Building Custom Doors on Site

Success comes from having a fast and easy method to join the rails and stiles and a super-flat surface for the glue-up

BY MARK LUZIO

Photos by Mark Luzio

Large sliding passage doors on guide rails—often known as barn-style doors—have become a popular detail in custom houses. Often these doors are oversized, calling for a custom door slab.

In this article, I want to demonstrate how it is possible to build large custom doors on the jobsite. I have run my own custom woodworking shop for many years and have a standard collection of industrial machines. But here I'll focus on how to build a large panel door with only the tools available on the jobsite. On many jobs, this on-site shop would be set up in the soon-to-be great room of a new house and typically includes a contractor's table saw, a small planer, and a router with a table mount. One key extra tool is essential for making the structural joint on a large wood door: a Festool Domino XL, a hand-held joiner that cuts oval mortises to fit Festool's "domino" tenons. A basic set of clamps is also required for the glue-up.

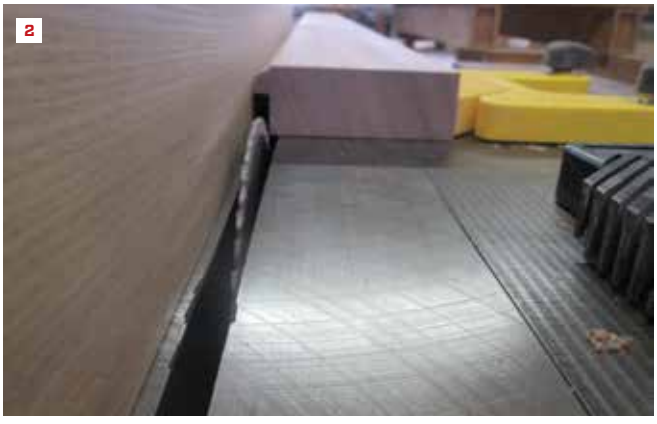
The last requirement in my jobsite shop is a set of box beams, which I make myself.

SWISS BEAMS

I learned the value of these beams 35 years ago while working in a co-op shop in Brooklyn, N.Y., with Stefan Rohner, a young Swiss cabinetmaker. He taught me the method of making them from a single sheet of 3/4-inch shop-grade plywood.

I start by ripping four sides, each 6 1/2 inches wide by 96 inches long. The pieces need to be straight and parallel. A Festool track saw would be a good option for making these rips, or a careful two-person rip on a decent jobsite table saw can work.

Using portable power tools on a simple jobsite setup, it's possible to make a custom door slab. The trick is creating a strong joint between the stiles and rails, which is done here with a Festool Domino. The author built this sliding passage door out of Utile, an African ribbon-stripe mahogany.



Starting out with dimensioned stock, the author uses a 7/16-inch quarter-round bit set to depth for a 1/8-inch step to mold one edge of each piece of the stile and rail stock **(1)**. When you're cutting the panel rabbet in the stiles and rails, it's critical that the step in the molding and the edge of the rabbet are in the exact same plane. To accommodate small discrepancies in the cut, he leaves 1/32 inch of material on the door, so he has room to adjust later when cutting his jack miters **(2)**. Making the initial cut for the jack miters is the trickiest part. He uses a plywood sliding table to crosscut the miter, doing a test cut on a piece of poplar to get the depth exact before making a finish cut on the mahogany **(3)**.

Next, rip four tops and bottoms, each 5 inches by 96 inches. The outside dimension of each beam will be 5 inches by 8 inches.

The beams are fairly light, which makes them easy for one person to move on and off the job. But in order to work, they must be absolutely square and stiff, and so the light, plywood sides need midspan support. I make five or six spacer blocks for each beam. These must be exactly the height of the 6 1/2-inch side and 3 1/2 inches wide. Builders know that all plywood varies in thickness, so be very precise in measuring and cutting your blocks so the beams will finish square and true.

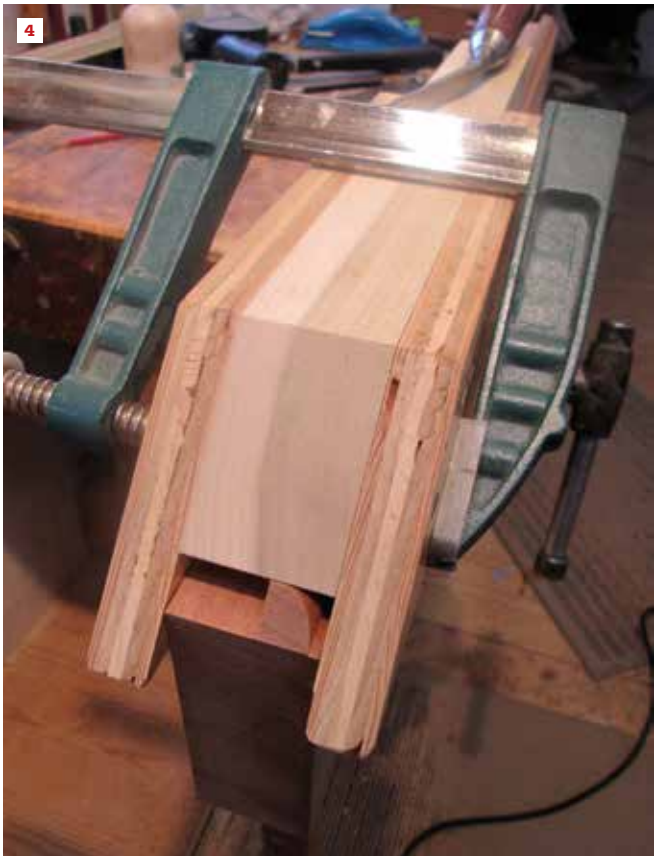
Before assembling the pieces, predrill all your parts, then glue them together as you assemble. The end result will be a super-straight set of beams. If both beams are the exact same dimension, you can get a perfectly flat surface. As a last step for my beams, I rip out 5-inch-wide strips of fiberboard (such as Homasote) and screw these to the top surface, countersinking so the screw heads are below the surface. This makes a no-slip, no-mar surface.

In my opinion, full-size tables or work benches are wasted space in any shop. If I do need a large table for a layout, I just drop a 4x8 sheet of MDF on the beams. The beams also make a great press for laminating thick stock (which I used in my article "Curved Paneling for a Circular Room," Aug/16) . For this job, they are used for the layout and for cutting the mortises with the Domino. They are also set up true and flat for the glue-up of the door.

THE WORK PROCESS

I make traditional 1 3/4-inch-thick doors with a 7/16 quarter-round milled onto one face. I use a bead mold to hold the panels, which are applied with a brad nailer after the doors are glued up.

The key to building a door efficiently and accurately on site



To fine-tune the jack miters, the author makes a "shooting block" **(4)**, which serves as a guide for a back bent chisel. The plywood sides of the shooting block register exactly with the very end of each rail. (On the stiles, the plywood sides register with the layout lines that mark the exact end of the shoulder). Once you shoot the miter, the whole joint closes up tight **(5)**. Once the jack miters are cut, use the Domino joiner to cut two mortises in the end grain of all the rails and in each shoulder on the stiles. The outside mortises on the shoulders that meet the top and bottom rails are cut "normal"—that is, the joiner registers on the flat part of the shoulder **(6)**.

comes largely from the Festool Domino. It's easy to use, but it's not immediately apparent that it will work on stock with molded edges. Most of the how-to videos shown online demonstrate the tool on square-edge stock. I have built hundreds of doors, most of which have been specced by architects or designers, and I can remember only very few that had no edge molding. However, with a simple jig and because the tool can make fairly deep mortises—up to 2 3/4 inches deep—it is possible to cut the tenons on doors with molded edges.

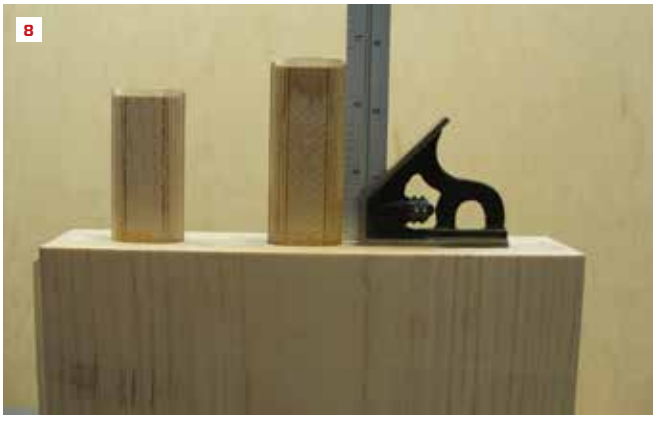
The general work process goes like this: I do all my fitting on the frame (stiles and top, bottom, and lock rails) before I use the Domino. After I cut the mortises, I dry-fit the frame, and then fit the center stiles. At that point, I glue-up the door; sand, scrape, and prefinish; then install the panels, locking them in place with an applied bead molding.

CUTTING THE PARTS

To build any door, it's critical to start with straight and true stock, which is not easy to find in today's world. For this job, I found some nice quarter-sawn Utile, a ribbon-stripe mahogany from Africa. I started with stiles and rails dimensioned to 5 1/2-inches wide with a 6 1/2-inch lock rail.

Install the 7/16 quarter-round bit in the router and adjust the depth for a 1/8-inch shoulder step. Lay out and mill the appropriate edges. To keep track of all my parts, and to mark out which edge I will mold, I use triangles. It's the best method for marking parts; they establish top, bottom, left, and right, all with one pencil mark.

Panel rabbet. Next, cut the rabbet for the panels. It is very important that the rabbet is exactly in line with the shoulder step because at each joint, you will cut out the molded edge, and the plane of the step and the plane of the rabbet will meet. Unless this



For cutting the inside mortise on the stiles, the author makes this simple jig with a 7/16-inch block (to match the depth of the molded edge) and an extra domino tenon **(7)**. The two mortises in the shoulder both get cut full depth, but because one is made off the block and the edge molding, the tenon needs to be cut 7/16 inch shorter **(8)**. When all the mortises are cut, the tenons get glued into place, allowing for an easier dry-fit **(9)**.

surface is a true 90 degrees, the door will never glue up flat. It's difficult to make this rabbet perfect with a jobsite table saw, so I always aim for leaving the stock 1/32-inch fat—that is, the wood left on the door after you cut the rabbet. (If you overcut the rabbet, however, there's no way to close the joint.) This allows you to plane back to the exact layout line. I do this with a pattern bit in a router and a straightedge. More on that soon.

I cut the stiles to 1/8 inch over the finished length. I cut the rails to exact length (which I can afford to do only if I am absolutely careful to allow for the removal of the round-over molding on the stiles).

In a large shop, you might want to cope all the rails, but I prefer to jack miter all the joints, and on the jobsite it's by far the easier method. Coping requires some expensive machines and tooling.

To cut a jack miter, I set the table saw blade to bevel at 45 degrees, and crosscut through the molded edge with the stile or rail on edge. A sliding crosscut tray for your table saw is a good jig for making these cuts. (I recommend using a kit from Woodcraft or another woodworking catalog. These include plans and resin glides that are already dimensioned to fit the crosscut grooves in the table saw.) Even with the sliding table, these cuts are tough to do well. It's hard to see exactly where you are cutting. Don't rush this. I always do a test piece on a scrap board and aim to make the final cut 1/32 inch fat so I have a little meat to work with. I can fine-tune the cut when I fit the door. The finish cut must extend precisely to the shoulder endpoint. I cut the miters in the stiles first and remove the excess molding with a router and a pattern bit.

The fine-tuning on the jack miter can be made with a shooting block and a back bent paring chisel. (Woodcraft sells a few nice back-bent chisels. Once you own one you will find that it is always your "go-to chisel.")

Once the frame is dry fit and clamped, the author knows the exact length for the center stiles, so these can be cut **(10)**. After the glue-up **(11)** comes scraping and sanding. As most woodworkers know, it's vital to get every speck of glue off all the exposed faces of the door, otherwise the finish will be absorbed unevenly into the wood and the glue will stand out like a sore thumb.

The shooting block is an "old school jig" in that it dates back to the beginning of joining wood moldings. I start with a piece of stock that's the exact same width as the door stock and about 10 inches long. This center piece has one end cut at 45 degrees and fits between two plywood sides that are also cut at 45 degrees. These sides hang below the center piece so the jig can be slipped over the edge of the door. The 45 on the plywood extends out in front, so you can line the jig up precisely on the layout mark for the end of the shoulder, while the 45 end on the center piece serves as a guide for the chisel, allowing you to maintain a perfect 45 as you precisely shave the jack miters. When done correctly, the jack miter on the rail comes precisely to the end of each rail, and the jack miter on the stile comes precisely to the end of the shoulder.

Mortising. With the jack miter trimmed exactly, you can now get out the Domino joiner. I lay out and cut the tenons in the end grain of the rails first. The Domino allows you to create two different width mortises (13.5mm and 16.5mm). I cut with the smaller size in the end grain of the rail for a tight fit, and with the larger size in the stiles to provide a little adjustment "float." This simple feature is important, as it allows for much-needed play during glue-up and accommodates wood movement over time.

At the position of the top and bottom rails, the outside mortise on the stile can be cut normally, as the machine registers on the flat part of the shoulder. But for the inside mortises, the machine runs into the moldings. I solve this by making a small block 7/16 inch thick (the depth of the molded edge) and fit it on the end of an extra domino. I push this into the existing outside mortise for making the inside mortise, cutting to the full depth of 2 1/4 inches. When the joint is completed, one domino tenon will be 7/16 inch shorter than the other.

Center stiles. I need to dry-fit and clamp the frame so I can fit the center stiles. I begin by gluing the domino tenons into the rails, then I clean up the glue and let those dry.

I set up my beams on sawhorses, checking to see they are flat and

The door is too big to be cut to its finished size on a table saw. Instead, the author uses an MDF straightedge to guide a pattern bit to square the door to its final dimension **(12)**. He then cuts the panels and prefinishes all the pieces with an initial coat of finish before installing the panels with an applied bead molding **(13)**.

true and that there is no twist caused by the horses sitting at odd angles on the floor.

Measuring off the assembled frame, I cut the center stile to exact length and fit the jack miters. Until the frame is assembled, there's no way to know exactly where these center pieces will end up.

GLUE-UP AND FINAL FINISH

The glue-up always goes fast so you need to be completely prepared. A complete dry-fit beforehand allows you to work out any kinks before the glue is spread. This is when you need to work out a clamp pattern, as well, so pressure gets applied evenly as you draw the pieces tight.

After the glue-up, I let the door dry overnight. In the morning, I scrape and sand. It goes without saying that getting every speck of glue off the door face is essential for a clear finish.

Squaring the door. This door is too large to square up with a jobsite table saw so there are two options: a Festool track saw or an MDF straightedge and pattern bit. I used the latter method on this project. If your pattern bit is too small, as mine is for this thickness door, make a full-depth cut, flip the door, and finish with a spiral flush trim bit.

Panels. The last step before finishing is to cut the panels. I prefinish all the pieces before installing these. I install the panels into the rabbet and secure them in place using a bead molding. I cut small molding like this using a manual miter trimmer (for example, a Lion Trimmer), which allows for a tight fit and saves me the hassle of making a special fence for my miter saw. It's also quiet, so I can enjoy my favorite Swiss jazz station on internet radio.

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