Three Ways to Make Cabinet Doors

Construct joints for fine furniture, glass panels or cabinets to go

BY STEVE LATTA

In a perfect world all cabinet doors would be constructed using stout mortise-and-tenon joints, built to last generations. When I reproduce an 18th-century piece, I build doors whose joints will outlast these achy joints of mine. My clients pay for that, and I would not sleep at night giving them anything less.

At the other end of the spectrum, would I go to the same effort for a bathroom vanity that will end up on the curb after the next remodel? Probably not. There are faster ways to make a door. A door meant for hiding everything from towels to toilet cleansers doesn't have to rise to the level of a hutch.

I could come up with a dozen or more methods to join doors, but there are three that will solve most needs: doors for the finest furniture, doors for glass panels and low-budget doors that you need to get done in a hurry.

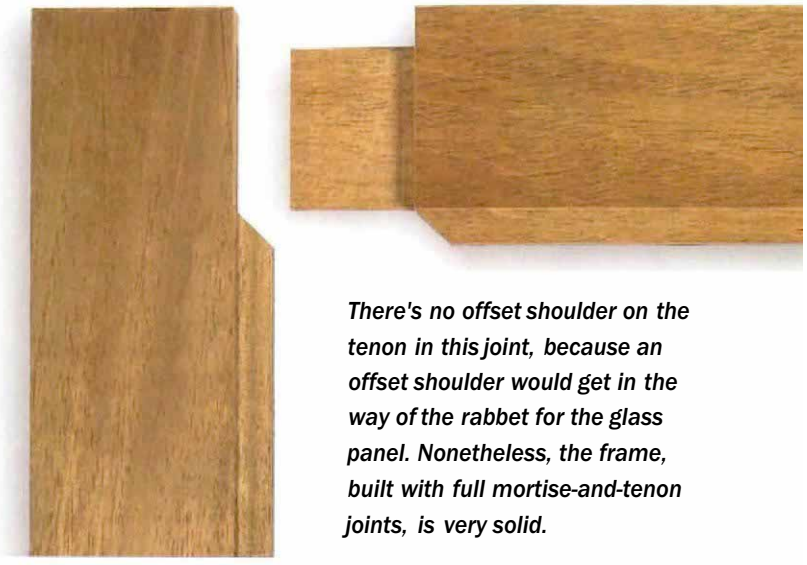
Best method for strong, classic frames

After cutting the stock to its rough size, mold a profile and cut a slot in all of the frame members. Although sometimes I'll use just the sticking portion of a cope-and-stick set to cut the profile and groove in one pass, I often resort to standard router bits. By mixing and matching standard bits, I have an infinite

SOLID PANEL

Full mortise-and-tenon joints make this the best method for constructing fine furniture. Additionally, the tenon's offset shoulder adds rigidity to the joint. The profiled corner must be mitered for the joint to close.

GLASS PANEL



There's no offset shoulder on the tenon in this joint, because an offset shoulder would get in the way of the rabbet for the glass panel. Nonetheless, the frame, built with full mortise-and-tenon joints, is very solid.

COPE AND STICK

Cope-and-stick bits are used to machine the profile, groove and stub tenons. To strengthen the weak stub tenon, glue a plywood panel in the frame.

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Shape the rails and stiles on the router table. *The sticking portion of a cope-and-stick bit cuts the profile and groove in one pass. Set the fence flush with the bearing.*

Rails must have offset shoulders. *Guide the stock along the tablesaw fence and push it using a backer block for extra support.*

Cutting the cheeks without a tenoning jig. *The rail is pushed along an auxiliary fence clamped to the tablesaw's fence. A backer block prevents tearout.*

Make final adjustments using a chisel. *The back wall of the groove on the stiles must be removed up to the miter. On both rails and stiles, use a guide block—a piece of scrap cut at 45° and clamped to the stock—to miter the inside corners of the profile.*

variety of profiles available to me. Cope-and-stick bits come in just a handful of profiles. To cut the slot, you can use a slot-cutting bit or a dado head on the tablesaw.

Mortises are cut next. These are usually located on the stile members. Cut them with your preferred tool, the same thickness as the width of the groove, flush with the walls of the groove. I generally cut the mortises to within ⅜ in. of the outside edges of the doors. But if you're making doors whose backs will be rabbeted for an overlay construction, leave at least ⅝ in. beyond the mortise. That way, when you cut the rabbet around the perimeter of the door frame, you won't cut into the joint.

Next, cut tenons on the rails. This involves a couple of setups on the tablesaw because the rear shoulder is offset more than the front shoulder. The offset has two advantages: It adds an element of triangulation to the joint, which makes it very strong, and it looks good from both sides. Begin by cutting the shoulders on the tablesaw, which will require two setups. Then cut the cheeks. To account for shrinkage, I prefer to machine tenons a hair oversized, then let the stock settle overnight.

For a tight fit, handplane the cheeks until the joint slips together snugly. Lastly, the molded profile must be mitered at the inside corners. I do this by hand, using a chisel and a simple jig. To locate the miter, fit a rail to a stile as far as it will go, mark the inside corner, disassemble and clamp the jig to the stock. Then shave away the waste with a chisel.

This method produces an exceptional joint that can be improved by draw-boring or wedging either a blind or through-tenon (see *FWW*#132, p. 74). With a typical 1½-in.-long tenon, the amount of glue surface is about four times that of a ⅜-in. stub tenon, the kind you typically end up with when using cope-and-stick router bits. It's unlikely that you'll ever have to repair a door built this way.

Door frames for glass panels and more

When a project calls for doors with glass panels, you need a frame with a rabbet on the back to house the glass. Although you could use the previous method for glass-paneled doors, it's not ideal. Be-

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Use a sticking bit or make your own profile from stock router bits. *A straight bit, left, a cove bit and a slot cutter were used to mold this profile. As an added touch, both sides of this frame were profiled.*

Shoulders are the same height on all sides of the rails. *After cutting the shoulders, raise the blade high enough to remove the cheeks.*

Miter both walls of the groove. *Using a guide block and chisel, pare away the miter, which in this construction will show on both the front and back of the door.*

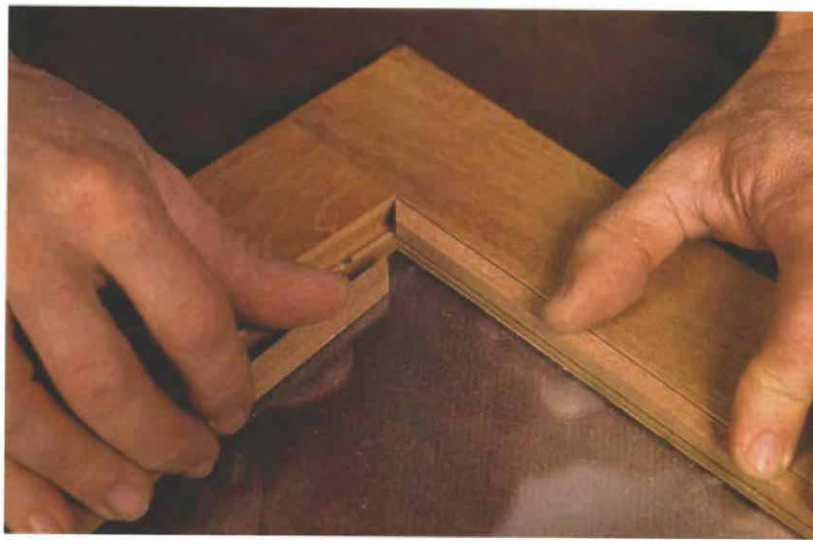
cause of the offset shoulder cut on the rails, a rabbet cut into the back of the frame will also end up offset and won't look good.

After milling the rail and stile stock to rough sizes, I run the molding. Cut the profile using either of the previous methods: by using the sticking portion of a cope-and-stick bit or by mixing and matching standard router bits.

Next, cut the mortises, same as before. The tenons, however, are cut differently. Forget about setting up for the extra shoulder cut on the back of the rails. Cut all of the tenons with continuous shoulders all the way around. Again, make them a hair thick and let them sit overnight.

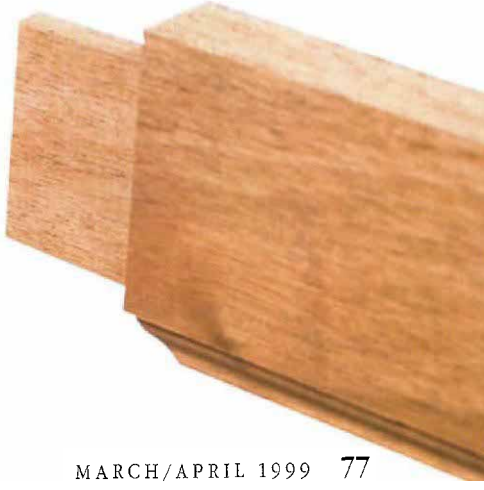
As in the previous method, the molded profile must be mitered for the joint to close. But because there's not an offset on the shoulders of the rails, both the front (the profiled edge) and rear walls of the slots must join in a miter. Use the same jig as mentioned earlier and a wide chisel to miter both walls at the same time. When you dry-fit the frame, you'll notice the back looks funny because of the miter. But for glass panels, rip off the rear walls of the groove, which eliminates the miter. To hold the glass, I'll often rely on tinted glazing putty alone. You could also rip strips of the same species of wood and screw or nail them in place, mitered at the corners. (Cut the bottom piece in two for ease of removal should the glass need replacement.)

If you like this construction method (it's faster than the first) and want to apply it to floating wood panels, here's a trick to make the back of the frame look as elegant as the front. Run a profile along the back inside edge of

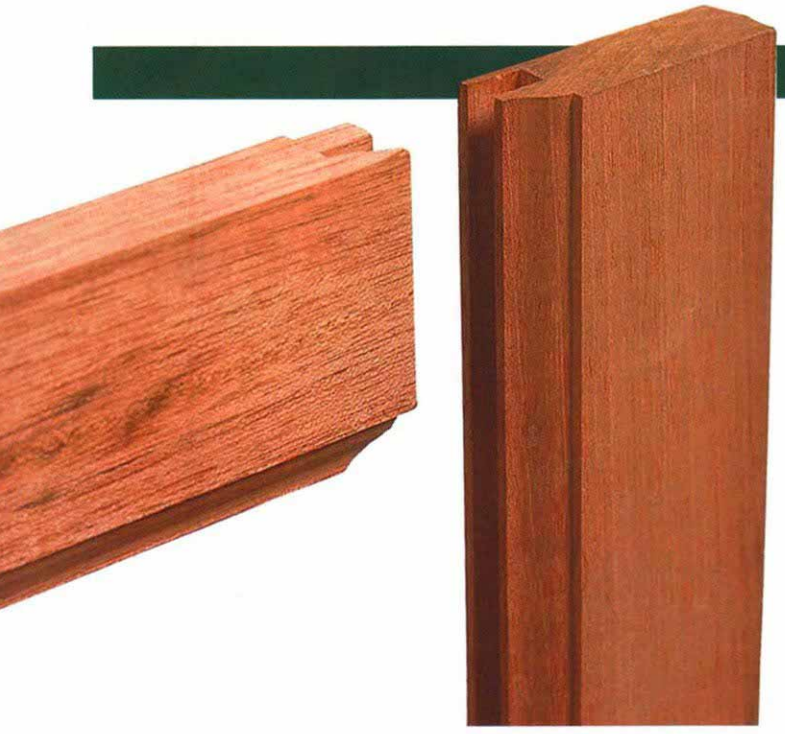


A glass panel is fitted from the rear. *After ripping away the rear wall of the groove, insert the glass and secure it with small strips of wood nailed or screwed in place.*

Same ***method, two applications.*** *By profiling both walls of the slot (top), you can make an elegant frame for a solid panel. Or rip off the rear wall (bottom) and fit a glass panel.*



Photos this page: Bottom left and right and middle right: Michael Pekovich



Cope-and-stick bits do most of the work. *The sticking portion of the bit cuts the profile and groove in one pass. These bits are best suited for ¾-in.- to ⅞-in.-thick stock.*

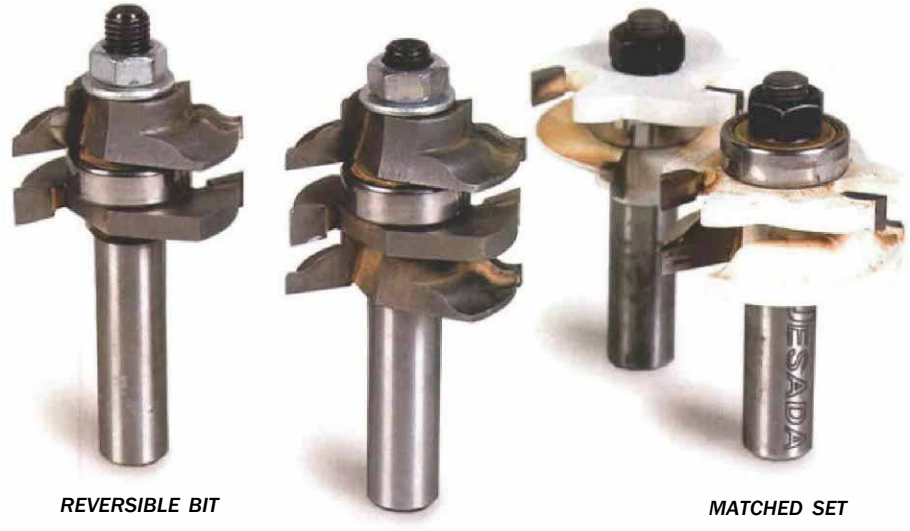
the frame. That funny-looking miter is transformed into an elegant inside comer, and the door will look good on both sides.

Cope-and-stick joints need reinforcement

A lot of inexpensive kitchen cabinets are built using cope-and-stick router bits. These tools cut the profile, groove and stub tenons in two quick operations. Many of these bits leave you with ⅜-in.-long tenons. (For more on the styles of cope-and-stick bits, see the story below.) Some router-bit manufacturers, such as Jesada, offer bits that cut 7⁄16-in.-long tenons. That's a slight improvement, but I wouldn't put solid-wood floating panels in door frames joined this way. A combination of seasonal movement and an occasional slammed door will take a toll.

The weak point of cope-and-stick doors is the profiled edge. Routing the profile removes a fair amount of wood. Yet this area is expected to do double duty as a mortise wall. Pull or push too hard on a door, and the stub tenon will split off the molded edge. The stub-tenon-to-groove glue joint is another weak area. There's not a lot of surface area to glue, and if you mill these parts a little loose or the wood shrinks, the joint will fail.

Cope-and-stick router bits



Cope-and-stick bits are made three different ways. *Reversible bits must be disassembled between coping and sticking cuts. Shims are used to adjust the fit. Combination bits are raised or lowered, depending on the cut. They may also be shimmed. Matched sets have separate coping and sticking cutters. No shims are used.*

There are three types of cope-and-stick (sometimes called rail and stile) router bits: reversible, combination and matched. All must be used in a router table. And although each bit has a bearing mounted on its shaft, I always use a router fence set flush with the bearing for extra support. To understand these bits, it helps to define their components.

The sticking is the profile and groove that is cut along the edge (long grain) of the stile and rail. The coping is the reverse pattern that is cut on the end (end grain) of the rail. The coping cutter leaves a stub tenon as deep as the groove for the panel.

For a tight-fitting joint, the bits must be machined to high tolerances, and

Top left and bottom photos, this page: Michael Pekovich

Rout the *matching coping*. *Use a backer block when cutting the coping along the end grain of the rails.*

To strengthen these joints, use a plywood panel (or other man-made product) and glue it on all four sides to the grooves. I know some woodworkers who try to beef up the stub tenons with dowels or loose tenons and then install floating solid-wood panels. They can help, but I've seen these fail prematurely. On most pieces of furniture, we're not talking about a lot of joints. Making full mortise-and-tenon joints just makes sense to me. □

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Where cope-and-stick joints fail. *The molded edge, which has been reduced in thickness, is a weak spot in this joint. That's why it's a good idea to glue plywood panels into the grooves of the door frame, which will produce a much sturdier door overall.*

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this isn't always the case. If you can't get a joint to fit after much trial and error, contact the manufacturer and see about getting a replacement. All of these bits require set-up time. Once you have a setup that produces good joints, make samples and keep them for reference.

Although prices vary greatly among manufacturers, reversible bits tend to be the least expensive of the three types. They're also the most difficult to use. After routing the sticking, a locknut must be removed in order to flip-flop the top cutter before machining the coping. Shims may have to be fitted between the bearing and top cutter to fine-tune the fit.

Combination bits, which are intermediately priced, have all three cutters positioned on the bit's shaft. To change between the coping and sticking cuts, the bit is either raised or lowered. Again, shimming may be necessary to get a good fit. With some bits, it's just hard to get a good fit; either the tenon is snug and the coping is loose, or vice versa.

The most expensive option is to purchase a set of matched bits that are machined to complement each other. Although I've never conducted an in-depth comparison test, among a random sampling of bits I had on hand, the matched set produced the best fit.—*S.L*

Reversible bits are adjusted by using shims. *A good-fitting coping and snug-fitting stub tenon require some trial-and-error when adjusting the distance between the cutters.*