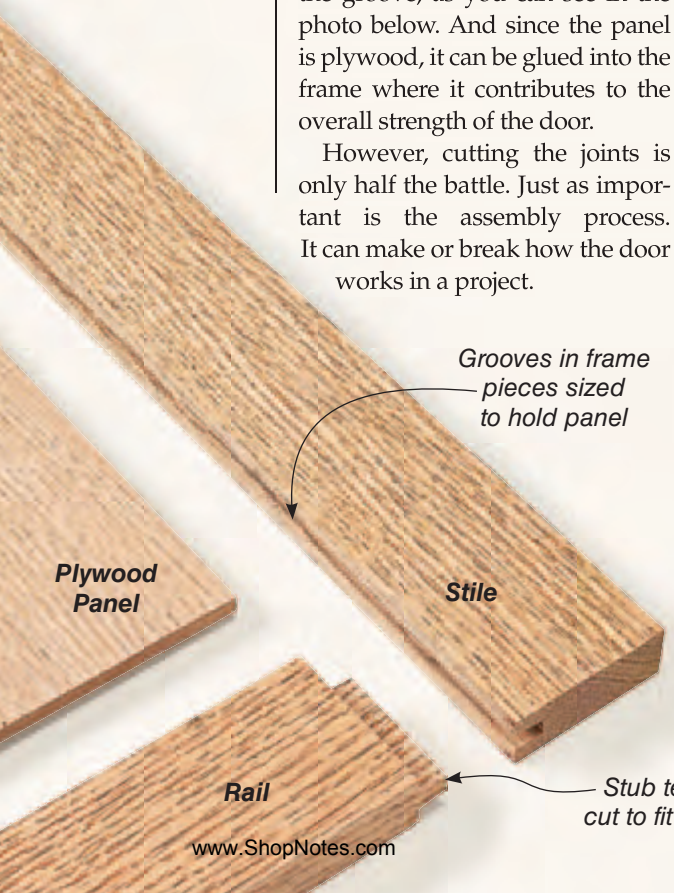
Follow this simple plan to get flat and square doors every time.

assembling Frame & Panel Doors

Using stub tenon and groove joinery to build doors is a mainstay technique in my shop. A big reason is the joints are easy to cut at the table saw. A centered groove cut in all the frame parts is sized to hold a plywood panel. A stub tenon on each end of the rails also fits in the groove, as you can see in the photo below. And since the panel is plywood, it can be glued into the frame where it contributes to the overall strength of the door.

However, cutting the joints is only half the battle. Just as important is the assembly process. It can make or break how the door works in a project.



DRY ASSEMBLY

Overall, there are two primary goals in assembling a door. It needs to be both flat *and* square. To accomplish this, there are a few details to consider before you even pick up a glue bottle and clamps.

The first thing to do is check the fit of all the joints and panel of every door you're making. The idea here is to sniff out any problems before it's too late.

The Frame. I begin by looking at the frame joinery. The stub tenons should have a "just right" fit in the groove. When glue is applied, they tend to swell a bit. Sand or plane them if the joint takes more than simple hand pressure to close.

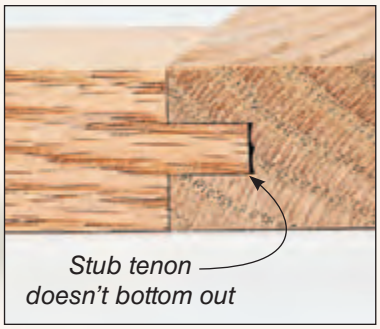
Then check to make sure that the joints close tightly at the shoulders. One way to make sure this happens is to trim the tenon so it doesn't bottom out in the groove, as shown in the left photo below.

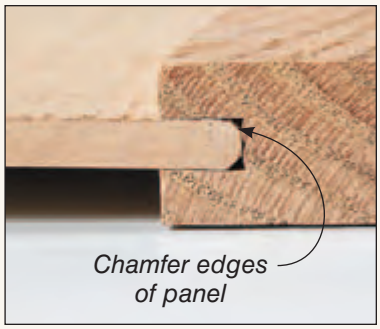
The Panel. Now, open up the frame and fit the plywood panel in place. As you reassemble the frame, there are a couple of things to be on the lookout for.

First, is the panel flat and does it slide easily into the grooves? A ¼" plywood panel has an annoying tendency to warp like a potato chip. If the panel is too distorted, you may need to set it aside and remake the part.

The other thing to look at is whether the frame joints still close up tightly. If not, it means the panel is too large. So you may need to trim it down at the table saw.

I like to chamfer the edges of each panel, too, as you can see in





the lower right photo on the previous page. This eases the fit of the panel into the grooves. And it prevents the face veneer from splintering. The gap it creates provides a reservoir for excess glue as well.

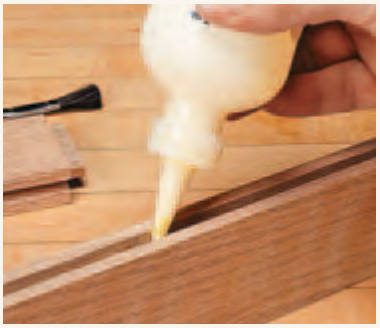
GLUE IT UP

When you're satisfied with the fit, you're ready to start assembly. There are two things to think about at this stage: Applying the right amount of glue in the right places and assembling the frame and panel in a logical order. But before you begin, it's a good idea to clear your worksurface and "preset" your clamps to the width of the door.

Spreading Glue. The two photos at the top of the page show how I apply glue. A brush allows you to spread a thin even, layer on the cheeks of the stub tenons.

For the grooves, simply run a thin bead along the edge straight from the glue bottle — there's no need to spread it around. The key is to use the right amount of glue. Cleaning up squeeze out in a frame and panel is tedious work.

▲ ***Stub Tenons.*** *With a brush, apply a thin coat of glue to just the cheeks of the stub tenons.*



▲ ***Grooves.*** *A thin bead of glue is all it takes in the groove. Inserting the panel spreads it around.*

There's one more thing about the glue I'd like to mention. Using a slow-setting glue can give you some added working time while you get the parts arranged.

The Right Order. To end up with a square and flat final assembly, I follow a specific routine.

The assembly process starts with turning a stile on edge. Then insert a rail into the groove. Make sure to keep the rail flush with the end of the stile. Next, I slip the panel into place (top photo below).

Now, fit the other rail at the end of the panel. Finally, add the remaining stile over the panel and stub tenons (lower left photo).

Clamps. I set the door flat on a pair of spacers, and apply the clamps across the ends, as you can see in the main photo on the facing page. This keeps the clamps from bowing the frame. Just snug the clamps up for now. It's your chance to check final alignment of the rails with the ends of stiles.

At this point, you can use a square to check the frame, as in the upper right photo below. (Or compare corner to corner measurements.)

It's a good idea to measure across the middle of the door, too (lower photo). The panel may cause the stiles to bow out slightly. So you may need to add a clamp to draw the stiles straight.

At last, tighten down the clamps. In a few hours, you can take the clamps off and be confident that the door is ready to go.

Stile, Rail, Then Panel. *Align the rail with the end of the stile before fitting the panel.*

◄ ***Check for Square.*** *Lightly tighten the clamps and make sure the assembly is square.*

Finish Up. *Top off the assembly with the remaining stile. Now you're ready for clamps.*

◄ ***Across the Middle.*** *Compare the middle to the ends to see if the stiles are bowed.*