

A quick and easy way to make a hidden reinforced miter joint

Text and photos by
Jerry Work © 2011

Carefully mitered corners add a touch of elegance to any square or rectangular piece. The problem is they can be fussy to align during a glue up as the joints want to slide all over the place unless you use special corner clamps. If you are surrounding a panel, those corner clamps don't work very well, if at all. The other issue is mitered joints are not very strong as they are end grain to end grain so they need to be reinforced.

Most reinforcing techniques rely on something showing - a spline, a dowel, a corner dovetail, etc., or they rely on something internal that is cut perpendicular to the two miters, like a domino, dowell or a biscuit. With such perpendicular reinforcing it is a chore to get all four corners to fully close since you have to spread all the corners apart to get the last tenon to fit into the corner mortise. If you are trapping a panel, it is all that much harder to keep the panel in place while getting all four corners aligned and closed.

There is a much easier and faster way that only involves a long drill bit with a stop collar, a centering drill guild, and a drill such as is shown here. While you can't see the reinforcing dowel, this joint is both perfectly aligned and reinforced with a 1/4" dowel so



it is super strong. The joint also comes together simply by pushing the two pieces



straight together without racking any of the other corners so it is really handy for making things such as panels and sliding doors for furniture pieces like this really nice small bar shown in my gallery just before it went to the customer.

The top is flame redwood burl and Brazilian cherry. The legs are tiger striped Oregon big leaf maple while the main body is highly figured maple surrounded by Brazilian cherry. The bottom shelf is figured Brazilian cherry. It is the panels and the sliding doors that are of interest here.

Notice in the photo right how the panels and the sliding doors all feature reinforced hidden miter joints instead of the more traditional rail, stile and panel construction in the lower photo.

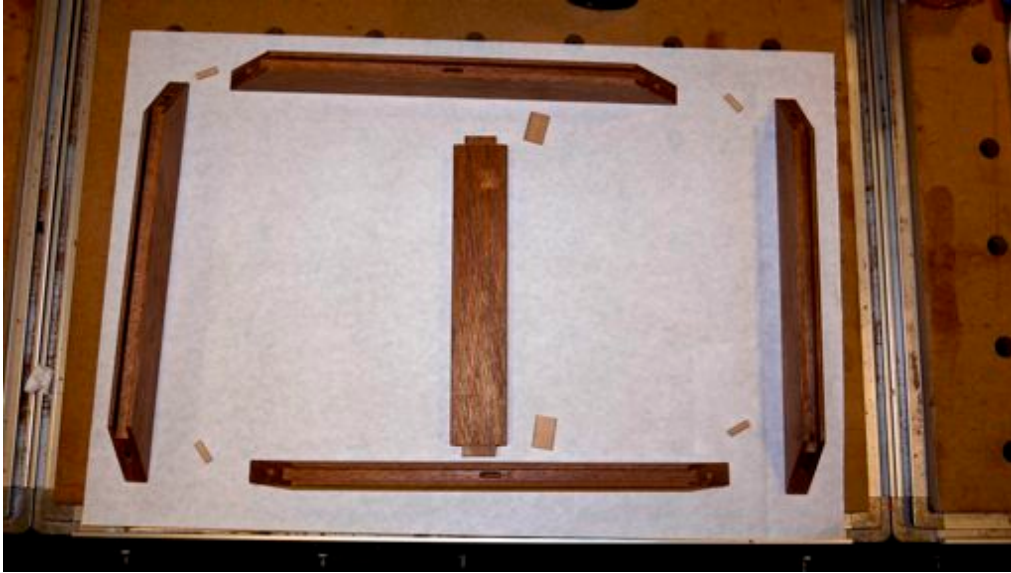


Since the panels in both cases are trapped in 10mm by 10mm grooves, the assembly must go

together by attaching the center stile to the two horizontal members, then the panels can slide into position, and the two vertical ends must then be able to press straight on without racking the other joints. This is easy to do using rail, stile and panel construction, but is not easy to do using reinforced miter joints that we want to discuss here.



Let's take a look at the components during assembly to see what is going on. The photo on the next page shows everything laid out and ready for glue. Notice that the center stile is indexed to the two horizontal members both by a 10mm tongue cut into the center stile, but also by a 6mm Domino centered in the end of that tongue. The Domino adds nearly 50% greater gluing area



and also holds the center stile in the correct location without sliding in the groove.

The “trick” is the dowels that register in holes drilled parallel with the length or width of each surround piece before the miters are cut.

We will see how to do this in a minute.

Note that by having the dowels positioned so they are parallel with the length/width of the surrounds and not perpendicular to the miter, the two end pieces can slide straight onto the assembly, registering in the holes in the horizontal members which both reinforces the miter joint and also brings the whole assembly into perfect square with little or no



effort other than bar clamping across the assembly. No corner clamps are required.

Here is the step-by-step.

First, machine your surround pieces to final dimension. I make mine 50mm wide by 20mm thick and cut the grooves and tongues centered 10mm wide by 10mm deep. Next, cut all your surround pieces to exact length required for the outside to perfectly fit into the opening where the completed assembly will be placed. The horizontal

members will be the inside width of the opening and the vertical members will be the inside height of the opening.

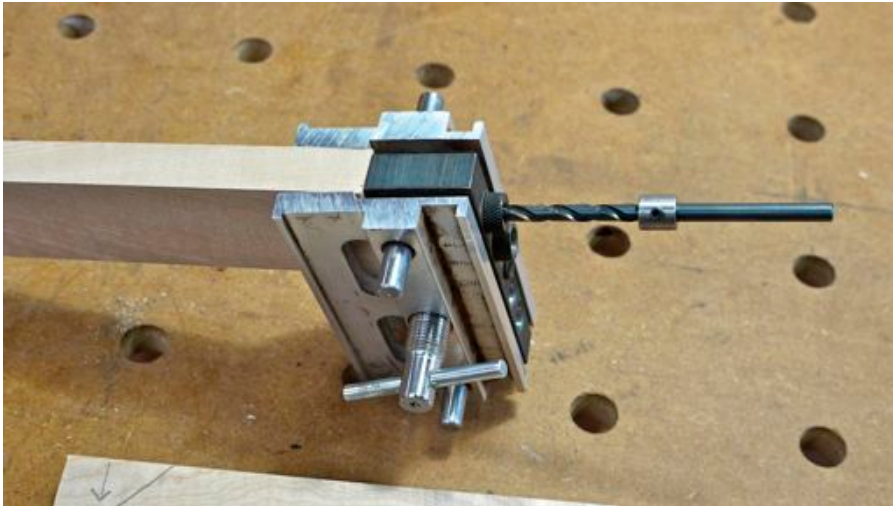
I use a self-centering drilling jig that takes inch denominated drill bits. The 1/4" drill bit is ideal. Buy one that is what is called "aircraft assembly bit length". That will be about 6" long for the 1/4" size. Also, buy a 1/4" stop collar that can be snugged securely onto the shaft of the drill bit.



On my jig the 1/4" hole bushing is centered exactly 25mm from the edge of the body. When I align the edge of the body with the end or edge of my work piece, I know the drill hole will be centered on the 20mm thickness of the piece (by the two faces of the self centering jig) and also centered on the 50mm width of the pieces if I align the end or edge with the end of the jig body. If your jig or work piece sizes are different, mark your jig so you can drill the hole perfectly centered in both dimensions.

Place the drill bit into the bushing and set the stop collar so the bit will penetrate into your work pieces all but about 5mm of the width. In my case, the work pieces are 50mm wide so I set the bit to drill a hole 45mm deep.





Set the workpiece into the jig, align the end of the jig (the center black part) with the edge of the first work piece and drill a hole into the end grain.

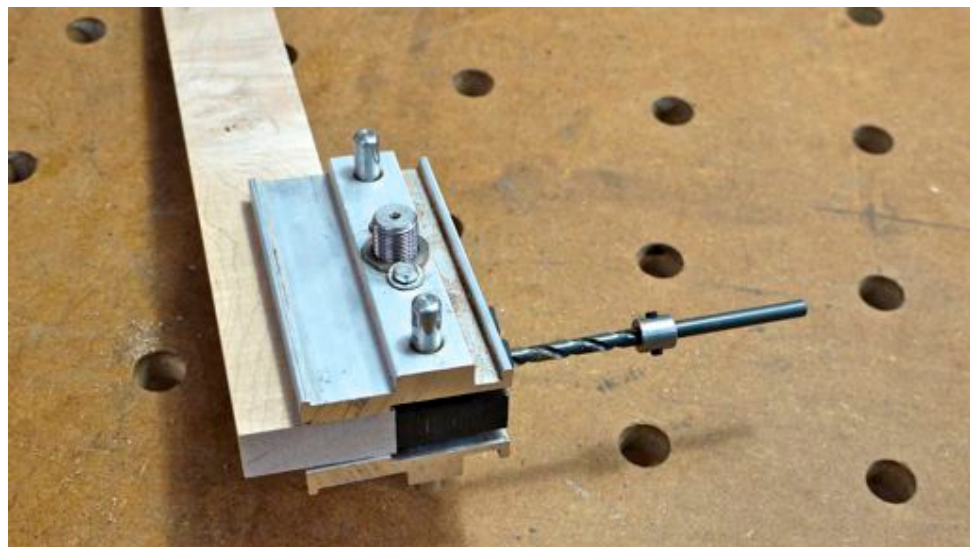
Reset the jig to be even with the end of the second piece and drill a hole into the edge.

The bottom photo shows the

holes drilled in each piece.

Now we will go to the Kapex and cut the 45 degree miters. We will make those cuts removing the outside of the drill holes so only the drill hole that will be hidden inside the miter will remain.

Note the pencil lines on these two work pieces to get the idea of how the miter cut will hide the drill holes.





The lasers on the Kapex make quick work out of setting a stop block so the miter cut will be exactly at the end of the work piece. This is key to having the assembly come out to your exact dimensions.

You can work with the Kapex set to 45 degrees either left or right, it doesn't matter.

There are no awkward and error prone

measurements like you normally have to do when making miter cuts - sometimes needing to measure to the short side and sometimes to the long side of the miter.

You already have your work pieces cut to exact length, so all you need to do now is set your stop so the cut miter hits the corner of the work piece.

Using this technique, every miter joint will come out exactly to the proper length, no matter how short or long the pieces need to be. You set just one stop and cut all the miters off of that one setup.

All that is left to do is to cut your reinforcing dowels to length. Since the drilled holes are in the center of the workpiece both in width and in thickness, and you stopped 5mm short of the width with each hole, the resulting dowel will need to be 10mm shorter than the width of your work pieces. In my case the work pieces are 50mm wide so I need dowels that are just shy of 40mm to allow for glue build up in the bottom of the holes.



Glue and tap one end of the dowel into either hole and you can then assemble the mating piece by pushing it straight together. No racking of the other corners required.

When you are done you can clamp the piece together either way. The dowels will keep all four of the miter joints from sliding, will align the edges perfectly and keep the corners nice, straight and tight - a perfect



miter joint and only you will know that it is very strong as well as beautiful!





The upcoming new Domino XL will have the capacity to drill mortises up to 70mm deep. That means that you can use this same technique on work pieces as large as four by twelves! Imagine a fence or gate constructed with perfectly mitered corners on anything from two by fours, four by fours, four by sixes and all the way up to four by twelves. A very dramatic shadow box effect can be created by mitering the narrower width on dimension lumber up to four by twelves. Only these mitered joints will be reinforced with one or more beefy dominos so they will stay closed and tight even after years in the weather (so long as you use water proof glues and properly finish the wood with suitable weather resistant exterior materials).

The work process is the same. Prep your work pieces to be the width and thickness you want and cut them to exact length.

Set the correct Domino depth of cut. If you are using 90mm material (the 3 1/2" width of a common two by four) and set your Domino to cut a 70mm deep mortise, you can use a 50mm long Domino. If you set the depth of cut to 65mm deep you can use a 40mm long Domino. In both cases, these lengths assume you are working in the center of the work pieces. Work from both sides if you want more than one Domino reinforcing the center of the miter.

If you want more than Dominos in the center of the joint, you can work from both sides and from different distances from the ends of the work pieces. Just be sure the mortise is cut exactly the same distance from the end of one work piece and the edge of the other so the miter corners will properly align when the joint is fully seated no matter how many Dominos you hide in that miter joint. The Domino XL offers a variety of ways to do this. You will need to readjust the depth of cut setting on the Domino when you work at points other than the center of the miter.

In most cases one or two centered Dominos this large will be all you will need for a really strong miter joint in larger lumber sizes.