

Course: Project - Morley Stool

Section 1 - Introduction

The Morley Stool is a sleek and modern-designed stool that can be used for lots of purposes. Whether you give it to your kids, use it in the shop or even as an ottoman, it will not disappoint.

I designed this stool to not only be functional and look good but for the building process itself to be fun and jam-packed full of woodworking techniques. It may be small in stature but there is a lot of great woodworking stuffed into this tiny stool. The Morley Stool features elements such as ripped and flipped panels, wedged mortise and tenon joinery, dadoed slats, and handmade edge profiles.

This class is created for upper beginners to intermediate woodworkers as there are some beginner techniques that we skip over. In this course you will learn about grain direction, wood selection, rip-and-flip panel making, using templates, flush trimming, wedged mortise and tenon joinery, shaping, and creating edge profiles by hand.

Thank you so much for joining me for this class. Let's get started.

Lesson 1.1 - Milling

This course is designed for upper beginners to immediate woodworkers. As such, we skip over much of the milling process and only show what you absolutely need to know. It is assumed that you know how to joint and plane a board to a specified dimension. Take a close look at the plans and the cutlist to understand how to prepare your parts.

Lesson 1.2 - Cutlist

With this video course you will also be provided a set of plans that contain a cutlist. The measurements provided in the cutlist are in their final dimensions so make sure to add a little extra when doing your rough cutting. I recommend getting all of your parts out of an 8/4 (2") board. This is especially important for the side panels so you can create them through the rip and flip method.

The cutlist also provides tenon to tenon length and shoulder to shoulder length. The templates that can be purchased (discussed in the next lesson) with this class do not include the tenons so you will have to add the extra $\frac{3}{4}$ " on each side for the tenons.

Lesson 1.3 - Templates & Materials

For this project, we will be using templates to create the main shape of the parts. This is very common in modern day furniture making. I am using $\frac{1}{4}$ " MDF material that was cut on a CNC machine. You have a couple choices when it comes to the templates - You can purchase them or create them. If you are interested in purchasing them head over to PhilipMorleyFurniture.com/templates. Please allow a couple weeks for your templates to arrive.

You can definitely make your own templates if you choose to do so. I will talk about this in the Section 3 Video. You will need to create a side, top rail, and bottom rail template from $\frac{1}{4}$ " MDF material. The best way to do this is by first cutting an oversized template blank. Use the provided diagrams to plot out the major points of the template. You will cut these out by hand on the bandsaw and then sand smooth. Gluing strips of sandpaper to a long flexible strip of wood will help to smooth out any imperfections. Don't forget that the tenons will be $\frac{3}{8}$ " wide in the finished piece but in the template you will need to make the mortises $\frac{5}{8}$ " wide to be able to fit a $\frac{5}{8}$ " guide bushing.

For your materials you will need the following:

- $\frac{1}{4}$ " MDF (if you do not buy the templates)
- 8/4 board that is at least 7" wide by 40" long
- $\frac{1}{8}$ " brass rod (other fasteners can be used)
- Wood glue
- Pressure sensitive double stick tape
- 2 Part epoxy glue

Lesson 1.4 - Tools

I designed this project to use some of the most common woodworking tools. If I was making this stool in my own shop for my business I may take another approach using some specialized tools. I don't want to show you how to make this stool and then for you to be forced to go out and buy a bunch of expensive specialty tools. To complete this project you will need the following tools:

- Router table
 - $\frac{5}{8}$ " Straight Bit (optional)
 - Top & Bottom Bearing Flush Trim Bit
- Jointer
- Planer
- Table Saw
 - Dado Stack
- Bandsaw
- Plunge Router
 - $\frac{5}{8}$ " Guide Bushing
 - $\frac{3}{8}$ " Spiral Upcut Bit
- Spokeshave

- Sandpaper
- Drill and Screwdriver

Section 2 - Lumber & Panels

Lesson 2.1 - Creating the Sides

We will be starting off our stool build by creating the side panels. We will be doing so with the rip and flip method. This is just another way of saying that we are going to create a slip matched panel on the bandsaw. You will want to start off by grabbing a board that is 2" thick by at least 7" wide and at least 12" long for 1 side. Go ahead and lightly mill this board. It does not need to be perfect as we will be ripping strips off this board on the bandsaw and will final mill later. Once you have your 8/4 board prepared it's a good idea to draw a large triangle across the face and one end so you will be able to keep them organized.

Lesson 2.2 - Rip and Flip

Head over to the bandsaw and set up your fence to cut about $\frac{7}{8}$ ". We want the final width of our sides to be $\frac{3}{4}$ ". Leaving $\frac{1}{8}$ " extra from the bandsaw is plenty as long as your bandsaw is cutting straight and your wood does not have a lot of internal tension.

Lay your board down on its face and cut 1 strip at $\frac{7}{8}$ " and stop. Take that strip and place it back on the board. Does it look straight? If so, you are good to continue cutting strips. If not, you will need to add a little extra to your cut and take your board to the jointer between cuts. If your board is 2" thick then you will need about 6 strips per side.

Lesson 2.3 - Gluing the Panel

We now have all our strips for the sides panels. Go ahead and lay them out as you see me in the video in a slip match pattern. Draw another triangle on their face so you know how to put them back together.

Although the edges of these boards are flat, they have not been truly and properly joined. We will square up the edges on the jointer before we begin the glue up. One thing that I like to teach and also do with my own work is to use the in-out method on the jointer. Imagine where each glue line will be - on one side of that line, write "I" on the other, write "O". This stands for In and Out. When you joint that edge you will either position the face in towards the fence or out away from the fence.

Why do this? Well, if your jointer is slightly off or out of square, following the in-out method will make sure that those imperfections are on opposite sides in the opposite orientation. This means they cancel themselves out. Trust me, this will really help to keep your panels flat.

These sides are a pretty simple glue up. Grab all your clamps, glue, tape, paper towels, scraper and anything else you will need. Put two clamps on the underside towards each end. You'll place one on top in the middle later. Place a thick line of glue on each side of the strips and spread it out with your finger and place boards together. Lightly clamp the material. Work your way around the panel and check all the edges to make sure they are remaining flat. Place the third clamp on top and tighten it down lightly. As long as everything is staying flat you can put more pressure on your clamps and then set them aside to dry.

Lesson 2.4 - Milling the Panels

I would give your panels at least 24 hours to dry before milling them. If you are not familiar with the milling process please watch our free Milling 101 video. Mill the side panels down to $\frac{3}{4}$ " thick. The length and width do not matter at this point as long as they are oversized.

I'm sure there are lots of people out there that have now realized that their panel is bigger than their jointer. If not, move on to the next lesson. You may be asking, "how do I mill a panel that is 11" wide on a 8" jointer? The snarky answer is, "You don't. You buy a bigger jointer." But of course that is not helpful.

So is it possible to mill an oversized panel? Yes, but it is not the safest process so please be careful. Let's say you have an 8" jointer. You'll start by removing the safety guard on your jointer and pushing your fence back as far as it will go. Lock it down. Next, set your jointer to cut $\frac{1}{16}$ " deep. Take one pass at a time until you have cleaned that face and created an 8" rabbet.

You now need a flat sheet of $\frac{3}{4}$ " MDF roughly 8" wide and the same length as your panel. Double stick tape it down into that 8" rabbet you just created. Flip it back over so that the MDF is down. You now have a flat sled that elevates the unjointed bottom of your board up a little. You can run this board/sled through your planer. Clean up the top, remove sled, flip over and then clean up the bottom to get a perfectly milled board.

Section 3 - Layout & Templates

Lesson 3.1 - Making the Side Templates

Use the provided diagrams to plot out the major points of the template. You will cut these out by hand on the bandsaw and then sand them smooth. Gluing strips of sandpaper to a long flexible strip of wood will help to smooth out any imperfections. Don't forget that the tenons will be $\frac{3}{8}$ " wide in the finished piece but in the template you will need to make the mortises $\frac{5}{8}$ " wide to be able to fit a $\frac{5}{8}$ " guide bushing.

Cut a square blank from $\frac{1}{4}$ " MDF that is 12"x12". Draw a vertical centerline going from top to bottom. You will measure out from this center line and up from the bottom. Next, mark out the horizontal lines that determine the height of the tenons. Measure from the bottom $3\frac{1}{4}$ " and $9\frac{1}{2}$ " and draw a line that is parallel with the bottom of the template. These are the centers of the mortises. Each mortise is $1\frac{1}{2}$ " tall so you will split the difference and mark a line $\frac{3}{4}$ " on either side.

You already have your vertical center line so you can mark 5/16" on either side of the centerline within your bottom mortise. We want the template mortise width to be 5/8" not 3/8". To find the centerline of the top mortises you will measure out 2-1/2" from the center line within the top mortise horizontal lines. Make the width of the remaining mortises as you did on the first. You now have three rectangles (5/8" x 1-1/2") that are your mortises.

You will need to cut the mortises before you shape the sides. I recommend doing this on the router table with stop blocks on either side or with a plunge router, a fence and stop blocks. With your machine turned off, insert your 5/8" straight bit and raise it to 1/8". Set your fence back so the bit is perfectly in line with your centerline of your bottom mortise. Set your blocks so that the template can only travel 1-1/2". Clamp them down securely. Tilt the template up until only one corner is touching the table resting against the block. Turn on your machine and slowly lower the template down into the bit. Once it is fully flat on the table you can then slide it to the opposing stop. Remove the template, raise the bit to slightly past 1/4" and repeat. Since the bit will be protruding through the template this time make sure your fingers are safely out of the way.

The process will be very similar with the top mortises. Find the center line, set fence and stops, tilt up, turn on machine, tilt down, slide and repeat. Since your left and right mortise are equal distance from the center line you should be able to flip the template side over side to cover the other mortise.

You are now ready to cut the curves on your template. These are really up to you. Try to stay to the general shape of the plans but otherwise you can change the curves however you like. I recommend making a few measured marks and then connecting the marks with a flexible ruler to create the curves.

Lesson 3.2 - Buying the Templates

You are of course welcome to just buy the templates if you would like to save a little time. You can do so by going to PhilipMorleyFurniture.com/Templates.

Section 4 - The Sides

Lesson 4.1 - Mortise Preparation

Let's gather everything that we need and set it up to prepare for our mortising. For the mortises in the sides we will be using a 3/8" spiral upcut bit housed within a 5/8" guide bushing. Go ahead and get both of these set up in your plunge router.

Next, let's set the depth. Since these are through mortises we want to ensure a clean cut that will look nice. To do so, I recommend cutting at 75% depth or more before doing a final pass at the full depth. Most plunge routers will have a turret stop. It looks like a disk with a series of screws and shafts sticking out at different heights. Set your full depth, which is a hair past 3/4", to the middle stop. Now rotate the turret so your router will get stopped a little early on the higher turret.

Grab some double stick tape, your backer board, clamps, and your air compressor or shop vac. You will need some way to get the chips out of the mortise in between passes.

Lesson 4.2 - Mortising the Sides

Start by placing a few pieces of double stick tape onto the back of your template. Place it down on your side material and firmly press down to secure it. Put a backer board under your side and clamp the side and backer board to your work surface.

Double check everything is safely secured and where you want it. Turn on your router and begin making small plunges into your mortises stopping from time to time to blow out or vacuum out the chips. Continue until you have plunged the entire mortise at 75% depth. Turn your turret stop to the full depth position and make a full depth final pass.

Repeat this process for all mortises. If you only have 1 template as I do then you will want to move on to the flush trimming step before you remove the template to do the mortises on the second side.

Lesson 4.3 - Flush Trimming the Sides

To get the sides ready for flush trimming on the router table we will need to first cut off the majority of the wood. Flush trim bits work best when they are only cutting about 1/16" of material. Take your side to the bandsaw cut close to the template without hitting it. Go slow and try to leave no more than 1/8". Be especially careful in the small inside curve of the stool legs. You will want to understand the radius of your flush trim bit before cutting this too tight. I talk about this a little more in the video.

Set up your flush trim bit while your machine is still unplugged. Raise the bit so that the bearing is riding along the template on the top. When routing end grain, you will occasionally experience the router being a little grabby. You always want to make sure your hands are out of the way of the bit so that their safety is not an issue. To help prevent potential problems you will want to make sure you are conventionally cutting - going against the cutting direction and by using a starter pin. A starter pin will help you move the material into the bit slowly and safely.

Take your time with this but you can go ahead and start flush trimming all sides of your stool side. Keep the router set up so it's ready for the second side.

Section 5 - Rails & Tenons

Lesson 5.1 - Layout

It's time now to begin laying out the tenons. There is one major thing to remember in regards to the tenon placement - the top rail tenon is not in the center vertically. It is offset slightly towards the bottom of the rail so it's at this point that you will want to determine the top, bottom and sides of your rail. Grab a tape measure, small ruler, a square and a sharp pencil and clamp your rail so the end is facing up. We are going to mark the tenon placement so we will have a reference when at the table saw.

Let's start with the top rail. Measure up from the bottom $\frac{1}{8}$ " and draw a line across the tenon. Mark $\frac{1}{4}$ " from the top. The distance between those two marks should be $1\frac{1}{2}$ ". We now want to mark out the cheeks of our tenons. We can either draw a center line and measure out on either side or mark $\frac{3}{16}$ " from the outer sides. It doesn't really matter since these lines are only for reference. We will ultimately be "sneaking up on it" when over at the table saw.

The bottom rail tenon is perfectly in the center. $\frac{7}{16}$ " from the top and bottom and $\frac{3}{16}$ " from left and Right sides. Mark them out in the same fashion as the top rail.

Lesson 5.2 - Shoulder Cuts

You will need a crosscut sled and some sort of stop to do the shoulder cuts on the tenons. The good thing is that all the tenons are the same length so we can set the stop and only have to worry about moving the blade height.

This is where a smart furniture maker would have a test rail ready to work on. I forgot about that, but I do recommend doing all of your testing on a scrap piece that is milled the same as your final parts. Draw a line going all the way around your rail that is $\frac{3}{4}$ " from the end. With your table saw unplugged set the rail right up to the blade so it will just be slightly to the right of the line. Set your stop there and clamp it down.

Using whatever measuring device you choose, set your blade height to cut $\frac{3}{16}$ ". This will be a cut that we will make on the faces of all of our tenons. A good tip to remember is that you will not see this initial shoulder cut even on a through tenon so it's a good idea to cut a little deeper than your measurement. Make all your $\frac{3}{16}$ " cuts.

Next, grab your bottom rail and raise the blade to $\frac{7}{16}$ " and make the 4 remaining cuts on that rail. It is this next rail that you need to pay close attention to. Set your blade height to cut $\frac{1}{4}$ " and make your top shoulder cut. Then, move on to the bottom making a cut that is $\frac{1}{8}$ " deep.

Lesson 5.3 - Clearing the Tenon Waste

We are now ready to use a dado stacked blade to clear away the waste that is not part of our tenon. We will also use this step to sneak up on our fit. Along with the dado set you will need 1 of 2 things - either an "L" Fence or a sacrificial fence. No matter which one you have, you set the dado stack up to be slightly wider than $\frac{3}{4}$ " so we can take the waste off in one pass.

Set up your crosscut sled or sliding miter gauge so you can crosscut the tenon. You will want to line up the shoulder cut you made earlier with the left side of your blade. This is where you will want your stop or your fence to be. You'll need to adjust the height of your blade the same way you did with the shoulder cuts. I talked about cutting a little deeper on the initial shoulder cut but here you will want to cut a littler shallower than your measurement to sneak up on the fit. You can always cut more off but you can't put it back.

Start with the cheeks so you can test the fit width-wise. This is $\frac{3}{16}$ ". Make one pass, then flip over, make another and then test fit. Do that until you have a perfectly fitting mortise. Repeat the process for the rest of the tenon cheeks.

For the remaining edges of the tenons I typically will use the bandsaw due to the speed of set up. We have a few different measurements to set up here so I find it much easier on the bandsaw. Set up your fence so you can easily cut on the mortise end lines you drew in the layout stage.

Lesson 5.4 - Rounding the Tenons

Now, we are going to round the tenons. Oftentimes I will use a $\frac{1}{4}$ " round over bit on the router table to do this. You can see this in several of the videos we have on demand. These tenons are pretty small so I will just be doing mine by hand with a rasp, chisel and sandpaper. This is a pretty straightforward process just remember not to hit your tenon shoulder as that is the part that you will really see. Take your time and test for fit regularly.

Lesson 5.5 - Splitting the Tenons

The last thing we need to do is split the tenons. I recommend leaving about $\frac{1}{4}$ " on either end. Anything more and you will risk splitting the wood. Head back to the bandsaw and set the blade to cut $\frac{1}{4}$ " from the end of the tenon. You can set a stop or you can just freehand cut these. Be careful not to cut into your tenon shoulder. It is ok to stop about $\frac{1}{8}$ " away from your shoulder to be safe. On the bottom rail that has the tenon perfectly in the center you can just flip it over to cut the other split. For the top rails, you will need to move the fence.

Section 6 - Shaping

Lesson 6.1 - Shaping the Rails

The great thing about shaping the rails is that you already know the process. Take your template and trace the shape on the rails. Take them over to the bandsaw and cut them out while leaving about 1/16" of material from your line. Double stick tape your template down to your rail and head to the router table. Using the same bit as before, flush trim the excess material off to get the desired shape.

Lesson 6.2 - Grain Direction

Seeing that this is such a short section I wanted to take advantage and talk a little about grain direction. In the video I speak a little about cutting "downhill." If you take that rail and you lay it on its edge so that when you look at the face the grain is going parallel like a horizon - the shape of the rail will form two "hills." Ideally, you want to always cut in the downhill direction. This is because when you cut uphill, the wood has nothing behind it and can sometimes tear out. You will have a much better final result when cutting downhill. This is when a flush trim bit with a top and bottom bearing comes in very handy.

Section 7 - Slats

Lesson 7.1 - Test Fit

We are in the home stretch. We will be working on the slats now and are going to establish the measurement for the width of the dadoes and their distance apart. The best way to do this is not actually by looking at your plans but from the stool itself. This far into a project there are lots of steps and variables at play and plenty of room for us to have made mistakes. A good way to avoid making a mistake with the slat dadoes is to just measure off the stool.

Start by lightly tapping in your rails into one side. Place the other side on top and tap it down with a rubber mallet. When it is mostly together you can put a clamp on it between the tenons to ensure it is fully seated. Now you can take your measurements. Determine what your overhang will be - it should be about 1/2".

Lesson 7.2 - Dadoes

Head to the table saw and set up your dado blade if it is not still set up. Start by making the blade 3/4" wide. We talked about a few fence options earlier and you can still use whichever you like but in this operation I recommend using a block spacer on your fence. Typically you do not want your material to have two points of fence contact when cutting. If your fence is not perfectly straight it can cause pinching, burning and even kickback.

Clamp a block on your fence towards the front and make your measurements from there. That way when you begin to crosscut the dados the material is no longer touching two fences. Use your miter gauge and some scrap material to begin making test dados. You should have about $\frac{1}{2}$ " of overhang but of course work from your actual stool not the plans. The test pieces are a great way to find the depth of cut on the dados as well. You want your slats to sit down over the side with just a hair gap between the top rails. It is approximately $\frac{1}{4}$ ".

If you have done a full test piece that you are happy with then you can start dadoing your actual slats.

Section 8 - Profiling, Sanding & Gluing

Lesson 8.1 - Decision Time

You now are at the point where you can take some artistic license to make your piece unique. You can lightly sand everything, glue it up and call it a day if you want. I believe that adding a few additional curves, profiles and chamfers can really take this piece to the next level. I will show you some of my favorite edge treatments after we do a bit of sanding.

Lesson 8.2 - Rail Profiles

When it comes to edge profiles you can either use a router bit or you can do them by hand. I will be discussing how to make unique edge profiles by hand but using a router table is perfectly fine.

On my stool, I will just be easing the edges of the top rails so I'll start with a profile on the bottom rail. Draw out a centerline on the top of the bottom rail and a line about $\frac{1}{8}$ " down on either face. These are the guidelines that we are going to work to as we remove material. Grab your handplane and begin to create facets or small chamfers from the centerline down to your guidelines. The handplane should remove the bulk of the material for you.

Grab your sanding block of choice and some sandpaper and work your profile to make those facets smaller and smaller until you have a smooth curve. If you have some sort of flexible material you can create your own flexible sanding block that works great for these profiles. Work your way up the grits until you are happy with the look and feel of the edge profile.

Lesson 8.3 - Side Profiles

On the sides of the stool I will be making my profile slightly asymmetric so that there is more of a curve on the inside. To me, it looks like they are pointing inward and grounds the piece.

For the sides, the basic process is the same as the rails. Make your guidelines and use a spokeshave to remove the majority of the material. The main difference here is that you need to pay attention to the grain and make sure you are cutting downhill.

Create your facets and then sand them smooth.

Lesson 8.4 - Sanding

After creating the profiles on all the edges that get them it is time to sand the faces of the parts. I will just use a block on the small parts but will then use my orbital sander on the sides. Don't worry about the outside face of the sides yet since we will be doing our wedging and flush cutting there.

Spend the most time on your coarsest grit. You are trying to remove the machine marks left from the milling process. The finer grits are used just to remove the striations from the grit before and should go much faster.

Lesson 8.5 - Glue Up

For this glue up go ahead and grab all your tools and supplies so you have everything at arm's length. You will need to have your wedges ready to go as well. If you don't have any wedges you can make some very easily. We have a free video that shows you how to make a Wedge Cutting Jig for the bandsaw.

In a normal mortise and tenon situation I would put most of the glue in the mortise. With this being a through mortise I will put glue on both the mortise and the tenon. You need to work quickly but don't hurry yourself to the point of making a mistake. Place glue on both the tenon and the mortise and use a mallet to put the joint all the way together. Continue until you have all the rails on one side. Apply glue to the other side and attach the remaining side.

Grab a couple clamps and slowly begin to apply pressure to the stool sides. Make sure the clamps are as close to the mortise as they can be without touching it. Do not put so much pressure on the piece to the point where it begins to distort. We need to insert our wedges while the glue is still wet so work quickly.

Lesson 8.6 - Wedges

We haven't spoken much about wedges yet but as I said, we have a free video that shows you how to make them. You can use the same wood or a contrasting wood as long as the grain is running the correct direction.

You will want to insert the wedges while the glue in the joint is still wet. Use a lightweight hammer to gently tap the wedges into the joint. I recommend tapping a few times on each wedge while switching back and forth. I find it helpful to listen to the sound of the wedge while tapping. You will hear a change in tone when it is all the way in.

While the glue is drying you can clean up the squeeze out. After everything has dried, you can cut off the wedges with a flush trim handsaw. Sand the outsides now that you have cut off the wedges.

Lesson 8.7 - Finishing

Putting a few coats of finish on before you attach the slats will make your life much easier. Since you have already glued up your stool I would use a wipe on finish that is easy to apply.

Lesson 8.8 - Attaching the Slats

There are lots of options for you to attach the slats. You can use screws and then fill in the hole. You could use brass screws with an elongated head that can be cut off to resemble a brass pin or you can use an actual brass rod like I am.

If you are following along with me and using brass pins like I am, you will want to take your 1/8" brass rod and cut it down to small pins about 2" long. Test fit all your slats and draw a few pencil lines so you can easily line up your brass pins. Pre-drill your 1/8" holes. Use a 2 part epoxy to lubricate and glue in your brass rods. Read the instructions that come with your epoxy to determine the dry time. Use a file to trim them down after the epoxy has fully dried. I would take one more sanding pass on the slats, apply the finish and then you'll be all done.

Lesson 8.9 - Conclusion

Thank you so much for taking this class with us. I really hope you learned a lot and came out the other side with an amazing stool. Don't be a stranger - share your project and let us know how it went. Take a look at the other classes we are offering and let us know what you'd like to see next.

Thanks so much. Happy woodworking!