon joint will never be the superhero of your joinery arsenal because it doesn't have the stuff necessary to be a strong joint. The mating parts are short (hence the "stub" moniker) and it's housed on only two sides: the face cheeks of the tenon. There is sufficient glue surface, but the cross-grain orientation compromises the glue joint. In the pantheon of woodworking joints, the stub-tenon joint may be more accurately described as a 90-pound weakling.

But even so, this can be sufficient for smaller, lightweight doors that don't take a lot of abuse. For example, you wouldn't choose this joint for kitchen cabinet doors or built-ins for the kids' playroom. But it's OK to use a stub-tenon door for a vanity cabinet or for a project that's built as much for looks as it is for service.

Once a door weighs more than four or five pounds, or is larger than 18" x 24", you must abandon the stub-tenon joint for a more substantial one. Mortise-and-tenon construction, dowels, loose tenons and even biscuit joints are superior choices for larger, heavier doors.

So why use a stub-tenon joint? Well, it's easy to make because it requires a minimal amount of setup time regardless of the method you choose to cut the joint. It's usually cut with a router in a table or on the table saw using a stack dado set.

The ease of setup is because the same groove that's cut to receive the panel doubles as the groove for the stub tenon. Plus, the same cutter that makes the groove can be used to form the tenon after an easy adjustment, which I'll tell you about later.

Other advantages of the stub-tenon joint include the ability – make that the requirement – to make either flat or raised frame-and-panel doors, and the relatively low cost and multipurpose use of the tooling required. For the router, all you will need is a ¼" spline-cutting bit; for the table saw, all you will need is a stack dado set (both of which you will end up using in countless future projects).

A disadvantage, along with joint strength, is the inability to add a moulded detail, such as a roundover or an ogee, on the inside frame edges. Only a square edge works because of how the stile, or vertical part of the the frame, comes together with the rail, or horizontal part of the frame. The use of moulded edges requires special tooling to produce a cope-and-stick joint (where identically opposite male/female shapes nest together). Tooling for this joint can be expensive and usually quite fussy to set up.

PHOTO BY AL PARRISH

Story by Steve Shanesy, editor & publisher

Making the stub-tenon joint is straightforward regardless of which method you select. The method you opt for will be dictated by what equipment you have in your shop. If you have a table saw and stack dado set (a wobble dado is not recommended for this operation), you're equipped for that method. Choosing to use the router table may depend on what type of router and table you have available in your workshop.

If you use a router (one that is either fixed-based or plunge-style) that requires you to adjust the height of the bit from below the table, you may find that making fine adjustments to your bit's height is a problem. We'll cover this process later in this article. But if you have one of the so-called router-lift mechanisms, or if you own a newer router that allows you to adjust the bit height from above the table (which makes these fine adjustments a snap), you'll find very precise height adjustments a breeze.

Which method is easiest? My vote goes to the router-table method as long as you have a router lift (which is expensive) or a router with through-the-base adjustment. This method allows the user to raise or lower the bit by inserting and turning a tool right through the base. It's the ability to make fine adjustments easily that tips the scales in favor of the router for me.

Getting Started

Regardless of which method you use, start by preparing the wood for the stiles, rails and panels. To the best of your ability, use stock that's flat and of uniform thickness. And be sure your saw or jointer fence (if you use one) are set exactly 90° to the table. Any cut that is out of square will lead to a door that is cockeyed or twisted (also known as "in wind").

When preparing your stock, cut out a few extra pieces that can be used for making test cuts when setting up the router or table saw. Make your stiles and rails about ⅛" wider than your project plan calls for. Additionally, add about 1" extra length to the stiles so they have what are called "horns" when the door is assembled.

The extra width and length give you a fudge factor when it comes time to fit the door to the cabinet opening. Should the opening be slightly larger than planned or out of square, the extra width and length will help you accommodate. Also, if the door itself is out of square, the entire piece can be fixed after assembly.

Now choose stock with the best grain pattern for the door parts. Select straight-grain material for the stiles and rails. This grain pattern usually is found toward the outside edges of boards. Then select the wider grain material for the panel stock. This grain pattern usually is found in the center of a board. Make sure you select pieces that are uniform in color for all the door parts.

Arrange the straight-grain stile and rail stock so that any curves or bows "frame" the panel appropriately. Generally, this would mean the grain should "curve out" at the middle points of the rails and stiles. When satisfied, mark each piece to identify its location. Be sure you note which side will face out after assembly.

Stub Tenons with a Router

With ¾"-thick stock, you'll want to use a ¼" spline-cutting router bit. It should be equipped with a guide bearing that allows the bit to make a cut that's at least 7/16" deep.

Mount the bit in the router and then mount the router in the router table. Next, set up the fence so it is in line with the front edge of the bearing. This is easy to do by using a straightedge held against the bearing and then bringing the fence forward (to the straightedge) until everything is in line. Lock the fence in place. If your fence allows you to adjust the infeed and outfeed wings, move them as close to the cutter as possible without impeding the cutters.

First up is to cut the groove on the long edges of the stiles and rails. The groove should be centered on the edges. Make a series of test cuts on scrap stock that's exactly the same thickness as your good material. When satisfied, run the stile and rail parts, making sure you always place the outside face up and the designated inside edges along the fence. By running all the parts this way any minor error in centering the groove in the board's edge will be minimized.

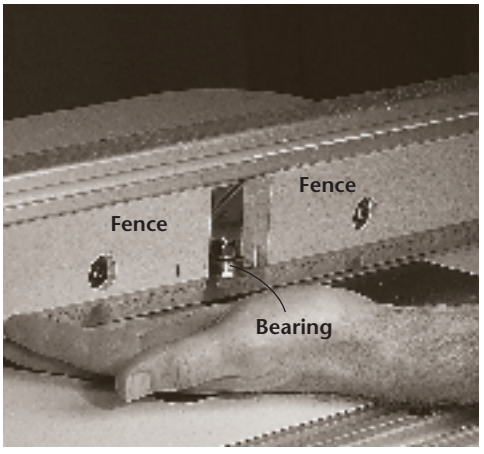
Next, form the tenons on the ends of the rails. The thickness of the tenon must match the width of the groove to make a good joint. The length of the tenon will match the depth of the groove automatically because, like the groove, the depth of cut is dictated by the bearing on the router bit.

First lower the router bit so that the top edge of the cutter is just a whisker below the groove. Before making a test cut, though, you'll need a back-up block to support and guide the narrow rail ends safely past the cutter. A back-up block also prevents "blow out" on the backside of the stock where the cutter exits.

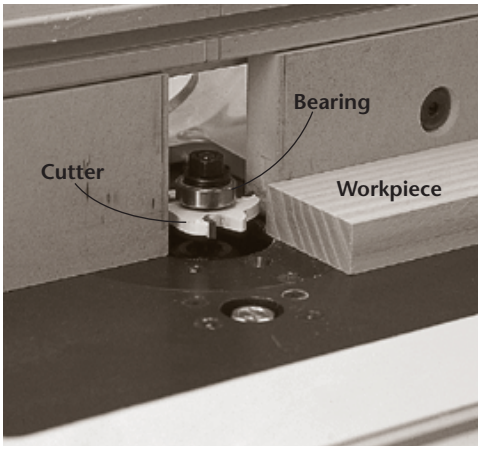
The back-up block can be a piece of ¾" plywood. But take care that the plywood you choose has truly square corners. If it is out of square, you will likely make your tenon cuts out of square, which will cause your door to become out of square when glued together. A handle for the back-up block, as seen in the top photo on page 14, is optional, as is the adhesive-backed abrasive sandpaper I added to help prevent the work from slipping during the cut.

To make the cut, place the back-up block against the fence and move the rail into position. Keep the face up and place the long edge of the rail against the back-up block and the rail end against the router-table fence. When moving the piece into the cutter, keep pressure on the rail down and against the back-up block. At the same time, be sure the block remains against the router table's fence. If it's your first time, make a couple of practice cuts on scraps to get comfortable.

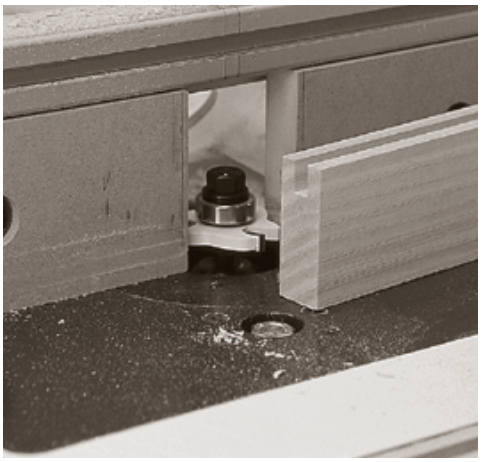
Every step of making stub-tenon doors requires square cuts, whether on the table saw or router.



Set the router fence using a straightedge. The fence face should align with the front of the bearing.



The first step is to cut the grooves in both stile and rail edges. To set the proper height of the ¼" spline-cutting bit in your router, center it on the width of the stock as closely as possible. The depth of cut is determined by the bearing above the cutter – 7/16" to ½" is ideal.



After making test cuts for the groove location, run grooves on the inside edges of all parts. It's important to keep the parts organized and marked so that the good face is up. By doing this, you'll minimize any problems caused by minor inaccuracies in centering the groove precisely.

To form the tenon, the rail must be run past the cutter twice. Rather than readjusting the router bit height, just flip the part over and run the second side. This is where the centering of the groove becomes important. Test-fit the tenon and continue adjusting the bit height until the tenon slips into the groove using only slight pressure. When satisfied, run both ends of each rail. (The stiles do not get this cut.)

Stub Tenons with a Table Saw

Much of the process used for making stub tenons with a router apply to the table saw as well. In this case, however, a rip blade and stack dado set are used instead of the spline cutter.

Install the rip blade (used because of its flat-topped tooth grind) and adjust the saw fence. The fence setting will establish the width of the groove in the stiles and rails. You will make the groove in two passes, each pass with the opposite side of the piece against the fence. This ensures the groove will be centered on the edge. If the panel is ¼" thick, adjust the fence so that ¼" of space is between the blade and the fence. Now set the height of the blade to slightly less than 7/16". Make a test cut and check the depth of cut.

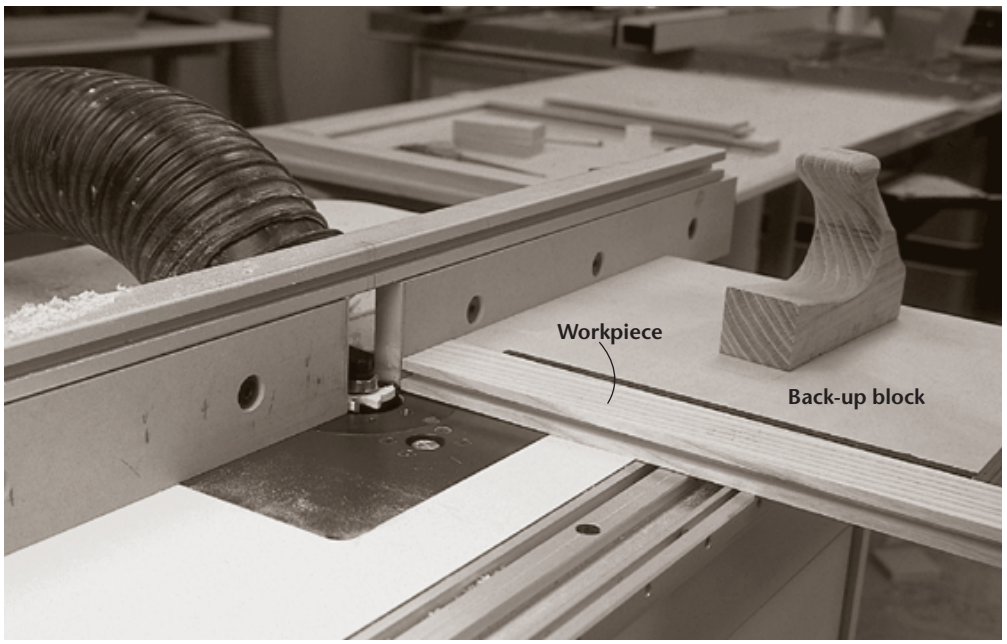
In setting the blade height, sneak up on the final height by adjusting upwards in small increments. You'll find that moving the blade down is not very precise – a function of the way a table saw works. When the blade height's set accurately, lock the adjustment, then make the groove on the inside edges of the stiles and rails.

To form the tenons you need to install a stack dado set that will cut at least ½". You also need to clamp a strip of wood, called an accessory fence, to your table saw's fence. This is to make sure part of the dado cutter is buried in the accessory fence. To bury it, lower the cutter below the table, move the securely clamped accessory fence slightly over the cutter, then slowly raise the cutter into the fence until it is about 3/8" high.

Now you can set the fence to make the cut that establishes the length of the tenon, in this case 7/16". Measure carefully and compare it to the depth of the groove you just cut. If the tenon is too long, it will bottom out in the groove and the joint won't close. It can be fine-tuned once the dado-stack height is properly set.

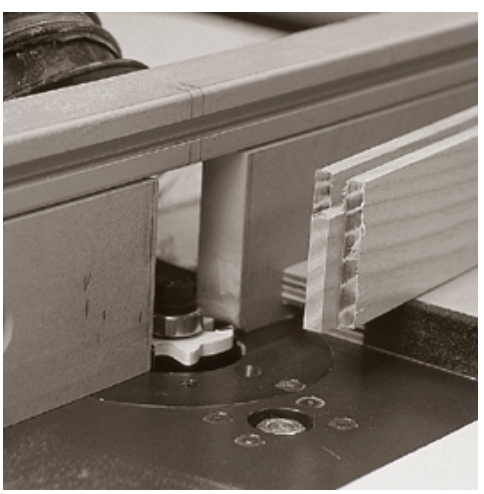
Just like you did when cutting the groove, start the height adjustment below the desired height and sneak up on the correct height. Make test cuts of both face cheeks of the tenon, then check the fit. When raising the dado stack, remember every amount of adjustment is doubled because you're taking material from both sides.

To make the cuts, use your table saw's miter gauge. Make sure the miter gauge is set square to the blade and fence. Place the rail against the miter gauge with the end tight against the fence.



A shop-made back-up block (with an optional handle shown here) helps you steady the rails when you're cutting tenons. It supports the part when the narrow width passes over the cutter. It also helps you make square cuts on the ends, an important aspect of making square doors.

When cutting the tenons, hold the part down firmly against the edge of the back-up block and tight to the router table fence. Guide the part using the edge of the block held firmly against the router table fence as well. After cutting one side, flip the part and cut the opposite side.



Three simple passes over a spline-cutting bit form the completed stub tenon and panel groove.

Push the rail over the blade with enough pressure so you can easily hold it down and against the fence. Check your tenon for proper fit and make adjustments to the fence and/or cutter height as needed. When satisfied, cut all the tenons.

Stub-tenon Door Panels

You can use flat or raised panels in stub-tenon doors. But remember, raised-panel doors add more weight because they require a thicker panel, usually ⅝" thick. With flat panels, you can make them ¼" thick to match the width of the groove exactly, or you can make them a bit thicker and cut a rabbet to fit the ¼" groove.

With flat panels, you can substantially increase the size of the doors and not worry about the weak stub-tenon joint by using plywood for the panel and gluing it in the grooves. By doing so, you gain tremendous strength and the stub-tenon joint does none of the work in supporting the door. With solid-wood panels, however, gluing all around is not an option because the panel will expand or contract with changes in humidity. It's acceptable to add glue at two places on a solid-wood panel – the top and bottom in the center of the panel. The panel will grow or shrink at its edges but not at its center.

When sizing the panel be sure to allow for wood movement as well. About ⅛" all around the panel is a good rule of thumb.

Before gluing the doors, you should dry-fit the doors without glue. You also should sand the panel before glue-up. Don't sand the stile and rail edges after assembly – do it before. Likewise, sand the inside stile and rail edges everywhere except in the joint location. This is very important to remember because sanding inside the joint can ruin the fit.

If you want to stain or color your project, you should do so before assembly. Not only is it easier, but you can stain up to the edges of the panel. If you don't stain up to the edges, it is likely that an uncolored part of the panel will be exposed when the panel eventually shrinks.

When it's time to assemble the project for real (called "final assembly"), add glue to the joint sparingly. You don't want squeeze-out to inadvertently glue the panel at the frame corners. Remember, the panel will need to move.

Clamp with moderate pressure, just enough to close the joint. Too much pressure can distort the door. Place the clamps in the center of the joint across the panel width. Also remember to place the rails in their proper locations, allowing for the extra-length "horns" at the ends of the stiles. Lastly, check the door for square.

Used in the appropriate situations, stub-tenon joints can be an easy and painless way to make attractive cabinet doors. WM

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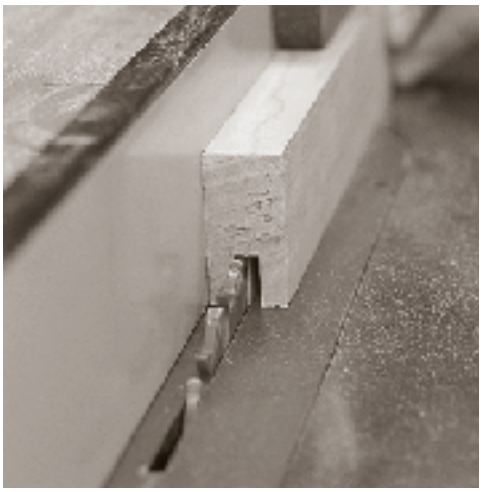
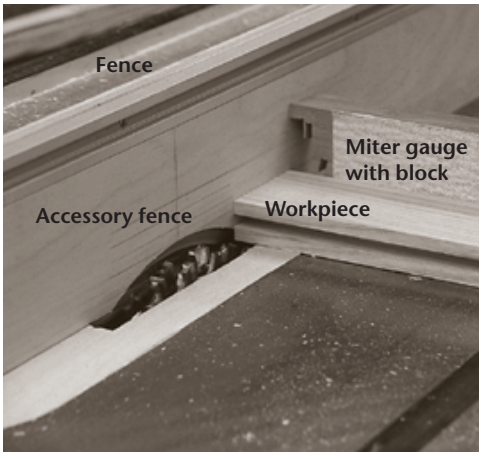
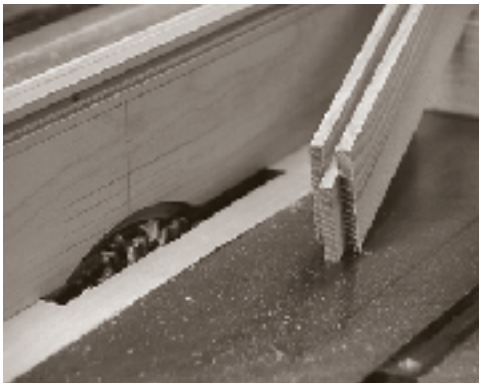


When making grooves on the table saw, a rip blade is used. With ¾" stock, set the fence ¼" from the blade. Make a ¼" groove in two passes, each with the opposite side to the fence to guarantee the groove will be centered on the edge.



Cutting tenons requires the addition of chippers to the dado stack and an accessory fence added to the table saw fence. Instead of a back-up block, the slot miter gauge is used. Sizing the tenon is done by adjusting the blade height and saw fence.



Proper alignment of the fence and saw height produces a tenon that's exactly as long as the groove is deep. The thickness of the tenon matches the width of the groove. Inserting the tenon in the groove should require just a little pressure.

"When I'm working on a problem, I never think about beauty. I think only how to solve the problem. But when I have finished, if the solution is not beautiful, I know it is wrong."

– R. Buckminster Fuller (1895 - 1983)
inventor, architect and engineer

Test the fit of the tenon and groove. The right fit will have both faces perfectly flush and the shoulders of the tenon should seat.

Select straight grain for the frame parts. The grain direction should sweep inward. Select "cathedral" grain for the panel. Note how the points, or "cathedrals," point in the same direction.