

Notes from the Shopsmith Woodworking Academy

BASIC JOINERY – The Mortise-And-Tenon

For over 5,000 years, woodworkers have used mortise-and-tenon joinery to make strong, functional joints. Primarily for right-angle joining, the mortise-and-tenon joint draws its strength from the mechanical joining of two pieces of wood, and from the glue applied to the closely-fitting surfaces. Many variations of the mortise-and-tenon exist – this article deals only with the basic, blind mortise-and-tenon.

NOTE: The photos in this article were taken using a Model 500 MARK V. All operations are performed identically on all MARK V models.

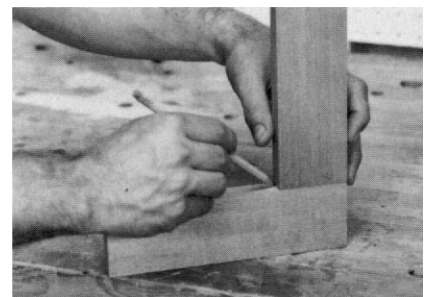
There are several basic rules that apply to mortise-and-tenon joinery:

1. Always cut the mortise first, then cut the tenon to fit – never the other way around.
2. To allow for excess glue, cut mortises 1/16" deeper than the length of the tenon that will fit into it.
3. The tenon thickness should be no less than 1/3 the thickness of the stock you're using. For example...3/4" stock should never have a tenon smaller than 1/4" thick.
4. Always allow 1/4" stock to remain when cutting a mortise. For example...you can cut a 1-3/4" deep mortise in 2" stock.
5. Make sure the mortise-and-tenon joint is snug – but not so tight that you have to **pound** it together – and not so loose that it slips apart.

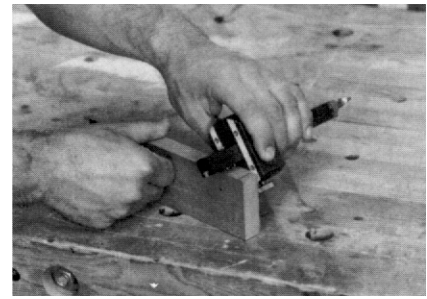
By keeping these five simple rules in mind and practicing, you'll soon add a new dimension to your woodworking.

IMPORTANT SAFETY NOTE: Cutting a tenon is a woodworking operation that must be performed without the use of an Upper Saw Guard. Be extremely cautious when cutting tenons and always remember to replace the Saw Guard as soon as you've completed the operation.

The first step in making a mortise-and-tenon joint is to mark out the location of the mortise on your stock. Remember that the length of the mortise is determined by the width of the rail that will adjoin it. Mark the stile where the rail joins it.



Mark the final **length** of the mortise. Remember rule #4 above — it should be at least 1/4" from the edge. Then mark the **thickness** of the mortise. Remember rule #3 above — it shouldn't be any narrower than one-third the thickness of your stock.



Use a square to mark the depth of your mortise on the side of the stock. Then use this mark to set the depth-of-cut scale on your MARK V Drill Press.



HOLLOW-CHISEL METHOD

The first (and probably easiest) method of cutting a mortise is with a Hollow Chisel Mortising Attachment on the Drill Press. Start by setting-up the Mortising Attachment and squaring it with your Rip Fence. Adjust your work table to center the cut on the stock.

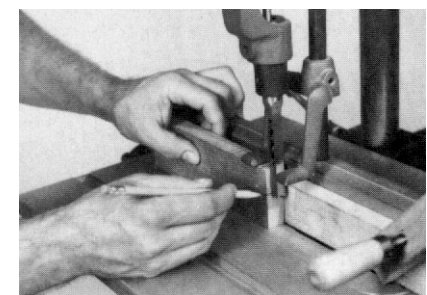


NOTE: When mortising hard woods, a great deal of downward pressure will be required...possibly resulting in table deflection, which could affect your accuracy.

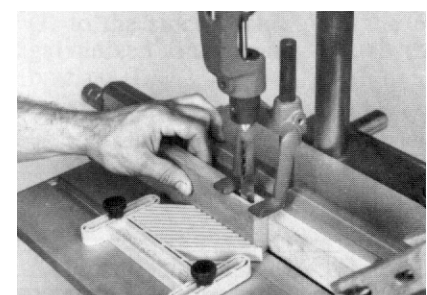
If you're working with a Model 510 or 520 MARK V for this operation, be sure to use your Telescoping Legs for added work table support.

If you're working with a Model 500 MARK V, a special Telescoping Support Leg is available for your machine.

Set your depth-of-cut on the drill press so the Mortising Chisel will "drill" 1/16" deeper than the length of the tenon that will fit into it. Secure the stock using the Mortising Hold-Down and a featherboard. "Drill" the two ends of the mortise first.

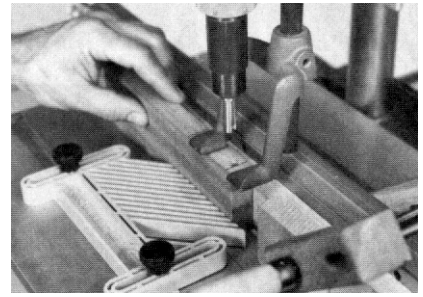


Next, "drill" out the remaining waste stock by working your way from one end to the other. If you experience problems, check to see that your chisel is sharp and that the table is adequately supported.

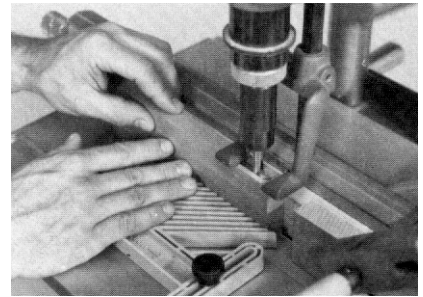


ROUTER METHOD

Mortises can also be cut using the Router attachment. Start by securing the stock with the Mortising Hold-Down and a featherboard, then use the appropriate Router Bit to “drill” a hole in your stock that’s as deep as your mortise. Turn off the machine and use either a stop block clamped to your Rip Fence or Shopsmith’s convenient Flip-Up Rip Fence Stop to limit your left-right travel while cutting the mortise.

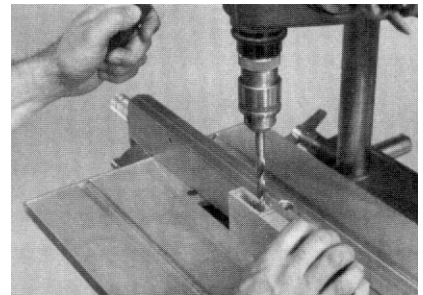


Use your Router Attachment to remove the stock 1/8” at a time. Always move your stock **into** the direction of the rotating Bit. Turn off the machine at the end of each pass, move the stock back to your starting point and repeat the process.



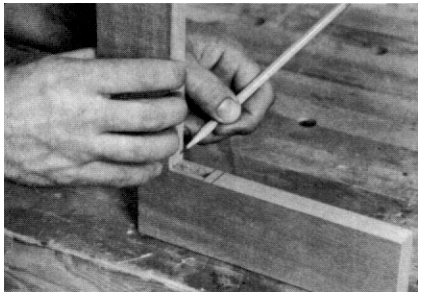
DRILL PRESS METHOD

With this method, you use your Rip Fence as a back-up and start by drilling the first two holes at either end of your intended mortise. Forstner bits are best for this job because they don’t require a center spur to guide them and they will easily drill overlapping holes without wandering off-center. Use a drill bit that’s the same diameter as the thickness of your intended tenon.



Next, drill a succession of overlapping holes, connecting your two end holes. Finally, use a sharp chisel to clean up the sides of your mortise.

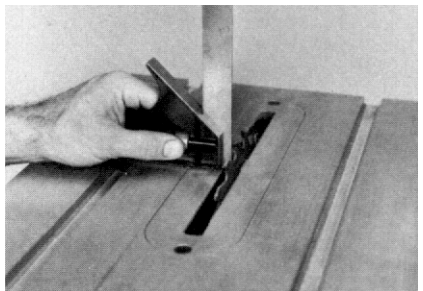
OPTION: With either the Router or Drill method of forming mortises, it’s perfectly acceptable to leave the ends of the mortises round, then round the ends of the tenons to fit them.



TENON-CUTTING

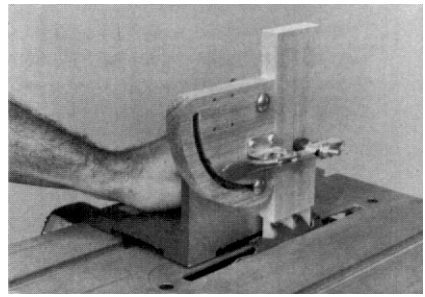
Start by cutting your mating pieces of stock to width and length, then use the cut mortise as a guide for marking the thickness of the tenon. Use a sharp pencil...or...better yet, an artist’s utility knife to transfer these lines precisely.

With the upper saw guard removed, use a square to set the sawblade depth-of-cut. Take the depth of your cut mortise and subtract 1/16” to allow for glue.



Clamp your stock to a tenoning jig such as Shopsmith's *Tenon-Master*. Adjust the jig's lateral movement to line up with the mark on your rail. Check the alignment by making a couple of trial cuts on a scrap piece of wood (the identical thickness of your actual stock) to ensure that your finished tenon will be centered and of the proper thickness.

Make the first cut by pushing the jig that's holding your stock through the cut.

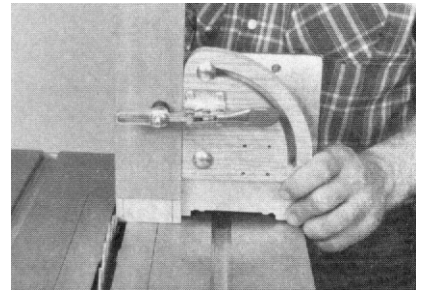


CAUTION: Turn the machine's power off and wait for the blade to come to a **complete stop** before returning the jig to the infeed side of your work table.

Flip your stock 180-degrees and make the second cut for the opposing face of your tenon. Check the tenon's thickness and positioning and make any necessary blade and jig adjustments prior to cutting your actual workpieces.

Rotate the main bracket on the base plate so the face of the tilting wooden trunion on the *Tenon-Master* faces your saw blade.

Using the mortise you've already cut as a guideline, transfer the length of your mortise to mark the width of your mating tenon. Again, use a sharp pencil or marking knife for this job – and make all trial settings on your scrap stock prior to cutting your actual workpieces.



Clamp your marked stock into the *Tenon-Master*. Set your final width-of-cut by loosening the knob and sliding the main bracket toward or away from the blade.

Cut the tenons by making a single pass on each side with a dado blade...or by making several successive passes on each side with a regular carbide-toothed blade. Make all final adjustments with your MARK V's quill feed and be sure to always turn the machine off between passes.

