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Canadian Woodworking

AUGUST/SEPTEMBER 2008
Issue # 55

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LINDA FULCHER

I would like to echo one of Vic Tesolin's suggestions when designing your own projects.

It took me a long time to learn this so I hope by emphasizing it, I can save you from making the same mistake I did. My own design flops have mostly been based on one simple error: designing in isolation.

I would pick a style I liked, at first, completely oblivious to the context it was in. Here is a very simple example of the result, which I am sure many of you will have experienced: Have you ever picked up an outstanding stone from along the river and then, when you get it home and pulled it out of your pocket, it seems to have lost it's allure? You find yourself wondering what you saw in it.

What I have come to realize is that often I was picking up a black stone that stood out in a pile of white stones, or a pink one glittering with quartz crystal in a bed of black and other glittering pink stones. What made the stones stand out was not inherent in the stone, but in the context. Remove the context and you remove the pizzazz.

When it comes to your projects, it is almost as if the styles you create 'talk' to the other styles adjacent to them (or not). So when you read through the design article, take special note of the advice to consider the surroundings in which your project will live.

If you are making the project for someone else, sometimes you start with what they like. You may not be given the freedom to stray too far from their vision, but you can certainly explain the principle behind creating a design that will fit in with the existing décor.

The added benefit of this approach is that, sometimes, limitless choice can be overwhelming. Taking the main elements of the existing furniture styles and décor, gives you some basic elements to play with and narrows down the choice. Best of all, it gives you an idea of what design elements are going to both fit in, and stand out.



PAUL FULCHER

You don't need to be a student of Freud (that's Sigmund, not the manufacturer) to know the power of 'free-association'. Think of a hammer, the thought of a nail is close behind; think of blue – sky is right there. Similarly, when Carl and I first discussed doing a reader survey, when he said survey, I thought prizes! So as he was busy fine tuning the questions, I sought out some great prizes to offer those readers that participate (see June'08 eNewsletter for details on prizes – all eNewsletters are available on our website.)

We will be running three separate surveys, each survey offering chances at three different prizes. To be included in this survey, register for our free monthly eNewsletter.

Surveys and prizes are a winning combination: you win by getting a chance at some very useful (and cool) tools; we win by getting your feedback – which is invaluable to improving our magazine.

Speaking of winning combinations, be sure to see this issue's Combination Machines (page 42). Long popular in Europe, combo machines are now catching on in Canada. Their exceptional quality, and small foot print, offer a viable solution for those with small shops.

You'll get a chance to see these machines in action at some of the upcoming woodshows (see page 45 for a full listing).

There are two other combinations featured in this issue. One combination consists of an Entrance Door article (page 36) followed by a project for an Entrance Door Surround (page 22).

The other combination featured is our Biscuit Joiners article (page 38), and our related Shop Jig that uses a biscuit joiner (and splines) to make strong and attractive mitre joints. (page 46)

It's a combination filled issue that I hope you enjoy.



CORRECTIONS

June/July '08, Issue #54

Page 12: Jeff Richardson of Wood Essence Finishes (woodessence.com) points out that Target Coatings Ultima Spray Lacquer is not a toxic finish to apply. Target USL is a waterborne lacquer, not a nitro-cellulose lacquer; it's non-flammable, featuring very low volatile organic compounds and zero hazardous air pollutants.



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Crazy Glue Bandage

The tone of Don Wilkinson's "Jerry Has An Idea" woodchuckle article (Apr/May '08, Issue # 53) was intended to be humorous, but one piece of advice tendered, the suggested use of Crazy Glue to close wounds is serious. The author squirted a few drops of Crazy Glue (cyanoacrylate adhesive), into the wound and pressed the edges together stating that it would hold until he got to the hospital when



he found time. My concern is that Crazy Glue can indeed be used as a tissue adhesive but it absolutely must not be used in an open wound. Rather, apply the Crazy Glue over the entire surface and edges of the *closed* wound to provide a seal and to create a surface bond. Brian F., Nepean, ON

• Thanks for your letter of concern. I appreciate that you took the time to clarify the proper

use of Crazy Glue as a tissue adhesive for our readers.

Shooting Board

Yours is an interesting magazine. One drawback to the design of the shooting board (Oct/Nov '07, Issue #50) is that you will wear one spot on the plane blade if it is used frequently. A simple solution is to incline the sub base so that the whole plane blade is used. Lloyd Smith, ON

• Lloyd, you make a good point. The design of a shooting board should take into

Continued on page 45

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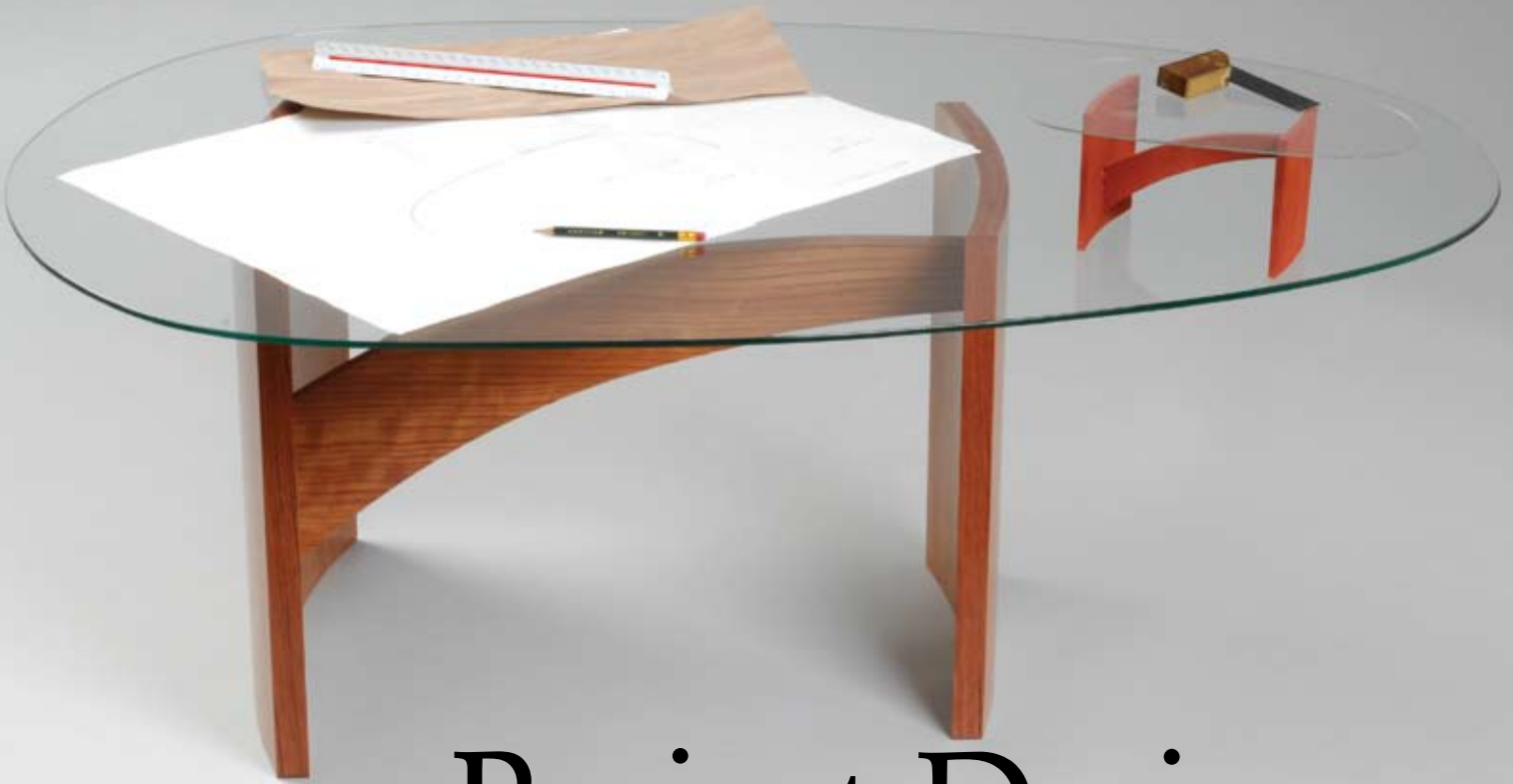
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Project Design

Building furniture of your own design can be a very rewarding venture. It gives you complete control over all aspects of your project: the style, shape, dimension, and overall feel of the piece. And, it's not as difficult as you might think.

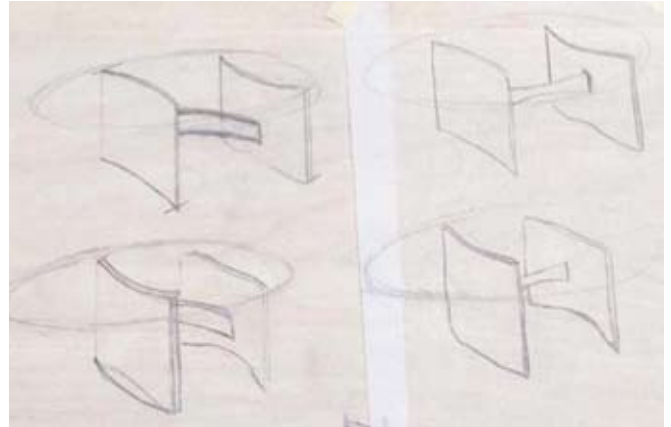
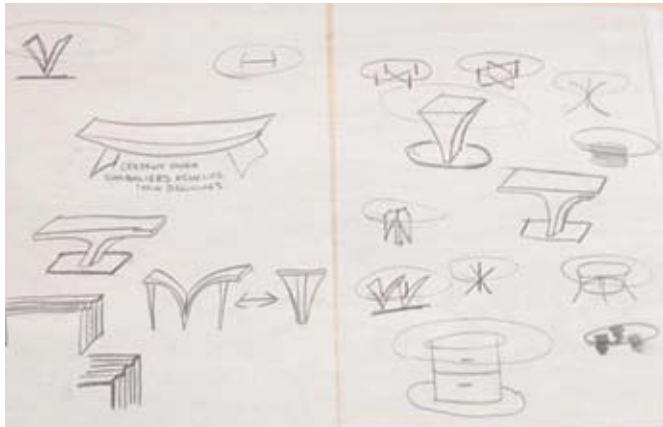
You don't have to be formally educated in design; with some basic knowledge, and practice, you can be designing your own furniture in no time. In this article, I will take you through the design process I used

for this coffee table, which I built for a recent commission.

Begin With the Obvious

The first step in the design process,

identifying what it is you want to build, might seem a bit obvious. However it's from this standpoint that the direction of your design will take shape. When the client for this project approached me, his



initial request was for a 'coffee table'. After a brief discussion we arrived at a clearer depiction of the client's needs: "I need a horizontal surface, about 17 inches off the floor to put my television remote, a magazine and my feet while relaxing on the couch". This more accurately describes the *function* that this particular coffee table will serve. In my opinion, functionality trumps form. If a coffee table doesn't do what it is intended to do, it runs the risk of becoming a more sculptural than a functional piece of furniture. When building for a client, it helps ensure that the functional requirements of the client are identified early on, and not subsequently compromised in the design process.

“ I obtain a lot of my design ideas from the existing architecture of the space that the project will live in; it's important to design your project to suit that space. ”

From Function to Form

Once you have a clear idea of the function for your project, you then need to come up with some concepts of what *forms* the project can take. To do this, I start with some very simple sketching. I always have a sketchbook with me in case an idea comes to mind. I obtain a lot of my design ideas from the existing architecture of the space that the project



will live in; it's important to design your project to suit the space it will be in. There is a lot of furniture in homes that are great pieces but don't look right because they are in the wrong space.

There are several guidelines that can make your sketching easier and more productive. When I sketch I use an artist's marker with a brush tip or a 6b pencil. Both of these mediums ensure that you won't try to put too much detail into the sketches; you want to focus on the overall form at this stage, not the details. For the coffee table in this article, I sketched four pages of simple forms that gave me plenty of ideas to choose from. At this point in the design, don't think about issues of wood type, construction details, or joinery. Focusing on any of these details will restrict your ideas to your skill level and not let you fully explore

all ideas. Design first, figure out how to build it later.

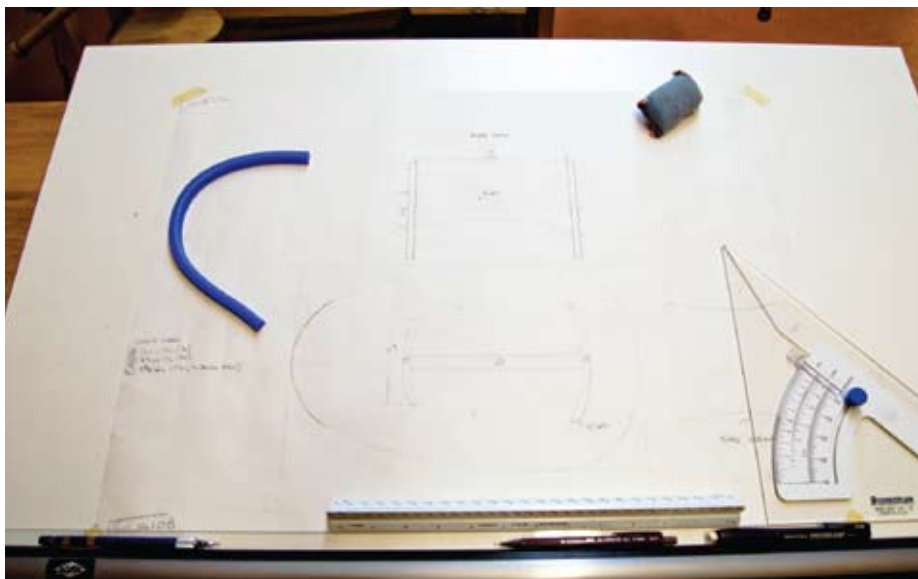
Refine the Form

Once you have a number of sketches done you can begin to narrow them down to a few that you really like. It is these few baseline sketches that you will further develop to arrive at your final design. A good way to do this is with tracing paper, which you can find at most artist supply or craft stores. Draw out different design options on sheets of tracing paper and lay the sheets over your sketch. Because tracing paper is translucent, you will be able to easily see how your ideas will affect the baseline sketch. Don't be afraid to try different things to develop your design, the only thing wasted is a small amount of paper and lead. It is during this stage that you have to learn to trust your eye. You can very easily see if something doesn't look right and change it with another drawing layered on to the baseline sketch.

Try to stay away from the shapes and sizes that are commonly used by industry. For example, $\frac{3}{4}$ " lumber is very common in production furniture so try $\frac{7}{8}$ " or $\frac{5}{8}$ " instead. Avoid the temptation to think in strict linear terms; this is the time to consider using curved elements in your design. Commercial furniture companies tend to stay away from curves because it costs more to produce. Working with these less common aspects will add some originality to your design.

From Model to Final Drawings

Once you have settled on a particular design, another helpful tool is to make a $\frac{1}{4}$ " scale model (or maquette). A model gives you an invaluable look at what the



final construction will look like. I tend to use 1/4" scale for my models because it allows me to visualize them at a reasonable size while still getting a good idea of their overall form. I usually use an architect's scale to measure things out for the model. You can make models using cardboard and styrofoam or scrap wood. Use a felt tip pen to draw features like exposed joinery, drawers and doors.

Having a 1/4" scale model also makes it easier to make full size drawings. I only make full scale drawings for details like joinery, edge profiles and curved elements, such as aprons. These full size drawings make layout of the joints much easier. When dealing with compound angle joinery, a drawing allows you to accurately measure the angles on paper and transfer them to machines or jigs.

Careful Selection of Lumber

Now you have taken a concept, developed it into a refined sketch, and made a model and detailed drawings. The next step is lumber. I usually make a cut list for a few reasons. A cut list allows me to figure out how much lumber I will need. It also allows me to work out the types of materials that I need (i.e. plywood, veneer or solid wood). Most importantly, a cut list provides an accurate shopping list when you head to your local wood store. I generally add an extra 30 to 50% to my lumber list to allow for extra material for machine set ups or to replace a piece that may have hidden checking or internal flaws. As well, if you botch a part (it happens to us all) you'll have extra material to get you through.

As for the lumber itself, there is plenty to consider. The first thing I look for is colour. I don't like to use stains or dyes on wood, so I pick wood that is in the colour



palette that I need. Some woods are quite homogenous in regards to their grain, like mahogany, while woods like zebrawood and oak have very strong grain lines and patterns. Wood selection can make or break a project so choose carefully. Again trust your eye. If the wood colour or grain is loud and outrageous then you should probably use it sparingly.

Before you start constructing your project in the shop, you should 'build it' on paper. I always make a list that outlines, in detail, the order of operations for the project. The benefit to doing this is twofold. First, having all the build steps laid out helps you to determine what steps come in which order. For example, if you're going to use a tapered leg you should cut the joinery in the leg first before cutting the taper so that you're mortising a square piece instead of a tapered one. Second, an order of operations allows you to discover any build problems before you're cutting into wood. The list will also keep you on track if you have to leave the project for a period of time or if you're having trouble staying focused.

Now it is just a matter of following your order of operations, going through the steps and completing the project. This is when

you decide on the construction techniques you will use and the jigs you will need to make. All through this process, I haven't thought very much about how I'm going to build what I've designed. Chances are I won't know exactly how to build what I've drawn. If I can't figure it out, I turn to years of documented woodworking techniques. There are many books and articles available in bookstores, libraries or on the web. One of my favourites is "The Encyclopaedia of Furniture Making" by Ernest Joyce. This is an excellent reference that I turn to often when I can't figure something out for myself.

Building a piece of furniture that you have designed yourself is a gratifying journey. Going through the process isn't difficult as long as you go through the same steps every time. I follow these steps entirely when I design and build a piece of commissioned furniture. With some practice, you will soon experience the joy of seeing your uniquely designed project move from concept to completion.



VIC TESOLIN
www.victesolin.ca

RESOURCES

Design Options: 3D Models,
June/July '08, Issue #54

Project Design: The Golden Rectangle,
Dec./Jan '07, Issue #45

Design Review: Telephone Table,
Dec./Jan '06, Issue #39

Furniture Design: Wine Cabinet,
Feb./Mar '05, Issue #34

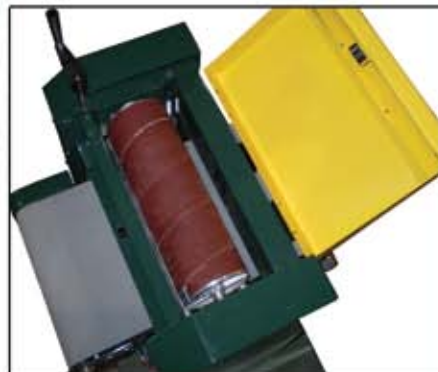




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Maple Knife Block



This handy knife block keeps your knives organized, sharp and at hand. My wife and I both enjoy home cooked meals and have acquired all manner of utensils to help us in the kitchen. At the heart of every kitchen is a collection of knives, and if like me, you prefer the heft and balance of a fine kitchen knife, you'll also want to protect your investment by keeping your collection in a custom made knife block. I still use the same professional Henckel knives that I bought more than 20 years ago, but the knife block has seen better days. When I recently picked up a new DMT ceramic hone (see sidebar) and found it would not fit in the slot the old sharpening steel had occupied, I decided that a new knife block was in order.

The spacing I've used for the knife slots will accommodate a common range of knives. If you are building your block for a specific set of knives, adjust the placement of the grooves to suit the knives you have. If you are unsure of the spacing, experiment using some styrofoam to be sure that there is adequate clearance around the handles.

This is an easy project, consisting of a couple of glue-ups, shaping the two pieces

and then the assembly. Select a dense, tight grained hardwood such as maple, beech, hickory or birch, while avoiding woods like yew, cocobolo or black locust, that are considered toxic.

Both of the main pieces for the knife block are laminated from thinner stock. While you could make this out of a solid block of maple, structurally it would not be a good idea. As the solid wood moves from one season to another, it would deform more than a version glued up from thinner stock. Also, as you work with a solid piece of material five inches thick, there is a good chance that the piece will not be equally dry all the way through. Exposing the inner core with its higher moisture content as you cut the knife slots will allow the interior to begin drying unevenly, which would also lead to deformation.

If you have a board with some defects, lay out your pieces so that the defects are hidden inside the glue-up. You only need perfect boards on the top and bottom of the stack for the main block and one on the front of the wedge block. The edges need to be clear of defects on all pieces.

- Using your jointer and thickness planer,

mill sufficient lumber to make up two blocks, one for the main block (A) about 6" x 6" x 12" to 14" long, and the other for the wedge block (B) about 4" x 5" x 12" to 14" long. I used eight ¾" thick pieces for the main block and seven pieces for the wedge block. Ensure that each piece is flat and square. You want these pieces to be at least 12" long to safely run through the planer. As well, any snipe from the jointer or thickness planer will be cut off when you trim the block to final size.

- Apply a waterproof glue (elmersrebuild.com, gorillaglu.com) to the pieces and then use a putty knife to spread it evenly over the surface, paying particular attention to the center of the pieces, where you don't want the glue to pool up. Be careful when applying the clamps – the pieces will tend to slip sideways as the clamps are tightened. Be sure to use enough clamps to allow you to apply sufficient pressure, evenly distributed over the surface. Once you have glued up the blank for the wedge and the main body set them aside to dry.

- Mill the stock to size for the keepers (C, D) while the glue cures.

- Once the glue is dry, unclamp the blocks and scrape off any glue squeeze-out. Mill the blocks to their final thickness and

width. Joint one side of the block and then thickness plane the opposite side to the final width. Repeat this on the other two sides.

- Use a cross cut sled on the table saw to square off one end of the main block, and then trim the other end of the block to final length. Set the table saw blade height to just over half the block thickness (2 3/8" for the main block and 1 3/8" for the wedge block). Check to ensure that the blade is exactly 90° to the table; the height of the blade will magnify any setting that is out of square. Make the cut in two passes, one from each side of the block.

- While you can cut the bevel on the wedge block on the table saw, it's safer to cut it on the bandsaw. A 3 or 4 tpi (tooth per inch) bandsaw blade works well for this cut. Fasten a scrap of 3/4" plywood on the mitre gauge from your table saw, set it to 45° and use it on the bandsaw to make the bevel cut. Feed both pieces at a slow rate to insure the blade tracks in a straight line and doesn't produce a barrel cut.

- Install a 45° chamfer bit in a router table and rout a chamfer with a 3/8" wide face on all edges of the main block. If you cut the slots before doing this your router bit will chip out as it enters every knife cut, and you can't fix it at that stage. Rout the front two edges of the wedge as well.

- Replace the chamfer bit with a 3/8" spiral bit and rout a dado, 3/8" in from the edge, across the leading lower edge of the front of the main block for the recessed keeper (C).

- Mark the locations for the slots on the top of the block and use a full kerf blade in the table saw to cut the knife slots. The knife slots are 3/16" wide. Make one pass to create a 1/8" wide slot and then move the fence over 1/16" to make another cut. The depth of the cuts will depend on the size of knives you have. If you are cutting a slot for a sharpening steel, make several passes with a regular saw blade

or use a dado set. If you want the bottom of the slot rounded, use a fluting bit on a router table. Make incremental cuts until

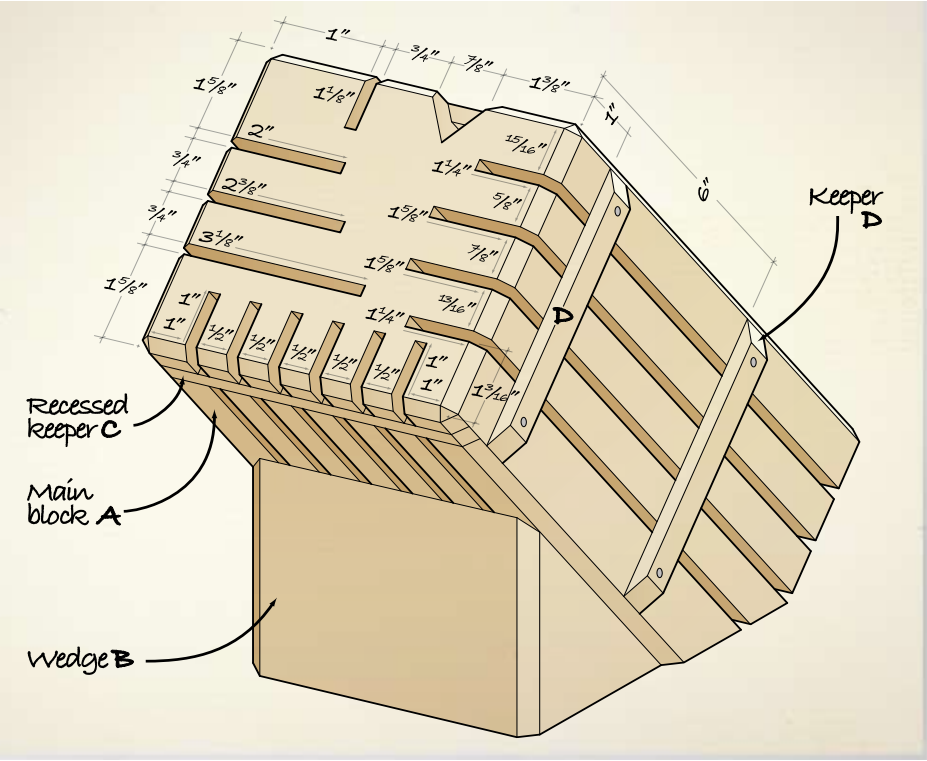
you have sufficient space for the steel. The DMT hone required a triangular slot, which I cut on the table saw.

The DMT Ceramic Hone

Most woodworkers are familiar with the range of fine sharpening products DMT makes for the workshop (dmtsharp.com). Their diamond and ceramic triangle sharpener (#CDT62) brings the same impressive sharpening technology into the kitchen to give you a perfect edge when preparing your feasts. The triangle sharpener gives you three flat faces, each with different grits for sharpening. There is a coarse diamond surface to transform a dull edge, a fine diamond surface to give you a razor sharp edge, and the ceramic surface for a finely polished surface. This sharpener works dry or with water, and only requires a few short strokes. The three corners are each of a different radius for sharpening your serrated and folding knives. Simply hold the sharpener with one hand and place the knife edge on the surface of choice at a 20° angle and draw the edge along the sharpener as you move it down the length of the sharpener. A couple of strokes on the three grades are all that it takes to put a razor sharp edge on a dull knife in less than two minutes.



MATERIALS LIST (All measurements in inches)					
Part		Qty	T	W	L
A	Main block	1	5 1/4	5 1/4	11 1/4
B	Wedge	1	3 1/2	4 3/4	5
C	Recessed keeper	1	1/4	3/8	5 3/8
D	Keepers	6	3/8	5/8	5



- Glue the recessed keeper into its dado and apply a couple of clamps. When the glue has set, use a chisel or block plane to bevel the edges to match the main block. Get it close, but leave the final cleanup for the sander.

- Sand all surfaces through to 150 grit in preparation for finishing. When both

When it comes to food related projects, allergies are a very real concern for many people. Nut allergies can be among the worst and can be life threatening for those affected. For this reason I recommend avoiding all nut woods (such as walnut or pecan) when making this project. Also, be aware that some finishes contain nut oils as part of the product formulation. I was intrigued when I noted that the NaturOil specifically mentioned that it contained no peanut oils. As my wife has extreme nut allergies I contacted Eric Chaimberg at Swing Paints and he was able to confirm that there are no nut oils of any kind in NaturOil and that it is completely safe for those with nut allergies.

blocks have been sanded, mix up some five-minute epoxy (elmersrebuilt.com) and glue the wedge to the base of the main block. Hold it in place for about five minutes or until the epoxy hardens.

- Give the knife block a couple of generous coats of Circa 1850 NaturOil (circa1850.com) before moving on. Use cheesecloth wrapped around a large kitchen knife to work the finish into the knife slots.

- Use a mitre sled on the table saw to cut the remaining keepers (D) to length and mitre the ends to match the chamfer on the main block. Give each of the pieces a couple of generous coats of the finish as well. Fasten them to the main block using 1" brass nails.

Drill a clearance hole in the keeper otherwise they will split as the nail is driven through them.

- Maintain the look of the knife block by wiping it with a fresh coat of NaturOil every month or so as needed.

Now all that's left to do is slip your knives in



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MICHAEL KAMPEN
mkampen@canadianwoodworking.com





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English

Garden Bench

This classic English style garden bench is a great introduction to basic mortise and tenon construction and a comfortable addition to any deck or garden.

I selected white oak (*Quercus alba*) for this project because it is a hard, fairly straight grained wood with outstanding wear resistance and good decay resistance. It machines well, and is easy to stain and finish with no need to fill the pores. Besides, it's a classic wood with a great pedigree, being the preferred choice for Craftsman style furniture. Other good woods for outdoor furniture include redwood, western red, eastern white cedar or one of the popular exotic species such as ipe, meranti, or teak.

All the tenons on this bench are straight and fairly uncomplicated to cut, except for the tenons on the arms (I), which have angled shoulders, and the double tenon on the center seat support (D), which is angled down. These tenons require careful setup and some handwork, but are certainly within the scope of the woodworker with average woodworking skills. All of the mortises are straight and are router-cut except for the two mortises in the back legs (A) that accept the arms. The easiest way to cut the tenons is on a table saw equipped with a tenoning jig (see Resources, below). The mortises were cut using a plunge router equipped with an adjustable straight edge guide and a $\frac{1}{2}$ " spiral cutter. Other methods of cutting mortises abound but this method is ideal for a small shop, requiring very little investment. If you haven't made a mortise and tenon joint before, or it's been a while since you last used this joinery option, I suggest you cut a few practice joints before committing to this project.

It's convenient to mill all the lumber for this project up front. Mill them slightly oversized and then dress them to finished dimensions as you build the project. When you set the pieces aside ensure that you sticker them to allow for adequate air flow. Most of the pieces are $1\frac{1}{4}$ " thick, which I milled from $\frac{6}{4}$ ($1\frac{1}{2}$ ") stock. I couldn't find any $\frac{8}{8}$ (2") stock for the legs, so I laminated two pieces of the $\frac{6}{4}$ stock together. On the materials list you'll note that I allowed extra length for the tenons. Except for the back slats (J), the arms (I) and the center rail (D), all the tenons are $\frac{7}{8}$ ", and the corresponding mortises are 1" deep. This leaves a bit of space for any excess glue. Finally, it's critical to ensure that all the boards are milled square and to the exact same thickness.

Shape the Back Legs

The back legs (A) are joined by scarf joints cut on a tapering jig. Start with stock about 38" long. Measure down $18\frac{5}{8}$ " on the front side of the legs and place a pencil mark. Clamp a leg on the taper jig at 10° to the blade, and cut off the bottom of the leg. Repeat this for the other leg, and then glue the cut off pieces to the opposite sides of the legs to form the bent back legs of the bench. Use a good quality polyurethane glue (www.elmersrebuilt.com), epoxy (indform.com) or high strength wood glue (www.gorillaglu.com). Don't skimp on the glue and use plenty of clamps. You'll also want to ensure that the pieces don't slip out of

alignment as you apply clamping pressure. After the glue is dry, scrape off any exposed glue, and then joint the front and side faces to the final dimensions.

Cut the Mortises

There are 21 mortises to cut on this bench: five on each back leg (A), three on each front leg (B), one on the front rail (G), one on each arm (I) and two in the center bracket (L). Rather than cut individual mortises on the crest rail (H) and back rail (F) to house the back slats (J), I routed a simple groove, and used filler blocks (M) to align the slats.

The mortises for the legs (A, B) and front rail (G) are cut first. Before cutting the mortises ensure that all your stock is milled to final thickness and width. To rout the mortises I used a plunge router equipped with a $\frac{1}{2}$ " spiral cutter and an edge guide. Begin by marking out all the mortises, centering them on the stock width. On the legs the mortises are $\frac{1}{2}$ " wide by 2" long and 1" deep (except the mortises for the arms). Cutting a 1" deep mortise in hard wood is tough on routers and bits, so cut in multiple passes and then square the ends of the mortises to the line using a $\frac{1}{2}$ inch chisel and mallet.

While I used a router to cut the mortises you could also use a mortiser. If you don't have access to a router, you can also cut the mortises by hand, first drilling out the waste with a $\frac{7}{16}$ " Forstner bit and then finishing with chisel and mallet.

Cut the Tenons

I cut the tenons using a tenoning jig and sliding table on a table saw. Other options include routing the tenons on a router table, or cutting them by hand with a tenon saw. First, cut the rails (E, F, G, H) and seat and center rails (C, D) to their final length. You will only cut the tenon on the front of the center rail (D) for now. Cut the shoulders first on the table saw. Clamp a stop block $\frac{7}{8}$ " from the opposite side of the blade, set the blade height to $\frac{3}{8}$ " and cut all four sides on the rails and seat supports. Set up the tenoning jig to cut the cheeks at $\frac{3}{8}$ " wide and to $\frac{7}{8}$ " deep. Careful setup of the tenoning jig is paramount here, so take your time. I always cut a test piece first to ensure that the tenons fit the mortises snugly. It's also practical to cut the tenons just a smidgen oversize and adjust them during assembly for a perfect fit. Cut the remaining end cheek cuts by hand using a crosscut saw; these cuts are not critical. Note that the tenons on the front rail (G) and the front of the seat rails (C) are mitred where they meet inside the front legs.

Shape the Crest Rail and Seat Supports

Begin with 5" wide stock for the crest rail (H), cut to finished length. Draw a layout line for the shape of the rail on the bottom edge of the stock, and then cut the shape on the bandsaw. Use the off-cut as a template to lay out the top of the stock. Cut this on the bandsaw also. Then smooth the cut lines with a hand plane, spokeshave, or sander.

On a piece of $\frac{1}{4}$ " MDF draw out the shape for the seat and center rails (C, D). Cut out the shape on the bandsaw and smooth the cut edge. Use this as a template to lay out the cut lines on the seat support stock. Cut the pieces to shape on a bandsaw. Clamp all three pieces together and smooth the shape with a hand plane or sander.

Cut the Groove for the Back Slats

The crest rail and the lower back rail are both grooved to receive the back slats (J). Rout a groove $\frac{3}{8}$ " wide and $\frac{1}{2}$ " deep. I found it easiest to rout the groove with a laminate trimmer equipped with an edge guide because it's small and square base allows the trimmer to follow the curve of the crest rail easily. The edge guide centers the cut on the stock. Take several passes at increasing depth rather than a single full depth cut.

Fitting Tenons to Mortises

Each tenon must be carefully fit to its mortise to ensure a strong joint. You will find it helpful to label each joint to ensure

correct fitting. You may have to trim the tenons very slightly with a chisel until it fits its mortise snugly; hand pressure and a little wiggling is all that is required to assemble the joint. Pare a little off both surfaces of the tenon to maintain centeredness. Check also that the cheek cuts are flush and even, and trim as required.

Cutting and Fitting the Arms

The rear of the arm (I) is mortised into the back leg with an angled tenon and mortised to the top of the front leg with a 1" square tenon. Rout a $\frac{1}{2}$ " mortise in the rear leg starting at 23 $\frac{1}{2}$ " from the bottom. The mortise is 1" long and 1 $\frac{1}{2}$ " deep. Square the ends of the mortise with a $\frac{1}{2}$ " chisel. Cut the end of the arm stock at a 10° bevel. The cheek cuts will also be cut at this angle. Cut a wedge of plywood about 10" long to use as an angle gauge. Set the fence to make the face cuts, with the first cut at 2 $\frac{1}{2}$ " and the second at 3". The top shoulder cut is square to the edge of the arm but at a 10° bevel. There is no bottom shoulder cut. Test fit the tenon to the mortise and trim as required.

Cut a 1" x 1" mortise on the front bottom side of the arm. I drilled out the waste with a $\frac{7}{8}$ " Forstner bit and then squared the mortise with chisel and mallet. Cut the matching tenon on the top of the front legs on the table saw with a tenoning jig. The

arms can now be shaped to size. Again, make a template out of $\frac{1}{4}$ " MDF to ensure a consistent shape on both arms. Ensure that the sides of the arms are flush with the sides of the rear legs.

Fit the Back Slats

Assemble the entire bench, and carefully check for square and a good fit of all frame components. Now is the time for minor adjustments as required. Disassemble and sand all components to 220 grit. You can now glue the seat rails (C) and lower rails (E) to the front and rear legs (A, B). After the glue has dried remove the clamps and assemble the rest of the bench temporarily without glue. This will enable cutting and fitting the back slats, which vary in length.

With the bench assembled, measure the length of the first two back slats (J) closest to each back leg. They should measure 11 $\frac{7}{8}$ " plus $\frac{5}{8}$ " for a $\frac{1}{16}$ " tenon on each end. Cut the four slats to length. Cut the tenons with a dado cutter in a router table and check the fit. Disassemble the bench and clamp the lower back rail to a large flat work surface, fit the four slats and add the crest rail. Clamp the crest rail to the work surface checking for square. The remaining back slats are all curved at the top and must be marked and cut individually. Starting with the middle slat, measure its location, check for square to the lower rail and scribe



Cutting the back legs



Double through mortise on center bracket



Routing groove in the crest rail



Cutting double tenons on center rail

a line for the top cut. Cut the curve on a bandsaw, place it back in position, and mark the length at the lower rail, add $\frac{5}{8}$ " and cut to length. Cut the tenons on both ends and fit. Repeat this for the rest of the slats. Cut filler pieces (M) to length to establish the spacing between the slats on the lower rail. Glue the slats into place in the lower rail adding the filler pieces as you go and keeping the slats square. Add the crest rail, gluing it to all of the slats, and installing the filler pieces. Check for square on all back slats and even spacing at the crest rail, and then clamp the assembly together.

Fit the Seat Slats

The center rail (D) has a double tenon on the end that fits into the center bracket (L). As for the tenons on the arms, these tenons are angled down at 10°, and do not have any shoulders. The matching mortises on the center bracket can be cut by hand or with a router.

Assemble the side assembly to the back assembly with the front rail (G) in place,

checking for square. Once the glue has dried, position the center rail (D) in place, gluing and screwing the center bracket (L) to the middle underside of the back rail (F). Cut the seat slats (K) to length. Drill and countersink the seat slats into place, and then cover the screws with plugs. You will need to trim the front one so that it fits between the front legs.

Finishing

Before applying a finish, do a final finish sanding of all surfaces with 220 grit sandpaper. If you did the bulk of your sanding before assembly, this will be a quick job. Check carefully for glue and clamp marks. Spray the bench with water and allow it to dry completely. This will raise the grain for a final sanding with 220 grit. Now is the time to apply an optional stain. Choose a good quality oil-based exterior fence and deck stain (circa1850.com) and apply three coats liberally with a brush, watching for drips as you go. Sand lightly between coats and allow the bench to dry for 48 hours before placing it outside. A well-constructed and carefully finished

bench will last a long time. To prolong its life, store it indoors during the winter, particularly in harsh winter climates. You might also consider a cover which will help reduce the impact of UV rays.

After you've completed this project you'll want to place the bench in a nice shady area in the back yard, stoke up the barbeque, and invite your mates over for a bit of well deserved gloating.

STEVE MORRIS
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SUPPLY CHECKLIST

- 25 BF of 6/4 lumber, 6" to 8" wide

RESOURCES

The Well Dressed Board,
Feb/Mar '08, Issue # 52
Tenoning Jig,
Apr/May '07, Issue #47



Fitting center rail to center bracket



Ready to cut shoulders on tenons



Template for arm



First cut to make arm tenon



Second cut to complete arm tenon



Gluing up side assembly



Test fit side and back assemblies



Front rail and center bracket installed

MATERIALS LIST (All measurements in inches)					
Part		Qty	T	W	L
A	Legs, rear	2	2	2	34 ½
B	Legs, front	2	2	2	24 ½ ¹
C	Rails, seat	2	1¼	2 ½	16 ⅜ ²
D	Rail, center	1	1¼	2 ½	17 ³
E	Rails, lower	2	1¼	2 ½	16 ⅜ ²
F	Rail, back	1	1¼	2 ½	48 ½ ²
G	Rail, front	1	1¼	2 ½	48 ½ ²
H	Rail, crest	1	1¼	3	48 ½ ²
I	Arms	2	1¼	4 ¾	21 ¹
J	Slats, back	15	⅝	1¼	14 ½ ⁴
K	Slats, seat	9	⅞	1⅜	50 ½ ⁵
L	Center bracket	1	1¼	3 ¼	1 ¹
M	Filler strips	28	⅝ ₁₆	⅝	cut to suit spacing

⁵ The slat that butts against the front legs will be trimmed to fit



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A red and white tricycle with a seat and handlebars. The frame is white, and the wheels, seat, and handlebar grips are red. It has a small bell on the handlebars and a kickstand.

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Part 2 Chess Set

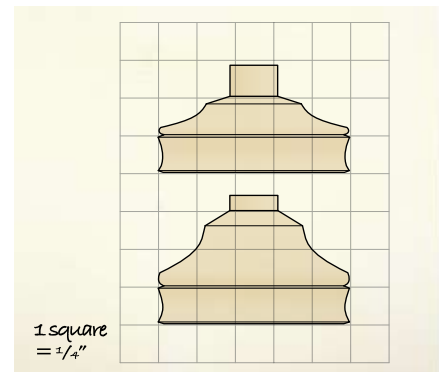
Last issue, Bruce talked about using traditional ring turning to make the heads of the knights. Now he turns to the bases for all the chess pieces.

First, let's take a moment to get familiar with the profiles we are about to turn. There are only two profiles for the bases in this project, each made up of several parts. The lower section has a $\frac{1}{4}$ " high column with slightly concaved sides, a chamfer at the bottom and a shallow 'V' at the top. On top of this sits a bead flowing into a half-cove finished off by a cone on top. The upper section is $\frac{1}{8}$ " high for major pieces and $\frac{1}{4}$ " for pawns. So, overall, the bases are $\frac{3}{4}$ " high for major pieces and $\frac{1}{2}$ " high for pawns.

Recall that we are using 1 $\frac{1}{2}$ " square stock and have 40 linear inches of each type of wood – 80" in total. Mount a 3" length of stock in your lathe. I leave the wood square and use a 4-jaw chuck with spigot jaws. This allows me to grip a lot of wood, or as little as $\frac{1}{4}$ ", ensuring a solid grip. This significantly reduces waste. Begin by roughing the piece down to 1 $\frac{1}{4}$ " in diameter. Trim the end square

and chamfer the corner very slightly. Then, cut a shallow 'V' $\frac{1}{4}$ " from the end. Using a parting tool make a cut $\frac{5}{8}$ " from the end until the remaining timber is $\frac{7}{8}$ " in diameter.

Many chess sets have felt on the bottom but I prefer to turn and decorate them with a chatter tool instead. Imagine a clock face on the bottom and run the flat edge of a



Base style for King and Queen (top) and other pieces (bottom)

chatter tool from center outward toward eight o'clock stopping just before the edge. Be sure to keep the whole face of the cutter in contact with the surface. This will cut a beautiful sunburst pattern. Then use a point tool (or a skew on its side) to cut a ring on the edge of the chatter work to give it a nice frame. This step only takes a few seconds and really adds to the quality of the pieces.

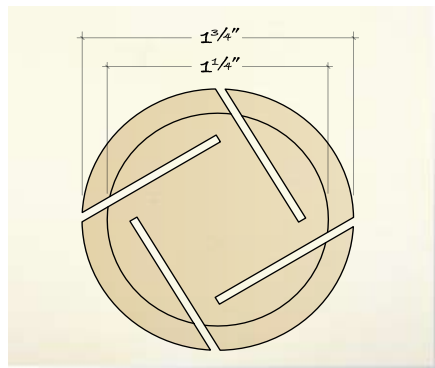
Cut a shallow cove between the bottom chamfer and the 'V' and turn the left side of the 'V' into a small bead (about $\frac{1}{16}$ " wide). Cut a cove that connects smoothly out of that bead and connects to the $\frac{7}{8}$ " part you made earlier. Move $\frac{1}{8}$ " to the left and part down again to form a tang with a diameter of $\frac{5}{8}$ ". Then cut a straight bevel from the end of the cove to the tang.

The base is now shaped properly and can be sanded. If you are using boxwood or blackwood and have made good cuts you will probably be able to start with 220 or 320 grit paper. Smooth out the coves but be careful not to sand out the sharp corners. They look much better when they remain sharp. Sand to 600 or 1200 grit and then finish with your favourite friction polish. I stay away from carnauba-based finishes, as they do not tolerate moisture very well. Try a synthetic-based polish instead.

Finally, part down from the left side of the bevel until there is only about $\frac{3}{32}$ " left and then part it completely off leaving a small post on the top. To finish the knight, drill a small hole in the bottom of the head and glue it on to the base using epoxy or carpenter's glue. The knights are done!

Turning the Rest of the Pieces

The knights were made up of two pieces. The rest of the chess pieces are each turned from one piece of wood. There are 28 more pieces to make – 2 kings, 2 queens, 4 bishops, 4 rooks, and 16 pawns. This can seem to be a daunting task but there are techniques to make it easier.



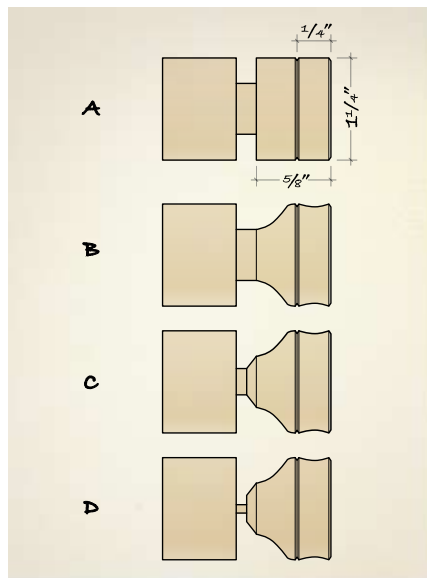
Collet plugs

Don't worry if common pieces are slightly different. Strive to make them exact but accept that variations in materials and your technique will make them differ, and this can add considerable charm to the set. Before turning the remaining pieces make yourself a set of story sticks. These are simple layout gauges that allow you to quickly and accurately mark where you need to cut on each piece. Make five of these story sticks from thin, stiff material such as plastic, veneer, or heavy paper.

Make two full size photocopies of the scale diagram of the pieces. Cut the photocopy templates out from one sheet and carefully cut them in half vertically. Glue each left side half to a story stick being sure to locate the bottom of the piece even with the stop on the right of the story stick. Using the second photocopy template and a good pair of calipers, measure all the different diameters of each piece and write them on the story stick for that piece. For example, where the base of the pawn meets the upper part, the diameter is $\frac{7}{16}$ " and the collar and the head are $\frac{1}{2}$ ".

Using the Story Sticks

Mount a piece of wood long enough for one of the chess pieces. Turn it to the correct diameter ($1\frac{5}{16}$ " for the king and queen, and $1\frac{1}{4}$ " for all other pieces) and finish the bottom as described earlier. Adjust the tool rest so it is at center and close to the wood, and while the lathe is running, lay the appropriate story stick on the tool rest and slide it to the left until the stop lightly brushes on the end of the wood. Using a pencil, mark all the appropriate lines from the story stick onto the wood. Now all the lengths you need are on the wood and you can read the diameter at any point off the story stick.



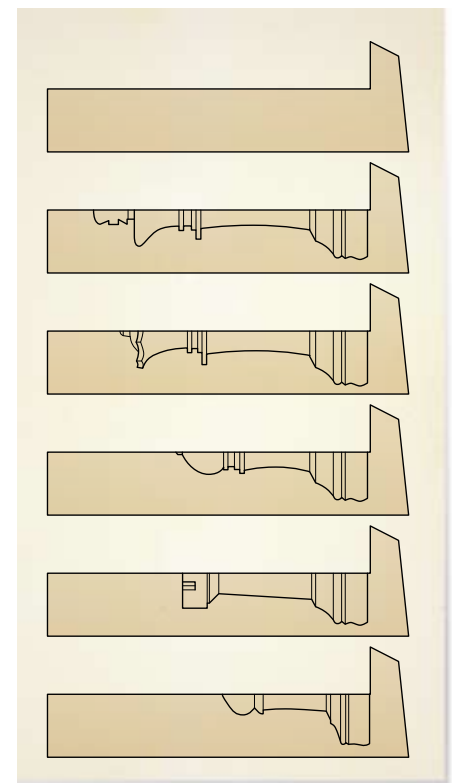
Turning the bases



Start from the right and work left (from the bottom of the piece to the top). Turn the base first. Move left (up) to the next mark and cut down to the right diameter. Then shape the piece up to that part. Continue up until you reach the top but leave enough material so you can sand and finish the piece before you part it off.

Finishing the Tops

With practice you can get nearly the whole piece finished leaving only a small piece of wood holding it to the lathe. But, of course you can't do it all – the very top is left unfinished. For the king, queen and rook we need to do even more shaping. In order to finish the tops we need to re-chuck each piece from the bottom in a way that will not mark it. To do this we need a collet chuck.



Story sticks

If you have a commercial collet chuck with the right size collets you are in luck; but if you are like most of us, you do not have this expensive and rarely used equipment. However, you can easily make a collet plug using your 4-jaw chuck. Well, actually, you need to make two – one for the kings and queens (at 1 $\frac{1}{16}$ "") and one for the rest (at 1 $\frac{1}{4}$ "").

Start by turning a piece of medium-density hardwood down to 1 $\frac{1}{4}$ " diameter and square off the face. Cut a clean, vertical recess in the end $\frac{1}{4}$ " deep by 1 $\frac{1}{4}$ " in diameter. Part this off about 1" long being careful to make a clean part on the back. Now, take this to your bandsaw and make four cuts in the piece.

Put this plug into your 4-jaw scroll chuck and align it so that it is squeezed smaller as you tighten the chuck. Place one of your pieces base-first into the plug and gently tighten the chuck. You will feel the plug squeeze the piece and hold it firmly. It may take some adjusting to get the piece centered but you will then be able to finish the tops of the pawns and bishops.

The kings, queens and rooks need special attention, so in the next issue Bruce will explain how to finish them. He will also share some delightful variations to this project.



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Illustration: Marcus Cutler

Yellowknife

The capital of the Northwest Territories, Yellowknife, is home to about half the territory's population of 40,000.

It is located on the north shore of ancient Great Slave Lake near the outlet of the Yellowknife River. While originally settled by First Nations people, the town grew in response to natural resource exploration and extraction. The NWT is home to some of Canada's largest rivers and biggest lakes as well as the great Mackenzie Valley. As with its cousin to the west, the Yukon,

the NWT exists within the boreal forest ecosystem. The official tree of the NWT is the Tamarack Larch, a small to medium size deciduous coniferous tree (it has needle-like leaves which it sheds in the fall.) reaching about 60' in height with a trunk of about 2' in diameter. It is used for posts, poles and firewood.

The shield at the top of our pattern is from the territorial coat of arms. The wavy line at the top, which should be blue, represents water, while the white above and below the wave represents ice and snow. The bottom left part of the shield shows gold squares on a green background (standing for the

mineral and forest resources of the south part of the NWT), while the right part shows a fox on a red background (the fur resources of the northern tundra).

Scroll cutting tips

Photo-enlarge the pattern to the size you want. Cover your substrate (such as 1/4" Baltic birch ply) with masking tape, and then spray-glue the pattern to the substrate. Using a #5 13 tpi blade, cut out the shaded areas on the template. Start cutting out the smallest areas first, moving on to the next larger areas. Once the pattern is cut out, remove the masking tape, lightly sand as required, and then apply your finish.



Vessels and photo by Ken Wiancko

Make Your Own Polish

Woodworkers, particularly novices, are often perplexed trying to find a suitable polish among the many offered for sale. Making your own polish isn't difficult; in this article I'll show you how to do it.

A simple recipe has been developed for a polish that you can make in unlimited and relatively inexpensive quantities, that's easy and quick to apply, provides a one-coat seal and finish, has a minimal drying time, and gives a soft glow to a high gloss depending on the buffing speed used.

I've tried more than 30 home brewed combinations of materials in my shop using mineral oil, tung oil, citrus thinner and turpentine as carriers. Some of the combinations that have proved successful are described below. I use the mixture that includes beeswax, carnauba wax, Damar varnish, and turpentine on my wax

finished wood turnings. The first three ingredients of this mixture are used in the food industry. Even though the amount of turpentine in this mixture is very small, for pieces with food applications you should substitute citrus thinner or orange solvent for the turpentine. If you do this you will need to use more of the solvent to dissolve the solids. Reducing the amount of solvent will create a paste, while increasing it makes liquid wax.

Brewing the Finish

Brewing your own polish takes some experimentation, but the results can be well worth the time and effort. Here are

some tips to make your home brewing experience easier.

- In the best interests of matrimonial harmony, buy a hot plate, a couple of cheap glass or steel pots to cook the finish in, and some glass jars to store the finish in. Also brew in your shop, not the kitchen.
- Even though brewing this wax finish is less offensive than painting a room with latex paint, it's best to brew your finish in a ventilated space.
- You need a double boiler – the pot containing the wax (the 'melting pot') should sit in another pot with water in it. Use just enough water so the melting pot,

with ingredients, doesn't float. Then place both pots on the hot plate.

- Combine all the ingredients into the melting pot by weight (I use an old postage meter).
- Bring water to a *low* boil, stirring ingredients occasionally to prevent sticking. The melting point for beeswax is 64°C (147°F), for carnauba wax 84°C (183°F) and for Damar varnish 120°C (240°F). You don't need to boil the turpentine as the moderate heat from the water will dissolve the solids. The solids will dissolve in about 1/2 hour.
- Pour the wax mixture into glass or metal containers to cool. As a safety precaution wear gloves, and be careful to avoid spilling the mixture on the heating elements. You'll also want to keep a fire extinguisher nearby, just in case.

The finished product shrinks as it cools, leaving a depression in the top of the

wax. The mixture weights given below for various 'home brews' will produce near equivalent weights of wax polish. Larger amounts are just as easily made by increasing the ingredient weights proportionally. It keeps well in a closed jar and if it hardens, simply re-melt the wax and add a dash of turpentine.

Using the Brew

The steps I outline below are based on my experience applying wax to wood turnings. If you are applying the wax to a piece of furniture you will have to buff by hand, or with an electric polisher; it's a good idea to use nitrile gloves (leevalley.com) when applying the wax to prevent mucking up your cuticles.

- Apply the wax thinly to the turned stationary piece - long way to the grain on spindle pieces and circularly to face plate work. Spin slowly until the surface

feels tacky to the gloved hand, then increase lathe speed for buffing with a soft paper towel.

- This mixture will close up wood pores, though you can add a little solvent compatible dye for use on dark woods if you wish.
- The wax also helps hide sanding marks. I find that the wax rarely streaks, and after setting for a day the depth of finish can be accentuated using a three wheel buffing system.
- A marked piece can often be repaired by a smear of the wax to the area and re-buffing.

Remember the old turning adage: Put the shine on your finished piece before shining with wax. Sand to 220 or 400 grit with alternate power and hand sanding before using your home brew. Polish at about 1000 RPM to give a soft matte finish. Progressively sanding up to 2000 grit (I use automotive body work sandpaper) with a single application of the brew and then buffing at 3000 RPM lathe speed results in a rich, gloss finish.

High lathe speed finishes using this mixture can be handled almost immediately without fear of finger marks. The finish sets in an hour or two and is odourless in two or three days. Slow speed or hand polished pieces will take a little longer to cure. This wax is equally effective for flat-work polish, working about a square foot at a time. You can sign your piece over this wax with a Lumicolor® pen.



KEN WIANCKO
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RECIPES FOR HOME BREW POLISHES

	Bees Wax	Carnauba Wax	Damar Wax	Turpentine	Mineral Oil
Soft gel, salad bowl dressing, matte, marks easily	30				90
Paste, sets with high speed buffing, soft finish	30		60		
Gel, high polish, accentuates sanding marks		10	60		
Paste, easy to apply, produces quite a hard finish	10	10		60	
Gel, easy to use, produces a hard, resistant finish	12	12	12	96	

Notes: All measurements are in grams. Ingredients can be found at craft stores and hardware stores.

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When I bought my first house I knew there was going to be some work to do. The front entrance looked a bit boring. Because it's such a prominent feature of the house I decided a front door surround would be a quick and effective way to improve the look of the house, while requiring minimal work on my part.

Take a Walk

Like most projects - all projects, come to think of it - a bit of planning will help keep you on track, and material waste to a minimum. Since the front door is often the focal point of a home, it's not a bad idea to do a little research into the different styles of door surrounds before making your final choice. I found that looking at different types of door surrounds was the best way to get a sense of what my options were. While old banks, courthouses and office buildings usually have beautiful, elaborate entrances, I found the most appropriate examples were on homes in the older areas of town. By driving or walking around these old neighbourhoods you will see a wide array of beautiful surrounds and be able to get a good visual idea of some different options. Remember to keep in mind the scale and style of your own home when doing this and keep the design compatible. If you find a design you really like and are unsure of the specific dimensions, I suggest you knock on the door and ask the homeowner if you could take a few photographs and make a sketch with some key measurements. They'll likely enjoy the compliment.

Overall proportion and size are the main elements to consider in the design process. What looks good on another house in your neighbourhood might not look great on your home. If you're really unsure about the overall size, make a full-scale model. Take a sheet of $\frac{1}{8}$ " masonite, cut it to fit around your door, trim to the outside dimensions, draw some details on the masonite with a heavy marker and put it in place. Any size or proportion issues should be visible at this stage, and you'll be able to fine tune the design so that it looks right.

Some Background

According to classical architecture, the basic design of a door surround, or entrance way, has fluted columns on either side of the door supporting a group of architectural elements (the entablature), over the top of the doorway. The entablature is further broken down into three sections: the architrave, the frieze and the cornice. The architrave (or top trim) is the lowest section and sits directly on top of the columns. It usually consists of simple mouldings. The frieze (or head board) is the middle section and is often kept fairly flat but may have some carving or relief applied to it. The cornice (or crown) is the top section and contains the projecting part of the entablature. This is where the term 'cornice moulding' comes from. It's not overly important to pay close attention to this formula, but hopefully with a bit of background information

Door Surrounds

If you are a woodworker with an average skill set, you'll find this is an easy weekend project that will not only add curb appeal to your home, but enhance its market value. And it doesn't have to break the bank - the materials cost under \$100.

you can start to pick out different types of architecture and understand a bit about the process of designing a surround for your door.

The step-by-step details of my installation may not include everything you want or need for your surround. You may have to make some changes to complete your design.

Material Selection

As with all outdoor projects, you can't go wrong with cedar. It has excellent decay resistance and takes stain and finish very well. Woods like Black Cherry and White Oak are also quite decay resistant and will look great painted or stained. However, no matter what kind of wood or finish you use, you will need to maintain the finish on a regular basis to protect the wood from rotting.

To cover large flat areas, exterior plywood is a good choice – it's very stable and easy to work with. When attaching the surround to the frame of your home, make sure you use galvanized nails and exterior screws. There will be fewer problems down the road with mineral streaking, and there will be less chance of these fasteners coming loose due to corrosion.

For this surround I used $\frac{3}{4}$ " lumber for the columns, frieze and applied base, and $\frac{1}{2}$ " stock for the architrave. Rather than mill the cornice I purchased a length of crown moulding from my local building supply centre.

Vertical Columns First

Since I have a fairly simple home, I designed a door surround accordingly – simple details with a medium overall size. I went with a flat, fluted column on either

side of the door and a straight forward entablature above the door. At the bottom of each column there is an applied base, for aesthetic reasons only.

There are two vertical fluted columns on either side of the door. The height of the columns should be the same as the distance from the underside of the door opening to the ground.

On a router table set up a vertical panel raising bit to produce the three column flutes. You could also use a dish cutting or straight bit. When fluting columns I like to machine at least three flutes per column and usually mill an odd number of flutes for balance. To facilitate routing, draw lines on the backs of the columns to show where the flutes start and stop, along with lines on the router table fence that show where the bit is cutting. Before routing use a dado blade to remove some of the material. It's best to take slow passes to finish the flutes. Using the dado blades to remove much of the material makes for a safer, smoother cut on the router table. Begin by machining the middle flute of each column, then move the fence and machine the flutes on either side. Stop routing the fluting 4" from the top of each column and 10" from the bottom. An applied base enhances the bottom of the columns. For these I milled stock 5" high and $\frac{1}{4}$ " narrower than the vertical columns, and then routed a bevel on the top and front edge of both pieces. You can vary the height to suit the look you want to achieve.

Then the Entablature

To determine the length of the frieze, add the width of the door opening, the width of each of the columns, and two $\frac{1}{2}$ " reveals. For my surround it came to 49 $\frac{1}{2}$ ". For the architrave, mill a $\frac{1}{2}$ " thick by 1 $\frac{1}{4}$ " wide



Original door frame

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half-round moulding. When attached to the bottom of the frieze it provides a simple transition between the columns and the upper section. Cut the architrave $\frac{3}{4}$ " longer than the center section and then machine the same half-round profile on both ends. Once cut to its final width, spread waterproof glue, such as Elmer's E741 (elmersrebuilt.com) on the face and clamp it to the bottom edge of the frieze.

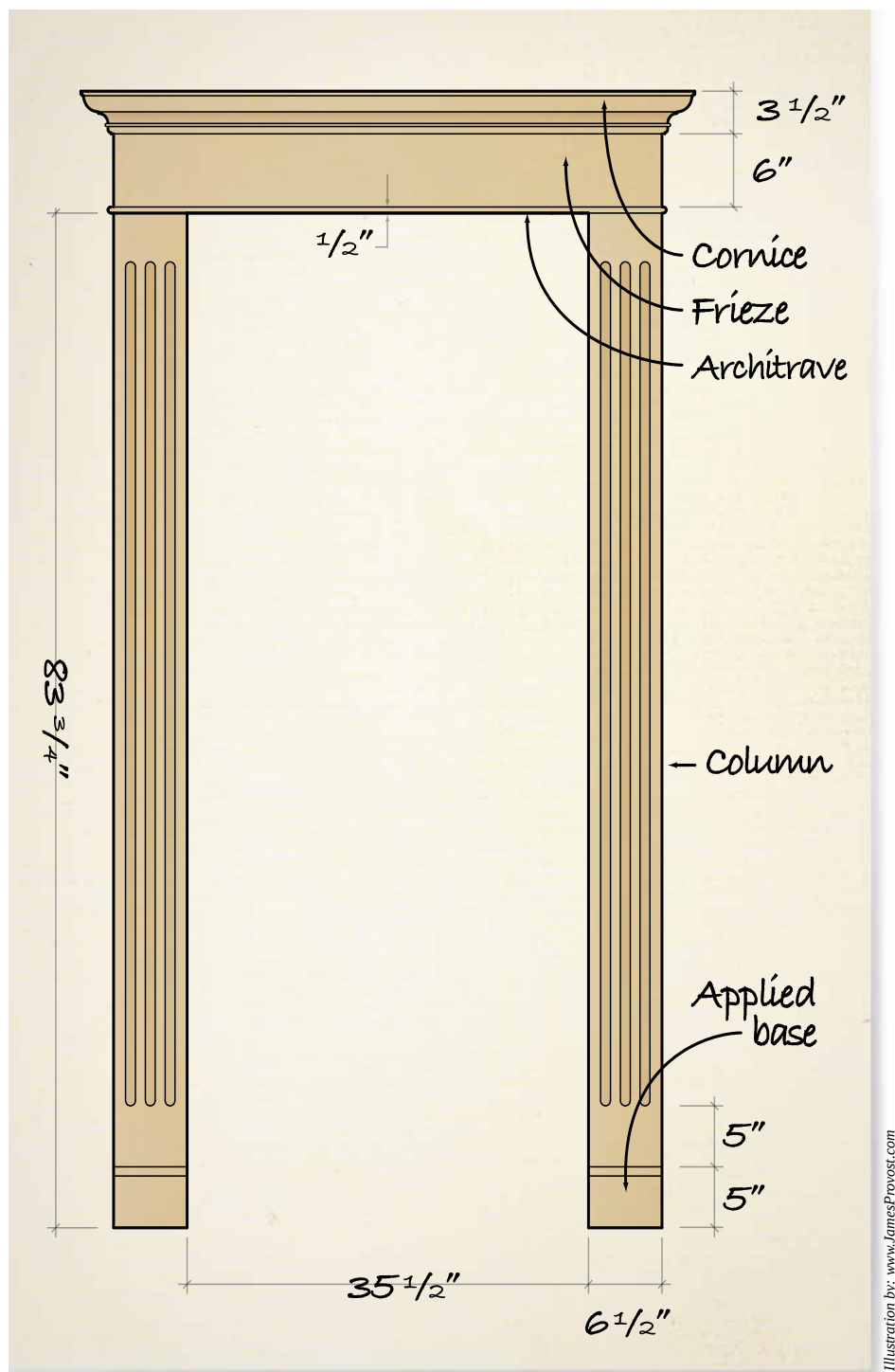
Mitre the ends of the cornice piece. Cut a small return for either end, and attach the returns to the center piece with glue and nails. It's important to make sure the width between the two returns is exactly the same length as the frieze, so they will fit together. Once the cornice is dry, attach it to the top of the frieze. To do this, drill a few holes through the frieze and glue and screw the cornice through the back of it. Because my house has a ledge directly above the surround, water will not be able to get in behind it. If you have no coverage above your surround, as is often the case, you should put a piece of flashing above the cornice just to keep the rain and snow from accumulating and rotting the wood.

Finish Before Assembly

Before installing the surround, sand the surfaces, more to give the paint some tooth to adhere to than anything else. To give the wood some extra protection from the elements, prime and paint all surfaces of each piece before installing them. This way even if rain gets behind the surround there will be some protection against rot. I recommend this step if you plan on using an exterior paint or stain and varnish on your surround. Whether you are using an oil-based or water-based paint you should use a good primer. The Zinsser line (rustoleum.com) offers an excellent choice.

Installation

Once the paint has thoroughly dried, you can begin installation. Use exterior screws in countersunk holes and attach the columns to either side of the door. Make sure to sink the screws into something solid, like a stud, the door frame or some plywood sheathing – although it's best if you can attach the



Column style surround



Rounding over architrave end



Gluing architrave to frieze



Vertical panel raising bit

columns to all three. It's a good idea to keep a ½" reveal between each column and the inside edge of the door opening, and use a temporary spacer to ensure that the columns are ½" off the ground. This way any water sitting on the ground will not migrate up the wooden column, and start the rotting process. This also means that when you're ready to install the upper section it will sit ½" above the door opening, giving a ½" reveal around all three sides of the door. While installing the columns, double check to make sure the outside dimension between the columns will end up matching that of the frieze so everything lines up when complete.

The process takes a bit longer if you are attaching the surround to brick. You will have to put a column in place and then drill pilot holes through the piece and into the brick with a masonry bit. Do one hole to start with, making sure the part is positioned properly before moving on to the other holes. Once all the holes are drilled, countersink them so plugs can be added later. You will have to use a proper masonry screw, found in most hardware stores. Staff can also advise you on what size bit to use for pre-drilling.

With the two columns in place, attach the top section in the same way – screws through countersunk holes. The base can be added in the same manner. It, like the columns, should be ½" off the ground. Once everything is attached to the house, plug all the countersunk holes with waterproof glue and wooden plugs. When dry, trim them with a chisel and sand them flush. Fill any nail holes as well as any gaps between each of the parts with some exterior caulking. It's important to keep cracks filled to reduce the chance of water damage. As is always the case with exterior projects, water is your



Cornice showing return

biggest enemy, so take the time to protect against it. I use Mono acrylic exterior caulking (rustoleum.com) to fill any large gaps between the surround and the house. If a gap is more than about ¾" I would cut a filler block to fit the gap and secure it with some caulk.

Once everything has been secured to the house and the gaps and cracks have been filled the only thing left to do is add a final coat or two of paint. Since you're painting outdoors make sure to follow the manufacturer's recommendations. Don't paint if the surface is in direct sunlight, the outdoor temperature is going to drop below 10° Celsius until the finish has cured, or when rain is forecasted – which leaves a pretty small window of opportunity for

us Canadians! Over the years you should keep a close eye on the state of the paint. If it starts to flake, the best thing to do is to scrape the loose paint off, re-caulk and paint again.

Now that you've completed the job, stand back and take a good look at the improvements made to your home. If you're like me, this is where you start to think... "I guess the front door could use a new coat of paint." or "Maybe it's time to make a couple of planter boxes for below the windows." A woodworker's job is never truly done.



ROB BROWN
www.equinoxinteriors.ca

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Sanders

Pneumatic sanders have been used in industry and commercial shops for decades. With the growing trend to equip workshops with compressed air, these production tools are finding a new group of enthusiasts.

Air-powered sanders have several advantages over their electrically driven cousins. They are smaller, lighter, quieter, have less vibration, and are safer in operation than electrically driven versions. They are also comparably priced, while offering similar performance. When working in an environment where flammable fluids and vapours are present, air-powered tools do not present the same risk as tools with arcing at the electric motor or switch.

Production woodworking shops use these sanders for their fast cutting action, which helps shop productivity, and for their ability to produce finely sanded surfaces ready for a high gloss finish. They are similar to the air sanders used by body shops to sand out the bodies on cars before applying a high gloss finish. If they can do this for an expensive automobile, imagine what they are capable of in the wood shop. Like all air tools, you have to keep them clean and oiled to maintain their performance, but this is easier than with the electric version. An electric sander must suck in air to cool the motor and this will often also suck in a great deal of debris over time which will eventually degrade the cooling efficiency of the motor; an air driven sander on the other hand has clean filtered air delivered to it from a remote location.

This air rushing through the motor as it spins also carries away any heat generated. Heat is the number one killer of electric tools. As the cooling airways of the motor



become restricted with dust, the temperature starts to rise. When the temperature rises the bearings begin to degrade and eventually the motor overheats and fails. Air sanders are made for production work and the inner components are much more robust, most often being all metal as compared to the plastic components in the electric version. The air used to drive the tools keeps these tools cool to the touch, a fact that will be welcomed on a hot summer day. On a cool autumn afternoon, they can even feel cold when using them for an extended period of time.

As with all tools, after years of service your sander may exhibit a drop-off in power, which means the motor may need replacing. Models like those in the Dynorbital line (dynabrade.com) feature drop-in motors. These motors can easily be changed on most models in less than ten minutes with just a few tools. Often

a thorough cleaning and replacing the vanes on the motor will restore the sander to like new performance. Most quality models used by professional shops will be supported with a complete line of renewal parts that can be ordered as the originals wear out.

Random Orbital Sanders

There are several different styles of air



Small sanders for small parts

sanders on the market, including inline (long bed or straight line), jitterbug, belt, orbital, and random orbital. Of these styles, woodworkers will be most familiar with, and likely find the greatest use for, random orbital sanders.

Air orbital sanders come in one of three different orbit options: $\frac{1}{32}$ ", $\frac{3}{16}$ " and $\frac{1}{2}$ ". For most woodworking applications, choose a model with a $\frac{3}{16}$ " or $\frac{3}{32}$ " orbit. A $\frac{3}{16}$ " orbit sander, like the Campbell Hausfeld PL1565 (chpower.com) is the one best suited to general sanding tasks, while a $\frac{3}{32}$ " orbit model, like the Samona 18778 (samona.com) is used for ultra fine sanding. There are models that offer hook and loop and PSA pads in the common five and six inch sizes. These sanders typically run at 10,000 OPM (orbits per minute), weigh in at about two and a half pounds, and require anywhere from 5 to 15 CFM of air at 90 PSI. The Campbell Hausfeld requires 11.6 CFM while the Samona consumes 6 CFM. Some sanders come with a speed adjustment on the tool, which allows for infinite control over the orbital speed, while others must be controlled via an inline regulator or by the regulator on the compressor (see "Compressors", Apr/May '08, Issue #53).

Another variation on this tool is the angled random orbital sander, such as the Grex AOS368 (grexusa.com). This is a small 2" angled sander with a pistol grip similar to that of a cordless drill. The small head allows it to be used in tight areas that other sanders can't reach and can be equipped with an optional 3" head when you need to sand a slightly larger area. The Grex has a 105° angled head, runs at 15,000 OPM, weighs a mere 1.4 pounds, and consumes only 2.2 CFM. This makes it one of the few air sanders that can be operated on a portable air compressor.

Dealing with Dust

These sanders typically come in one of three styles: non-vacuum, central vacuum and self-generated vacuum. The non-vacuum version of the sander has no provision for pickup of the sanding dust



Air sanders are smaller and lighter than electric sanders

at the source. When using a sander of this type, use adequate local collection such as a downdraft sanding table in combination with an ambient air filter, and a respirator. The central vacuum model is equipped with a fitting that allows it to be connected to a central dust collection system like any other sander. The self-generated vacuum model incorporates a venturi design that creates its own airflow to carry the debris into a remote collector, without the need for an external vacuum line. It is the ideal choice when you do not have a central collection system installed.

Air Demons

OK, so now you are probably wondering why we don't all have these fantastic labour-saving sanding tools in our shops. The simple answer is that to operate these tools, you typically need a large air compressor. Most air sanders consume a great amount of air with many falling in the 14-18 CFM range. To run these sanders you need a compressor that can supply them with the required amount of air, which normally means running at least a 5 HP compressor with at least a 40 gallon tank. If you are purchasing a compressor, this is definitely a case where bigger is better.

For intermittent use, and where the air consumption of the air sander is under 5 CFM, such as the Grex AOS368, you can

use a portable air compressor (as long as the CFM rating of the compressor is close to the air consumption requirement of the air sander). However the compressor will operate at 100% duty cycle.

Pneumatic sanders are tough production tools designed to make a less than pleasant task as painless as possible. In a professional shop that has been plumbed for air and has an adequate commercial grade compressor, these sanders offer unsurpassed user comfort because of their light weight and cool operation when used for extended periods. They are capable of aggressive swirl free cutting which will reduce the time spent sanding, letting a shop be more productive.

The casual user will need to weigh the advantages offered by the sanders against the need to invest in a much larger and expensive compressor than might normally be required.

For a review of the of the Grex AOS368 and Campbell Hausfeld PL1565 visit our web site at: canadianwoodworking.com/Newsletters/reviewindex.htm



MICHAEL KAMPEN
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Samona 18778



Campbell Hausfeld PL1565



Grex AOS368

Douglas fir

(*Pseudotsuga menziesii*)



There is only one species of Douglas fir found in Canada, though it occurs in two forms. The Coast form grows along the west coast of mainland BC and on Vancouver Island. These are the classic towering giants of the west coast. A variant grows in central BC and the southwestern part of Alberta. These inland firs are smaller, seldom reaching the 300 plus foot height of the coastal firs.

Characteristics

Typically the heartwood is of a reddish brown, and the sapwood is a light rosy colour, darkening with exposure to UV rays. The wood is generally straight, though it is sometimes wavy grained, and has a medium to fairly coarse texture. There can be quite a bit of variation in the colour, weight and strength of the wood, particularly between old growth trees and second or third growth trees. Over time the wood tends to redden with exposure to sunlight.

Working Properties

The tough fibre of Douglas fir makes it somewhat difficult to work with hand tools, so it's important to keep tools sharp. The same goes for power tools. With sharp

blades it machines to a smooth, glossy surface. It glues well, and as for most lumber, pre-drilling before screwing is recommended. It takes stain and all types of finish well. Douglas fir is a resinous wood and the resin canals can occasionally leak and bleed, marking the wood with tiny lines most visible on longitudinal surfaces.

Physical Properties

Douglas fir is very dimensionally stable and has a moderate resistance to shock, high stiffness and crushing strength, and high bending strength. It takes well to lamination but isn't recommended for steam bending. At 12% moisture content it has a specific gravity of .50 and a weight of around 33 pounds per cubic foot.

Uses

The predominant use of Douglas fir is in the pulp industry, and construction and building products: lumber, plywood, doors, studding, roof trusses, floor and ceiling joists, window frames, laminated beams, and general millwork. Nonetheless, it makes a wonderful wood for furniture and fine cabinetry. It also makes an excellent secondary wood (such as interior framework, drawer parts, dust panels and back panels). When quarter-sawn to expose its vertical grain Douglas fir is especially attractive. It is available in a wide range of dimensions, and in plywood and veneer form. Pricing is about \$5.00 per board foot.



Douglas fir

Shrinkage

Moisture Content	0%	6%	20%
Tangential	7.6	5.5	2.5
Radial	4.8	3.0	1.4
Volumetric	12.4	n.a.	n.a.

These figures are for coastal fir

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Rail and Stile Doors

There are two things that woodworkers build a lot of: boxes and doors. Building a door is a skill almost every woodworker will need at some point or another. Following a basic series of steps will lead to success on the router table every time.

Door construction has evolved over time and the frame and panel door has become the way to accommodate seasonal wood movement while providing a rigid frame to keep the free-floating panel flat.

Traditional doors, made with tenons may still be the most appropriate when building high end furniture or intricate jewellery boxes, but when faced with a whole kitchen full of doors to make, turning to the router table makes sense. Using a rail and stile bit set will allow you to make the frame elements for the door with repeatable accuracy, while the raised panel bit will allow you to make the field panels from solid stock. These bits must be used in a router table with a solid fence.

What You Need

The router table you use can be anything from a basic shop-made table to a top of the line precision router table (freud.ca, kregtool.com), but it needs to meet three conditions.

- It must be flat. The table should not be dishd or have a crown or you will not be able to get accurate cuts.

- It needs to have a solid fence that can be adjusted to the bit. I prefer to have a sacrificial fence that I can close up on the bits to act as a zero clearance insert; this provides additional support to the piece being shaped while also reducing tear-out on the finished piece.

- You will also need a cross slide sled to shape the end grain on the rails. A cross slide sled can be as elaborate and luxurious as the Jessem (jessem.com) or as simple as my favourite, a block of MDF cut square on the table saw for the purpose.

The bits you'll need to make doors on the router table offer several options as well. These are available in two forms, either a reversible bit, or set of matched cutters. With the reversible bit, the cutters and bearings are stacked on a shaft in one configuration for the cross grain cuts on the rails, and then reassembled in another configuration for the remaining cuts. After making the first cuts, the user must remove the cutters, reassemble them with the proper shims and then tighten the nut. As the name suggests, a matched set has been manufactured from the start to function as a pair. Modern router bits are all ground on CNC machines and this ensures that

they are a perfect match for each other. I find that the additional messing about that the reversible bits require not to be worth the marginal savings to be had when purchasing these over a matched set.

When selecting a bit to raise the panel, you will be faced with several options as well. Panel raising bits can be either horizontal or vertical. Horizontal panel raising bits tend to be large in diameter, roughly three inches across, and these must be used with a multi speed router. As the bit diameter increases, the surface speed of the carbide cutting edges increases as well and when the bit exceeds the optimum value, the bit will heat up and the wood will burn. The panel is routed face down on the router table. Using jigs it is possible to create arched panels with this type of panel raising bit. Some sets, like the Blue Tornado R916 (busybee.com) combine a pair of matched rail and stile cutters and a horizontal panel raising bit.

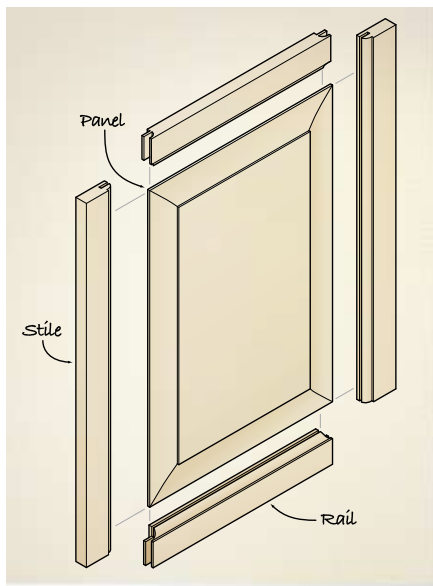
A vertical panel raising bit can rout the same profile as the other type but the panel is run vertically along a fence instead. If you do not have a variable speed router, then this type of bit will still allow you to

make raised panel doors with your existing tools. The bits are available individually, or as a complete set with the two matched rail and stile cutters and a raised panel cutter. Some of the more expensive horizontal panel raisers have a back cutter to create a tongue of the correct thickness as the panel is shaped.

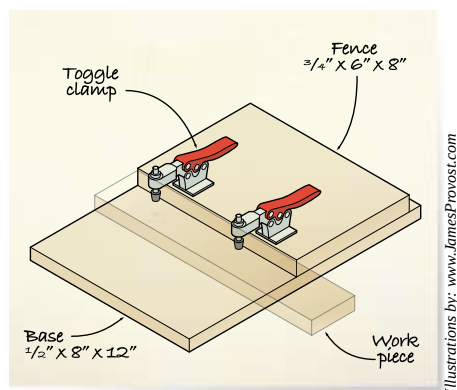
Route the End Grain First

A rail and stile door requires precise joinery to look good and to function properly. Flat, square and straight stock is essential. Use a jointer, thickness planer and table saw to prepare your stock. Lay out all of your pieces and select the best faces, the ones you want to face forward, and mark an 'X' on the back of all pieces. This 'X' should be facing up, towards you, for all operations.

Set up the end grain cutter in the router. To make it easier to remember that this is the first bit you use, take a permanent felt tip marker and write the number '1' on it. To make it easier to recall if it is the rail or stile that gets routed first, remember that



Frame and panel



Cross slide sled

Rail and Stile or Cope and Stick

Look through woodworking catalogues for these bits and you may find yourself confused. They are referred to as Rail and Stile bits and Cope and Stick bits. This is primarily a regional difference between American and Canadian markets. Historically, American craftsmen used frame and panel construction to make doors stable using hand planes. The profile was cut on the stiles using hand planes and then the rails were cut (coped) to match. To add a decorative element to the door, the panel was often embellished with an applied moulding (stick) around its perimeter. In other words, one bit two names.



Coping rail ends



Routing edge profiles



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R comes before S in the alphabet. And to keep it straight in your head as to which pieces are the rails and which the stiles, remember, the rails go horizontally, like the rails on a balcony. Set up the bit so the bearing is flush with the face of the fence. Raise the bit to make the cut; the shoulder should be about twice as thick as the lip. Do not cut all the way into the back up board or you will lose the advantage of a zero clearance support. When you have the final height set, make the cut into the backer.

Do not use a mitre gauge in combination with a fence for this operation. The mitre gauge will register 90° to a slot in the table but since most fences can be locked down anywhere, they will never be parallel to the mitre slots. Instead use a cross slide

sled. To make a cross cut sled cut a piece of 3/4" plywood to about 10" x 10". This piece must be perfectly square. Screw a handle to the piece diagonally from below using brass screws. Wax the underside and the edge that runs on the fence to help it slide easier. Use this as the cross sled to stabilize the rails for the narrow end grain cut.

Rout the Long Grain Next

Remove the end grain cutter from the router and replace it with the long grain cutter. Use one of the pieces that you just routed to set the height of the bit. Place the piece face down on the table and the top of the groove cutter should line up with the top edge of the tongue. Rout a test piece to check the fit. When routing the stile, use two feather boards, place one on



Raising the panel



Unsupported material will chip out

the fence to hold the material to the table, and place another on the table to hold the stock to the fence. This ensures an accurate and chatter (ripple) free cut the full length of the piece. Adjust the bit until the two pieces form an ideal fit; any very minor imperfections can be sanded out later. Rout all of the stile pieces.

Mill the Panel

The center of the door is typically made of a panel of solid wood glued from narrower stock. In general you want to avoid using a solid plank for the panel to avoid excessive seasonal movement. The size of the panel should be the size of the opening on the door plus the length needed for the tongues on each side. Cut the panels slightly undersize, about $\frac{1}{8}$ " in both directions to allow for some movement. Set up the panel-raising bit in the router table and adjust the fence to make the cut in several passes. Move the bit out of the fence a little more for each successive cut and make all of the end grain cuts first; the log grain passes will clean up any tear-out.

If your panel raising bit doesn't have a back cutter, then use a slot cutter or cove bit to rout the back edge of the panel to bring the tongue to the correct thickness. Sand and finish the center panel before assembling the door. Finishing the center panel after the door has been assembled will leave a small, unfinished border visible as the panel floats freely within the frame to accommodate any seasonal movement of the wood.



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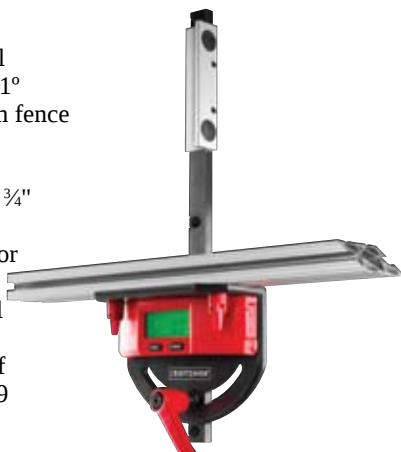
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woodworkersgallery

This project was chosen by the members of our website's woodworking forum.

Queen size bed by Mohammad R. Salavatipour, Edmonton, AB.

Mohammad says that this walnut bed with maple inlays is the most challenging project he has undertaken since he starting woodworking in 2005. The initial design for the bed focused on fluted posts as the dominant feature of the project. As the design process continued finials, inlays and a curved cap and moulding on the tops of the footboard and headboard were added.

The posts were made by laminating two 8/4 boards. The finished size is about 3 3/4". Though a novice wood turner, Mohammed found that the posts were not as challenging to turn as he thought. Much of the effort went into building the jigs for the flutes and reeds. The most time consuming aspect of the project was building the curved cap on the tops and the curved moulding below them. All are done by bent lamination and then routed on the router table. Almost all the pieces are attached using traditional mortise and tenon, or floating tenon joinery. In general, Mohammad prefers hand tools to power tools. For example, the mitre cuts at the center of the cap and the moulding on the top of the footboard were done with hand tools; there was absolutely no room for any error, particularly



after spending so much time on preparing the two pieces. Overall, the bed dimensions are 88 1/2" by 65 1/2" and houses an 80" by 60" platform for the mattress. The headboard posts are 60" high and the footboard posts are 40". The maple inlays are 1/4". The finish is boiled linseed oil, followed by two coats of shellac, and then a brushed on water based polyurethane.

A beautifully executed project by a talented novice; we look forward to seeing more of Mohammad's work.

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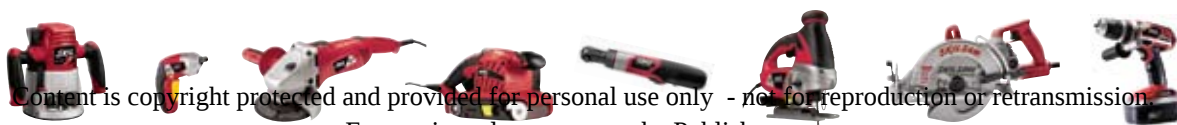
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Entrance Doors

Doors are one of the most immediate and welcoming features of your home. A custom made entrance door can significantly enhance both the look and the feel of your home.

There are a lot of options when it comes to selecting a new entrance door for your home. The most popular materials are steel, fiberglass, and of course, wood. There are single doors, double doors and doors with single or double sidelights and transoms (windows above the doors). Doors can incorporate opaque panels, clear glass panes, and a variety of frosted and/or textured glass panes. And, you can select from a multitude of door designs based on Craftsman, Shaker, Mission and Contemporary styles

Steel doors, which obviously won't warp or twist, and are unaffected by mildew or moisture (when properly finished), have a middle insulating layer (typically a polystyrene core) that offers

a better R-value than composite or wood doors. The R-value shouldn't be a major determining factor in selecting a door, as the square footage of a door represents a small proportion of the total surface area of a house. Steel doors typically come in a smooth finish and are factory primed. If you don't have access to spray equipment, or don't enjoy finishing, I highly recommend purchasing a pre-finished door. Some manufacturers and some retailers offer pre-finished doors. Choose a steel door if low maintenance, high durability, and optimal security and protection are key factors. Typical warranties are for 10 years. The main drawback of a steel door is that it can be fairly easily dented, and it can be very difficult, if not impossible, to repair the dents.

Fiberglass doors have some similar characteristics to steel doors; they are dimensionally stable and come in a wide range of styles and colours. A polyurethane foam core gives high R-values, and the doors come with a smooth surface or a realistic wood grain surface that is more resistant to denting than steel doors. As with steel doors they come factory primed and have to be stained or painted before installation. Standard fiberglass doors are warranted for five years, premium doors for up to 25 years. Choose a fiberglass door for extreme climates and high traffic entrances, or if you want a faux wood look.

For a truly custom look that lends an air of uniqueness, and offers a warm, rich appearance, look to a wood door. There are

two options: have a custom door shop build a door for you, or, build it yourself. Building a door is not overly complicated; however it does require that you are comfortable working with mortise and tenon joinery, have a good sized workspace, and a high level of precision in your woodworking. It's definitely not a project for the novice woodworker.

Solid Wood Doors

Some of the more popular woods for doors are Honduran mahogany, white oak, Douglas fir, eastern maple, and cherry. Regardless of the wood you select, choose kiln-dried straight grained stock free of knots or other defects. Quarter-sawn lumber is a good choice. You'll need 8/4 (2") or 10/4 (2 1/2") stock in 8" lengths for the stiles and 3' to 4' lengths for the rails. It's a good idea to mill the lumber slightly oversize, sticker it and set it aside for a week or so to acclimatize it to the humidity level in your shop.

As with many large scale projects it's a good idea to draw the plan for your door to scale. I use a scale of 1:4, and draw out each of the major joints full size.

There are a number of ways to build a door, but the easiest is using mortise and tenon joinery with a solid wood floating

panel. Solid wood doors weigh quite a bit, so you will want to use joints that won't come apart over time. You could use loose tenons, wedged tenons, or draw pegs on the M&T joints. Ensure you use waterproof glue (elmersrebuild.com) or epoxy (indform.com) on all the joints. An expansion gasket (atlanticgasket.com) will allow normal expansion and contraction, and eliminate moisture leakage while keeping the panel centered.

If you have access to a shaper, or a router table equipped with a 3 1/4 HP router, then you can use a raised panel bit to shape the panel and a profile bit set (busybeetools.com, vermontamerican.com) to shape the stiles and rails. An alternative is to apply raised moulding on the stiles and rails to hold the panel or insulated glass insert in place.

Before you begin building a door, purchase the hardware. You'll need an entrance set, three hinges and chrome or nickel plated screws. For doors 1 3/8" thick and 32" wide use 3 1/2" hinges, for doors 1 7/8" thick and 37" wide use 5" hinges. For intermediate sized doors use a 4" or 4 1/2" hinge. Typically, hinges are placed 7" from the top of the door, and 11" from the bottom, with the middle hinge centered between the two. If you're replacing an existing door you'll



want to use the same hinge placements on the new door.

Use a durable, easy to maintain finish on the door. An enamel paint is an ideal finish, but completely obliterates the look of a wood door. Oil-based varnish and spar varnish are two commonly used finishes, as are penetrating finishes like Cetol (sikkens.com) and Penofin (penofin.com). If the door is exposed to the elements and receives a lot of direct sunlight, expect to refinish the door every three or four years, sooner under extreme conditions. If the door is protected by an overhang or by a storm or screen door, you may only need to refinish every five to seven years.

CARL DUGUAY
cduguay@canadianwoodworking.com

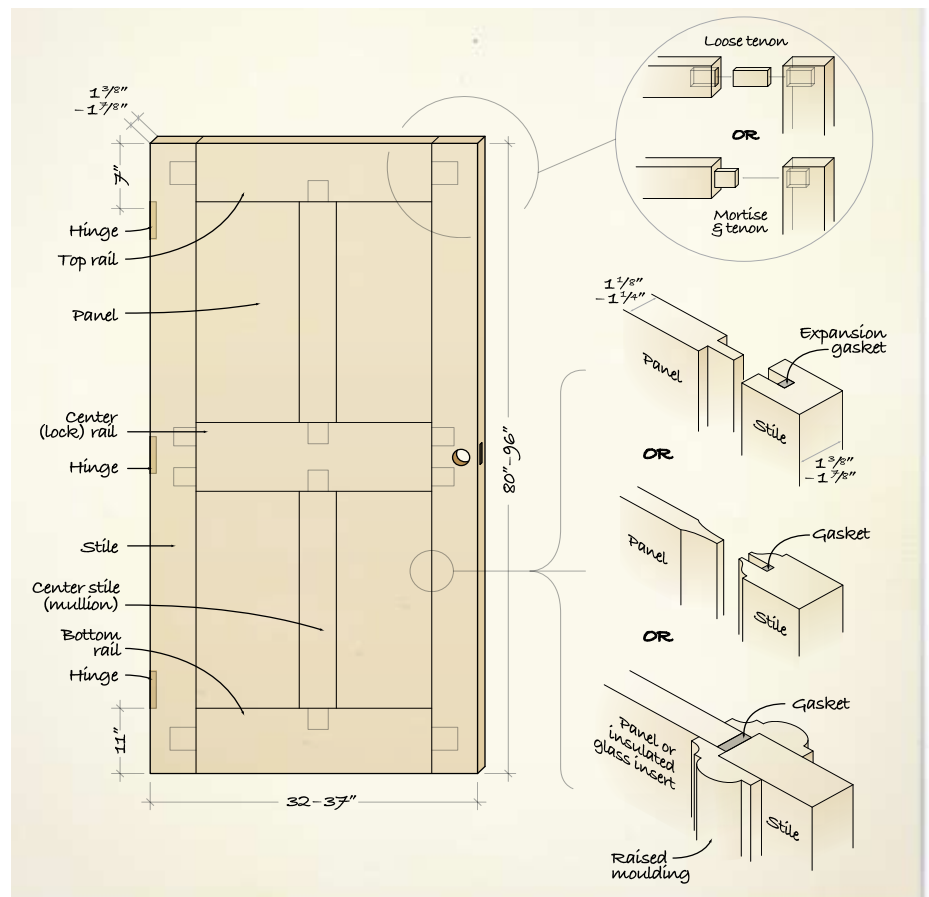


Illustration by: www.JamesProvost.com

Photo courtesy of DouglasFirDoors.com



Biscuit Joiners

When it comes to assembling sheet goods, nothing is quite as fast and efficient as a biscuit joiner.

The biscuit joiner was initially developed in the late 1950s by Herman Steiner. The Swiss cabinetmaker was looking for a better method to assemble the cabinets he was making from the newly introduced particle board. Because of the way particleboard was manufactured, the joinery techniques in use at the time with solid wood panels were not suitable for this new material. Steiner introduced the first portable plate joiner, under the name Lamello, in 1968. The patent protection for the Lamello has long since expired and now many different manufacturers offer biscuit joiners as part of their woodworking tool line.

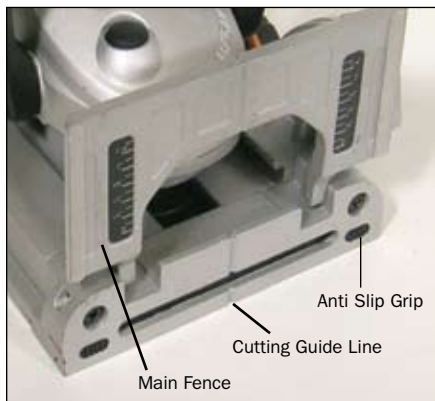
Groove, Glue, Insert, Clamp

A biscuit joiner (or plate joiner) is designed to aid in the assembly of man-made panels in cabinet carcass construction. The body of the tool is essentially the same as that of a portable angle grinder. Instead of spinning a grinding wheel it spins a small 4" saw blade with carbide tipped teeth. Using a fence on the front of the tool, the tool is registered against the work piece and the blade is plunged into the material to make a crescent shaped groove. A matching groove is then also cut in the opposing piece. Glue is applied to the grooves, an oval shaped 'biscuit'

(plate) is inserted into the groove, and the two pieces are clamped together. As the biscuit absorbs moisture it expands slightly to fill the groove. This method of joinery has simplified countless tasks, from cabinetry and window casings to rail and stile doors, face frames and furniture.

Biscuits

The wooden biscuits that serve to connect two pieces of sheet goods together are all 4mm ($\frac{3}{32}$ ") thick, and come in three standard sizes: #0, #10 and #20. These are made from a hardwood, often beech, which has been dried and then compressed



The fence



Joiner controls



Height adjustment fence

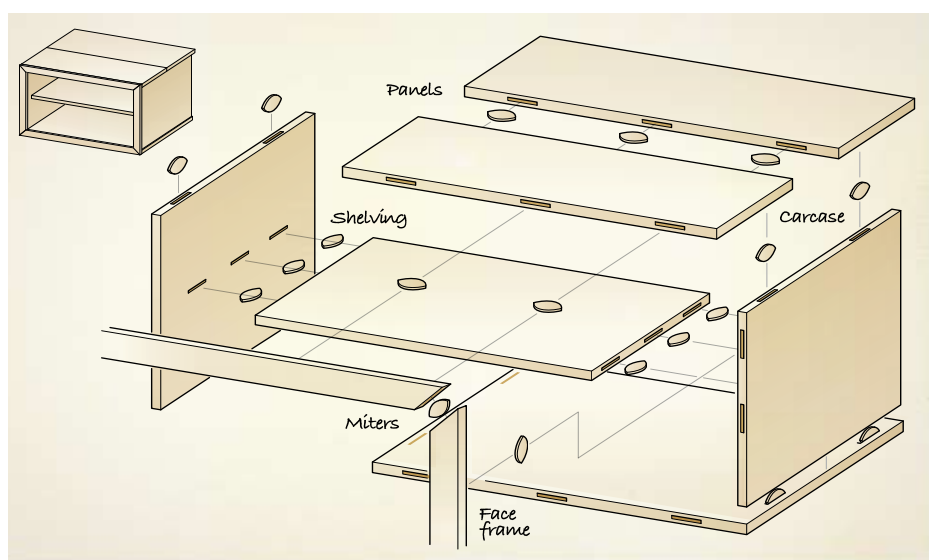
Biscuit #	Size (mm)	Size (inches)
0	15 x 47	5/8 x 13/4
10	19 x 53	3/4 x 2 1/8
20	23 x 56	1 x 2 3/8

in a press. When in contact with glue the biscuits absorb the water to expand slightly and fill the space in the biscuit groove. Since all manufacturers use the same size blade to cut the biscuit grooves, biscuits are interchangeable from model to model; what will differentiate one biscuit joiner from another is the fence. However, not all biscuits are alike. Some brands seem to have a lot of variation in biscuit thickness; sometimes the biscuits are difficult to insert in the grooves, and at other times they are too loose. Ideally you want a biscuit that fits inside the groove snugly. It's a good idea to keep your biscuits sealed in a plastic bag or container when not in use.

The Porter Cable 557 joiner includes a 2" blade (in addition to the standard 4" blade) to cut grooves for a 'mini' biscuit (#FF), which measures 13mm x 30mm (½" x 1 ¼"). These are particularly useful for assembling very small boxes, face frames and moulding.

A Solid Smooth Fence

When joining two panels it is critical that the biscuit grooves be cut perfectly parallel to the fence for the panels to line up with each other. To cut these slots accurately a biscuit joiner must have a solid main fence that moves smoothly through its plunge cycle without any resistance or hindrance. When the plunge mechanisms are built to lower tolerances, any slop in the travel will lead to the fence racking as it is plunged, resulting in erratic travel. When looking at the fence, pay particular attention to the adjustment knobs. The main fence should be



Biscuits can be used for a wide range of joinery

easy to adjust through its various settings and when positioned, the settings should be firm enough to remain in place, without drifting, through a day's work. They should be easy to access and be simple to manipulate, with sufficient heft to allow them to be tightened without breaking off or stripping out.

The biscuit joiner must be able to cut a slot parallel to a board's edge at varying thicknesses, and to do this it uses a height adjustment fence that drops down from above and is locked in at a chosen angle or by registering both the biscuit joiner and the pieces to be joined off the same flat work surface. Any play in the fence mechanism that allows the blade to wobble on its axis will result in a slot that is too wide for the biscuit. This could also be caused by excessive run-out on the saw's arbour as well. If the slot is slanted from one side to another then, when the two sides are brought together, the two halves will slope in the opposite direction with the end result that the biscuit may not fit. Some models, like the Triton TC9BJM (tritonwoodworking.com) have a main fence with a removable,

height adjustment fence; on the Triton this fence is adjustable in height from 0" to 1 ¾". On other routers the adjustment fence is integrated into the main fence.

The three different size biscuits (#0, 10 and 20) require different depths of cut, which is set by the depth adjustment knob. The letter 'M' stands for maximum depth capacity of the tool. The adjustable fence can be easily angled to cut slots on a bevelled edge. On the front of the main fence is a cutting guide line that is lined up against the cutting line on the work piece. A set of anti-slip grips on the front of the main fence help to keep the biscuit joiner steady on the work piece. On some biscuit joiners the handle is attached to the main body of the unit; on other joiners the handle is attached to the main fence.

When it comes to dust extraction for biscuit joiners there are three options. You can let the debris be ejected from the machine onto the floor, you can capture it in a bag, or you can connect it to a powered dust extractor. When working on a few joints, or if you happen to be in tight



Slotting 3/4" stock with main fence



Bevel cuts with height adjustment fence



Slotting thick stock with height adjustment fence in place

quarters, then it is not too much of an issue to simply let the debris fly. Cutting the small slot doesn't produce a lot of waste. If you are working at a bench and will be cutting a lot of slots, connecting a dust collection bag to the dust port is a good idea. It will keep your work area clean and the air clear. If you will be using your machine a great deal, connect it to a dust extractor that switches on automatically when you use the biscuit joiner.

The carbide tipped blades that come with these tools should remain sharp for a very long time. When it comes time to change the blade, some of these tools provide easy access for this; others make it somewhat more of a chore. You can likely get a couple of sharpenings out of the blade before you have to purchase a new one.

Contrary to popular belief, biscuits are not meant to keep bowed panels aligned when gluing up panels. Using biscuits to compensate for poorly prepared stock is a poor construction practice, as the panel will continue to have internal stresses because the stock was not prepared properly before the glue was applied. Seasonal movement of the wood will compound these stresses. Ensure your boards are straight and true before gluing them up.

A Myriad of Uses

Biscuit joiners were developed to provide a simple, cost effective method for cabinet shops to join particleboard panels. If that was all they were used for, they would be of little interest to the average woodworker. Fortunately these tools are much more versatile. They are commonly used when assembling kitchen cabinets and other case goods, window casings and other architectural trim. Biscuits are also used in the construction of rail and stile doors, bookshelves, drawers and when making and installing face frames on cabinets.

If you only work with solid wood, a biscuit joiner might still be of interest. When assembling a large panel from narrower boards it can be a benefit to use some biscuits to help align the boards and keep them from sliding relative to each other as you tighten the clamps. For simple projects, biscuit joinery will suffice in all but the most demanding applications.

Some Helpful Jigs

If you don't find yourself building a lot of kitchens and your biscuit joiner is gathering dust, you may prefer to look to one of its alternate uses. I use my biscuit joiner to reinforce the mitre corners on small boxes and picture frames (see Biscuit Mitre Jig on page 46). The biscuit joiner is a fantastic tool to add splines to any glued mitre joint. Splines strengthen this notoriously weak end grain glue joint by providing additional face grain glue surface. When contrasting woods are used it provides a decorative corner element. Spacing them up the side of a box gives a decorative joint that looks similar to a finger joint.

A biscuit may not be a suitable substitute for more traditional joinery in some situations as it is typically the weakest joint when compared to mortise and tenon or dovetail, but it certainly has a home in any well equipped workshop.

For a review of the Triton TC9BJM visit our web site at: canadianwoodworking.com/Newsletters/reviewindex.htm

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* As seen in Fine Woodworking's 2004 Tool Guide, pg.121.

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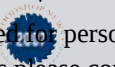
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Combination Machines

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If you work in a small shop, then you know how difficult it can be to arrange your machinery efficiently. Adding new equipment can be next to impossible. Combination machines enable you to get more machinery per square footage of shop space than conventional stand-alone machines. Even if floor space isn't at a premium in your shop, there are a lot of advantages to combo machines.

When it comes to acquiring machinery, most woodworkers think of 'and' buying. I'll buy a table saw and a bandsaw and a jointer and a planer and a... In part this is because virtually all North American manufacturers sell single-function machinery. European manufacturers, on the other hand, have long produced compact machines that perform multiple tasks. These combination machines are common in Europe. You may be unaware, however, that several such brands, most notably Felder (felder-group.ca) and Mini Max (minimaxcanada.com), have been available in Canada for a number of years.

Combination machines come in two main

configurations: a 2-in-1 combo (jointer/planer, table saw/shaper), and a 4-in-1 combo (typically combining a table saw, jointer, planer and shaper; often an optional horizontal mortiser is available). There are a variety of engineering refinements that distinguish these machines.

On a combo machine a 3 HP, 220 Volt motor is likely the smallest you'll find, compared with a 1 to 1 ½ HP, 110 Volt motor on standard Canadian machines. A 220 Volt motor will run more efficiently and cooler than a 110 Volt motor, and you'll appreciate a more powerful motor when cutting thick, long stock. The 4-in-1 combos will typically have multiple motors. For example, the Hammer C3-31 has three 4 HP motors: one for the table saw, one for the shaper, and one that the planer and jointer share. Unique to European machines I believe, is the inclusion of a separate power switch that cuts all power to the tool, and which can be locked for safety (or unauthorized use). They also use electronic or mechanical switches that stop saw blade rotation within ten seconds

of pressing the 'off' switch. Along with multiple motors are multiple dust ports on the 4-in-1 machines: typically one or two at the base of the machine, a separate port for the shaper, ports for the jointer/planer, and a dust port integrated into the blade cover.

A common misconception is that it takes a lot of time to switch from one operating mode to the other, particularly from jointing to planing operations. In practice, I have found the average change-over time to be under two minutes. To reduce the number of change-overs you'll find it expedient to plan out your work schedule in advance, and work in a methodical fashion.

Obviously, four machines grouped together will weigh more than a single machine. Weights vary considerably though: the four component MiniMax Lab 300N weighs 860 pounds (390 Kg), twice as much as the General 50-250 table saw (409 lbs/186 kg), while the four component Hammer C3-31 comes in at a hefty 1,190 lbs (540 kg), three times as heavy as the General. Moving these machines around the shop can be a bit of a

challenge. Fortunately most manufactures have an optional rolling carriage with a lifting bar and steering roller. With a rolling carriage you can manipulate a combo machine with the greatest of ease. All this extra weight has an additional benefit – it substantially reduces vibration and helps absorb motor noise. The combo machines I have seen in use are noticeably quieter than stand-alone machines. Remarkably, these combo machines are designed to pass through a standard 32" doorway.

One of the most admired features on combo machines is the sliding table. If

you've not used one before, then you really owe it to yourself to try one out at a woodworking show or store. A sliding table does away with the need for a cross cut sled, and it makes processing large panels and repetitive precision cuts so much easier; you don't push the stock, you push the table on which the stock rests. An advantage of this set-up is that it forces the user to stand on the left side of the

machine, out of the line of the saw blade, a much safer position.

A riving knife, in conjunction with a blade cover, has been a standard on European machines for decades. The riving knife is attached to the arbor assembly and moves in tandem with the blade, unlike the splitter and blade guard set-up on North



Mini Max FS30 Smart in planer mode



Mini Max FS30 Smart in jointer mode.

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American saws that must be removed for many cuts. The blade covers are super quick to remove as well. On the Felder and Hammer machines the throat plate and the opening for the saw blade is much narrower than on stand-alone saws; safer when milling thick stock, and eliminating the need to replace the plate with a zero clearance insert.

These combo machines offer lots of other features, some standard, some available as options: rip fences that can be set in an alternate low position when milling narrow stock; self-aligning cutterhead knives;

optional 4-knife cutterblocks; optional Torsa knife systems on the joiner/planer; and reversible, tilting shapers that operate on a double trunnion system. There are numerous accessories that can also be added to these machines, including horizontal mortisers, scoring saw attachments, and extra large outrigger tables.

A combination machine does cost more than the equivalent stand-alone counterparts. The Felder AD531 joiner/planer retails at \$6399.02, the Hammer C3-31 4-in-1 is priced at \$9,223.03, and the Mini Max Lab 300N costs \$8,699.00.

Bear in mind that these machines have many built-in features that you are likely to add on to stand-alone machines, while offering additional features that can't be found on conventional machinery.

In the final analysis it comes down to the kind of woodworking you do, the level of precision you want in your machinery, and the amount of money you are willing to invest in your business or hobby.

CARL DUGUAY
cduguay@canadianwoodworking.com



Felder AD531 in joiner mode



Felder AD531 in planer mode

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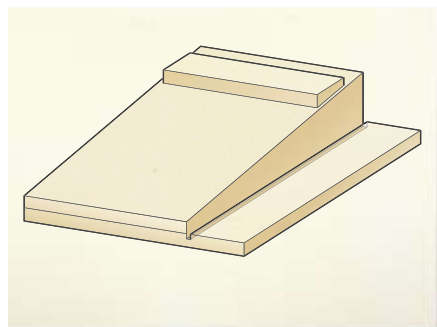


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Continued from page 2

account how you use your plane. If you use the same plane for both shooting and for bench work, and if you regularly hone your blade, then it is highly unlikely that you'll ever wear the blade in one spot. However, if you dedicate a plane exclusively for shooting, and do a lot of it, then an inclined shooting board is a good idea.



Illustrations by: www.JamesProvost.com

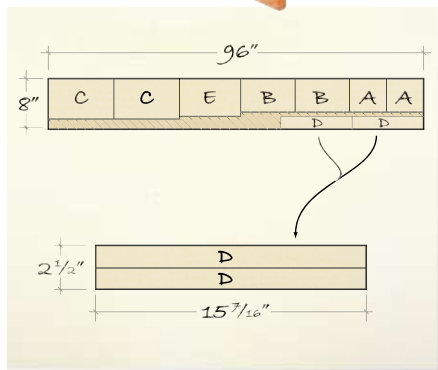
Inclined Shooting Board

Step Stool Layout

Please provide me with a layout of cuts for your step stool in issue #49 (Aug/Sept'07). I'm having trouble getting this to work on a piece of 8" x 8' board.

Linda H., Charlottetown, PEI

• You can get all of the pieces out of one board, but to get the last piece, the narrow front cross brace (D) will require a couple of extra steps. You will need to cut the other pieces from the board, and then glue up two narrow strips from the remainder to make the last piece. If you do not want to purchase an extra board or glue up the off-cuts for the final part, you can purchase a board that is an additional 16" longer, or one that is 2 3/4" wider (though this will increase the scrap left over.)



Step Stool Layout

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Making the Jig

- Cut all of the pieces in the material list to size, leaving tool guides (E) a little long for now. Left over ¾" ply is a good choice for this jig. Sand all parts before finishing.
- Locate the short fence (B) 12" from one edge of the base (A) and the long fence (C) 8 7/8" from the adjacent edge. Screw two gussets (D) to each fence. Drill 3/8" dowel holes on the bottom of the fences and gussets, and then, using dowel centers, transfer the dowel holes to the base plate.
- Drill dowel holes in the base and then dowel and glue the fence assemblies to the base.
- Cut a 45° bevel on the front of one of the tool guides (E) so they can butt up against the gussets. Place a square against the two fences and mark the intersection of the two fences (B, C). Place your biscuit joiner on the base at a 45° angle with the center mark on the tool at the point of intersection



Using the Jig

Begin by cutting the mitre joints for your project. Before you apply the glue to the mitre joints, 'size' the mitre edges. Mix some wood glue with a little water and then paint this on the exposed end grain to seal the surface. When the sizing is dry, apply glue as you would normally and clamp the work piece together using a band clamp. After the glue has dried, place the mitred work piece in the jig and then use the joiner to cut slots for splines in the corners. To create a row up the side of the work piece, raise the joiner using the spacers that you prepared earlier. When you reach the halfway mark, turn the work piece over and continue from the other edge. Use a thickness planer to prepare the feathers to fit the slots. Glue them in place (contrasting woods add visual appeal) and then plane or sand them flush when the glue is dry.

THE EDITORS



Biscuit slots cut

Biscuits glued and trimmed

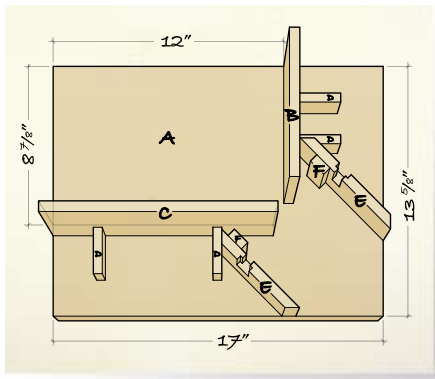


Illustration by: www.JamesProvost.com

MATERIALS LIST (All measurements in inches)					
Part		Qty	T	W	L
A	Base	1	1/2	13 5/8	17
B	Short fence	1	1/2	4	7 1/2
C	Long fence	1	1/2	4	10 1/2
D	Gussets	4	1/2	2 3/8	2 3/8
E	Tool guides	2	1/2	4	To fit
F	Tool stop	2	1/2	7/8	7/8

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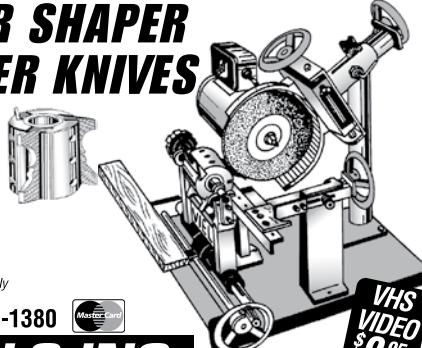
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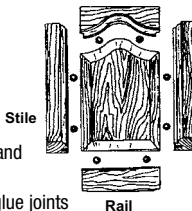
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Oh, To Build A Canoe

In my last column I wrote about wooden inventions, specifically that greatest of Canadian inventions, the canoe.

For many years I wanted to build a cedar strip canoe; primarily because they were inexpensive to build, and (for several months) my shop was too cold for customers to use. Plus, I needed a project that would keep me moving around enough that I wouldn't freeze to death.

It had always been my eight-year-old son's dream to build a canoe - ever since I first told him that he wanted to. Since the shop was empty, we decided to build one. And, even though I had never done it before, I was fairly certain that he hadn't either. A trip to the local bookstore was in order since it was warm and closer than the library, which I was no longer allowed to use, but that's a whole other story.

We browsed the racks until we were warm and eventually located the ideal book for our project: "The Ideal Book of How to Build a Cedar Strip Canoe in Three Days or Less Without Even Trying or Knowing What You're Doing", or something like that. I bought it with the boy's allowance. The book had several plans and we finally agreed on the one I liked. We drew the plans onto ¾" plywood and cut out the forms to which cedar strips would be fastened. The forms were numbered and fastened to the strongback, creating what appeared to be a skeleton of a canoe, albeit a deformed and severely warped one. We checked

and checked again. The two center forms were much too small, causing the sides to dip inwards as if the canoe was wearing a corset.

Something was clearly wrong with the plans. Now, I know that every woodworker is saying to themselves, "Yeah right, it was the plans that were wrong!" I also realize that every woodworker out there has used the exact same excuse when they screwed something up, but in this case, it was true! We decided to guesstimate the correct sizes and eventually came up with something that looked a lot better than what we began with.

Weeks passed into months and every day after school the boy would trudge the many blocks to the shop. Blizzards, snow squalls, freezing rain, nothing could stop him from the joys of working alongside his dear father. I never once worked on the canoe without him. This was a father/son project and I wanted it to be as special for me as it was for him.

Eventually, every cedar strip was fastened neatly in its place and carefully hand sanded to a flawless, 1600 grit finish. The sides were perfectly faired and all that was left to do was apply the fiberglass cloth, which we planned to do the following day. The boy would come over after school and I would shut the shop so we wouldn't be disturbed more than we already were. Early the next

day as I was getting everything ready for the big moment, a truck pulled up with some lumber I had ordered. Unfortunately, the canoe needed to be moved from in front of the loading bay.

With great care I lifted the front of the canoe stand, and very cautiously swung it to the side. I walked to the rear of the boat and, oh-so-gently lifted it and swung it around. As I carefully moved it around, the front legs on the stand collapsed and the precise point of the bow dropped four feet to the concrete floor. Without the fiberglass to hold it together, the hundreds of individual pieces of lovingly shaped, hand-fitted and sanded cedar strips shattered and splayed apart like the petals of some gigantic alien flower. I thought of the hundreds of hours the boy had joyously spent on that boat and I was heartsick. I phoned his school to tell him not to come over. I simply couldn't bear to see the look on his sad little face. I'd rather let his mother deal with it.

The remnants of our glorious canoe served us nobly as kindling for the rest of that winter. We never attempted to build another one. We bought some lovely polyurethane kayaks instead.

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