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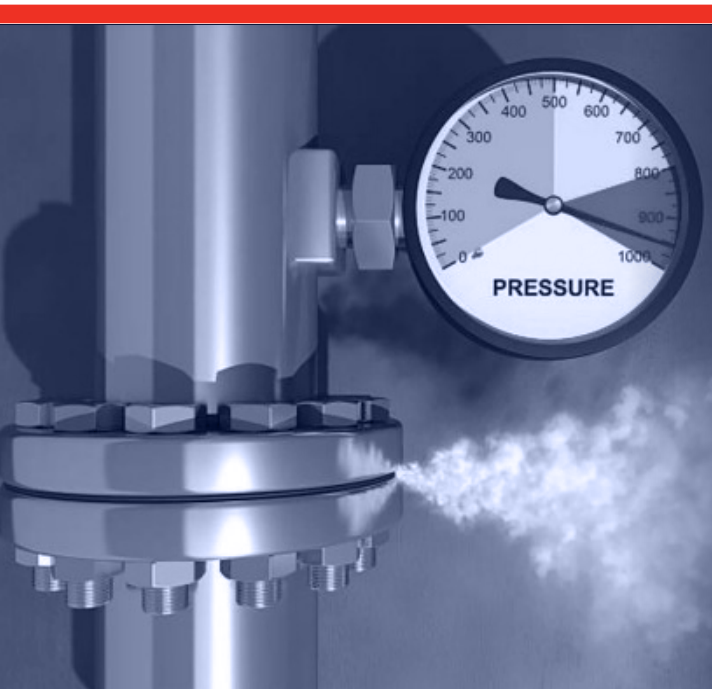

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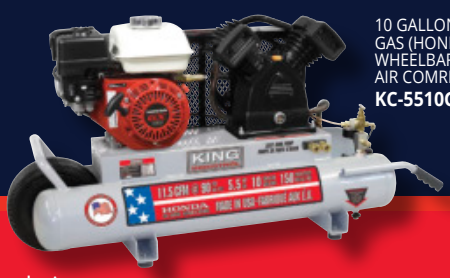

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editor's letter

Everyone needs more storage

rbrown@canadianwoodworking.com

Keeping your possessions organized, safe and within arms-reach is an age-old challenge that's never easy to master. However, as woodworkers we have the ability to design, build and install projects that will go a long way to customizing the storage we need to make our lives more organized and enjoyable. With a bit of imagination and skill it's not overly hard to solve many household storage issues and have a place for just about everything in your home. Living in an organized home, with storage projects you've completed yourself, is a very satisfying feeling.

This issue includes two types of storage articles: step-by-step projects to make and in-depth information to expand your woodworking skills and knowledge. The projects will help you store all types of items, from clothes, books and hats, to audio-visual equipment, makeup and whiskey. Our skills-based articles range from exploring project hardware and closet design to garage storage hacks. There's something for everyone here. I'm really proud of this issue.

To give our members extra thanks for their support, we've got a number of online extras that further explore some of the topics covered in this print issue. View an in-depth video about how you can machine the modern lap joint used in the bookcase project, and learn a few tricks about how to machine, prepare and finish the copper and steel components in the makeup organizer. You can find both of these videos on our website. We'll also be sharing those videos via our digital newsletters in the near future.

Here at *Canadian Woodworking & Home Improvement*, we're all very appreciative of your support and look forward to hearing what you think about this storage issue.
— *Rob Brown, Editor*

publisher's letter

Why we're publishing "double issues" in 2024

If you or anyone you know runs a small business, you understand that the past few years have been challenging.

We've experienced unprecedented increases in printing and shipping costs over the past two years. In order to keep our business viable, we need to reduce our manufacturing costs while continuing to pay our writers, editors and others for all the original content you expect from us.

In 2024 we will publish three separate issues rather than six. Each issue will have twice as much content as our past issues. While a "double issue" costs more to print and ship than before, the total will be less than the cost of manufacturing six separate issues. You will still receive as many new articles and features as before, but delivered in three printed issues rather than six.

In this increasingly digital era, we also will be adding new original content to our website that members will be able to enjoy as part of their subscription.

We appreciate your understanding of the need for this change in our business plan. It's our 25th year, and we are as committed as ever to being a trusted resource for woodworkers. If you have questions or concerns, please email us at member@canadianwoodworking.com.

— The team at *Canadian Woodworking & Home Improvement*

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Issue #148 • Spring 2024

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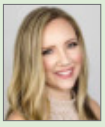

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Subscriptions in Canada (plus tax)

One-year digital membership $21.97

One-year digital plus print membership $29.97

Single copy cover price $12.99

Canada Post Publications Mail 40035186
ISSN 1921-6432 (print) ISSN 2371-9028 (online)
HST 85195 6862

We acknowledge the support of the Government of Canada

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Magazines Canada

CANADIAN Woodworking & HOME IMPROVEMENT

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Cover photo by Rob Brown

letters

Part of a community

I love your magazine and look forward to receiving my copy every month. It's so quintessentially Canadian – small and not too brash, but practical and credible. The magazine is professionally packaged and well-organized with a good balance of content for all skill levels of woodworking and home improvement. The articles, editorials and reviews are original and honestly presented by Canadian craftspeople. The interviews are engaging and inspiring, and bind us all together in our love of wood and being creative in general. Even your ads are from Canadian companies who we are all happy to support. Reading my copy makes me feel part of a community of like-minded, and for most of us, gentle people.

Thank you, and please keep up the excellent work.

Robert P.
Red Deer, Alberta

Thanks for the Festool prize package

Thank you so much for selecting me as the winner of the December draw. I'm humbled by such a valuable prize and I really appreciate it.

I would also like to acknowledge both Chad Martin and Jennifer Taylor. They could not have been more helpful; Chad with the contest forms and Jennifer with several queries about starting my subscription with a specific issue to avoid duplication and a back issue I had missed on the newsstand. I've been buying each issue that way for a long time and I'm glad to finally be on board as a member.

Once again, a heartfelt thank you to everyone at the magazine and to Festool for supplying such a great prize. The dust extractor and sander will get a lot of use in my workshop.

Jeff L.

Thank you for your letter, Jeff. The monthly membership giveaways have been a great addition to the long list of benefits of being a member of Canadian Woodworking & Home Improvement. Working with our partners and clients, we have secured a list of amazing prizes for each month in 2024. The draws are held at the end of each month through a random draw and all members/subscribers are included for a chance to win. Check out any of our social media channels, website and newsletters to see what prize is coming next. — Chad Martin, Advertising Director

Member Giveaway Draw Winners

October 2023 – Michael S. Tottenham, ON
Won the **Festool Plunge Cut Track Saw**

November 2023 – Rod D. Ponoka, AB
Won the **King Canada Wet/Dry Sharpener**

December 2023– Jeff L. London, ON
Won the **Festool Random Orbit Sander & Dust Extractor**

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Tool Reviews

Melbourne Tool Company low-angle, bevel-up smoothing plane

Well-designed, accurately machined, stellar looking.

Kakuri Oire Nomi chisel set

Razor-sharp, durable chisels that hold an edge well and are easy to resharpen.

View these reviews and more at:
canadianwoodworking.com/**reviews**

Fabulous Finds

Blue Spruce Optima Chisel Plane

What caught our eye on this tool was the position of the blade – it lays flat on the work surface like a paring chisel – and the shallow bevel angle that makes it easier to remove very thin shavings. This is the plane to reach for when you need to flush trim plugs, smooth end grain, pare away joinery surfaces, clean glue squeeze-out, smooth rabbets, clean up tight corners and for anywhere and anywhere else you can't use a normal hand plane. The A2 steel blade attaches flush to the bottom of the rigid aluminum handle. Made in the U.S. **BlueSpruceToolWorks.com**

Micro Mystery

Can you guess this object commonly found in most shops?

Follow us on Instagram to see regular "Micro Mystery" challenges.

We will post the answer to this one in our summer issue.

Previous issue: Depth adjustment knob on a Veritas block plane.

Video Links

canadianwoodworking.com/**videos**

Canadian Quotes: Brocklen Johnson

How to apply iron-on edge banding (members only)

Keep in Touch on Instagram

We'd love to connect – come follow Rob, Carl and Chad @canadianwoodworking. We also think you'd really enjoy these other Canadian woodworkers we follow. Check them out!

Jenna Rutherford
@fromhousetohomediy
Focusing on DIY home renovation projects to empower you to create homes with heart

Vic Tesolin
@vic_tesolin_woodworks
Hybrid woodworker, teacher and author

Pat Lap
@patlapofficial
Just a dude having fun in the workshop

Lesley de Abaitua
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Free Plan

Make a Custom Bathroom Vanity

Build a vanity for your bathroom that looks as attractive as a well-made piece of furniture.

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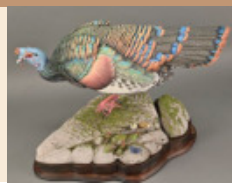

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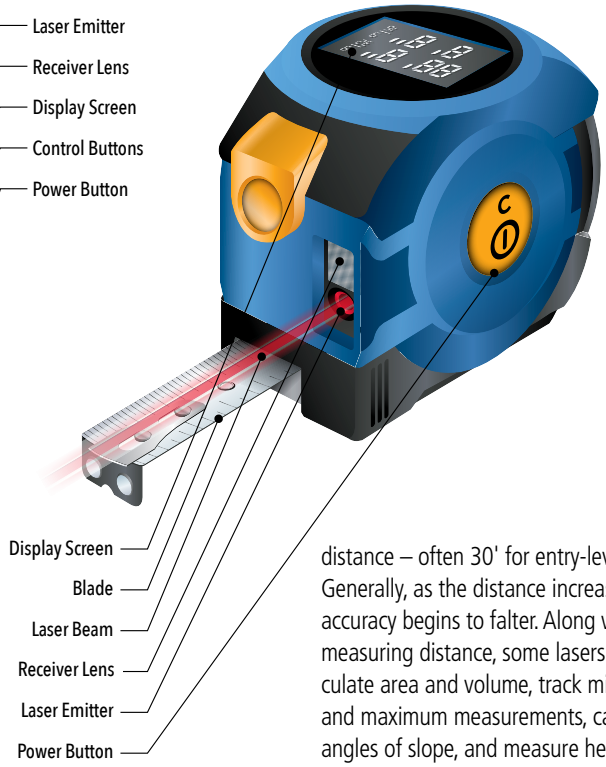

While a tape measure is a great choice for distances up to about 16', for longer distances a laser distance measure (a.k.a. digital laser meter) is easier and faster to use, highly accurate and offers much more functionality. It works by emitting a narrow beam of light and then measuring the time it takes for the light to hit an object and reflect back to the laser measure. Where the light hits the target you'll see a dot (red or green), unless the target is very far away. Lasers that emit green light are brighter and travel farther while red lasers consume less battery power and the light beam is easier to see outdoors. Over long distances outdoors, laser dots are practically invisible. To overcome this, some lasers have a built-in optical viewfinder. Others have a built-in video camera that displays where the laser dot is on the unit's display screen.

Entry-level lasers can measure distances up to about 100', which is all most DIYers will need. Units designed for tradespeople are capable of measuring distances upward of 650'. Lasers can have either LCD or LED display screens. LED screens, which are more expensive, are much brighter and easier to read. Some lasers display measurements in Imperial units, others in metric and others in both standards. Accuracy can vary from 1/4" to 1/32" over a specified distance – often 30' for entry-level lasers. Generally, as the distance increases, accuracy begins to falter. Along with measuring distance, some lasers can calculate area and volume, track minimum and maximum measurements, calculate angles of slope, and measure height or width of objects by triangulation. Most entry-level lasers don't have memory storage or Bluetooth connectivity. This shouldn't be an issue for DIYers.

Laser tape measures are essentially standard measure tapes (typically with blades that extend up to about 16') that include a basic laser distance feature (that measure up to about 65'). They offer the advantage of both measuring options, making them practical tools for DIYers.

Types: Laser distance measure; Laser tape measure
Power source: AA, AAA or lithium-ion batteries
Price: $20 - $400
Reach: 20' to 650'
Accuracy levels: 1/4" to 1/32"
Screen types: LCD, LED

Get the Most Out of Your **Laser Distance Measure**

Don't stare

Most LDMs use Class II lasers and are not directly hazardous to the human eye. However, it's still a good idea not to stare into the beam or point the laser at anyone's face.

Keep it clean

The laser emitter and receiver lens rely on an uninterrupted beam of light, so you'll want to keep them free of dust and dirt.

Know what you need

Most lasers have multiple operating modes so it's important to understand what you want to do with your laser. Hint – read the user manual.

Keep it steady

To ensure you get the most accurate results, keep your meter as stable as possible. Butt it up against a wall or lay it on a steady surface.

Mark the target

Outdoors, especially when it's sunny, the laser dot can be hard to see on your target. Mark the target with a piece of masking tape or purchase a reflective laser target plate.

Photos by Rob Brown Illustration by Len Churchill

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toptenTop10

Ways to Improve Storage

"Out with the old" is the first step to finding more space for household and personal items. Focusing on a certain area or items to be stored yields big results, too.

BY ROB BROWN

1 Nearest the Main Door – Maybe not the spot for an armoire in most homes, but smaller dedicated storage like a coat rack, umbrella stand, or wallet and key shelf will go a long way to keeping the front entrance of your home tidy, welcoming and functional.

2 Nearest the Secondary Door – Boot trays and lots of seasonal jacket and clothing storage will come in handy for your family, especially during the shoulder seasons where you need everything nearby in case the weather turns (which it will). It will also reduce dirt and clutter. Reusable bag storage, anyone?

3 Basement – Get serious with some basic floor-to-ceiling plywood and 2×4 storage shelving. Once you have large plastic lidded bins for storing gear and other items, customize the shelf heights to fit these bins. For the ultra-organized, this is the time to buy a label maker. For me, it's Sharpie time.

4 Outside – When the indoors becomes too cluttered and full, turn to the outside. A shed, or even a covered area, will provide security and protection from the elements for items that unnecessarily take up room indoors.

5 Shed or Storage Locker – Rather than just stacking items on top of each other, take a bit of time to create some very basic, sturdy shelves for these areas to not only let you fit more into the space, but also allow access to what's there without needing to first pull everything out.

Photo by Dreamstime

6 Garage – Don't be afraid to change with the seasons. If it's winter put the bikes up high; if it's summer replace the bikes with skis, shovels and salt. There are lots of garage-organizing products on the market, but we woodworkers and DIYers are a creative and handy bunch, so think outside the box.

7 Inside Wall Cavities (between 2×4s) – Many interior walls are without electrical wires, ducts or water pipes. Granted, it's not a huge area, but a few simple custom cabinets between studs will go a long way towards storing smaller items. This is especially true for small bathrooms where product bottles, bars of soap and toilet paper take up a surprising percentage of storage space.

8 Bedroom Built-Ins – When closets are non-existent (or full) built-ins are a simple way to provide more storage in a critical area of everyone's day-to-day life. Consider long-term storage needs and build storage that has adjustable shelves and the potential for future adjustments.

9 Kitchen – Possibly the trickiest room in the house to organize properly. Getting rid of lesser-used stuff to make more room for regularly used stuff is job one. Next, adding extra shelves to existing cabinets, organizing the area under the sink or making a custom cabinet is the way to go. Consider adding other storage areas nearby to store those infrequently used kitchen items.

10 Basement Workshop – I'm not looking to make enemies here, but keeping a basement workshop clean, while making sure it doesn't migrate too far into the rest of the basement, is probably a good long-term approach to working wood in your basement. If tools do cross your workshop's boundaries, make sure to store them neatly so nobody gets angry.

ROB BROWN
rbrown@canadianwoodworking.com

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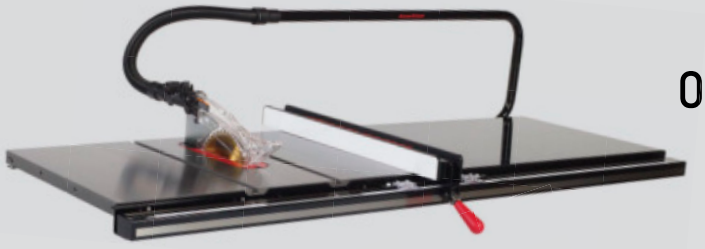

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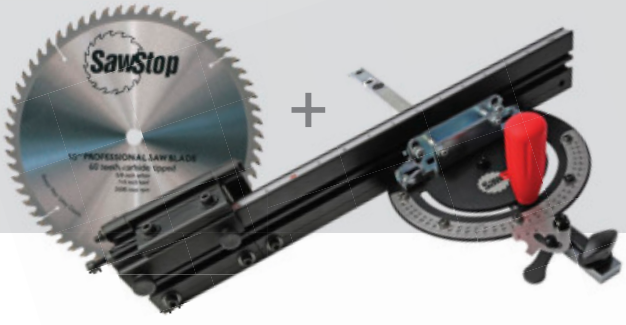

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Brocklen Johnson

…on inspiration, commissions and why new makers should imitate, then innovate.

BY ROB BROWN

"Sidde Stool" – Made of white ash and Danish paper cord, the seat features a weaving technique that doesn't include pins or hooks. According to Johnson, weaving the seat was not only the most time consuming, but also the most rewarding part of making this stool.

How long have you been building furniture?
Three years.

What sort of furniture do you specialize in?
Solid wood and veneer, residential furniture.

Tell us a couple interesting things about your personal life.
I'm certified to facilitate breathwork. We can change our mental and physical states by influencing how we breathe. Breath is medicine.

If you weren't a furniture maker what would you be?
I would be dedicating most of my time helping others to connect with themselves to create deeper connections with others.

In order, what are the three most important items in your shop apron?
Pencil, tape measure, Olfa knife.

Do you prefer hand tools or power tools?
Machines and power tools have their place to speed up the process, but I find slowing down and using hand tools allows for a deeper connection with a piece of work.

Solid wood or veneer?
Solid wood. Each piece has such unique characteristics and it's fun to get creative with the grain.

Figured wood or straight grain?
I really love incorporating some kind of figure into a piece as kind of a feature surrounded or supported by grounding straight grain.

Inherited Vintage Stanley Sweetheart or fresh-out-of-the-box Veritas?
Inherited. I'm deeply grateful to those tools and skills passed down through the generations.

Favourite wood?
Black walnut 100%.

Photos by Brocklen Johnson (Lead photo by @avrandhawa)

Brocklen Johnson, 39, Marka Furniture Co.
markafurnitureco.com
Location and size of studio — 1000 Parker St., Vancouver, B.C.
Education — Red Seal Cabinetmaker/Joiner

quotes

Once I've broken out solid wood parts on the table saw I love getting into a flow on the jointer and planer. As the surfaces get cleaned up, the wood grain really comes through to show its beauty.

There are so many great designers/makers on social media, but I'm inspired when I see what Nick Pedulla is producing. Local designers like Nicholas Purcell, Jeff Martin Joinery and Alex Quiring (Northbound Furniture) are a few more I really admire.

I believe creative inspiration comes from a source greater than me. I like to research designs to really get my excitement building, then I'll set an intention and do some breathwork or meditate to clear my mind and be open for design ideas to land. It can take a couple days or a week before a good idea comes.

New makers should imitate, then innovate. I've spent a lot of time spinning my tires trying to reinvent the wheel (pun intended) when an already good design could use a little tweaking with my own flavour. Imitation is the sincerest form of flattery.

Commissions are the most satisfying because of their originality. It's fun to problem solve and make something no one else has made before.

I really enjoy the entire process, discovering what the client is looking for, where their inspiration comes from and what their story is, then creating a piece original to them.

I think more exposure to workshops and making more opportunities for creativity and play will bring new makers to the scene. There's a sense of accomplishment when completing a personal project that will be used daily or given as a gift. The greatest gift we can give someone is our time, and a woodworking project takes a lot of it.

My designs are inspired by the materials. I like to get the feel of the space a piece will be in before deciding on materials, and then come the design details.

I've been using Procreate on iPad for perspective millwork design sketching, but I really like good old pencil and paper

"Claro Bed and Side Tables" – Live edge claro walnut is carefully used to create a harmonious, durable and aesthetically pleasing bedroom set. The drawers in the side tables run on wooden slides, keeping the look and feel simple and traditional.

I get really fired up in the design phase, then somehow energy wears down in the middle of the build. Once the project is nearly finished it's amazing to see what has developed from a sketch or an idea.

It's a fine balance between living in a city that's affordable, yet with a market that can support a living. I've managed to utilize my experience in cabinet making to support my business between custom furniture projects. I get creative outside of furniture making, too.

Any skill can be learned with the right amount of desire. I used to think only "furniture makers" could make furniture until I learned how to make furniture.

I built a table for the Canadian Embassy in São Paulo, Brazil, that I'm really proud of. It's 54" wide and 12' long with two 4' extensions on each end. The thing is massive. Solid walnut frame and legs with bookmatched quarter cut veneer top.

ROB BROWN
rbrown@
canadianwoodworking.com

Go Online for More

VIDEOS: Visit our website to view a slideshow of Brocklen's work.
RELATED ARTICLES: Jackie Chapman *(June/July 2023)*, Felix Mckenzie *(Oct/Nov 2022)*

INFO: DIFFICULTY – **2/5,** LENGTH/TIME – **3/5,** COST – **2/5**

MAKE A SPACE-SAVING LIVE EDGE COAT & HAT RACK

Creating storage near a front door is tricky. You want enough hooks and shelves to store frequently worn items like coats and hats, but you don't want to overwhelm an entryway with too much clutter. This coat and hat rack is the perfect solution for an already tight area.

Photos by Steven Der-Garabedian

BY STEVEN DER-GARABEDIAN

While the newel post at the bottom of the stairs is a convenient spot to hang my jacket and hat, it's not quite what a woodworker should be using. It also becomes inconvenient when guests come over and their stacked jackets slide to the floor and hats get squished. Time for an upgrade.

A strong back

I found a piece of black walnut sitting in my collection that had amazing colours, a pleasant shape and some live edge, and just seemed like it was looking to be mounted on the wall. I'm not one for pouring epoxy, nor am I a huge fan of live edge material, but this piece seemed right to be the backdrop for coat and hat storage. On its own, the piece was wide enough for the spot near the door, however, it wasn't high enough for the design I wanted to create. I found a couple more planks that would fit the bill.

I milled them all up to give me a back panel 7/8" thick by 28" wide. The length worked out to 31" on the long end and tapered to 24" on the short side. Local wood supply sources should have lots of attractive pieces for you to choose from, as live edge is popular. Alternatively, making a rectangular back with roughly the same dimensions would also work well.

Edge joining doesn't require any extra internal support, however, it does help align the parts and makes gluing smoother, especially when working by yourself. I chose Festool Dominos but dowels, splines or biscuits would work fine. To accommodate the shape of the top piece for clamping, I glued up two pieces of 5/8" MDF, traced the live edge shape onto it and cut it out at the bandsaw. I also made up some 1/4" thick pine cauls to conform to the remainder of the bend.

Bends and laminations

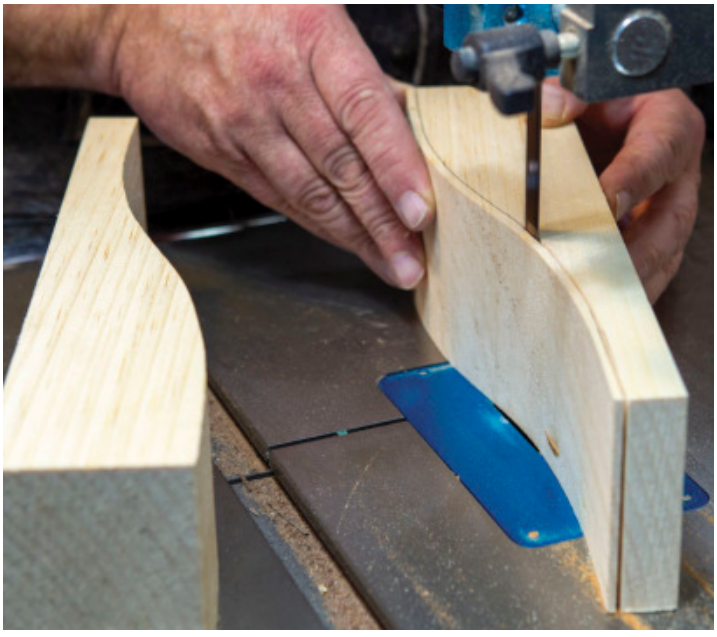
I thought using bent-laminated wood with a simple curve would be a great way to create supports for the hat pads and also allow spacing them away from the back panel.

The curve is a simple "S" shape. The form is 3" × 4" × 12". Draw the shape onto the bending form and cut it out as smooth as you can on a bandsaw. If your blade is sharp and you take your time, very little sanding will be required. You will also need to accommodate for the thickness of the laminations, so cut another 1/8" off the inside of each piece of the form. The final amount of material removed from the curved form should be equal to the thickness of the plies in one lamination. I cut some cherry into two pairs of 3/16" thick × 3" wide and approximately 14" long laminations. I eventually dyed these black, but more on that later.

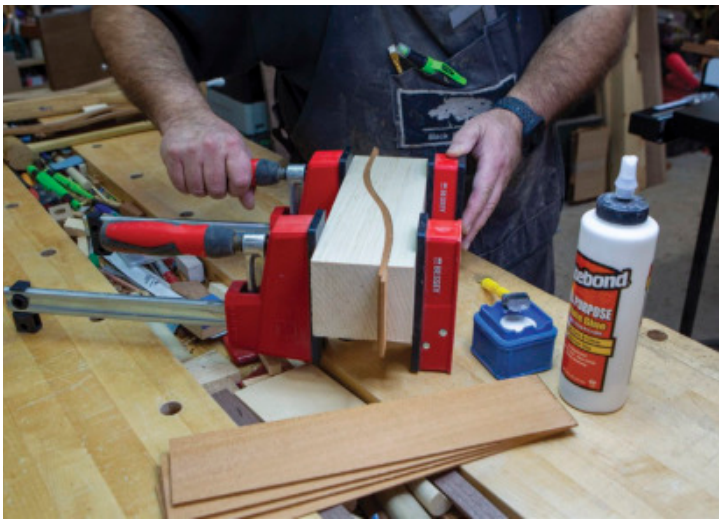
Dry clamp the pieces and see if you need to make any adjustments. While the form doesn't have to be perfect, you'll still need to apply good pressure for a seamless glue-up. Add some packing tape to the inside of the form, apply glue, add clamps and let it sit overnight. Rinse and repeat, as you'll need two pieces for the hats (each form makes two arms); more if you opted for a wider back board with more hat pads.

When the laminations have cured, edge joint one side and cut them on the bandsaw to just slightly over 1-1/8" wide. This will leave room to clean up the edges with a few passes of a hand plane. As far as the length, I ended up going with 11", however, adjust this to suit your own design.

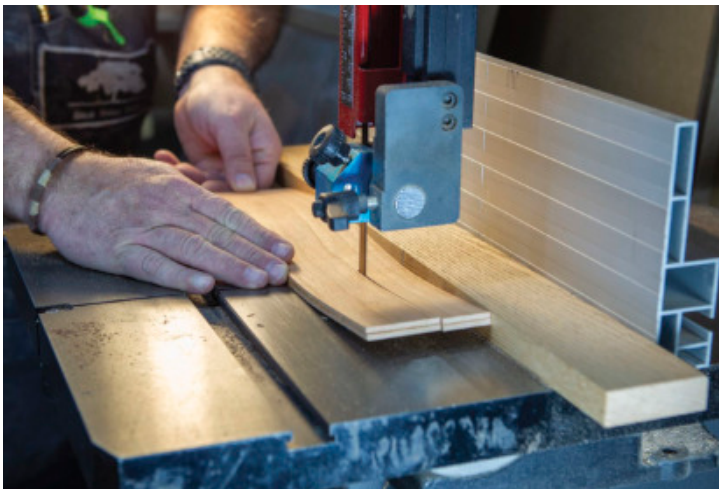
Cauls Are Critical – Cauls will spread clamping pressure over the width of the joint, but even more importantly, these cauls will help protect the live edge from being damaged by the clamps.



Remove Material – Once the lines are drawn on the blank, use a bandsaw to remove the same amount of waste as the laminations are thick.



Clamp It Up – With glue on the mating faces, put the lamination in the form and clamp the two halves together. Leave it to dry overnight.



An Easy Rip – Ripping thin material like this on a bandsaw is a breeze. The freshly cut edge can be cleaned up with a hand plane.

Square to round

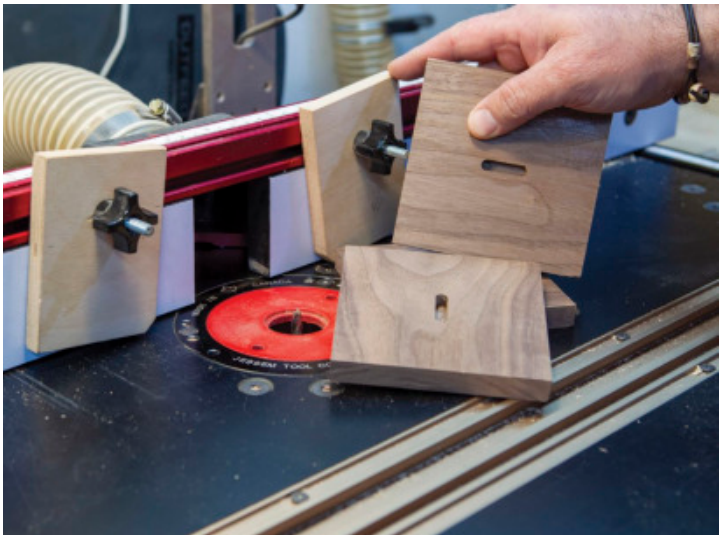
It's much easier to cut the joinery on the hat pads while they're square. I milled up three pieces of black walnut to 1/2" thick and 4-1/4" square. Cut them to 4" diameter circles after the mortises are taken care of. The router table makes quick work of the mortises with a 1/4" spiral bit and a pair of stops. Cut the mortises 1-1/8" wide and 1/4" deep. This part of the joinery can also be done with chisels, a drill, a small router plane, etc. Choose the method you have the tools for and are most comfortable with.

Square up the ends of the mortises at the workbench using chisels. You could also round over the support arms, but I thought it would come out cleaner squaring them off. Dry fit the supports. As they are hand cut and fit, each support and pad combination will be unique to each other, so I marked them with a coloured marker inside the mortise and the top of the support.

I like the bandsaw for a safe and easy way of cutting circles. While there are jigs you can buy or spend lots of time making, I ended up taking about 15 minutes to make mine. Start off with a 1/8" thick piece of hardboard approximately 6" wide and 8" long. Mill up a piece of wood that fits in the guide slot of your bandsaw table. It should be a snug fit, yet movable, and sit just below the tabletop. Secure this to the hardboard so it's perpendicular to the long edge and the blade will cut a portion of the hardboard. I used a few drops of Titebond's Thick CA adhesive and some accelerator for a strong and speedy glue-up.

Put the jig on the bandsaw and cut about halfway into the jig. At this point clamp another piece of wood on the out-feed side of the slot to act as a stop. Remove the jig and drive a nail from the bottom of the jig, in line with the kerf, but 2" away. You can also use a drop of CA here to hold the nail in place. Turn the jig over and cut the nail, leaving it about 3/16" proud.

Mill up some scrap wood to fit tightly into the mortises of the hat pads and press them in. Next, find the centre by drawing lines from diagonal corners and using an awl to create a hole that will sit nicely on the freshly cut nail. Now place the jig and a hat pad on the



Add Mortises – Before the hat pads can be rounded, it's best to machine the mortises in their undersides. A router table, complete with stops, makes quick work of this process.

Small Circle Jig – Der-Garabedian often cuts circles on his bandsaw with the help of a simple jig. The nail acts as a centre point for the workpiece to rotate on. The jig has a wood strip attached to its underside that runs in the mitre gauge groove on his bandsaw and allows Der-Garabedian to start the cut in the workpiece.

Materials List

Part	Qty	T	W	L	Material
Back	1	7/8	28	To Fit	Black Walnut
Circular Hat Pads	3	1/2	4	4	Black Walnut
Hat Support Arms	3	3/16	1-1/8	11	Cherry
Rectangular Hooks	2	3/8	1-1/8	5	Black Walnut
Shaped Hooks	2	7/8	7/8	5	Black Walnut
Brackets (Trapezoids)	5	3/4	1-3/4	2	Black Walnut
Shelf	1	11/16	5	18	Black Walnut
French Cleat	2	3/8	2-1/2	18	Baltic Birch
Rear Corner Blocks	2	3/8	1	1	Black Walnut

Cut the Hat Pads – Once the workpiece is fit on the jig, Der-Garabedian moves the jig forward to cut into the workpiece, then once the wooden strip on the base of the jig comes into contact with the clamped stop, he rotates the workpiece until a round workpiece is produced.

bandsaw. Slowly push forward until you hit the stop and carefully rotate the hat pad until you've cut yourself a circle. Repeat this process two more times. Sand the pads' edges smooth with sandpaper.

Paint it black

I rarely stain wood. If I want something light, I'll use maple, white ash, pine or similar. And if I want a dark tone, then I'll use black walnut. Having said that, I've been toying with dyeing wood black for a strong contrast. I think I may have found the right solution by using India ink. With only one coat it goes on smoothly, dries fast and takes a finish very well. It also leaves the grain lines so the piece still looks like wood.

I milled up two pieces of black walnut that were 3/8" thick by 1-1/8" wide and 5" long for two of the four hooks. I rounded the tops off by first tracing a curve using a roll of blue masking tape, then cut and sanded them smooth. These two pieces, along with the curved support arms, were then dyed black. Make sure to clean up the pieces before dyeing with sandpaper to 180x grit.

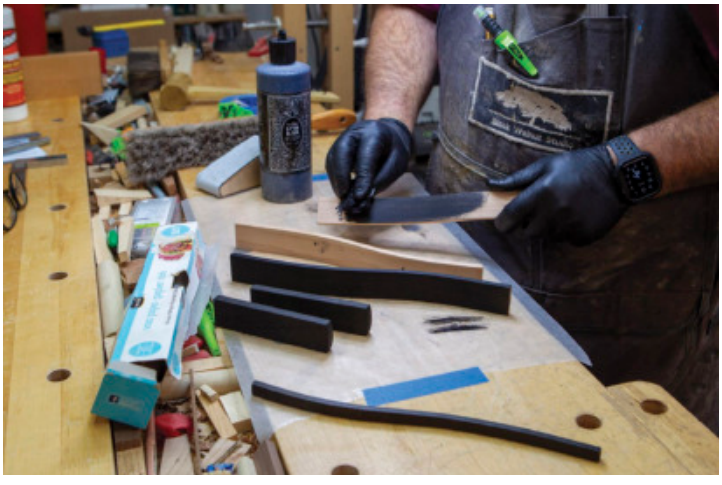
Floating the shelf

While letting the ink do its work, I removed the back panel from the clamps and started to clean it up. There was a crack forming at the top and I added a modified butterfly to help keep it in check. I then moved on to sanding the surfaces and edges working through grits from 120x to 180x. You could sand to 220x or finer, however, read the recommendations for the finish you plan on using.

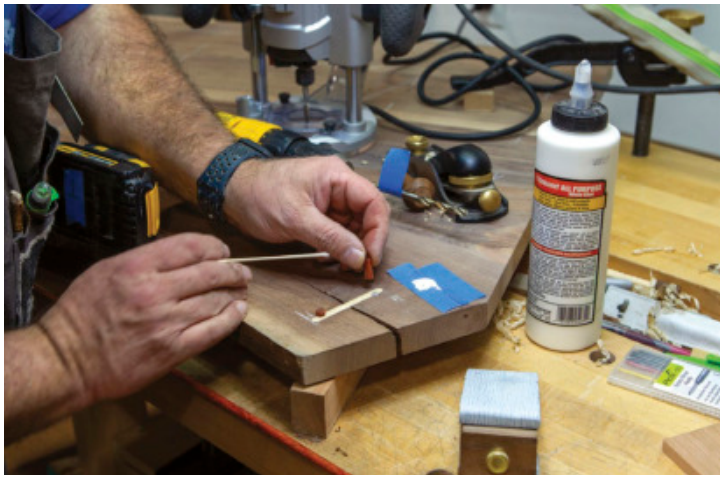
I've used the blind shelf supports (Item 00S0520, Blind Shelf Supports, pair) from Lee Valley Tools before and it makes adding a shelf without visible brackets easy. To accommodate for the bracket, I started off by drilling a 1-3/4" diameter hole in the back that was as deep as the thickness of the bracket supports. Next, using the centre point the Forstner bit left, I drilled the through-holes using increasing size drill bits until reaching 7/16". Read the instructions for the shelf supports you use to make sure you account for width and, more importantly, shelf thickness. I milled up a piece that was 11/16" thick × 5" deep × 18" long. Using the drill press, I bored matching holes into the back of the shelf that were 4-1/2" deep.

Angles, brackets and hooks

I was contemplating adding store-bought hooks, but after a few days of searching through what seemed like an infinite number of options,



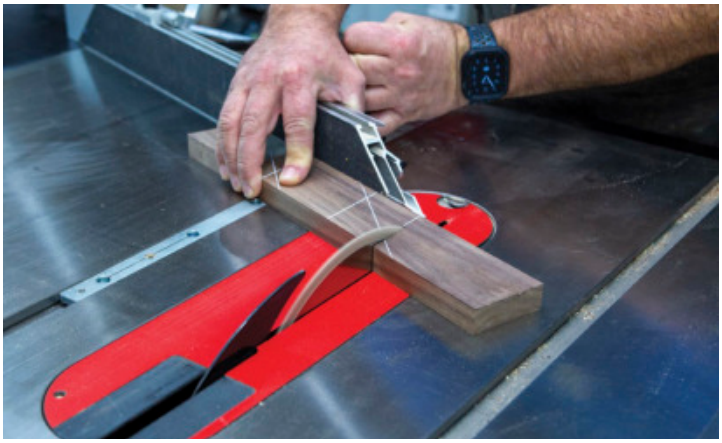
Great Contrast – India ink provides nice contrast for this project. Der-Garabedian colours the three curved and two straight hooks that get installed onto the wooden brackets.



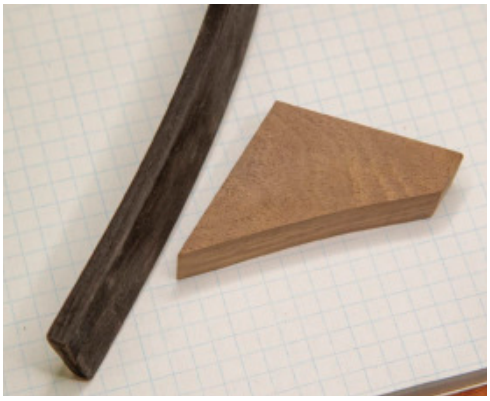
Mind the Gap – A crack was showing up in the back board, so Der-Garabedian machined and installed a straight strip of wood to help keep the crack from spreading. He also added two contrasting exotic plugs for strength and aesthetics.

Hidden Hardware – If you're going to use floating shelf hardware, ensure you read the instructions and machine for it properly.

Through Holes – Der-Garabedian bores a clearance hole through the back so he can install the floating shelf hardware. The shallow, large diameter holes are to accept the plate on the hardware at the rear face of the back panel.



Cut Small Brackets – Small pieces are always hard to cut on a table saw. Der-Garabedian lays out the cuts on the blank, then cuts them out. He's laid the parts out so he can then take the small, freshly cut blank to the bandsaw and cut the blank into two parts.



Slight Curve – While two of the brackets need a flat edge to accept the straight, shorter hooks, three brackets need a slightly curved front edge to accept the laminated hat pad support arms.

I chose to create my own. There are two different versions at the bottom of the rack and I needed a way to make them stand proud.

Mill up some wood that's 3/4" thick and about 2-1/2" wide and long enough so your hands remain a safe distance from any blade. You'll need five brackets: two for the rectangular hooks that were dyed black and three for the hat pads. I cut these trapezoid-shaped brackets first on the table saw with a mitre guide angled at 28°. For the cut along the top base, I moved to the bandsaw as it would have been too risky to hand hold a piece this small on the table saw.

Two of the brackets need flat surfaces and a block plane makes quick work of that. The three for the hat pads will need to be slightly curved to match the back of the support arms. You can do this in a number of ways, but I found a curved bottom spokeshave and some sandpaper wrapped around a 1" dowel worked just fine. Keep checking your progress against the support arms to make sure you have just the right curve.

The last two hooks on the bottom of the rack start off as 1" square blanks that are 5" long. Use the drill press to drill a 3/8" hole into one end of each blank approximately 2-1/2" deep. Next, cut a 28° angle on the end with the hole to let you hook a coat on to it.

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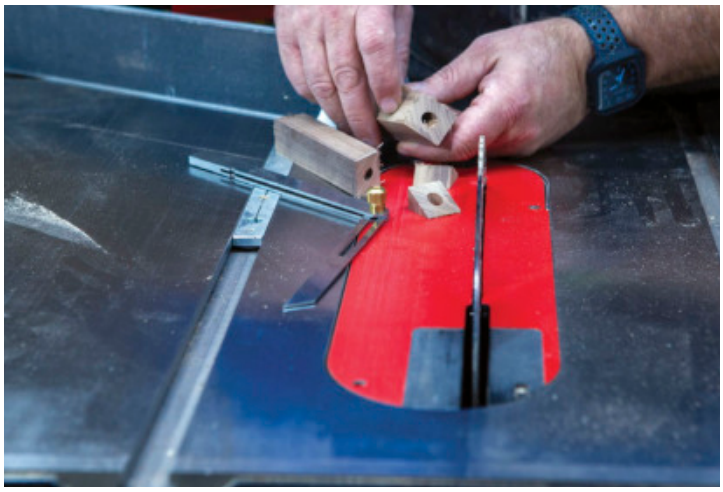
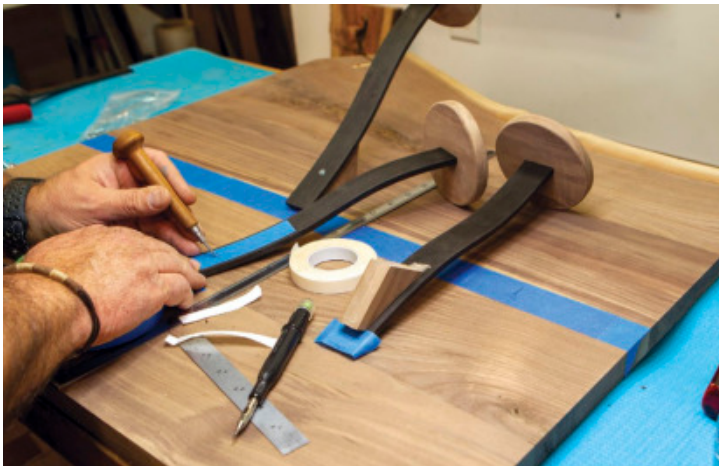
Plumb Holes – In order to ensure the holes are bored straight into two of the hooks, Der-Garabedian used a guide block, fence and clamps to fix the workpieces in place while boring.



Angled Hooks – The two angled hooks need to be bevelled on one of their ends. A mitre gauge is one option, and that's what Der-Garabedian used. If this is too close for comfort, bandsawing, handsawing or using a simple customized shooting board are other options.



Screw Layout – A bit of blue masking tape will allow you to add marks to the parts without risking not being able to remove the marks.

Match the Angle – Once the angled hook has been cut, Der-Garabedian uses it as a guide when he's drilling the dowel holes to fix it to the back.

I wanted something that was facetted and tapered as far as the cross-section shape went. I chucked the blank in my shaving pony and went at it with a spokeshave. I also wanted to leave some texture on these, so while I sanded, I left a few flat spots and tool marks.

Rehearsal of sorts

It would be too cumbersome to apply a finish while all the parts were mounted to the back panel. However, I wanted to position all the pieces and drill all the holes that were required before the finish was applied. I glued the hat pads onto their respective support arms. Once cured, I tried different mounting positions until I was happy with their position and stance. Use double-sided tape and blue tape to try different options until you're satisfied with the results.

To mount the assemblies to the back panel, use double-sided tape to stop the brackets from sliding around as you drill for screws. I used flat head #8 × 2" wood screws to attach the assemblies to the panel. Account for the thickness of your back panel and use an appropriate screw length. Drill countersunk holes on top for the heads and pilot holes into the back. The arms, hooks and brackets

Coming Together – Screws secure many of the hooks. Der-Garabedian coloured the screws black once he was done.

Attach Hardware – Finally, the floating shelf hardware gets attached to the back so the shelf can be installed.

should be drilled with clearance holes. To attach the shaped hooks, use a 3/8" brad point bit to drill for 3/8" dowels. Start off perpendicular to the back then slowly change the angle to match the hook.

Finishing up

Remove all the hooks and brackets and clean up any scratches that might have shown up during the dry run. I opted for two coats of Osmo Top Oil, as it will provide good protection even if I place a wet hat or rain-soaked jacket on a hook.

After the finish has cured, assemble the blind shelf hardware and screw it in its place using a pair of #8-1/2" flat head wood screws. As for the whole assembly, a French cleat is a good way of mounting it to the wall. Baltic birch makes a good choice for this method. I also like the fact that the back panel will be held proud of the wall. I ended up using a 3/8" thick piece that was 5" wide and 18" long. Angle your table saw blade to 45° and rip the piece in half along its middle. Mount one half to the back using a pair of flat head #8-3/4" wood screws. To ensure the shelf is supported properly, I attached a block on the back of the rack, the same thickness as the French cleat. These were located near each of the two lower corners, slightly away from the edge so nobody can see them.

Once the location has been picked for your rack, mount the mating piece to the wall using longer screws into studs and drywall anchors if needed. Finish up by adding the hooks and hat rests to the front at their pre-drilled locations. I covered up the shiny screwheads with flat black enamel paint.

After 24 years at this house, I finally have a proper place to hang my hat. Imagine what I'll accomplish in another quarter century.

STEVE DER-GARABEDIAN
info@blackwalnutstudio.ca

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MAKE A WHISKEY CABINET

This whiskey cabinet can store your prized spirits and a few special glasses, and also features extra storage and display areas.

Photos by James Dobson Illustration by Len Churchill

Gang Them Together – Dobson clamps two similar parts together before cutting the tails to speed up the process of creating the dovetail joints for the case.

Helping Hand – A mitred piece of scrap, clamped inline with the location of the mitred end of the joint, gives Dobson a guide for his chisel while he's paring the joint.

Ready for Assembly – These case parts can now be used to lay out the mating portion of the dovetail joints.

BY JAMES DOBSON

Several years ago, I stumbled upon a retiring woodworker on the *Canadian Woodworking & Home Improvement* online forum who was selling part of his lumber collection. He was local to me and so I headed over and spent an hour with him as he showed off his tool collection and spectacular lumber before I picked up two beautiful 10' long cherry boards he'd had for over 40 years. Obviously, this wood needed to be used for something special so I kept it on my rack until the right project came along, a hanging liquor cabinet. Once I settled on my design, which went through many iterations in my sketchbook, I planed the boards to their thickness and cut them to length, and the joinery began.

Kumiko, the thin pieces of wood that make up the door panel, are a strong design feature of this whiskey cabinet. I'll cover how to make them and install them in the door frame.

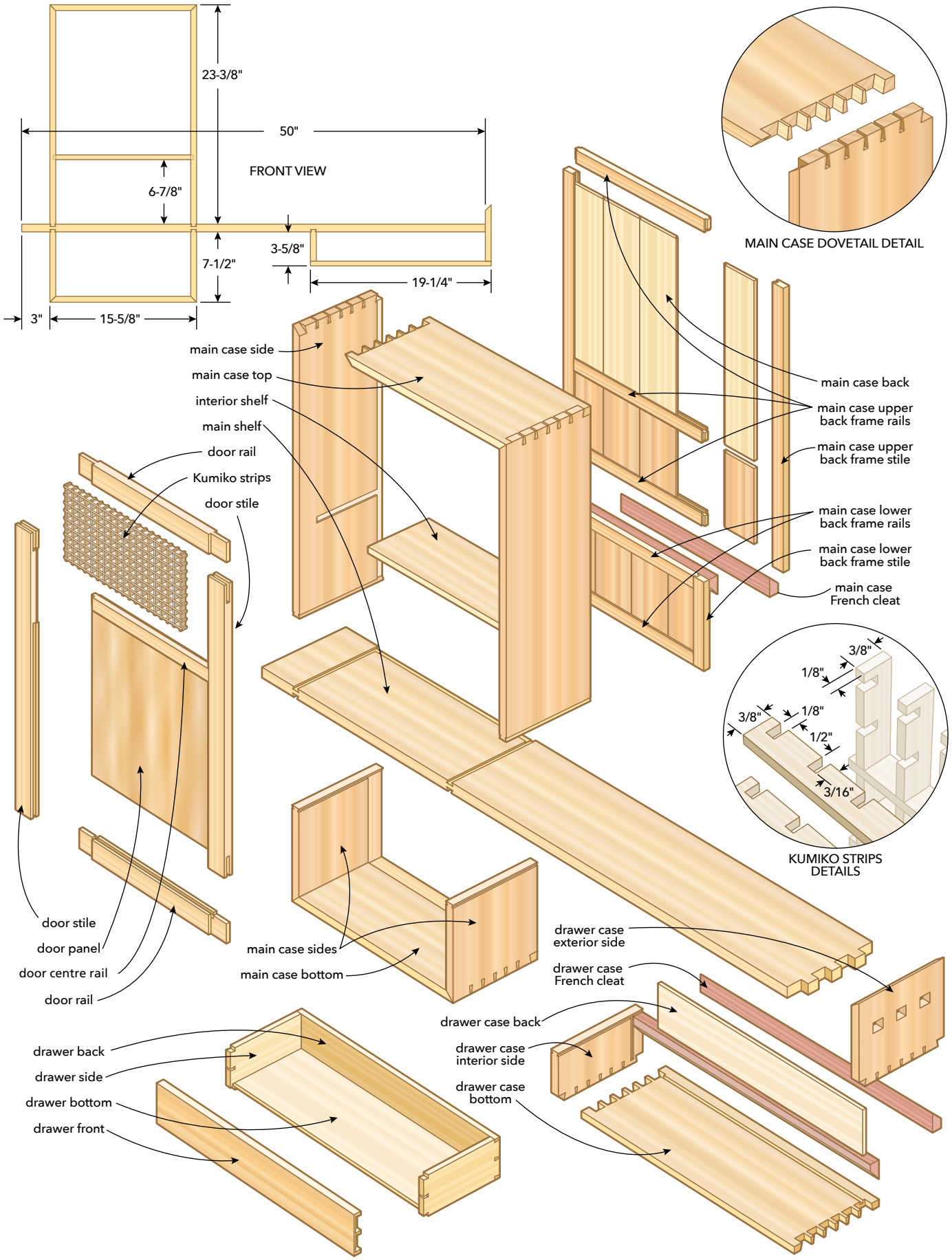
Assembling this cabinet with all its different dovetail joints is an exercise in following the order of operations. The through dovetails need to come together in a side-to-side manner, and the sliding dovetails need to be assembled in a front-to-back manner. If this order gets messed up it's impossible to assemble the project. Follow my approach and you'll end up with a fully assembled case.

The case – Part 1

The cabinet case with the door and the compartment below are made as a single unit. Dimensions are fairly important here. The case needs to be the length of the door plus 1/8" (for a 1/16" reveal at top and bottom) plus 1/4" for the top sliding dovetail, plus 1/8" (or the width of your table saw blade for the kerf when you cut the case in half), plus 1/4" for the bottom sliding dovetail, plus the depth of the bottom case. The width of the case is the width of the door plus 1/8" for a 1/16" reveal. Also remember that you need the width of the sides (5/8" plus 5/8") added to each of these lengths as the case is dovetailed.

That sounds complicated, but as long as you're comfortable fitting your door to your opening, rather than hitting an arbitrary measurement, you should be able to manage it without too much difficulty. Save some cutoffs for setting up your router table later.

Dovetail the corners using hand tools or with a router and jig, whatever you feel most comfortable with. I mitred the front corners of my dovetails, which is something you can't do with a dovetail jig, but with some hand tools you should be able to make it work. The hardest part about mitring dovetails is wrapping your head around what is waste and what needs to be kept. I like to keep a picture of the disassembled joint nearby that I can refer to. Mark the waste with your pencil and cut to the line. A guide block cut at 45° is very helpful when paring the waste down to the line.


23-3/8"
50"
FRONT VIEW
6-7/8"
7-1/2"
3-5/8"
19-1/4"
3"
15-5/8"
MAIN CASE DOVETAIL DETAIL
main case side
main case top
interior shelf
main shelf
door rail
Kumiko strips
door stile
main case back
main case upper back frame rails
main case upper back frame stile
main case lower back frame rails
main case lower back frame stile
main case French cleat
3/8"
1/8"
3/8"
1/8"
1/2"
3/16"
KUMIKO STRIPS DETAILS
door stile
door panel
door centre rail
door rail
main case sides
main case bottom
drawer case exterior side
drawer case French cleat
drawer back
drawer side
drawer bottom
drawer front
drawer case back
drawer case interior side
drawer case bottom

Materials List

Part		Qty	T	W	L	Material
Main Case Side	2	5/8	7-1/4	31-11/16		Cherry
Finished case is 1/8 shorter to accommodate the kerf of a 1/8 blade when cutting the case in two						
Main Case Top and Bottom	2	5/8	7-1/4	15-5/8		Cherry
Interior Shelf	1	1/2	5-1/4	14-7/8		Cherry
Main Shelf	1	13/16	7-1/4	50		Cherry
Drawer Case Interior Side	1	5/8	7-1/4	3-3/4		Cherry
Drawer Case Bottom	1	1/2	7-1/4	19-1/4		Cherry
Drawer Case Exterior Side	1	5/8	7-1/4	6-1/2		Cherry
Drawer Case Back	1	1/4	3-1/2	18-1/2		Maple
Drawer Front	1	1/2	3	18		Cherry
Drawer Sides	2	3/8	3	6-3/4		Poplar
Drawer Back	1	3/8	3	18		Poplar
Drawer Bottom	1	1/4	5-1/4	17-3/8		Poplar
Door Stiles	2	5/8	1-1/2	22-13/16		Cherry
Door Rails	2	5/8	1-1/2	14-3/8		Cherry
Door Centre Rail	1	5/8	1	11-7/8		Cherry
Door Panel	1	1/4	11-7/8	13-7/16		Cherry
Door Kumiko strips	8	1/8	3/8	36		Balsa/Spruce
Main Case Upper Back Frame Stiles	2	1/2	1	23-9/16		Cherry
Main Case Upper Back Frame Rails	3	1/2	1	15-1/8		Cherry
Main Case Lower Back Frame Stiles	2	1/2	1	7-5/8		Cherry
Main Case Lower Back Frame Rails	2	1/2	1	15-1/8		Cherry
Main Case Back	1	1/4	14-1/2	30-1/4		Maple
Will be cut into three sections but breakout as one for grain continuity.						
Main Case French Cleat Cut in half, one half on wall	1	3/4	2-1/4	14-3/8		Baltic Birch
Drawer Case French Cleat Cut in half, one half on wall	1	3/4	2-1/4	18		Baltic Birch

Hardware List

Name	Qty	Size	Details	Supplier
Traditional Ring Pull	2	32 mm	01A6132	Lee Valley
Weathered Brass Ball-Tip Hinge	2	n/a	02H1004	Lee Valley

Keep Things Clear – Dobson likes to mark the portion of the joint that will remain with masking tape so the process of removing waste is clear.

Bring Them Together – After a dry fit, Dobson applies glue to the joints and brings the parts together snugly with clamps.

Add Spacers – Temporary spacers help keep the cabinet from shifting while it's being cut in two. These spacers also make it easier to machine further joints on the gables to allow them to mate with the main shelf.

Dry assemble the case and make sure everything fits well. Next, glue it together, making sure it's square. While the glue is drying, set the case aside and begin milling the main shelf, which is slightly thicker than the case sides. I started by leaving it about 1/16" wider than the case sides. This will be planed flush after assembly.

Once the glue on the case was dry, I added two 1/2" thick plywood spacers on the backside of the case using pocket screws. Secure one on each side of the cut line but do not use glue, only screws. These will be removed later and the holes will be covered by the back panel. Perhaps these spacers are unnecessary, but I felt better about crosscutting the case on the table saw with the spacers to ensure that the case didn't spring closed when cut. Set your table saw to make that cross-cut. Using a sled for this operation is recommended.

Stay Safe – Dobson is about to cut the cabinet into two parts. Notice the spacer clamped to the rip fence. This keeps the portion of the workpiece that's between the fence and the blade away from the fence once the cut is made.

Sliding Dovetails – The main shelf needs some sliding dovetail grooves to accept the dovetail tenons that will be machined in the freshly cut ends of the case. A simple jig will go a long way in helping you create straight dovetail grooves across a workpiece. Dobson routed a smaller, straight groove first to remove much of the waste before he routed the dovetail groove.

The shelf

Before removing the plywood spacer, set one of the freshly cut case pieces on top of the shelf board and mark both the inside and outside of the case sides with a pencil. Remove the case and you should have four lines across the face of the shelf. Use a square to continue these lines around to the other face. Use a jig to cut the sliding dovetail socket. I used scrap lumber to make a T-jig, which is just two pieces of wood with jointed faces, screwed together at a 90° angle. When the lower face is clamped to the edge of a board, a router can ride along the upper fence and make a perpendicular cut across the face.

Plowing the dovetail groove in one pass is possible, but depending on the density of wood you're using and how sharp your bit is, it often leaves a better cut if you remove some of the material in the dovetail groove before making the final pass with the dovetail bit. This initial operation to remove some of the waste can be done on a table saw, but I prefer using a second router equipped with a straight bit.

Clamp the jig to some scrap and then use a straight bit that's smaller in diameter than the narrowest part of your dovetail bit and rout a groove just shy of 1/4" deep through the lower fence. Follow this up with your dovetail bit set at 1/4" deep. Having two routers with bases of the same diameter makes this operation much easier, though it's certainly not mandatory. Your jig should now have a dovetail-shaped groove in the lower fence that will assist you with aligning the jig with the location of the dovetail groove on the workpiece.

Clamp the jig to your shelf board. The dovetailed groove on the lower fence should be centred between the two pencil lines that show the width of one of the case boards. It doesn't matter which

Keep Things Straight – Shown is the completed pair of dovetail grooves in the main shelf. Pencil lines, even if they aren't perfectly accurate, will help keep the parts and the necessary joinery straight in your mind while you work.

Dovetail Tenon – Be patient when cutting the dovetail tenons to size. Sneak up on the final dimension for the best results.

Mark the Tenons – Mark the locations for the tenons in the end of the main shelf, then remove the waste.

Transfer the Tenon Locations – Dobson uses the tenons on the end of the main shelf to lay out the locations for the mortises in the mating workpiece.

Remove the Waste – Once the locations are marked, use a saw to remove the waste so the tenons fit nicely.

one you start with. Before routing, extend the pencil lines from the shelf directly onto the jig. Mark the jig to show which line corresponds to the inside of the case and which side corresponds to the outside. Now you're ready to rout.

Start with the straight bit. Set it for just a hair under 1/4" and rout a groove across the workpiece. This removes most of the material and makes the next pass with the dovetail bit much smoother and cleaner. Move your jig to each of the five spots on the shelf that will need a sliding dovetail; four for the case and one for the small drawer. You will have to clamp your jig to alternating sides of the board to keep the interior side of the jig pointed to the inside of the case, so make sure your board sides are parallel to each other. Once all five grooves are cut, switch bits to the dovetail bit and repeat the operation.

The case sides need the sliding dovetail tenons cut on their ends. Take the same dovetail router bit you used for the sockets to the router table to make this cut. Sink the bit into a sacrificial fence and then make some test cuts on one of your saved cutoffs. You're looking for a close fit, but not one that you need to hammer closed. Using hand pressure is best. Once you have the fit dialled in on scraps, bring the case sides to the router table and cut the dovetails on all four ends of the side pieces. When in doubt, cut the joints all slightly tight and refine the joint as needed by adjusting the fence inward slightly. Just remember that moving the fence in by 1/64" will remove 1/32" from the dovetail tenon as you will make a pass on both sides of the tenon. It's very easy to end up with a tenon that's too small if you're not careful.

The drawer case

Before changing any settings on the router table, cut the dovetail for the drawer inner case side, but leave it long for now. The drawer outer case side is attached to the shelf with three through tenons. Mark out square tenons, equal to the width of the shelf board with one in the centre of the shelf, and then another two spaced evenly towards either side.

Once they're cut, add a kerf across the grain for wedges. To transfer the tenon location to the drawer case side, scribe a line where the top of the shelf will meet the side. With the drawer case side flat on your bench, clamp a fence across that line. Butt a second

Chop Them Out – Dobson works from one side, partway through the workpiece, then flips it over to work in from the other face. This will eliminate chipping on the underside of the workpiece.

fence against the edge of the drawer case side. Set your shelf board on top of the drawer case side and use a marking knife to mark lines where the mortises will need to be cut in the case side to accept the tenons.

Remove the shelf board and the fences and use your square and marking knife to connect the bottom edges so you have the lower limits of the mortises. Wrap these lines around the drawer case side with a square and marking knife so you know where the limits are on the other side of the board as well. This process needs to be done as accurately as possible. Use a marking gauge to set the vertical edges. Align it with the mark you made and then mark the line on both sides of the board.

To remove the waste, drill a small hole in each corner of the through mortises. Thread a coping saw blade through the hole and connect the dots. Get as close to the lines as you are comfortable with. Clean everything up with a chisel. Cut across the grain first to avoid splitting the board. Work in from both faces to further avoid any tearout.

The drawer case bottom is attached with through dovetails. This board is thinner than the sides, but using the same dovetail angle

Stopped Grooves – The 1/4" grooves that accept the back panel are stopped so they don't protrude into the dovetail joints.

More Assembly – Here, the drawer case bottom and drawer case interior side get glued together. Ensure the parts mate at 90° while they dry.

helps keep a consistent look across the piece. The pins need to be cut on the bottom board and the tails on the sides or the piece can't be assembled down the road. This approach also leaves you with the traditional dovetail look you'll want.

The drawer case has a 1/4" back panel that sits in a groove 3/4" from the back. The 3/4" space is for the French cleat that will be used to hang the cabinet. At the router table, mill a 1/4" slot in the drawer case bottom and sides. A stopped groove is needed in the main shelf between the sliding dovetail and the end of the board.

The sliding dovetail for the inner case side is what makes this assembly a little more complicated than normal. To begin, I glue the drawer case bottom and drawer case interior side dovetails together. Use a 90° clamping guide to ensure this assembly stays square. When that has dried, apply glue to the sliding dovetail that will join the inner drawer case side to the shelf and slide that joint together. Clamp in place and then insert the back. The drawer exterior case side can now be glued into the dovetail and through tenons. Be sure to support the inner case side so it remains at 90° while closing the exterior side joints. Too much force could break the sliding dovetail. Before the glue has dried, wedge the through tenons to close any gaps and tighten the joint.

The Case – Part 2

Returning to the main case, glue the upper and lower sections into the sliding dovetails on the shelf. This is fairly straightforward. Apply glue and slide the case pieces into position, ensuring they're flush across the front.

Using a rabbeting bit, cut a 1/2" deep and 3/16" wide rabbet around the rear edge of the upper case for the back frame and panel.

The lower case needs a deeper rabbet. Taking progressively deeper passes, cut the 3/16" wide rabbet down to 1-1/4" deep. This allows room for the 1/2" back frame and panel plus a 3/4" plywood French cleat that will be used for hanging the cabinet.

The upper case also has a secondary shelf inside it. I rout a 1/2" groove that's 6-7/8" up from the bottom of the case. To do this, cut a plywood spacer for your router to run against. It should be sized so the groove is at the correct distance from the corner of the cabinet. Clamp the spacer to the case side, butting it up tight to the main shelf board. Rout the groove, being sure to stop short of the front of the case. Remember, the door is inset so stop at least 7/8" from the edge, or either the stopped rabbet will be visible in the finished piece or the shelf

Drawer Case Is Assembled – Now all four parts that make up the drawer case are assembled. The drawer case exterior side, pictured at the right of this assembly, is the final part of the assembly to be brought together.

Shelf Groove – A router, guided by a straightedge, creates a dado for the shelf to fit into. Sizing the straightedge so it butts up against the mating workpiece will eliminate any positioning mistakes.

Back Parts – The rails that make up the outer frame for the back are grooved to accept the back panel.

will stop the door from fully closing. Flip the case over, clamp the spacer to the other side and repeat. Mill the shelf board down to 1/2" and size it to fit in the grooves. The back edge should be flush with the bottom of the rabbet for the back panel.

The back

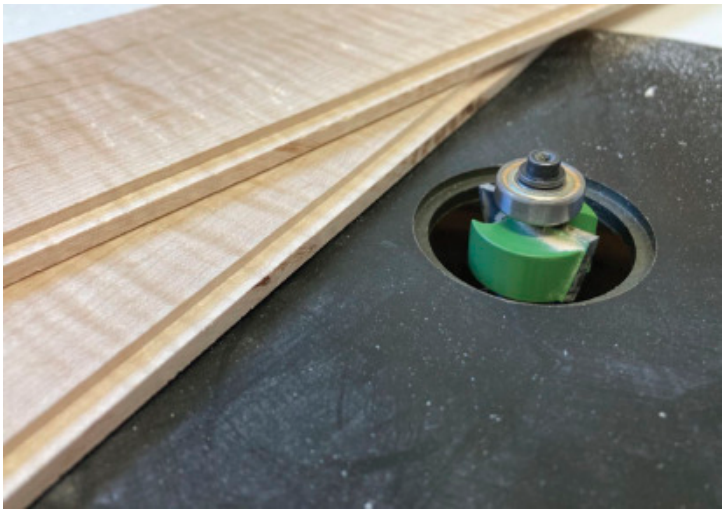
The back is constructed with frame and panel construction. Floating shiplapped planks act as the panel. This makes an attractive back, while accommodating wood movement.

The frame is light 1/2" thick and 1" wide cherry. You'll need enough frame material to make two panels. Rout a 1/4" wide by 3/16" deep groove down one side. There are two stiles and three rails for the upper case, and two stiles and two rails for the lower case.

The panels are resawn from an 8/4 curly maple board. The panels are milled down to 1/4" thick so they fit in the frame grooves. Using the rabbeting bit, I cut a 3/16" wide rabbet 1/8" deep on the opposite long edges of each panel. I prefinished these before installing them.

To assemble the back, cut stub tenons on the ends of the rails to fit into the grooves on the stiles. We don't need a huge amount of strength here. For the upper case, mark where the three stiles will be glued on the rails. The middle stile is spaced to fall centred on the secondary shelf, inside the top cabinet. Crosscut the panel boards to fit in the groove. Assemble by gluing the three stiles to one rail, inserting the panel and then locking everything in place by gluing the top rail in. I used nickels to evenly space the shiplapped boards. If any of the back boards are too loose, a little drop of CA glue into the groove from the backside will keep them in place.

To install these panels, insert them into the case and use a wedge to ensure they remain tight. Forgoing the clamps means the frame will exactly match the case and you don't have to worry about fitting it later. Once dry, both frame and panels can then be glued into the back rabbet. Clamps should be used to hold the frames in the case rabbet.



Small Joinery – Small shiplap joints will fill the visual gaps between the slats that make up the back panel.

Cheap Spacers – Once the back parts are cut to size and the joints machined, Dobson uses nickels to space the back slats evenly.

Glue It Up – The back panel is now glued up. Ensure the cabinet is still square before putting it aside to dry.

Backer Plate – Dobson added a piece the same width as the kerf of his blade to the edge of a backer plate, then screwed that plate to his crosscut sled. The distance between the edge of the small piece and the blade will give him the distance needed to make the kumiko pattern

Cut Some Notches – Once the blade height is set, all the half-lap cuts will mate nicely and produce an even kumiko grid pattern.

saw mitre slots to the bottom of a 3/4" piece of Baltic birch plywood. Attach a front fence and then make a partial cut through the board. Attach a rear fence ensuring it is square to the kerf. Accuracy here will pay off on the finished project. A secondary fence is made with a piece of 1/4" MDF. Dimension it to be just slightly smaller than your rear fence and then set the table saw blade to project 1/8" above the sled. Cut a 1/8" × 1/8" kerf in the secondary fence and then glue a 1/8" × 1/8" × 1/2" stick into the kerf. This will act as a registration pin.

Drill pilot holes in the secondary fence and attach it to the rear fence with screws. The registration pin is set 1/2" away from the kerf on my fence. You can change the spacing if you prefer a tighter or wider pattern. It's a good idea to keep the overall width of the kumiko pattern in mind now, as this assembly will eventually get fixed between the door rails and stiles. It's important the overall dimensions of the door fit the opening. The rails and stiles can be trimmed a bit to size the door correctly, but you won't want to be forced to remove much from the rails and stiles or the proportions will be off.

The door

It's generally easier to fit a door to an opening than an opening to a door, so once you have your case glued together you can start working on the door. This door features a simple kumiko-style grid pattern. You can easily substitute another pattern here, depending on your taste. The kumiko jig will set the dimensions of your kumiko panel so start with it, keeping the width of the door rails in mind, and then build the door around the panel.

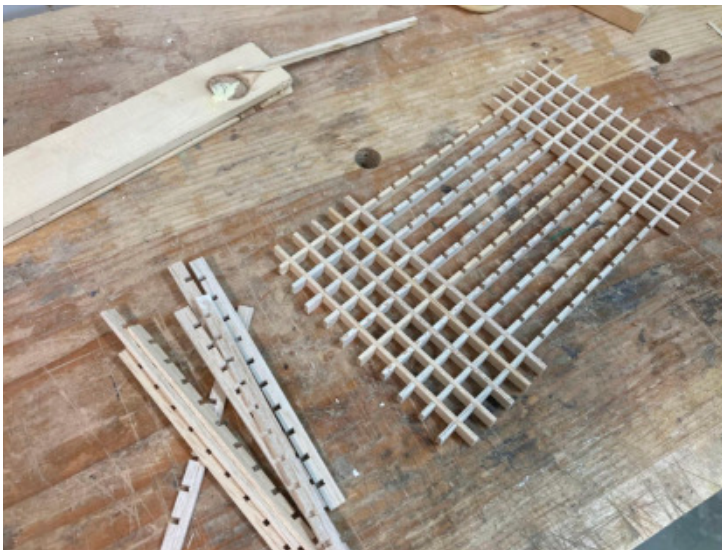
The kumiko jig

The jig to aid with making the kumiko is essentially a simple crosscut sled. Attach runners sized to fit snugly in your table

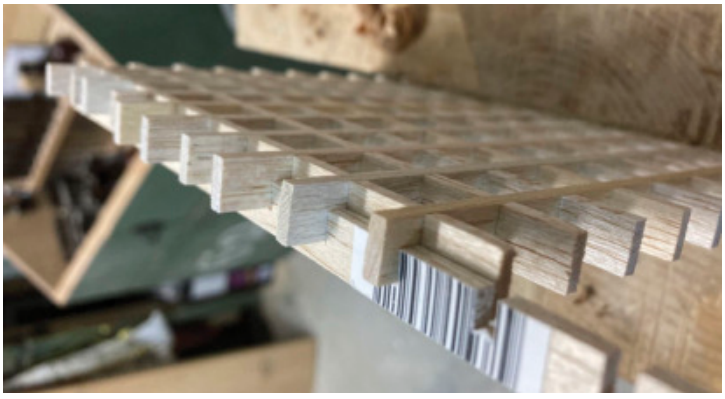
The kumiko

You can dimension your own lumber for kumiko but I find this tedious so I buy presized 1/8" × 3/8" strips of wood from my local hobby shop. They come in spruce or balsa and are consistently sized. You will pay more for them, but the time saved was worth it to me. I use balsa when I don't have to cut angles other than 90° and spruce when making a pattern.

This panel is just squares, so I've used balsa. Set your blade height to 3/16", or half of the height of the strips. Next, butt a strip against the registration pin. Make your first cut and then engage the fresh kerf on the pin. Make another cut and continue until you've made all 19 kerfs on the horizontal piece and 10 on the vertical



Add Some Glue – A small dab of glue on the inner face of each half-lap joint will keep the strips together for good.



Trim to Length – Dobson temporarily installs another kumiko, then uses a flush cut saw to trim the glued-up kumiko to length. The extra 1/8" extensions will be used when installing the gridwork in the door frame.

pieces. Being off by even 1/16" when you're attaching the secondary fence to the main fence of your sled means that difference will be multiplied by however many notches are cut. This usually isn't critical, though it will mean you'll likely have more or fewer squares than I ended up with. Starting with a few extra pieces at the start of this process may be helpful. When I get to the last kerf I lay the strip down flat, engage the last kerf on the pin and then cut the strip free. Cut one extra piece.

Assembly is straightforward. I add a tiny drop of glue in each half lap and use a small hammer and a block of wood to help seat each piece. Once the glue has dried, slide the extra kumiko strip against the outside edge and, using a flush cut saw, trim each of the overhanging pieces. Using the strip will ensure that the remaining protrusions are all 1/8" around the entire piece. We will use those for mounting later.

Rails and stiles

After surfacing your lumber for rails and stiles, cut them to length by marking them directly against the cabinet opening. Their width is determined by the opening of the cabinet and the dimensions of the kumiko panel. We want the opening to be

Kumiko Design Options

Kumiko are thin strips of wood that cross each other and form the structural portion of a door or other panel. They're a common feature in traditional Asian furniture and interior house design. They're often backed with handmade Japanese paper or another translucent material. Kumiko often join each other with half lap joints, though other pieces can be added and glued into place.

They have recently exploded in popularity and it's easy to see why. The "asanoha" pattern has become the most popular design. It's not too difficult to make a very eye-catching piece that includes kumiko, but as more and more woodworkers incorporate kumiko into their work, it can become a little stale seeing the same asanoha pattern over and over again. Here are some tips for shaking things up a bit.

Try a new pattern

There are many books on the market for you to learn from. There are also many designs on the internet that will encourage you to spice up a design you're considering. New jigs and techniques for cutting birds-mouth joints and interlocking sections will bring your work up to a new level.

Build the kumiko into a larger project

Instead of just making a panel, put that panel to work in another way. The strict geometric pattern can be played against the organic flowing lines of the grain in a larger piece. Scale the patterns up or down to fit into furniture or into boxes.

Incorporate other woodworking techniques

Take advantage of the regularity of kumiko patterns by adding some variety. Use steam to bend a strip to add curves and flowing lines to your pieces. Vary the patterns on each side of the curve to add some real interest. To cut the half laps, first bend the strip and then lay it in position on top of your grid. Mark either side of each intersection on the grid pieces with a sharp pencil. When they have all been marked, pop the grid pieces out one at a time and cut the angled half laps on the inside of the marked line. Reassemble and install the curved strip into the slots. Flip it over and mark all the intersections on the curved piece. Pop it out again and cut the slots. It should now sit flush with the grid and be ready to be filled with your pattern.

Get Creative – Kumiko can be designed in many different ways. Including only horizontal and vertical members is a traditional approach, but using curves and angled pieces can bring new life to a classic design.

Start with the Slots – Dobson cuts the slots for the door joinery on the bandsaw.

Notched Tenons – Once the tenons are machined on the table saw, a notch to accept the door panel needs to be cut into some of the tenons.

Rout a Rebate – Rout a rebate into the rear face of the door so the kumiko panel can be installed.

Drill for Pegs – Holes in the corner joints will accept pegs. The pegs will increase the strength of the frame, yet also play a role in aesthetics.

identical to the width of the panel from the outside edges of the vertical strips; the 1/8" protrusions will sit in a rabbet and should not be counted in this measurement. Mark this width on one of the rails and then divide the remaining dimension of the rail by half. This will be the width of your stiles. This ensures the opening for your panel is exactly the width of your panel. I've used the same width for the top and bottom rails and a slightly narrower width for the centre rail.

Use a marking knife to set the shoulders of the bridle joint that will be used to assemble the door. Lay out the joint on the stiles with the slot centred. I cut the slots on the bandsaw. I used a stop clamped to the fence to set the length of cut. Flip the piece over to cut the other side. This ensures that the slot is centred on the stile. A chisel makes quick work of the waste.

The tenons are cut on the rails using the table saw. I use a sled to cut the shoulders and then move the piece, making multiple cuts, until the entire cheek is cut. I leave it about 1/16" too thick. Returning to the bench I use a router plane to smooth out the cheeks and bring them down to the perfect size. The middle rail is cut in a very similar fashion, but those tenons are only 1/4" long.

Next, I rout out grooves in the stiles, and lower and middle rails for the solid panel that fills in the rest of the door. Set a 1/4" straight bit in your plunge router or router table and make these cuts. Remember, this is a stopped cut on the stiles and should not continue past the top of the middle rail or all the way through the tenons on the rails.

The centre panel is 1/4" thick. Cut slightly oversized strips on the bandsaw and joint and plane them to size. Joint the edges and glue the panel together. I use tape across the joints for panels like this. Once the glue has dried, plane or sand to your finished smoothness and apply your finish of choice (linseed oil in my case).

Assemble the door. Do a dry assembly to make sure it fits nicely. Make any adjustments now. A square door will make fitting it much simpler. Once you're happy, glue it together. While perhaps unnecessary, I like to add 1/4" dowels to the corners and where the centre rail meets the stiles. This is mainly for visual appeal. Fit the door into your case opening by planing away the outside edges of the door until you have a consistent reveal all the way around.

To fit the kumiko panel, use a rabbeting bit at the router table and cut a 1/8" rabbet around the opening for the kumiko panel. Do this on the backside of the door. Your kumiko panel should fit snugly into this opening.

Mortise for Hinges – Once the door is complete, hang it to see how it fits. It might need to be trimmed slightly to fit into the opening evenly.

Fold It Over – Dobson chose a pull that can be inserted through a hole in the door frame. The tips of the hardware can then be bent over to secure the pull in place. These are very traditional pulls.

Hardware

With the door done, it's time to add hardware. I've gone for mortised butt hinges and a very simple ring pull. Lay out the mortises for the hinges and use a router plane to cut away the waste. Transfer the hinge locations to the case and repeat in the case sides.

If you opt for the same pull I used, you'll find it very simple. Drill a hole for the shank and push it through. Your hole should be big enough so that the shank doesn't catch on the edges. Use a pair of pliers to bend over the shank and then hammer it into the backside of the stile as if it were a pair of nails.

The drawer

To finish the cabinet, we just need the small drawer. The drawer front is made from cherry while the back, sides and bottom are poplar. This is a simple box so it's back to cutting dovetails. I've used through dovetails on the back and half blind on the front.

After laying out the pins on the front board I find it useful to go to the drill press to remove material from the half blind socket. This makes removing the waste much simpler. Everyone's got their preferred method, though. The drawer uses the same ring pull as the cabinet door and installation is the same. Just note that the grain direction of the drawer front is different than the stile, so when you hammer in the shank ensure you don't split the drawer front. Drill a pilot hole if necessary.

Careful Drilling – A pilot hole will help keep these small frame members from splitting. A piece of tape applied to the drill bit will stop you from boring through the frame.

Dovetailed Drawer Front – Half-blind dovetails secure the drawer front to the drawer sides. Once again, Dobson uses tape to keep the waste clear in his mind.

Finish

Sand everything to 320 and then finish with the product of your choice. I've used an oil/varnish blend from Detwiller Linseed Products, a local producer of linseed oil finishes. The cherry absolutely pops under an oil finish so I would recommend it over a water-based finish. Once cured, buff out with some wax.

Hanging the cabinet

The cabinet hangs on a French cleat. Cut a strip of plywood with a 45° bevel on the long edge. Cut two pieces to length to fit behind the lower section of the main case and behind the drawer. I've left a 3/4" gap here for this. Glue the piece on all three sides and add a few pocket screws to hold it in place. Two smaller pieces are cut and screwed to the studs in the wall. The cabinet will rest securely on these cleats.

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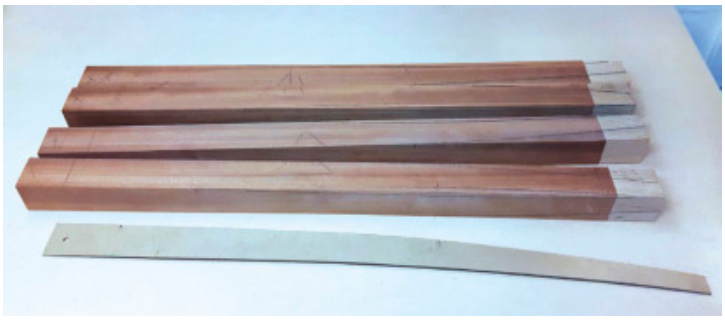
INFO: DIFFICULTY – **4/5,** LENGTH/TIME – **4/5,** COST – **3/5**

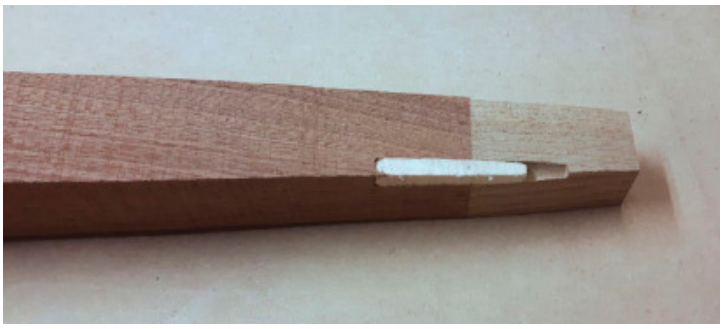
Make a Cabinet on Stand with Sliding Doors

Functionality and solid construction, not ornamentation, are the highlights of this cabinet.

Photos by Carl Duguay (Illustration by Len Churchill)



Templates Are Great – Duguay used a hardboard template to lay out the curves on the legs. This offers uniformity across the different parts.



Avoid Mistakes – When you're attaching the feet, consider where you put the dowels. Disaster can strike if you don't plan properly when cutting the curves in the legs.

BY CARL DUGUAY

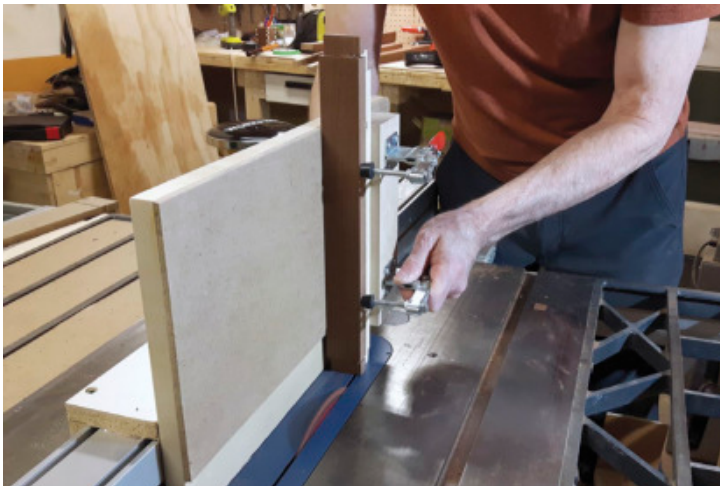
This unadorned cabinet leans heavily on Danish modern design, in particular the work of James Krenov. It uses traditional mortise and tenon and dowel joinery with a simple shellac finish. The height was chosen to suit the client and the wood was selected to complement the furnishings in her living room.

It really doesn't matter in which direction you start building. I always start with the base, then the cabinet, and finally the doors. I begin by milling all my stock to rough dimension and then let it acclimatize in the shop for at least a week.

A light and airy base

The legs for the base have a slight curve towards the front and sides. Once the stock is cut to final dimension, I attach the feet with dowels. The dowels must be installed off-centre. Remember to mark the dowel locations on the bottom of the feet, otherwise you may be in for a nasty surprise when you cut the curved leg sides to final shape.

Draw the leg pattern on a piece of 1/4" hardboard and transfer the cut lines to the legs. Before shaping the legs, lay out and cut the mortises for the aprons. I do it with drill and chisel, but other options include the router table, a hollow chisel mortiser, handheld router and mortising jig, or Festool Domino. Once the mortises are cut, I shape the legs on the bandsaw and fair them using a block plane and scrapers, and, if needed, a final touchup with 180-grit sandpaper.



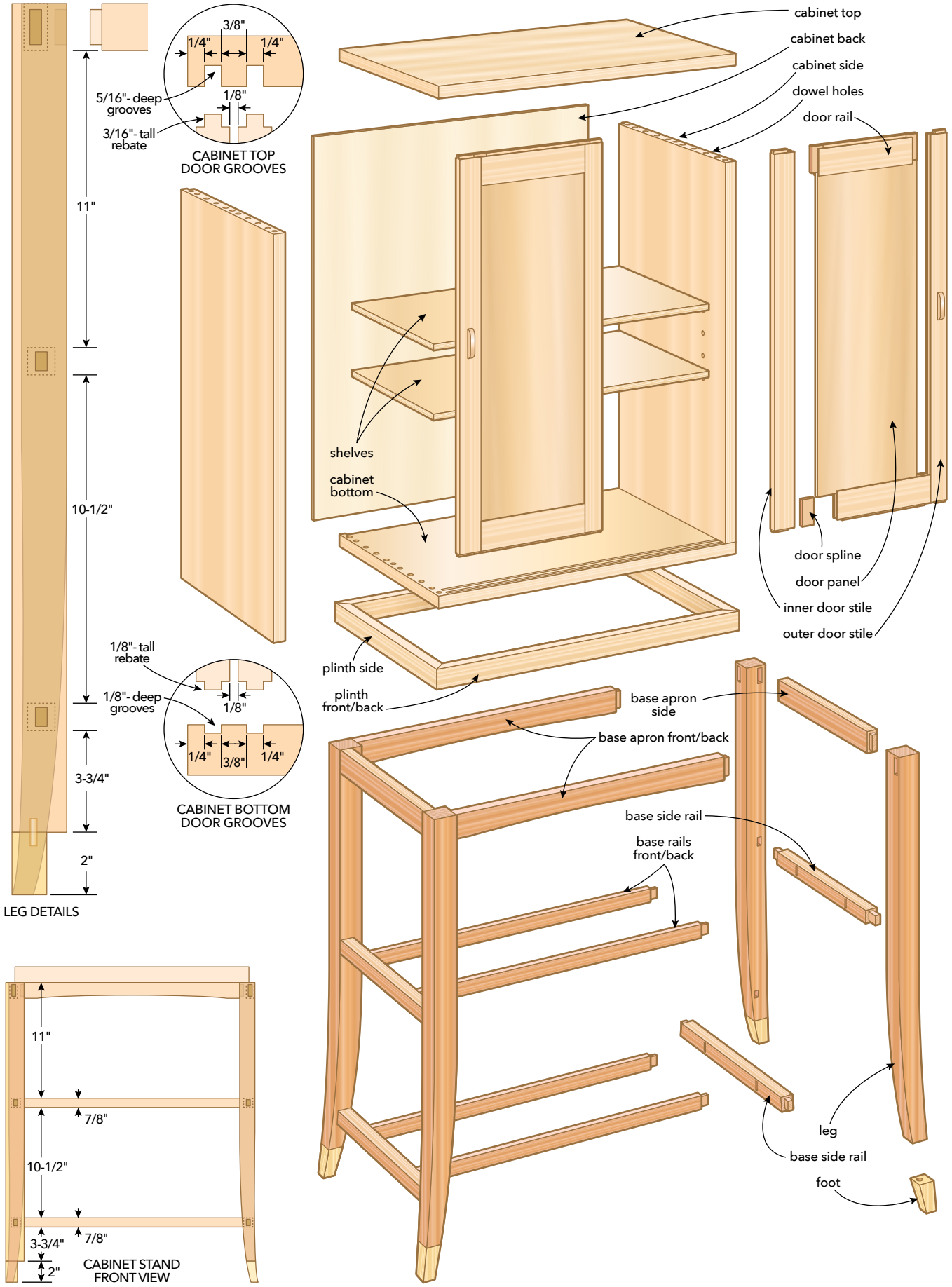
Cut the Tenons – Duguay uses a simple shop-made tenon jig to machine all the faces to form each tenon. This is done on the table saw, though you could use a router jig or cut these with hand tools.

The next step is to cut the aprons to length, which I do on the table saw using a crosscut sled and then cut the mortises using a tenoning jig. Dry fit the aprons to the legs to ensure that everything is square.

You can now lay out the mortises for the rails further down the legs. The shoulders of the tenons are cut at an angle relative to the curve of the legs. These rails aren't necessary for structural support so they can be omitted. Make sure you do a final dry fit before gluing up the base.

Nice Fit – Duguay fits the mortise and tenon joints that secure the aprons to the legs with sharp hand tools.

Careful Layout – Chopping mortises by hand works nicely and is enjoyable. The key to this approach is careful layout and sharp tools.


3/8"
1/4"
1/4"
1/8"
5/16"- deep grooves
3/16"- tall rebate
CABINET TOP DOOR GROOVES
11"
10-1/2"
3-3/4"
2"
LEG DETAILS
1/8"- tall rebate
1/8"- deep grooves
1/8"
1/4"
3/8"
1/4"
CABINET BOTTOM DOOR GROOVES
cabinet top
cabinet back
cabinet side
dowel holes
door rail
shelves
cabinet bottom
plinth side
plinth front/back
door spline
door panel
inner door stile
outer door stile
base apron side
base apron front/back
base side rail
base rails front/back
leg
base side rail
foot
11"
7/8"
10-1/2"
3-3/4"
7/8"
2"
CABINET STAND FRONT VIEW

Materials List

Part	Qty	T	W	L	Material
Cabinet Top / Bottom	2	3/4	14-1/2	21-3/4	White Oak
Cabinet Sides	2	3/4	14-1/2	25	White Oak
Cabinet Back	1	5/16	21-1/4	25-3/4	White Oak
Plinth - Front / Back	2	3/4	1-1/4	22-1/8	White Oak
Plinth - Sides	2	3/4	1-1/4	14-7/8	White Oak
Shelves	2	3/8	To Fit	20-1/4	White Oak
Door Rails	4	1/2	2	7-1/2	White Oak
Outer Door Stiles	2	1/2	1-1/2	25-1/8	White Oak
Inner Door Stiles	2	1/2	1-1/4	25-1/8	White Oak
Door Panels	2	1/4	7-7/8	21-5/8	White Oak
Door Pulls	2	5/16	3/8	1-7/8	White Oak
Legs	4	1-3/4	1-3/4	26-1/2	Sapele
Base Apron – Front / Back 19-1/2" between shoulders – 1/2" tenon on either end	2	3/4	1-1/2	20-1/2	Sapele
Base Apron – Sides 12" between shoulders – 1/2" tenon on either end	2	3/4	1-1/2	13	Sapele
Base Rails – Front / Back Final length depends on the curvature of the legs	4	7/8	7/16	22	Sapele
Base Rails – Sides Final length deplends on the curvature of the legs	4	7/8	7/8	14	Sapele
Feet	4	1-1/8	1-1/8	2	White Oak

A stable box on top

Unless the design incorporates curves, cabinets are quick and easy to build. No one joinery method is superior to another; choose the one you're most comfortable with. For over 40 years I've used dowel joinery on display cabinets and not one has come apart. A simple dowelling jig makes it easy to ensure that the dowel holes are perfectly aligned. For 3/4" stock, either 5/16" or 3/8" dowels work fine.

Before assembling the box, cut the grooves for the sliding doors and the back panel. The doors on this cabinet are 1/2" thick, so I made the grooves 1/4" wide and 1/8" deep on the bottom and 5/16" deep on the top. The grooves are routed so the doors are about 1/8" apart when installed. This will prevent them from rubbing together.

For the back, you can install a plywood panel, a frame and panel or, as I did, a shiplapped slat back. You'll need to rout a rabbet around the back of the cabinet to house the slats, which will be nailed into place, but just not yet.

If you plan to install a shelf or two in the cabinet, now is the time to drill the holes for the shelf supports. I usually drill three to four holes about 1-1/2" apart so the shelf position can be adjusted. I use brass shelf supports that are only 9/32" in diameter, making them less obtrusive inside the cabinet (#63Z0216, leevalley.com).

Once again, dry fit everything before breaking out the glue and clamps. Once you're satisfied, glue up the box, then nail the back in place.

Dowels Can Be Simple – A simple dowel jig, like this one Duguay used to secure the cabinet corner joints, is easy to use and surprisingly strong. It can be used to bore holes in the top / bottom, as well as the sides.

The Base is Done – Here, the base is just about ready for the cabinet. Duguay chamfers the upper ends of the legs once the cabinet is in place. This allows him to create the perfect look.

Smooth Grooves – Here, the ends of the door grooves get squared up. The deeper grooves are located in the cabinet top.

A Door, Unassembled – All the door parts are machined and ready for assembly.

A Door, Assembled – Ensure the doors are square before they're put aside to dry.

Door Groove Details – Here you can see the grooves that house the lower edges of the doors.

I installed a riser between the cabinet and base. The corners are mitred and the riser is screwed to the base. You can attach the cabinet to the base by installing screws through the bottom of the aprons through the riser and into the base of the cabinet. However, I chose to rout 1/4" × 1/4" slots on the inside face of the riser and use L-shaped shop-made blocks to attach the cabinet. You could also use Z-shaped metal clips (#BP581142G, Richelieu.com).

Frame and panel doors

I make sliding doors between 3/8" and, as on this cabinet, 1/2" thick. Here again, you have several choices for the joinery, including mortise and tenon, tongue and groove, cope and stick, and spline, which is what I used for this project. The grooves for the splines and the door panels are the same width as the panels are thick (1/4") and 7/16" deep. I made the door panels 1/4" thick – you could make them a tad thicker. The grooves in the rails and stiles to accept the panels are just under 1/4" deep. I like to keep the doors as lightweight as possible, as they slide nicely then. The

Looks and Function – The base rails are as much for the aesthetics of the piece as they are to add structural rigidity to the base.

door panels are free-floating, though if you use sheet stock there's nothing wrong with gluing them in place.

After you've assembled the door, cut the rebates on the top and bottom of the doors to fit into the grooves in the front of the cabinet for the doors to slide back and forth – about 3/16" at the top and 1/8" on the bottom.

A simple finish in and out

My standby finish for furniture that won't be subject to a lot of handling is shellac. I typically lay on six or seven thin (2 lb.) coats. I then buff on a coat of wax. I prefer shellac because it highlights wood figure, enhances colour, provides good wear resistance and is excellent protection from moisture. It's also great inside enclosed spaces like cabinets and drawers because it's virtually odour-free. For your cabinet, apply a finish that you're comfortable using and gives the look you want.

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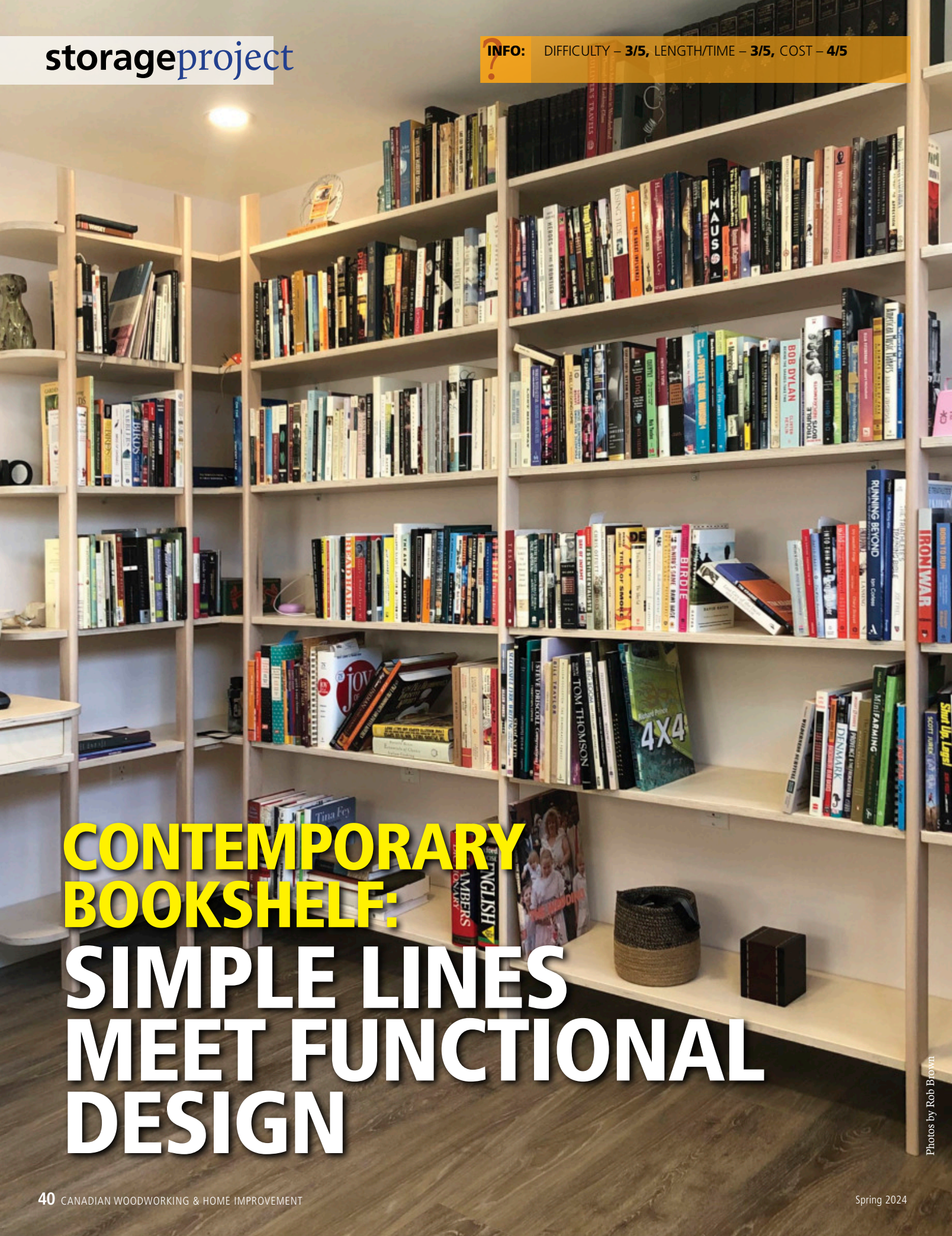


CONTEMPORARY BOOKSHELF: SIMPLE LINES MEET FUNCTIONAL DESIGN

Photos by Rob Brown

This plywood and solid bookshelf keeps costs and build-time down, but will leave you with a clean, uncluttered area to showcase your book collection.

BY ROB BROWN

A bookcase can turn into a huge project if you let it. Cabinets housing adjustable or fixed shelves, lots of solid trim, possibly fluted columns, crown and base moulding, all with a nicely applied finish, is as serious as it sounds. Installation is also a major undertaking.

When we decided we needed a fairly large bookcase in our office, I knew this could go sideways if I let it. I had a couple of main worries when we talked about the project, especially knowing how many books we had to house. Material cost was first on my list. Lots of sheet stock, combined with some solid lumber, isn't cheap. If we decided to add doors and drawers, door hinges and drawer slides would increase the cost even more. Next on my list of challenges was how much time this was going to take. A paying customer gets whatever design they'd like, but when I'm doing projects for us, I'd prefer not to spend forever on them.

Overall design

For the reasons above, I wanted to design a simple, somewhat modern bookcase to minimize the expenditure of money and time. Clean lines and simple construction techniques were my goals. Over the past year I'd finished a kitchen made with Baltic birch plywood. Exposed plywood edges were the visual focus of the project, and it turned out really well. I ran that approach up the flagpole and my partner liked it.

Baltic birch makes up the shelves. There's no need to apply solid wood edging or iron-on tape to its exposed edges. Now, how to make those shelves stay in place and support a collection of books? Solid wood cleats, or possibly metal L-brackets, would support the rear edge of the shelves, but obviously the fronts of the shelves needed support, too.

I considered using 3" wide strips of Baltic birch plywood for the vertical sections. It would have been a simple approach, but I thought it might be too flimsy to comfortably support the kind of weight we'd be dealing with. Solid soft maple would blend in with the birch, and I had enough in the shop to make it happen. Obviously, solid birch would have also worked well in this situation.

I played around with a few approaches for joining the shelves to the solid wood vertical supports. A simple, yet strong, joint was needed. Since the rear edge of the shelves would be fixed to the wall, the bookcase wasn't going to rack and move sideways. These joints would mainly be stressed downward. The notch in the solid wood verticals would support the shelves and the notch in the shelves would provide a positive location for assembly.

This bookcase would be large; over 6' high and 10' long. The need for knockdown joints was critical. I decided to use a small L-bracket at each leg-to-shelf joint. These would be either tucked in just below the shelf (on the lower shelves) or just above the shelf (on the upper shelves) so they wouldn't be visible.

Testing, Testing – The notches on the rear edges of the legs needed to accept the shelves nicely. Too narrow, and assembly would be virtually impossible. Too wide, and there would be gaps. Brown used some shims to fine tune the width of the dado set, but tape or paper could also be used.

Plan your cuts

Any shelf needs to be sized for the location where it will be installed, so this article will talk about the general approach to building a bookcase, rather than give too many specific dimensions.

When dealing with sheets I like to plan all of the cuts on a piece of paper. I draw a rectangle on the paper, mark where the cuts will be made, label each part and add a few basic dimensions. I do this in pencil, as there's often some shifting to be done part way through the planning process.

I only needed two sheets for this bookcase. My "reduce material costs" approach was already paying off. I got the lumberyard to rip both sheets in half so I could fit them in my vehicle and be more maneuverable when I got them in the shop.

Get to work

One of the first things I did was to use a long, thin length of material to mark out the heights of the shelves. This gave me a layout stick to guide me.

Once I got the material in my shop, I further ripped the two sheets into 11-3/4" wide shelves. Next was crosscutting them to length. As you can see, part of my bookcase is about 8' wide, while the lower section is about 10' wide, and fits under an electrical panel. The 8' long upper section was easy, but I decided to glue the lower shelves together end-to-end to make the full width, as opposed to fixing those shelves together with metal hardware or wood cleats during installation. The resulting joint isn't going to be bomb-proof, though it will be strong enough for what I'm asking it to do. If you want to try this approach, I'd suggest adding vertical supports fairly close to either side of the joint for added strength. I'd also suggest not loading the shelf near the joint too much.

Once the lower shelf parts were cut to length, I routed a 1/4" wide slot in the mating edges. I would eventually cut spline material to insert and glue into these slots to help align and strengthen the joints. I glued these shelves together end-for-end later, as it would be easier to handle shorter boards.

Next, I broke out the solid verticals and cut them to final size. Although their exact thickness doesn't matter, the thicker they are, the stronger they will be. I used 4/4 material and brought them down to about 7/8". As long as they were all the same thickness the mating joints would be easy to machine so everything would fit together. I ripped these lengths to 2-1/4" wide.

Square Up and Clamp – Brown ensures the legs are all aligned at their ends before clamping them together and machining the notches in them.

Nice Notches – With the legs ganged together, Brown cuts the notches in their rear edges to accept the plywood shelves.

The joints aren't complex

At this stage I had all the main parts cut to final size and could focus on the joinery. I made a test joint well before the project started to see if my partner liked it. It also allowed me to work out any machining details. I'd recommend using a piece of scrap plywood and a short length of the solid wood that's the same size as the vertical supports you're using in the bookcase to set up the machines to create a sample joint. It's a lot cheaper to make a mistake on some scrap than on 8' long pieces of Baltic birch plywood.

Notch the legs

I put a dado set in my table saw the same width as the plywood. I used shims to adjust the cut so the fit was just right; not too snug, or the parts would be very difficult to assemble, nor too loose to leave me with gaps and sloppy joints.

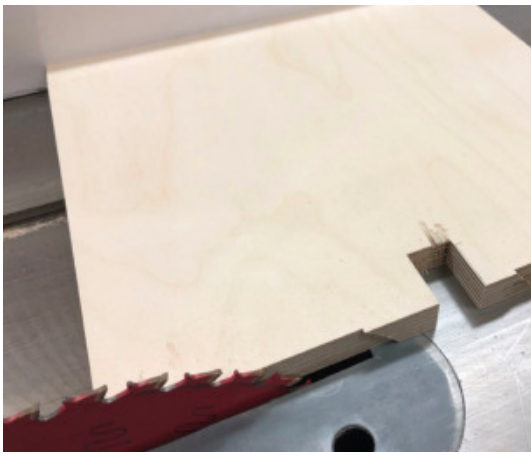
Using the long, thin strip with the shelf heights as a guide, I marked the locations onto one of the vertical pieces. I then ganged the uprights together with clamps, ensuring the piece with the shelf height marks was on the outer edge.

Long parts aren't always easy to machine. I found waxing my table saw's surface, and buffing it with a cloth to remove any excess wax, gave me a smooth surface for the workpieces to slide across easily. This was important for machining the notches in the uprights.

I aligned the location of the notches with the blade and clamped everything to the mitre gauge. I also clamped a scrap backer board to the rear of the parts, where the blade would exit the outer piece, to minimize tearout. One by one, the notches were made, and because the parts were all cut at once, all the notches matched. I also clamped the short upright to the group, so its lower end was flush with the other lower ends, so it would match the taller pieces.

Be Patient – Here, the notch in the router template is being machined. This notch will guide a template router bit to machine the notches, so this notch needs to be sized very carefully. Notice the screw stop on the stop block that Brown's using. This screw can be driven in ever so slightly to sneak up on the perfect fit.

Double Check – You can check how well the notch in the template fits over a piece of plywood, but it's best to then use this template to machine another notch in some scrap to determine if you have the right fit or not, as a template router bit sometimes doesn't trim the edge of the workpiece to the exact same size as the notch in the template.



Choice Is Yours – Although it's not completely necessary, Brown chose to remove about 1/8" from most of the front edge of the template, but to leave the material near the notch. This gives the bearing on the router bit something to run on shortly before the bit starts to machine the wood.

Notch the shelves

The shelves were a lot more work, and the chance for misalignment of even one notch is relatively high, especially if you let your mind wander for a moment. All the notches have to be aligned or the shelves won't accept all the uprights. I'm not saying having one notch 1/16" off will ruin everything, but this is where accuracy, patience and attention to detail come in handy. Start off by having your shelf sections organized and labelled.

Make a router template

A simple router template will guide the bearing on a template bit so each of the notches in the shelves are not only equal, but cut at the correct width to accept the legs. I used a piece of plywood about 12" × 12", and ensured two opposing edges were parallel, then trimmed the other two edges square. On one of those edges cut a notch the same width as the legs. This is one of the places where accuracy matters. I used a block with a screw stop on my crosscut sled. I marked the thickness of the legs onto the centre of one edge of the template, then clamped the screw stop to the fence of my sled, being careful that the cut I would make would be within the line, not beyond it. After making the first pass, flipping the template end for end, and making the second cut, I checked it against the thickness of the legs to see how close I was. If it was still too narrow, I adjusted the screw to give me a wider notch and retested. When I was close, I tested the template on a piece of scrap and checked the leg for fit. In theory, the flush trim bit should cut a notch the same size as the notch in the template, but it's always best to check this with a piece of scrap before settling on the width of the template notch. I removed a bit more material from the notch in the template by slightly driving in the screw and re-cutting both sides of the notch. Repeat this until the routed notch in the scrap accepts the legs nicely.

At this stage I ripped about 1/8" off the notched edge of the template, but stopped about 3/4" away from the notch, then flipped the template end-for-end and repeated. This gave me a portion of the template that protruded a bit past the plywood workpiece, so the bearing on the template router bit would come into contact with the template before it started to trim the workpiece.

Finally, mark the centre line of the notch onto the inner edge of the notch so you can align the jig with a centre line you'll mark on the shelf.

Machine the shelf notches

Mark the centre lines of the legs onto the shelves. I then used a square to transfer these marks slightly past where the notches will be cut so aligning the routing template is easier. You don't want to remove the waste in these notches, then not have a centre line to work with.

When it comes to the shelf parts that will eventually be glued end-to-end to make a 10' long shelf, some planning is required. Butt the shelf parts end-to-end and lay out the shelf notches as if they're one long shelf.

Position the template on the plywood workpiece so the front (notched) edge is flush with the front edge of the shelf. Adjust it left / right until the centre line mark on the template lines up with the line on the shelf, then trace the location of the notch onto the

Mark the Notch – Brown uses the template to mark where the router will cut, then he can remove much of the waste. Notice the joint's centre line marked on both the workpiece and the template. These lines can be aligned to locate each notch.

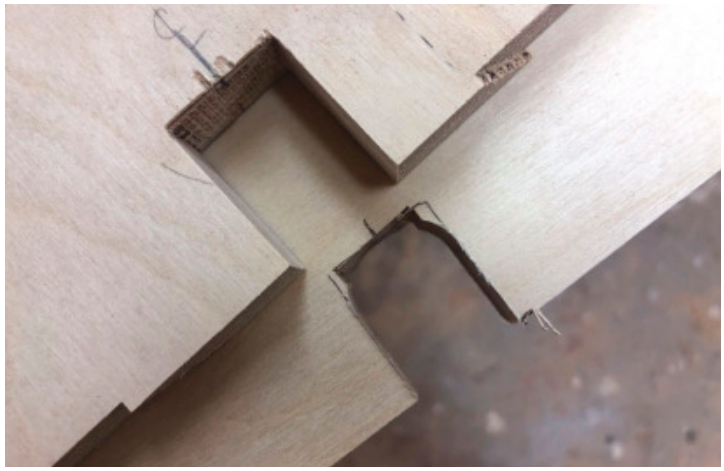
Two Crosscuts and a Rip – Although it's possible to remove all the waste to create each notch with the router bit, the results are a lot better, and there's much less wear on the router and the bit, if the bulk of the waste is removed beforehand. You definitely want to avoid tearing out any of the wood fibres when you cut across the grain. Tearout may be visible in the final project. A Japanese handsaw is great in this situation, though you can also stay a bit further from the line than Brown did. Scoring just inside the line will also work. A coping or fret saw will remove the waste block.

workpiece. I found the easiest approach to removing the bulk of the waste was to use a fine Japanese saw to create two kerfs down either side of the notch, then use a fret or scroll saw to cut the waste free from the workpiece. These cuts don't need to be exact, though they must not go beyond the two lines that run perpendicular to the front edge of the shelf.

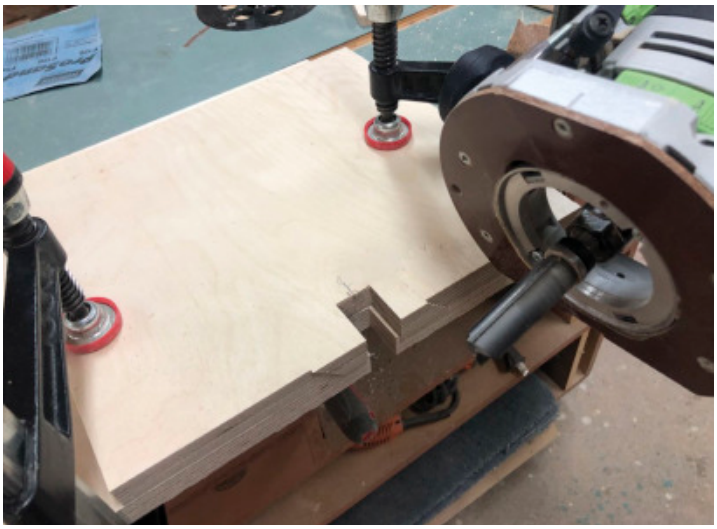
Return the template to the workpiece, aligning it carefully with the centre line on the workpiece, and clamp it in place. Rout the remaining waste in the workpiece. Repeat this process for all the shelf notches.

Round over the shelf notches

I added a 1/4" radius round over to the inner edge of the shelf notches. Rather than do this one by one, I found it easiest and fastest to gang a bunch of like parts together accurately and rout the



Finished Notch – A router bit will leave a rounded inside corner. Although it may not look good now, the assembled joint will cover all this. The inside corners of the leg will eventually come to a stop where the sides of the notch start to taper inward.



Trim It Flush – With much of the waste removed, and the template bit in the router, it's time to finish up these notches in the shelves.

Lots of Round Overs – With all the notches complete, Brown uses a piece of scrap the same thickness as the legs to align a series of notches so he can round over their edges. Doing this router operation with all the shelves together means much less tearout as you exit each shelf. Notice the piece of scrap Brown added on top of the batch of shelves to eliminate tearout from the top shelf.

Nicely Rounded – With the first pass complete, Brown will clamp a piece of scrap to the underside of the opposite side of these notches when he routs the other side.

edge. I inserted a piece of scrap the exact same thickness as the vertical members into the notches, adjusted the shelves so they were all flush on their outer edges and clamped them in place. I also clamped a support block to the end of the edge, where the round over router bit would exit in order to eliminate blowout. After routing each edge, I repositioned the shelves and moved the support block before rounding over the next batch of edges. I found it easiest to sand the rounded edges before removing the clamps each time. The shelf notches are now complete.

Time to Sand – While the notches are all aligned, Brown sands their rounded corners.

Round over the vertical supports

To further highlight the rounded appearance of the shelf-to-leg joint, I eased the front edges of each vertical leg. I installed a 3/8" radius round over bit in my router table and set the fence flush with the bit's bearing. I then shaped both front edges on all the legs to leave me with a bullnose look.

Finally, cut the upper ends of the vertical supports at a 20° angle to give a finished look.

Rounded corners

The ends of the shelves get a 3" radius arc on the front edges. This further adds to the modern look and removes any sharp corners from the bookcase. I drew the arc on a piece of scrap about

Slice the Fibres – Scoring just outside the arc with a sharp knife will snip the fibres of the wood and stop any tearout from the jigsaw as you trim most of the waste from the outer corners of the shelves.

An Even Arc – With the arc template clamped to the workpiece, Brown routs the corners of the plywood flush.

Pre-Drill for the Brackets – With a piece of scrap plywood in the aligned notches, Brown adds screw holes for the L-brackets he will use to secure all the leg-to-shelf joints. Ensure the brackets don't overlap the notches at all as that creates challenges down the road. Aim for a gap of about 1/16" between the edge of the L-bracket and the edge of the notch.

12" × 12", cut it close to the line, then sanded the curve accurately. This template would allow me to mark the arc on the workpieces so I could trim off most of the waste. Then, the pattern could be clamped to the workpiece and a template bit used to cut the final arc into the workpiece.

Glue the longer pieces

With all the machining complete, I cut the 1/4" splines that assist with joining the parts that make up the 10' long shelves. Ensure you can keep them parallel during glue-up and that you have clamps long enough to span their length. Add some glue to the joint and spline and bring them together. No need to overtighten as that will just cause the long shelf to curve and the joint to potentially be misaligned.

In my case, these were the three lowest shelves, which meant I could glue a 1/2" thick × 4" wide × 12" long piece of plywood to their undersides, overlapping the joint 6" on each side, to add extra strength. If you don't have this option, just be sure to handle them with a bit of extra care until they're installed and it also might be a good idea to not load the shelves with too much weight. Plywood is strong, but this end-to-end joint isn't bombproof.

Installation supports

While in the shop, I cut some support lengths to assist in the installation. These were pieces of plywood (though solid wood would also work nicely) cut to match the distances between the notches on the legs. These pieces were used to prop up the shelves during installation, as only the fronts of the shelves will be fixed to the legs. Number them so it will be easy to identify their order during the install.

Sand everything

At this stage it's not a bad idea to do a test fitting of all the parts to ensure they go together. The main challenge is that you machined the joints to a friction fit, but once they all need to go together at the same time the friction fit will seem a bit too tight. If it's hard to assemble at this stage you might consider belt sanding the thickness of the legs slightly to ease assembly. On the other hand, if you think the notches in the rear edges of the legs are the sticking point, hitting the faces of the shelves, near the notches, with some extra sanding will loosen up those joints.

Once all the machining is done, ease all the edges. Plywood, especially Baltic birch, has a tendency to splinter at its edges if they're left sharp. I heavily ease them to avoid this. Next, sand the exposed plywood edges so they're clean and smooth, and follow by sanding both faces of each piece. The solid wood vertical supports also need a good sanding.

If you're going to use a wood cleat adhered to the underside of these shelves (towards their back edge) to attach them to the wall, this is the time to glue and screw them in place. You could even attach cleats to the upper face of the shelves above eye-level to make them less visible, though that might affect how books or other items sit on the shelf. A solid wood cleat around 7/8" × 7/8" will add strength to the shelves, as well as give you something to screw through when connecting with a stud in the wall. I used metal L-brackets, so didn't attach cleats.

Apply a finish

Everyone will have their preferred approach when it comes to selecting a colour and topcoat to apply to this bookcase. Whatever you apply, you'll need a large enough space to maneuver these long

On the Level – Brown used one of the long shelves to check how far out of level the floor was, then measured for the differences in height where the legs would be located. He was then able to trim a couple legs shorter so the notches in the legs would all line up.

shelves. The nice thing about a bookcase is that it likely won't get a lot of abuse, nor will it see a lot of liquid or chemical spills, so an extremely durable finish isn't needed.

I applied a coat of Varathane's Ultimate Wood Stain in Linen White to give a slightly pickled look. On top of that I applied a few coats of polyurethane, sanding between coats. I didn't apply a heavy topcoat as I like the simpler look of a light coat. I also didn't need a lot of protection.

The edges will soak up more finish than the faces, so you might want to consider an extra coat or two for them when applying the topcoat. Generally speaking, sand between topcoat layers for a smooth finish. Be sure to let the finish dry before loading up the shelves with your book collection.

Installation

I'll be honest; it took some head scratching to figure out the best way to assemble and install this bookcase. It was about 10' wide and heavy. I also had only a few inches of extra space between the walls on either end of the bookcase to play with.

Floors and walls are rarely level and flat. I used one of the longest shelves to check for level and also measured how far out of level the floor is where the legs would rest on the floor. I left the leg that would be at the lowest level as-is, but marked and trimmed the other legs as needed, so the notches in the legs would all be at the same level.

Start the Assembly – With a couple legs laying front edge down on the floor, Brown started adding the shelves, starting with the lowest shelves. At this stage, the parts were located on the floor so they could be raised into the bookcase's final location against the wall.

I started by placing two of the uprights on the floor and added the lowest four shelves, fitting the notched joints together. A few very light hammer taps seated the joints nicely. I then added the L-brackets to secure these joints together. In my case, any more than four shelves may have added too much weight to the assembly, not only causing it to be too heavy to carefully lift, but also causing the lowermost joint to be stressed enough that it might break at the notch in the legs.

To reduce stress on the lowermost leg notch, I used a few scraps to lift the lower end of the legs a few inches off the ground. With the help of a second set of hands, we tilted the bookcase up and positioned it a few inches away from the wall. I had the installation supports nearby and quickly put them between each of the shelves, including a short one under the bottom shelf, so the leg-to-shelf joints wouldn't be stressed too much. If your leg-to-shelf joints are at all loose you'll have a hard time with this. Adding them in between the shelves, as well as below the lowest shelf, before tilting the assembly upwards is highly recommended. One option is to use one of the remaining legs for this. Temporarily put the rear edges of the shelves into the notches on one of the legs. This will allow you to insert the installation supports and remove the leg as you won't be able to assemble the bookcase with an additional leg there.

At this point I slid the bookcase against the wall and positioned it in its final resting place. Working from the bottom shelf upwards, I used a few L-brackets near the existing legs to secure the rear edges of the shelves to the wall studs. This ensured the unit as a whole didn't go anywhere.

Add L-Brackets – Once the notches were seated, Brown used L-brackets to fix the joints together. You can see the pieces of plywood he used on the underside of the lower shelves to extend them to about 10' long and create a strong joint. Since they are lower shelves the plywood pieces will never be seen.

Ready to Raise – The lower few shelves are now fixed to the vertical uprights. Notice the scraps of plywood Brown placed under the lower, front corner of the bookcase. This will allow the unit to be more easily tilted upward and land on the front legs without stressing the notches in the legs too much.

Next, I added the remaining legs, taping them into place and installing L-brackets to fit the legs to the front of the shelves. A few more L-brackets added even more strength to the unit. I checked for level front-to-back as I went.

At the corner joint, between the long bookcase section and the short section, I used butt joints to mate the shelves with each other and used a piece of 1/2" thick plywood on the underside, screwed to both shelves, to keep them tight and level with each other.

After the fact

This isn't a bookcase that can be counted on to hold thousands of pounds of books, but it's certainly holding up well in our home. We loaded it with our book collection and it barely flexed. If you want to add some extra strength, using a solid wood cleat fixed to the studs along the rear edge of each shelf will go a long way. Adding more vertical support legs will also add more strength.

This is a modern bookcase that uses minimal materials. My aim was to create it with simple, clean lines so it wouldn't overpower the small room it's in and we're pleased with how it looks and functions.

Rob's now considering designs for his next bookcase, as this one was filled mostly with his partner's books. "Are you ever going to read these again?" was asked a few times while loading up the shelves. He quickly learned that question wasn't welcome.

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VIDEOS: Subscribers can view a detailed video of how Brown machined the notches in both the legs and shelves by visiting the Videos section of our website.

RELATED ARTICLES: Simple, Yet Attractive Modern Bookshelf *(Apr/May 2017)*,
Build a Bookcase *(Dec/Jan 2024)*

Solid Support – Because the leg-to-shelf joints are the only joints supporting the shelves during the first part of the installation, Brown cut strips of wood that go under each shelf to support their rear edges. Although you can't see it in this photo, he cut a short strip for under the lowest shelf, too. You could use an extra vertical upright, but these strips can stay in until the rear edges of each shelf are fixed to the wall with L-brackets.

Last Leg – Brown adds the final vertical members and tapes them into place before securing them with L-brackets. You can see a few L-brackets holding the rear edges of the shelves to the wall in this photo, but he added many more shortly after this photo was taken.

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KingCanada.com

The ideal bandsaw for small workshops

Equipped with a powerful 3/4 HP motor, the compact King Canada **12" bandsaw (#KC-1202FX)** delivers a 12" cutting capacity between the frame and blade and a 6-3/4" resaw capacity. It has a generous 18-7/8" by 15-3/8" tilting table with rack & pinion adjustment. The upper and lower ball bearing blade guide system also uses rack & pinion adjustment. The dust chute accepts 2", 3" and 4" dust collector hoses. It comes with a cast aluminum miter gauge, rip fence with 5" high face, push stick, adjustment wrench and hex keys.

KingCanada.com

Get a superior finish on all your lumber

A benchtop thickness planer is a cost effective way to machine lumber to final thickness. The King Industrial **13" planer (#KC-13HPC)** features a helical cutterhead (equipped with 26 cutter inserts) that is quieter, requires less energy to operate, reduces or eliminates sanding work and leaves a smoother finish, with no tear-out, especially when it comes to figured woods. It features a 15 Amp motor with thermal overload protection, four precision ground columns for extra stability, preset depth stops for repeat cuts and a 2-position dust chute with 4" and 2-1/2" adapter outlets.

KingCanada.com

A versatile and flexible tool for a multitude of sanding tasks

The King Industrial **6"× 48" belt and 9" disc sander (#KC-760L)** can handle a wide range of sanding and surfacing jobs. The powerful 1 HP, 10-amp direct drive motor delivers a disc speed of 1,740 RPM and a belt speed of 1,250 SFPM, while a heavy-duty cast-iron body and steel base add stability and minimize vibration. The belt platen is covered by a graphite pad that reduces friction and increases belt life. A quick belt release lever makes for easy belt replacement. The solid cast-iron belt and disc tables have integrated T-slots and tilt from 0° to 45°. The adjustable belt unit operates vertically, horizontally or at any angle in between. Connect to a shop vac or dust collector via the dual 2-1/2" to 4" dust hook-up adapters.

KingCanada.com

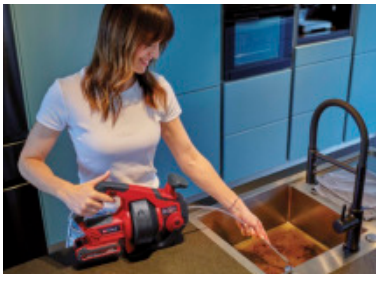
Open up a whole new world of wood surface finishing

Anyone who does a lot of sanding, especially with shop-sawn veneer, large panels, or figured lumber, will find the King Industrial **22" open drum sander (#KC-2244DS)** indispensable for obtaining consistently flat, smooth surfaces in short order. With its open ended design this machine can sand a 44" wide piece in 2 passes. The powerful 1.75 HP drum motor spins at 1,720 RPM, while the 1/8 HP belt feed motor enables you to control the feed rate from 0 to 31 inches per minute. The maximum sanding capacity is 1/64" per pass, and you can sand stock up to 5" thick. Comes with a metal stand and 4 caster wheels for easy mobility.

KingCanada.com

The go-to tool for cutting, cleaning, polishing and shaping metal

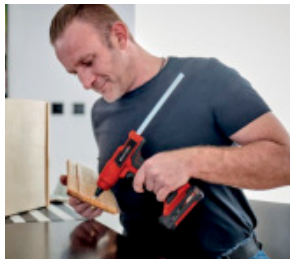
The Einhell **4-1/2" Cordless Angle Grinder (#4431147)** delivers a maximum (no-load) speed of 8,500 RPM and accepts standard 4-1/2" accessories. It features a brushless motor (with a 10-year warranty), soft start, restart protection, overload protection and quick-adjust safety guard. The quick-fix nut eliminates the need for a face spanner to change the cutting wheel – accessory changeovers are quick and tool-free. Its separate motor and gearing design provides for smooth operation. At only 3.4 pounds you can use it for extended periods of time without undue forearm and hand fatigue. Battery and charger sold separately.
Einhell.ca



Clear clogged drain pipes quickly and easily

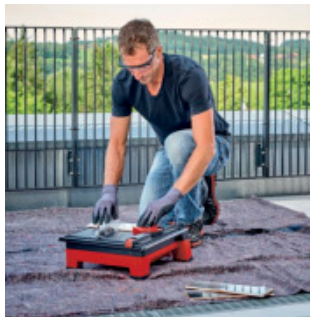
The Einhell **cordless drain auger (#4514165)** will clear obstructions from drain pipes up to 2-14" diameter with a 1/4" diameter 22 foot long galvanized rust resistant cable. The auger operates at variable speeds up to 560 RPM and features a right and left rotation that makes it easy to release the cable and a locking mechanism for freeing up stubborn dirt. A convenient LED light illuminates the working area. Battery and charger sold separately.
Einhell.ca

The ideal glue gun for shop or home



The Einhell **cordless full size hot glue gun (#4522201)** makes a better temporary adhesive than masking tape, enables you to build and then disassemble models, holds odd-shaped workpieces in place while wood glue dries, holds moulding in place while you permanently attach it with a brad nailer, and a lot more. Shaped like a drill/driver you'll find it much easier to control and it doesn't require a stand like many glue guns. It has a short 120-second warm-up and switches off automatically after 5 minutes without being used. Includes an additional flat glueing nozzle and five 7/16" × 8" glue sticks. Battery and charger sold separately.
Einhell.ca

Cut tiles quickly and cleanly, anywhere



With the Einhell **4-1/2" cordless wet tile saw (#4301191)** you can cut ceramic, porcelain and stone tile quickly, cleanly and just about anywhere. The worktable, which can be tilted, has an angle scale from 0° to 45°, plus an adjustable angle stop for miter cuts with settings from -45° to +45°. You get a generous cutting depth of 15/16" at 90° and 5/8" at 45°. At just under 8 pounds it's easy to carry, while non-slip, low-vibration feet keep the saw steady in use. Includes a diamond cutting blade. Battery and charger sold separately.
Einhell.ca

The ultimate tool for drilling and chiselling concrete, stone and masonry

The Einhell **3/4" SDS-Plus cordless rotary hammer (4513906)** is the tool to use when you need to drill large, deep holes in concrete or a regular basis. Powered by two 18V batteries, its powerful brushless motor (with a 10-year warranty) delivers 2.3 ft.-lbs of impact power with speeds up to 1,100 RPM and impacts of up to 5,300 BPM. It's equipped with a universal SDS-plus tool chuck with semi-automatic function, precision electronic speed control, overload slip coupling, an infinitely adjustable drilling depth stop made of solid metal and a vibration-cushioned main handle. Supplied with a practical transport and storage E-case. Battery and charger sold separately.
Einhell.ca

Illuminate your work area

When working in areas around the home or jobsite that are not ideally illuminated, the Einhell **2000 lumen hybrid LED work light (#4514137)** enables you to clearly see what you're doing to do the job well. It has 20 modern, high-performance LED lights with three user-selectable brightness levels that illuminate even the darkest corners. Its compact size and swiveling head allows you to reposition it easily and quickly for the task at hand. You can also use the work light with the included 120V adapter. Battery and charger sold separately.
Einhell.ca

The Ultimate Precision Joinery Machine

The **PantoRouter** is the safest, fastest, cleanest, most accurate, most repeatable and easiest joinery machine on the market! Cut your mortise and tenons, box joints and dovetails on a true joinery machine rather than the old-fashioned way using your table saw, bandsaw, router table and hand tools. You can set up and cut angled or compound-angled joints in minutes, virtually dust-free due to the incredibly effective dust collection hood. Go from setup to glue-up in under five minutes in most cases. Box joints and dovetails can be variably spaced, and custom templates can be shop-made to produce the perfect size and shape for your project. Custom furniture makers become more efficient, and hobbyists can create professional-looking projects with ease. Customers rave about PantoRouter's thoughtful design, engineering and high-quality construction. Visit their website to see videos of the PantoRouter in action and learn more about how others are using this unique joinery machine.
PantoRouter.com

INFO: DIFFICULTY – **4/5,** LENGTH/TIME – **4/5,** COST – **4/5**

CRAFT A MID-CENTURY MODERN SIDEBOARD

Simple lines and plenty of storage space make this classic sideboard stand out.

Photos by Rob Brown Illustration by Len Churchill

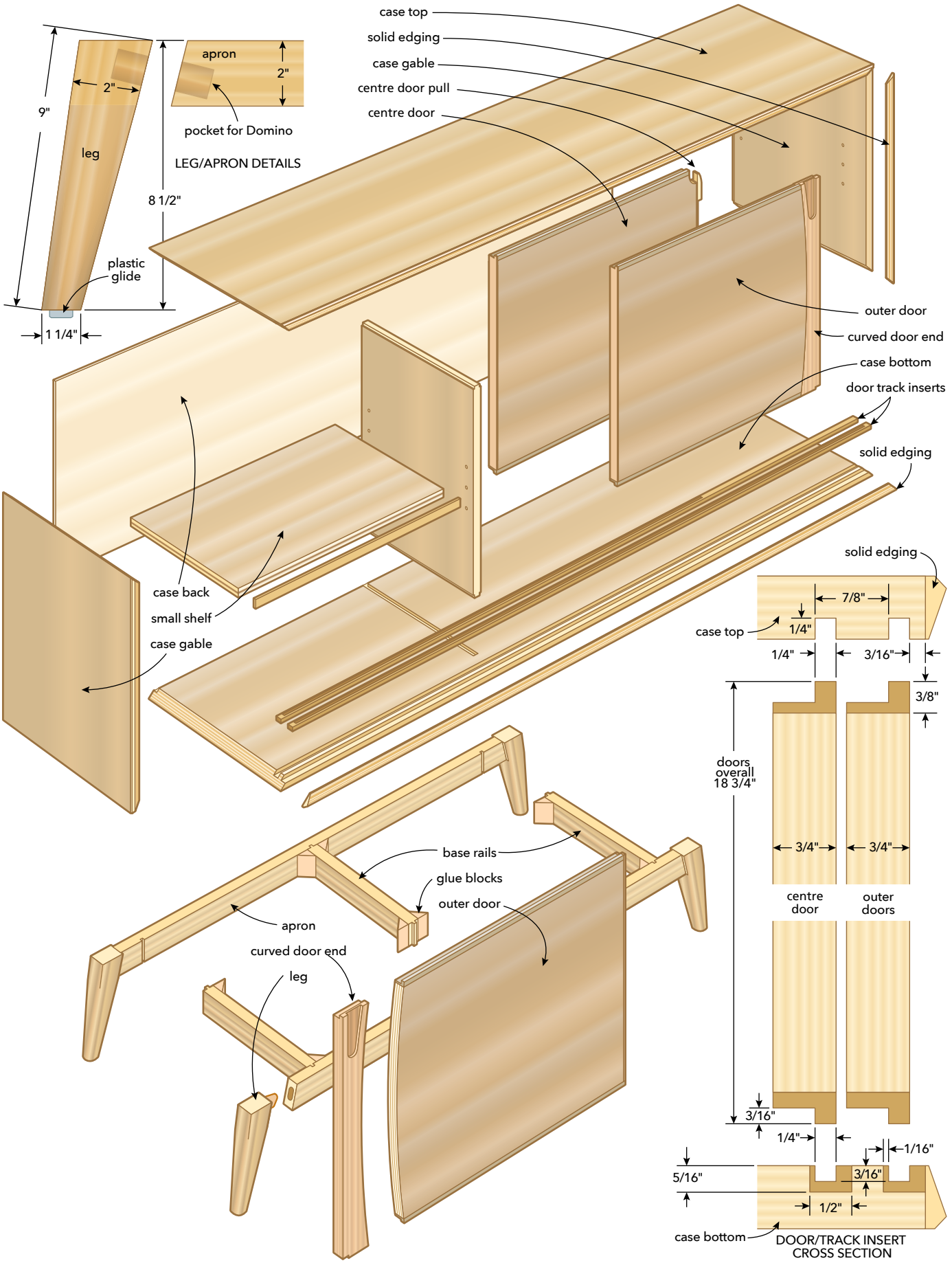
BY ROB BROWN

Mid-century modern is a minimalist style of furniture popular between the mid-1930s and mid-1960s. Straight lines were common, as were angled legs. Simple curves were also incorporated from time to time. Darker woods like teak and walnut were often used in these pieces. This style is also referred to as Danish modern.

Over the past decade the style has become popular again. Designers and the general public are buying these pieces up. As woodworkers, we don't have to wait patiently to find what we want in an antique store; we can make what we like.

Design

I wanted to keep the main case of this sideboard clean and simple. This meant bevelled corner joints with the grain wrapping around the top and gables. A piece of solid wood trim covering the four front edges of the case would allow me to shape the edge with an interesting detail. Hinged doors are fine, though I really like the simplicity and functionality of sliding doors. The only trick is that two tracks are needed in order for one door to slide behind the other two. Further, this meant the handles on the doors couldn't protrude, as they would hit another door while sliding. Not a problem.


case top
solid edging
case gable
centre door pull
centre door
apron
2"
2"
9"
leg
pocket for Domino
LEG/APRON DETAILS
8 1/2"
plastic glide
1 1/4"
outer door
curved door end
case bottom
door track inserts
solid edging
case back
small shelf
case gable
base rails
glue blocks
outer door
apron
curved door end
leg
solid edging
7/8"
1/4"
case top
1/4"
3/16"
3/8"
doors overall 18 3/4"
3/4"
3/4"
centre door
outer doors
3/16"
1/4"
1/16"
5/16"
3/16"
1/2"
case bottom
DOOR/TRACK INSERT CROSS SECTION

Materials List

Part	Qty	T	W	L	Material
Case Top	1	3/4	16	66	Walnut Plywood
Case Bottom	1	3/4	16	66	Walnut Plywood
Case Gables	2	3/4	16	20	Walnut Plywood
Door Track Inserts	2	3/8	1/2	65	Solid Walnut
Divider	1	3/4	13-1/2	19	Walnut Plywood
Solid Edging	1	1/4	7/8	To Fit	Solid Walnut
		Enough for the case, divider and shelves			
Back	1	1/4	To Fit		Walnut Plywood
Small Shelf	1	3/4	13-3/8	To Fit	Walnut Plywood
Large Shelf	1	3/4	13-3/8	To Fit	Walnut Plywood
Shelf Solid Edges	2	1/8	3/4	To Fit	Solid Walnut
Outer Doors	2	3/4	18-1/16	20	Walnut Plywood
Centre Door	1	3/4	18-1/16	21-1/2	Walnut Plywood
Lower Door Edging	3	5/16	7/8	To Fit	Solid Walnut
Upper Door Edging	3	3/8	7/8	To Fit	Solid Walnut
Side Door Edging	4	1/8	7/8	To Fit	Solid Walnut
Curved Door Ends	2	1-3/16	2-1/8	To Fit	Solid Walnut
Centre Door Handle Veneer	1	1/32	7/8	To Fit	Walnut Veneer
Centre Door Handle Pull Strip	1	1/4	1-1/16	2-1/2	Solid Walnut
Legs	4	1-1/2	2	9	Solid Walnut
Aprons	2	1	2	44	Solid Walnut
Base Rails	3	1	2	13	Solid Walnut
Glue Blocks	6	To Fit			Hardwood

Hardware List

Name	Qty	Size	Details	Supplier
T-Nut Inserts	4	1/4-20 Thread		Hardware Store
Adjustable Plastic Glide	4	1/4-20 Thread	#00F1501	Lee Valley
Brass Screws	2	#6 × 1"		Hardware Store
Brass Shelf Pins	8	5mm diameter		Hardware Store

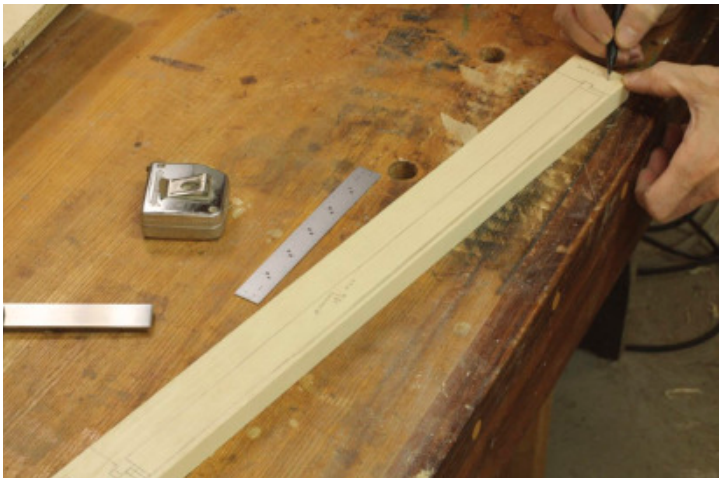
The base was also kept fairly simple, though I wanted to add a small amount of flair with angled, shaped legs. I also kept the base a fair bit shy of the overall case width, as I liked the negative space below both ends of the case.

You can play around with all these details and much more. Join the case with through dovetails. Use hinged doors to keep them all visually aligned. Play with proportions. When it comes to the base, make it wider. Or possibly taller. Curve the legs. Or keep them straight, but join them to the aprons at 90° angles. Cut a shallow curve into the underside of the front rail. To be honest, if I were going to build this again, I might do just that.

For details you're having trouble visualizing, or for details that you need to be very accurate with, making a full-sized cross section drawing is a great idea. I found I needed to do this with the doors and the track they would run in, just to make sure the doors and the trim I added to their top and bottom edges were all sized correctly. Adding in the solid wood insert that the sliding grooves would be machined into also helped fine-tune these details.

Materials

With the design process complete, I purchased some sheet goods and solid lumber. I decided on two sheets of 3/4" G2S (good two sides) walnut plywood, one sheet of 1/4" G1S walnut plywood, and a few planks of solid walnut. One of the pieces of solid was 6/4 so I could obtain the legs from one piece, and the rest was 4/4 material. If you don't mind laminating the legs from 4/4 material, you'll save yourself some money. Do it thoughtfully and it will likely never be noticed by anyone but yourself.



Full-Sized Drawings – Lots of details can be worked out with a full-sized cross section drawing. Here, Brown is drawing the door / track / top / bottom cross section.

Be Sure – At times, Brown draws details directly on the workpieces to ensure things line up. This shows the location of the solid wood inserts, the grooves the doors will slide in and the shape of the solid wood edge treatment on the front of the case.

It's possible to build the sideboard with one fewer sheets. One option is to make the back from 3/4" plywood. Another approach is to purchase one sheet of 3/4" plywood for the case and one sheet of 1/2" plywood for the doors and back. This may give you challenges when machining the integral finger groove if you machine it too deep.

The case

I ripped the case top, case bottom and gables to rough width, then machined and glued the solid wood edging on the front edge of these four parts. Just make sure the solid edges are thick enough so you can machine the edge profile you'd like on the front edge of the case. The four plywood parts were still 1" longer than needed right now. When dry, I trimmed the edging flush.

Cut two grooves to accept the sliding door track inserts in the case bottom. Because it's plywood, and I don't want the plywood edge to be visible, I machined a 1/2" wide × 5/16" deep groove, then glued solid wood into the groove. This allowed me to run the door groove into this sliding wood track insert later. The case top doesn't need sliding door strip inserts, as this area won't be visible when the sideboard is complete.

The rabbets to accept the 1/4" back panel were cut at this stage.

At this point you can cut the four case parts to final length, then bevel the ends of the parts. I cut these bevels on the table saw using a sacrificial fence. Check the "Related Articles" at the end of this article for a link to the technique I used.

Rout some grooves

I machined the grooves for the dividers before routing the grooves the doors slide in. In hindsight, it would be safer and easier to flip those operations because once the door sliding grooves are complete, it's slightly easier to make sure the divider grooves are stopped far enough from the door sliding grooves.

Rout the grooves for the doors to slide in. These are machined in both the top and bottom panels. An edge guide allows you to rout grooves parallel to the front edge of these two parts. I stopped the front and rear grooves about 1/2" away from the gables. I also stopped the right edge of the rear groove about 1" away from the right edge of the centre door. This is because the rear door only slides to the left side to open, and when it's slid closed again, the stopped groove will position the door accurately in the centre of the cabinet.

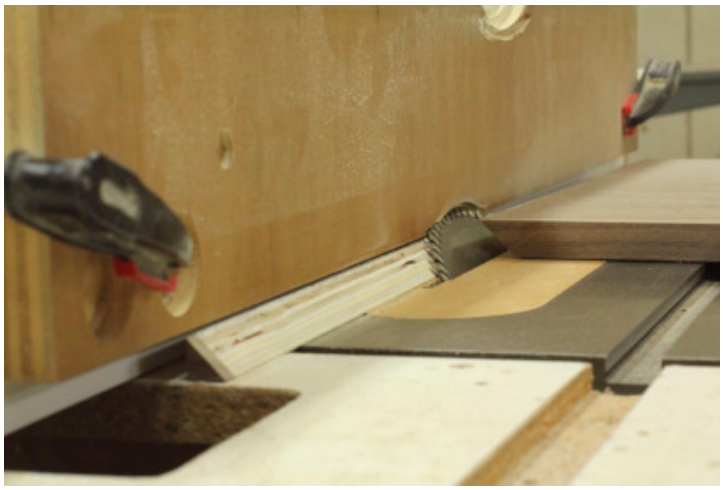
Add a divider

To rout the 1/2" wide × 1/4" deep dadoes to accept the divider, I used a router and a simple shop-made 90° jig as a guide. The dadoes were stopped at least 1" before they crossed the sliding door grooves.

Cut the divider to size, keeping in mind to add 1/2" for the tenon length (one 1/4" long tenon on both ends). Apply a solid strip of wood to the front edge of the divider, trim it flush, and machine the tenons to fit the routed dadoes. You'll have to trim the front edge of the tenons back so the joint won't be visible.

Shape the solid edges

Machine the edge profile on the solid wood edging. I made two cuts on the table saw, but you could use a router table for this step if you wanted. I have a right-tilt blade on my table saw, so had to perform the steps in a certain order. If you have a left-tilt blade you'll have to reverse the cuts to the get best results.



Simple Bevels – With the case pieces cut to length, Brown sets his table saw to machine the bevel joints on their ends and makes the cuts. The offcut sits in the ample gap between the fence and the blade once it's removed.

For the first cut, I moved the fence to the left side of the blade and cut the small 45° chamfer on the outer corner of the edge. Doing this cut first allowed me to run the workpiece on its 3/4" wide front edge. For the second cut, I moved the fence back to the right side of the blade and adjusted the angle to about 20°. Both of these cuts were positioned so the blade exited the face of the workpiece about 1/16" away from the joint between the solid wood and the veneer on the plywood, but on the solid wood side of the joint, obviously, so I wouldn't expose any of the plywood under the veneer.

Dry fit the case

With the joinery cut, it was time to make sure all the parts fit together nicely. Because we were dealing with bevelled corner joints, this was no easy operation. I used masking tape to bring the four bevelled corners together, but working alone made this dicey. Use lots of masking tape, and make sure it's strong, high-quality tape. Before taping the parts together, I sanded the inner surfaces of the divider and case.

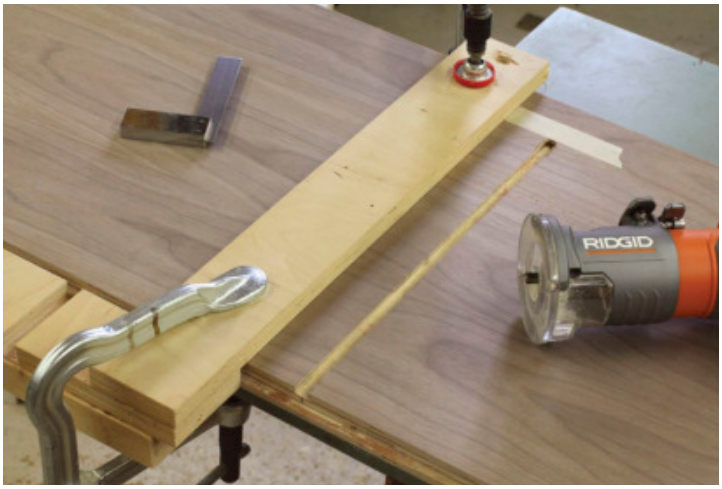
Rather than taping the four case parts together end-to-end, and having a heck of a time folding these long parts together, I taped the top and two gables, then added the bottom when the first three parts were positioned. I also assembled the case on its back so the pieces were better supported during this step. The divider was slid into place once the four case pieces were taped together.

I used a few shop items to assist me with supporting the bottom when it was brought into position.

Now for some glue

Now that I had a pretty good idea of how the piece was going to get assembled, and knew the parts all fit together, I applied glue to the bevelled joints of the top and gables and brought them together before gluing and adding the bottom and taping it in place. The divider got installed at this stage. If it's too complicated to install it now, position it in place without glue, then when the rest of the case is dry you can fix it in place for good. Ensure the case is

Groovin' – A trim router, edge guide and straight bit will make quick work of machining the grooves for the doors to slide in.



Simple Jig, Accurate Dadoes – Once this simple 90° jig is clamped in the appropriate location, Brown adds a mark where the dado needs to stop, near the front of the base. He can then rout the dado to accept the divider.

square before letting it dry.

Trim the back to size and temporarily tack it in place to add some strength while you further work on it.

The base

In order to come up with a base design I was happy with, I mocked up four spruce legs and a few aprons. Not only was I able to test for overall proportions, but I was able to play around with the shape of the legs. Square legs would have been easy, but the legs were where some flair was going to be added to this otherwise fairly linear cabinet.

When I was happy with my approach, I broke out the legs from some 6/4 material and the aprons from the 4/4 material and started to lay out joinery. This included ensuring each blank had one straight edge (this edge would be in the inner edge of each leg) and the top end of each leg was trimmed at an angle. The overall length and width of the legs were left rough.

When I broke the leg blanks out of the larger board I made sure the front legs came from the same part of the board so the grain and colour would match. I also used a straight-grained portion of

Flip the Fence – Brown moved the table saw's rip fence to the left side of the blade to make the first cut to shape the edge profile at the front of the case. If you have a left-tilt saw you can make this cut with the fence on the standard (right) side of the blade. This pass should be made first, so the flat portion of the front edge can reference off the table saw's upper surface.

the lumber, and broke out one blank that was twice the length of a leg, then crosscut that blank in half. The freshly crosscut edges would be the tops of the legs, though they both had to be cut on an angle first. This gave me virtually bookmatched front leg blanks.

I opted to join the legs to the aprons with Dominos, but mortise and tenons would also work well. A series of larger dowels would also provide enough strength to secure the legs to the aprons. Machining the joinery before shaping the legs is the best approach, as once the legs are shaped they will be rounded, making them hard to secure to a workbench. They will also be harder to work with when they're smaller.

Shape the legs

With the joinery on the four legs complete I turned my attention to shaping them. I used one of the spruce mock-up legs as a guide, and further fine-tuned the first walnut leg. When I was happy with this first leg, I marked it and used it as a template for the other three legs. I wanted the legs to look identical, but when you're hand shaping wood that's sometimes a challenge.

I traced the outer profile on each leg blank, removed the waste with a bandsaw and used a host of hand tools to start rounding the legs. Chisels, a block plane and a spokeshave removed the bulk of the material and allowed me to shape these blanks into pleasing legs. In order to keep the legs looking uniform I also drew a circle on the ends of the legs, which further gave me something to shape to. This process took a fair bit of time, but I think the results were worth it. Again, straight, or even angled, legs would have been easy, but the legs are one of the main design features of this piece.

With the legs shaped, I turned my attention to the rails. The joinery was already cut on the ends of the front and back aprons, but the three rails had to now be made. I cut 1/4" deep notches on the inner faces of the aprons and 1/4" long stub tenons on the ends of

Profile Complete – This is the freshly cut second pass Brown made to machine the front edge profile. Notice how he left barely over 1/16" of solid wood where the solid edge mates with the veneered surface. This will allow Brown to ease this edge and make the transition between solid wood and veneer to visually disappear.

Dry Run – A dry run will allow you to work out any assembly details. These four case parts aren't small, and bringing them together accurately isn't an easy task. Masking tape and a support of the right size are critical to success. Notice this is only the case top and both case gables. The case bottom will be added once the first case gable is clamped at 90°.

the rails, sanded the parts, glued the legs to the aprons in two sub-assemblies, then brought the entire base together. I also added a few glue blocks to strengthen the rail-to-apron joints.

The last detail was to drill for T-nuts in the underside of each leg and hammer in a T-nut. This piece of hardware will allow you to install an adjustable plastic glide in the end of each leg and ensure the sideboard doesn't rock when in use.

Time for doors

The doors were next. I opted for the difficult route with the two outer doors. This sideboard has very simple lines, which is in keeping with the style, but I wanted to add a gentle curve to their outer edges, rather than take the simple approach of making a rectangular door for either end of the case. There's nothing wrong with skipping this step, though I do think it enhances the overall design. A word of warning: It takes a fair bit of time and careful machining to get this right. It's certainly not rocket science, though.

I ripped the three door panels from a sheet, planning the grain so it would look pleasing once the doors were installed. I didn't cut the doors to length yet, because machining the arcs on either ends of the two side doors is easier if the door blank is larger. There's just more to clamp to a worksurface when working with a larger workpiece. Top to bottom, the grain was centred on the case opening, and left to right, the focal point of the grain was centred on the case opening. This causes some waste, and is dependent on the sheet you get. When making the case I would save the best-looking sheet for the doors, as they will be more visible than the case.

A tip about adding the curves to the ends of the two outer doors: Leave these two doors oversized in length by a few inches, as that extra material will come in handy when securing the doors to a workbench while you rout the curve on each panel. You may be able to screw into this extra material at the waste end of the workpiece, through a work surface, but be careful to keep the screws far enough away from the spinning router bit.

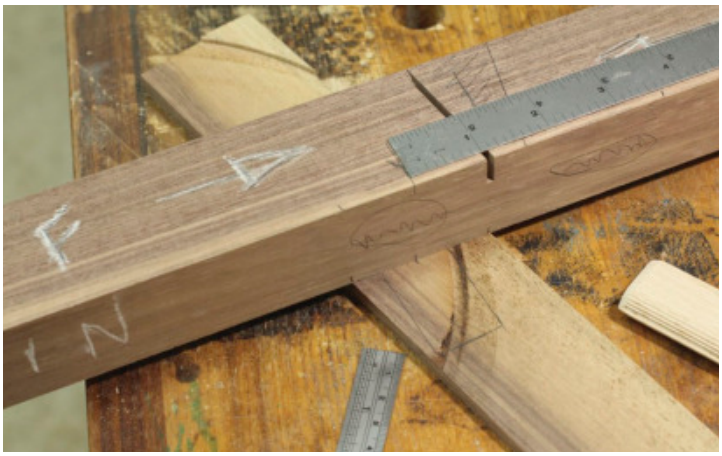
I ripped the three doors to width, then added solid edging to the top and bottom of the doors. This edging is thicker than typical edging, as it will have the sliding door tenons machined into it down the road. The goal was to have about 1/4" of solid visible at the top and bottom of each door when it was complete.

When the upper and lower edges are dry, trim them flush with the faces of the doors. Next, cut the centre door to final length and trim the centre edges of the outer doors flush. Now you can apply the 1/8" edging to all of these freshly cut edges. Make sure to leave the two outer ones for now, as we will get to adding the curved edges on those two next. When dry, trim the edging to length and for thickness.

Two curved outer edges

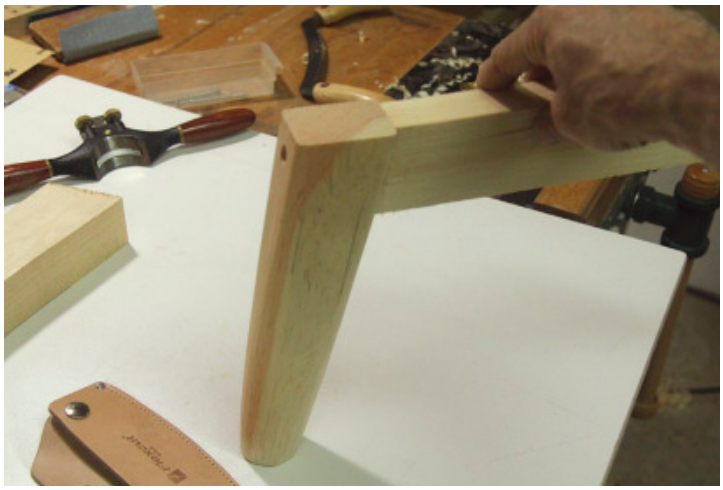
After some mockups to make sure the curve I machined would look good, I set up a router with a straight bit and secured it to a very long circle cutting jig. You will have to attach a few lengths of plywood together end-to-end. Secure the outer door panel to a work surface, using the waste portion beyond the curve. If you use

Dry, But Together – Still without glue, the first gable has been rotated into position and clamped with a 90° bracket, and the case bottom (on top, in this photo) has been taped and positioned in place. The supports hold the far end of the bottom at the right height because Brown is working alone.



Leg Joinery Details – The "F" signifies the front face of the front leg, while the arrow is pointing upward. The arrow on the other front leg is partially hidden by the 6" ruler. Obtaining both front legs from the same blank will mean the grain and colour of both legs will be mirrored when complete. Brown has drawn rough locations for Domino tenons on the edges of the legs, and is working out exact locations now. This thin piece of scrap below the leg workpiece is the same width as the apron, and has the location of the Domino tenon drawn on it to make sure it doesn't protrude through the edge of the apron. The scribbled-out portion of wood between the two angled lines is the waste between the two legs.

Refine the Shape – Further shaping of the legs happens with block planes, files and sandpaper. Notice the circle that's barely visible on the end of this leg. Brown can use it as a guide while shaping the leg to ensure the four legs are shaped similarly.



Mock It Up – A piece of spruce was used to mock up the shaped leg and apron detail. Once shaped to his liking, Brown will use it to guide him while he shapes the four walnut legs.

Rough It Out – With the Domino joinery complete, Brown roughs out the shape of the leg with a draw knife.

clamps they will get in the way of the router and plywood beam used to move the router in an arc.

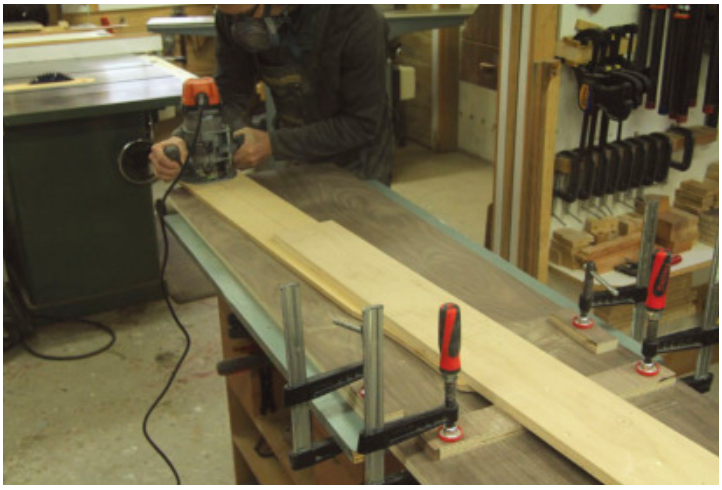
Next, use a screw to secure the circle cutting jig to the workbench and with multiple passes rout the curve into the door. I left about 1/32" of material on the door after the final pass, as that will help keep the door stationary during the entire pass. When you remove the door a sharp knife and sandpaper will flush the lower, curved edge. Another option is to leave 1/8" of material and use a flush trim bit to clean up this edge. To shape the other door, you could set this up again, but I opted to clamp the two doors together and pattern rout the second to match the first.

Curved solid edging

The solid edges that will be glued to the curve on the two outer doors need to be machined. Make sure to break out the curved solid edges at least 6" longer than their finished length, as that extra bit of material will allow you to screw the parts to your work surface so they remain stationary while the curve is being routed into

Assemble and Strengthen – Once the base is together, Brown adds glue blocks to add more strength to the assembly.

Tricky Angles – Because the legs mate with the aprons on an angle, a simple clamping jig needs to made. This jig hooks over the far end of the apron, runs about 36" toward the leg being clamped in place and has a surface to place a clamp head on. It might be possible to just run a long clamp across the entire length of the apron, but the angled legs might cause the clamp heads to slide off the legs while applying pressure.



Circle Cutting Jig – Brown screwed together a few lengths of plywood to act as a circle cutting jig long enough to machine the slight arc on the doors. As you can see, Brown hasn't cut the doors to rough length yet, as routing the curves on their ends is easier if the workpiece is long, as it gives him something to clamp.

Mating Solid Edges – Brown cuts a mating arc into the two solid wood edges that will be glued to the arcs on the ends of two of the doors. Two support strips are clamped or screwed to the work surface to support the long circle cutting jig.

them. Also make these solid edges wider than they need to be, as they will be trimmed to width once glued to the door panels.

The process of routing the curve into these two pieces of solid wood is virtually identical to machining the curve in the outer door panels, except for the fact that a slightly different radius needs to be used. This slightly smaller radius will differ by the width of the straight router bit you're using.

When the curves are cut, dress the curved solid edges to within about 1/32" of the thickness of the plywood door so you won't have much material to remove when flushing the solid. Glue the curved edges onto the outer doors. When dry, trim them flush on all sides and cut the doors to finished size.

Door handles

Sliding doors force you to use flush-mounted hardware for at least the rearmost door. I also didn't want to use standard

Handle Jig Design –Brown designed and built this router jig to machine the recessed pulls. Before machining the real thing, he used this jig to machine a pull in some scrap.

Rout the Recesses – Using his shop-made jig, Brown routs the recesses that will act as handles in the doors. To rout the other recess, Brown will remove the spruce guide on the underside of this jig and screw it to the top surface of the jig.

protruding hardware for the two front / outer doors for aesthetic reasons. Instead, I decided to machine a finger groove into the curved solid edge.

After a mockup to ensure that not only the finished finger groove would look good, but that my approach would work as well in real life as it did in my mind, I got to work on the doors. A template guide in your router's base plate will follow the pattern on a simple jig. This will guide a plunge ball bit to create the finger groove.

Make the template

I used a piece of 1/2" particleboard to make this template, but other materials will also work. I cut the straight portion of the cut-out on the table saw, then moved to my scroll saw to cut the curved portion. I smoothed it with a file and sandpaper, then clamped it to the door. With a few passes, I routed the finger groove to a depth of just over half the thickness of the door.

The centre door handle

I treated the centre door differently than the outer two doors. My main goal here was to keep the look as simple and unobtrusive as possible. I used a drill bit and jig to remove a quarter round section of material in the extreme upper right corner of the door. This small cavity would allow the user to insert a single finger and slide the door open. A small cleat on the edge of the door allows the user to pull the door closed.

When the quarter hole was bored, I applied a piece of walnut veneer over the exposed plywood. This step is to be considered before drilling the quarter round in the corner of the door. In order to be able to press the veneer over the exposed plywood I found it easiest to find an item in the shop that would help with this. Anything rigid enough to hold its shape under some mild clamping pressure would do. I found a small metal cylinder and selected a drill bit that would leave an arc to allow the small metal cylinder to work its magic and press the veneer into place. A few layers of paper towel helped spread out the pressure of the metal cylinder and ensure the veneer was pressed into place evenly.

This partial hole allows a finger to be inserted into the opening so the door can be slid open. When it comes to rest, the edges of both the centre and far left doors will be approximately flush, making it almost impossible to close the door. I added a pull strip to the right side of the door to give the user something to pull on.

Make the doors slide

The tenons on the upper and lower edges of the doors will allow them to easily slide left and right. I machined rabbets on the rear face of the doors, and left the fronts of the doors as-is. To

Careful Drilling – Brown machined the hole in the scrap, removed a 90° section from the scrap, then used it to guide the drill bit as he removed a quarter circle from the door.

Careful Gluing – Brown used a metal cylinder to apply pressure to a layer of veneer to cover the plywood edge of the finger hole. A few layers of paper towel help apply even pressure until the glue dries.

install the doors, the upper tenon needs to be slid into the groove in the underside of the case top, then the lower edge of the door can be positioned in place and lowered into the groove in the case bottom. The process of fitting the doors properly can take some time, and a bit of extra trimming with either a table saw or a shoulder plane. You want the doors to slide easily.

To cause the rear door to be positioned accurately between the other two doors, I adjusted the tenons on the centre door to stop the door in the groove so it was centred on the cabinet.

Shelves are the last parts to be made. Cut them to size, apply a solid edge, and when dry add a profile to the front edge of the shelf that matches the profile on the front edges of the case. Drill shelf pin holes in the gables and divider, being careful not to break through the outer face of the gables.

To cut the audio/visual vents into the back panel, make a simple template sized to your needs. Clamp it on the back and rout the openings.

Simple Jig, Accurate Cutout – Once the centre section is removed, Brown can clamp this jig to the back and flush trim out an opening in the back for cords. The first three cuts were made on the table saw, but a jigsaw removes most of the waste before Brown returns to the table saw to make the accurate final cut. Otherwise, the piece of waste in the centre could become airborne.

Apply a finish

A project like this needs at least a medium amount of protection. Thankfully, that leaves you with lots of options. Mid-century pieces rarely have a thick film finish. A penetrating oil finish, applied by hand, is a good option. The hardwax oil finishes on the market today are good quality. Even an oil / varnish mixture is very much in keeping with this style of piece.

I tested a few different finishes to see how they would look on the walnut, and eventually went with Rubio Monocoat Pure.

With the back removed from the cabinet, and all the parts separated, I made sure all the surfaces were sanded evenly. I applied two coats to the entire piece. Using a laminate sample the same size as a credit card, I squeegeed the finish on, let it sit for 10 minutes or so, then wiped if off with a clean rag. For some of the areas a laminate sample couldn't get to, like the profiled front edges of the case, the curved finger pulls and the sliding door grooves, I used a Scotchbrite pad to wipe on the finish.

After allowing the first coat to dry, I sanded the finish with 320 grit paper, cleaned the surface and applied the second coat, let it sit for 10 minutes, then wiped it clean. I then let it cure for a few days. A bit of wax on the door tenons and the tracks made for smooth operating doors.

The base is attached to the case with some L-brackets.

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FURNITURE & CABINET HARDWARE
FOR HOME & SHOP STORAGE

Photos by Rob Brown

BY CARL DUGUAY

Storage projects for the home and workshop will greatly benefit from using the right type of hardware. All of these hardware products have been designed with function and looks in mind, and come in a wide of variety of options. Researching what hardware you'd like to use before you get started will go a long way to ensuring you end up with a beautiful, functional and strong project that goes together with ease.

There are dozens of hardware product categories on the market, and within each category there can be dozens of different designs and materials in a range of styles, from classic to modern. Many pieces are available in a range of finishes, including brass-plated, nickel-plated, satin chrome, oil-rubbed and antique English. Some, like kitchen cabinet levellers and many types of drawer slides, are available in only one colour. Trying to find the right product for your project or your home can be somewhat onerous. Here are some of the more widely used hardware products used in furniture and cabinet storage projects.

Hinges

Plain (a.k.a. standard) **butt** hinges are the most common type of hinge, used on everything from entrance, bedroom and kitchen cabinet doors to fine display cabinets and fancy boxes. They consist of two leaf plates each with three or more curved "knuckles". A pin that slips into the knuckles joins the leaf plates together. The hinge pins can be untipped or tipped for a more decorative look.

There are also ball-bearing, spring-loaded and lift-off butt hinges. Ball-bearing hinges, used primarily on large, heavy doors, have bearing rings between the knuckles that help reduce friction so doors open and close more easily and smoothly. Spring-loaded (a.k.a. self-closing) hinges, typically installed on screen, garage and gate doors, have a hollow centre section that contains a spring that automatically closes the door. Lift-off hinges allow you to quickly remove the door from the cabinet.

Butt Hinges – Butt hinges are simple and strong, and come in a wide range of sizes and finishes. They usually have to be mortised into both the door and the frame to work properly and look good.

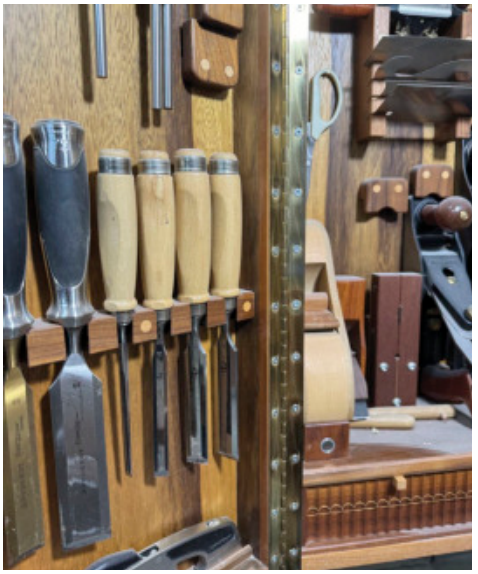
While plain hinges require you to cut a mortise to house the hinge, **non-mortise** hinges are simply screwed into the cabinet frame and door. These hinges are usually much thinner than plain hinges, about 1/16" thick, leaving a smaller gap between door and frame. However, they don't support as much weight as mortised hinges. Some non-mortise hinges have one leaf that's cut out to receive a smaller opposing leaf so they mount flush.

Strap hinges are part of the butt hinge family and commonly found on gates, barn doors, storage chests and some kitchen cabinets. Smaller brass or stainless-steel versions are used on fancy lidded boxes and cabinets. They're mounted on the exterior of the door and frame.

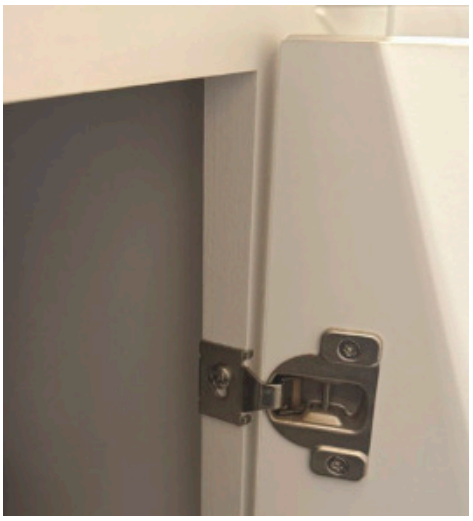
Piano hinges can be considered a type of butt hinge. They have two leaves that run the length of the hinge and a single pin that connects the leaves together. Think of them as the work boots of

No-Mortise Butt Hinges – These types of hinges don't need to be mortised into doors or frames, as each leaf of the hinge is cut away to allow the other to close properly. No-mortise hinges like these aren't meant to carry a large amount of weight.

Strap Hinges – Strap hinges, often used on exterior gates and large chests, offer a bit more screw-holding strength over a large area because the holes in the hinges are more spread out. When used on chests they offer a largely decorative touch.



Piano Hinges – Piano hinges offer strength over a longer dimension, as there are screws and a central pin along the whole length of the hinge. Here, a piano hinge secures a door on a hanging tool chest.



Face Frames – When hinging a door on a cabinet with a face frame, specially designed hinges need to be used. They can either be secured to the front of the face frame or, as in this case, to the inner edges of the face frame.

European Hinges – These types of hinges are available in a wide range of styles, so ensure you purchase the correct ones. The angle they open to, whether they are soft- or regular-close, and the position they hold the door in relation to the gable are the main options.

Soft Close – Most brands of European hinges are available in soft-close options. Each brand is different, but this brand closes part way normally, but when the arm closes enough to press against the small, dark area in the middle of the hinge's base, it slows the closing movement of the arm.

footwear - functional and durable. They're also quite easy to install – just screw them in place. They're available in 3', 4' and 6' lengths and can be easily cut to whatever length you need. You can also get small piano hinges as short as 2-1/2" for use on small boxes. They're usually attached with #1 screws or flat head brads.

Kitchen and bathroom cabinets are either face-framed or frameless. For face-framed cabinets there are **face frame** hinges, a type of semi-concealed butt hinge in which only part of the hinge is visible, and **surface-mounted** hinges that are attached on the outside face of the frame and door without a mortise for a more traditional look.

European-style (a.k.a. 35mm, Blum or concealed) hinges are some of the most common types of hinges found in kitchen and bathroom cabinetry as well as wall units. They can be used on overlay or inset face-framed cabinets and frameless cabinets. When the door is closed, these hinges are completely hidden from view. They take a bit more work to install on new cabinets as they require drilling 35mm holes for the hinge cup. Because the holes need to be precisely drilled for the doors to hang correctly, it's best to use a jig such as the Kreg Concealed Hinge Jig (Kregtool.com) or Rockler JIG IT Concealed Hinge Drilling Guide (Rockler.com). One of the major advantages of these hinges is that they're adjustable in three ways - left and right, up and down, and in and out – which makes it super easy to ensure all your cabinet doors are perfectly aligned.

Euro hinges are available in two styles. Compact hinges are smaller and a good choice when you want to maximize space inside the cabinet or have slightly less visible hardware. Long-arm hinges provide a clip-on-off feature that enables you to remove doors for cleaning, repairing or refinishing. Euro hinges also have different opening angles – from 90° to 170° - depending on how wide you want the door to open.

Different Installation Options – Some European hinges come with this type of screw and need to have larger holes bored to accept them. Most hobbyist makers don't need this type, and just purchase hinges that work with regular screws, though the screws and hard plastic posts in this hinge can be removed fairly easily. (Photo by Blum)

Barrel Hinges – These types of hinges are one of the least visible on the market. Accurate mating holes need to be bored in the mating parts or the two hinges won't line up properly. (Photo by Lee Valley)

SOSS Hinges – Like barrel hinges, these are very discrete hinges with a very smooth movement. They also need to have mating cavities that are machined carefully for the hinges to work. (Photo by Lee Valley)

Knife Hinges – Like barrel and SOSS hinges, knife hinges need to have carefully machined recesses to house and locate them. They're a good choice when the situation calls for one. The style in this picture is straight, though they also come in offset versions.

Full Extension Slides – Full extension drawer slides run smoothly and can carry a fairly high amount of weight. (Photo by Lee Valley)

Drawer Glides – They aren't as smooth acting as their full-extension counterparts, but they're easy to install, work well and are cost effective. (Photo by Lee Valley)

Snap-close (a.k.a. self-close) hinges have a built-in spring that, after you begin to close the door, snaps it shut fairly abruptly. Soft-close hinges have some form of internal damper that closes the door more gently.

European hinges are available in three main formats, depending on how the door will be orientated compared to the gable it's attached to. **Full overlay** hinges are used when the door will overlap the gable completely. **Half overlay** hinges are used when there will be two doors hinged on a single gable (one door on either side) and both doors will collectively conceal the gable's edge. **Inset** hinges are used when the face of the door will finish in the same plane as the front edge of the gable, causing the front edge of the gable to be visible.

Though the thickness of the gable isn't important when using inset hinges, when you're using full or half overlay hinges, gable thickness comes into play. There's likely barely enough lateral adjustment in the hinges to not purchase a different base plate, allowing you to use the same hinge and base plate on both 3/4" thick and 5/8" thick gables. Having said that, if you're using 5/8" thick gables, I'd recommend purchasing base plates that are 3mm thicker that will allow you a bit more range of adjustment when dealing with full or half overlay hinges.

Barrel hinges are hardly noticeable when installed. They're used on display cabinets, lidded boxes and lightweight swing doors wherever you want a discrete hinge. They consist of two barrel-shaped cylinders with a hinged knuckle joint that enables them to pivot for opening and closing. You need to drill precisely laid out holes in the door frame and cabinet for the barrels. They're generally used for doors from 1/2" to about 1-3/8" thick.

Invisible (a.k.a. SOSS) hinges are similar to barrel hinges in that they're invisible when the door is closed, and scarcely visible when the door is open. They consist of two arms that extend outwards when pivoted to enable the door to swing open. To install them you need to cut a rabbet. The fastest, easiest and most accurate way to install them is with a router and a jig, such as the Woodhaven SOSS Hinge Jig (Woodhaven.com).

There are two types of **knife** (a.k.a. pivot) hinges: straight and offset. Like barrel and invisible hinges, they're very discrete. These hinges are installed at the top and bottom of the door and the hinge side of the cabinet. Use a straight knife hinge when the top and bottom of a cabinet extend past the sides and an offset hinge when the cabinet top, bottom and sides are all inline.

Slides and glides

Slides and glides (a.k.a. drawer runners) enable drawers to open and close smoothly. **Slides** consist of a stationary rail that's attached to the side of a cabinet and one or more moving rails. A 3/4 or 7/8 extension slide has one moving rail and will extend 3/4 or 7/8 the length of the slide. A full-extension slide has two moving rails and will extend the full length of the slide. There are also over-travel slides that extend an inch or two beyond the front face of the cabinet. Virtually all slides use ball-bearings (typically stainless steel) to facilitate movement of the rails. This reduces friction and makes drawers operate more smoothly and quietly. Slides have different load-bearing capacities, ranging from around 50 pounds up to 400 pounds.

A **glide** (a.k.a. roller or Euro slide) is a less refined runner that usually has two thin rails each with a single plastic wheel to facilitate movement. Almost all are bottom-mount, 3/4 extension and epoxy coated (usually white). While they're the most economically priced runners available, they don't support as much weight as slides.

Side-mount slides, like the ones mentioned above, are common. Installing them isn't overly difficult and made easier if you use some kind of jig, such as the Kreg Drawer Slide Mounting Brackets (Kregtool.com) and undercut head screws (Richelieu.com). On frameless cabinets the slides are simply screwed into the cabinet and drawer sides. On face-frame cabinets the slides are attached to the frame stile and also to the back of the cabinet by means of a bracket, as well as to the drawer sides.

Growing in popularity are undermount (a.k.a. bottom-mount) slides, as they're virtually invisible, offering a cleaner appearance. Centre-mount slides are also largely invisible and suitable for light-duty applications. They're available in 3/4 extension.

Slides are also available with three different motion features. Self-closing slides use a spring-actuated mechanism that pulls the drawer closed. Soft-closing slides have

Easy Installation – Jigs, like this Kreg version, make installing drawer slides easier and more accurate. (Photo by Kreg)

a spring mechanism and damper that slow the drawer as it shuts so it doesn't slam. Touch opening (a.k.a. touch release or push-to-open) slides employ a spring and trigger mechanism that pushes the drawer open when you apply fingertip pressure to the drawer front.

Pocket door slides are used when you want to open the doors and then slide the doors into the side or top of a cabinet. You'll often find them on entertainment centres and armoires, and possibly some kitchen cabinet situations. They're more complex to install.

Stops and Catches – An assortment of magnetic and friction stops and catches can make using doors and drawers easier and more functional.

Lever Handles – Although they're less common than a round knob door handle, a lever handle can be easier to operate for those who have their hands full with groceries or for someone with arthritis. (Photo by Weiser)

Handles

Anything that you hold with your hand to open and close something is essentially a handle. **Doorknobs** and door **levers** are the ubiquitous handles found on large doors in virtually every home. They come in a plethora of styles and finishes. People who have difficulty using their hands (for example, with arthritis) often find levers easier to use. And when using both hands to carry something a lever can be operated with an elbow.

On smaller doors and drawers, such as kitchen cabinets, display cabinets, dressers, sideboards and the like, **knobs** and **pulls** are used. Knobs are round or oval while pulls have parallel arms connected by a rod. It's a matter of personal preference where you use both of these, and often they're available in matching options so you can use both knobs and pulls in the same project and still maintain the same look.

On large, heavy entrance doors (the kind you find on store entrances, offices, and

Latches – A latch can help keep a lid closed, which might be beneficial for many reasons. Some latches even have locking mechanisms.

Matching, but Different – Knobs (left) and pulls (right) can often be purchased to match, so you can keep the style of the project the same across all the doors and drawer fronts.

classic- or luxury-style homes) you often find large wood or metal pulls used. In the workshop, small, modest lobed (a.k.a. fluted) or tapered knobs, usually made of plastic, are used on jigs and fixtures.

Catches, latches and locks

All three are fastening devices most often used to keep doors closed. **Catches** are the simpler of the three, comprising two pieces that "catch" together. To release the catch, you simply pull the door from the cabinet. There are a variety of catches including friction-fit, magnetic, bullet and ball / roller catches.

Latches, on the other hand, require you to manually disconnect the two holding pieces to release the door. Most often they're mounted on the exterior of the door. Doorknobs, in fact, are a type of latch as they consist of a handle, a latch and support

Bumper Crop – An assortment of bumpers will come in handy to reduce noise from banging doors or add grip to the underside of a small box or project.

Gliders – While this glide screws onto the underside of a project to reduce scratching the floor, others can be hammered into place or come with adhesive surfaces. (Photo by Lee Valley)

components that make the two parts work together. There are also bolt latches (used on windows and utility doors), gate latches (used on gates, and garage and barn doors), spring latches (a bolt latch with a spring that automatically retracts the bolt), draw (or toggle) latches that pull two surfaces together (such as on a toolbox or a chest), and cam latches (often used to hold cabinet and desk drawers closed).

Locks offer more security than catches and latches. They're mainly used on the odd door or drawer that will be tasked with storing valuable items. Although this is more often the case in an office setting, there's nothing saying a home office or storage unit can't have a lock on some or all of its doors and drawers.

Stoppers, bumpers and door closers

Doorstops protect walls, furniture and doors from damage caused as a door swings open. There are two types of doorstops: those that prevent door handles from denting walls and those that keep doors from closing. The classic baseboard-mounted stop consists of a flexible spring or a rigid arm with a rubber tip. The spring or arm is usually screwed into the baseboard. Other stops are mounted onto the bottom side of the door or on the top of the hinge pin. Wedge door stoppers are not fixed and are temporarily placed under the bottom edge of a door.

When you want to keep two items from banging together, or protect one item from

Kitchen Cabinet Levellers – Adjustable kitchen cabinet levellers make quick work of levelling a group of cabinets and also provide a way to attach a toe kick underneath the cabinets. They also work well with wall units and vanities.

damaging another (think cabinet doors, picture frames on the wall, lamps on a table), use a **bumper** or bumper pad. They can be made of rubber, plastic, felt or cork. Most have a self-adhesive backing for easy installation. For kitchen cabinet doors and drawers, you'll want to use **dampers**. A damper absorbs the impact of slamming doors and drawers and gently closes them. They do this by means of a pneumatic mechanism built into the damper.

Door closers prevent entry and bedroom doors from slamming shut. The most common type is mounted at the top of the door and to the door frame. Concealed door closers are mounted into the top of the door and door frame, making them virtually invisible.

Gliders, casters and levellers

Gliders (a.k.a. sliders) are small discs that you attach to the bottom of furniture legs so they can more easily glide over a floor. Some incorporate either a manual or spring-loaded self-levelling feature. They can be attached by means of double-sided tape, nails or screws. Non-marring felt gliders are best for hardwood flooring while nylon or polyethylene sliders work best on carpet or tile flooring.

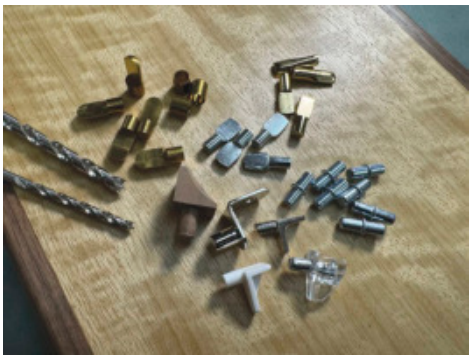
Casters make it easy to move furniture, cabinets and shop machinery across floors. They typically consist of a wheel and a mounting frame with holes that enable you to screw the caster in place. Another common style of caster has a stem that's inserted into a hole that you drill into the cabinet or furniture leg. Rigid casters don't swivel while swivelling casters rotate a

Level the Ground – By drilling a small and large hole in the bottom of a leg, and hammering in a T-nut, a threaded, adjustable leveller can be installed to stop the project from rocking.

Cabinet Feet – Adjustable cabinet feet are both functional and attractive. They're available in different styles to suit the project. (Photo by Lee Valley)

full 360°. Either of these can have a locking feature, often a foot-activated brake. Casters are rated for the weight capacity of each caster, which can range from a few hundred pounds up to a ton. Nylon casters work best on carpets while urethane casters are a better choice for tile, concrete and wood floors.

Levellers, as you might have guessed, adjust to provide a level, stable base for furniture and cabinets. In the shop they're useful for levelling machinery or equipment. Shims (a.k.a. wedges) are a good choice for a temporary fix. For a more permanent fix there are T-nut levellers, which are installed into a hole you drill into the bottom of the item. Cabinet levellers are widely used to quickly level kitchen cabinets or wall units. You install them under the cabinet base. Some include a plate clip to which you can attach a kick board (plinth) directly onto the leveller. Cabinet levellers are typically around 4" high, and offer about 1/2" of adjustment both below



Shelf Pins – A range of shelf pins are pictured here. Most are inserted directly into the holes in a gable, though some require a sleeve to be inserted into the hole before the post can be installed. Diameters are typically available in 5mm, 7mm or 1/4". They can also be made of wood if you want a unique addition to a display cabinet.

Hooked – Hanging hooks come in a wide variety of sizes, styles and finishes to suit just about any project.

Brackets – Available in many shapes, finishes and functions, brackets can help strengthen a project in many ways.

and above that dimension, so you can level the cabinets they're attached to.

Another option, particularly suitable for bookcases and display cabinets, are cabinet feet, which consist of a decorative foot with a mounting plate that you screw into the base of the cabinet.

Shelf pins

Many storage units and cabinets have adjustable shelves to allow you to adjust shelf height depending on what items you're storing on them. The only hardware needed for this is shelf pins. They come in three main diameters: 5mm, 7mm and 1/4". They consist of two main parts; a metal or plastic post that fits into a hole that's drilled in the cabinet gables and a flat surface attached to the post that the shelf sits on. Some have a tab that ensures the shelf doesn't tip upward at all.

High-quality shelf pins come with a metal sleeve that gets inserted into holes in the gables, then the pin fits into the sleeve.

There are special shelf pins that are to be used with glass shelves. They have a metal post with a rubber sleeve around it so the shelf is much less likely to break.

Hooks

Storing clothes, especially coats and other outerwear, sometimes calls for a few hooks to be included in a closet design. They're almost always very simple to add. Hooks come in a range of sizes to suit your needs. They're also available with single or multiple fingers on each piece of hardware, so one hook can easily hold multiple items. Smaller, more delicate hooks can be purchased that would be appropriate for holding a purse, or other more formal items, near an entry door. Other hooks are very rudimentary and strong, and are great for basement or garage storage tasks.

Brackets

Shelf brackets are a very simple approach to fixing one or more shelves to the wall at 90°. Often white, but they can also be found in other colours, these shelf brackets are great for adding simple storage in closets, basements and garages. Screw a few brackets to some studs so their heights are aligned, rip the shelving material to the correct width, place it on top of the brackets and screw the shelves to the brackets. These brackets aren't meant to support the weight of a set of snow tires, but they will easily hold lighter items. Stronger shelf brackets have a support strut that extends from near the bottom of the vertical member to near the front end of the horizontal member. Weaker brackets are just "L" shaped.

L-brackets are used to add strength to a project by connecting different parts to each other at a 90° angle. They're usually chrome, but you can sometimes find them in different colours.

Straps, also called mending plates, are flat pieces of metal hardware that act like L-brackets, but aren't bent to an angle. They have a few screw clearance holes drilled in them so you can span two parts to fix them together. They're relatively strong but are limited by the holding power of the screws that keep them in place and the material they're used with.

Sources:

- **Classique Hardware** is a Canadian online retailer that has an extensive selection of architectural, cabinet and restoration hardware – ClassiqueHardware.com
- **Horton Brasses** manufactures more than 1,000 different pieces of authentic reproduction cabinet and furniture hardware – Horton-Brasses.com
- **Lee Valley** is a Canadian retailer that carries a wide range of cabinet hardware – LeeValley.com
- **Metal Style Bouvet** is a Canadian online retailer of decorative hardware in modern, classic and period styles, made in France - Bouvet.com
- **Whitechapel** manufactures a wide range of classic and contemporary style cabinet and furniture hardware - Whitechapel-ltd.com

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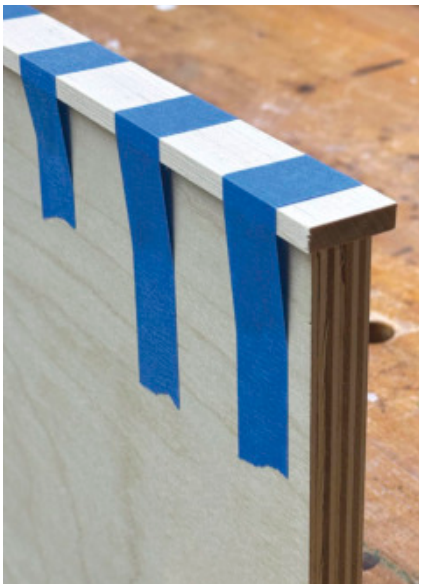
21 TIPS FOR DESIGNING CLOSETS

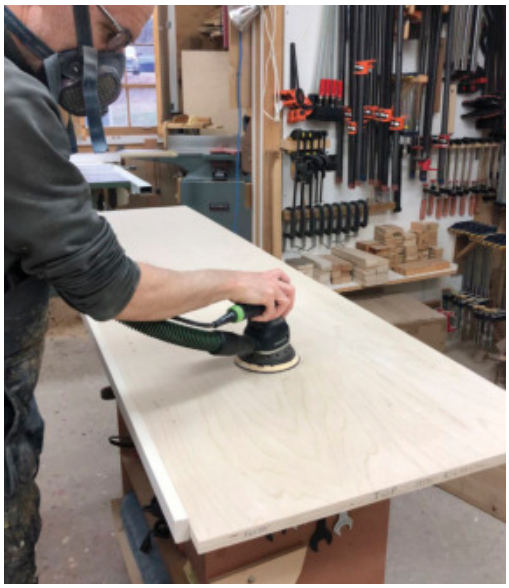
Designing a closet storage system can be a daunting process. If your closet is small, you'll want to make the best use of the limited space. If you have lots of space, you'll still want to plan it out properly to avoid a disorganized mess once it's complete.

Photos by Rob Brown (Lead photo by Dreamstime)

Know Your Sheet Goods – Different sheet goods each have a different set of pros you can leverage when building large storage organization systems. They also all have cons that you can avoid. Learn their pros and cons so you can build the best project possible.



Cover the Edges – The edges of sheet goods are typically undesirable to look at and don't offer much durability. Adding iron-on tape is one option to cover the edges, but adding solid wood will provide you with a high degree of protection for a high-traffic area.



Panels Are Perfect – Working with panels is almost always easier than dealing with large, fully assembled cabinets. Having said that, each project is different, so you have to make the decision for yourself. Often, a mix of smaller cabinets and larger panels will be the best approach.

BY ROB BROWN

1 Keep It Simple – A complex, busy design can overpower small or large closets with extra visual clutter, making spending time in your closet overwhelming. A complex approach will also make the project overly difficult to machine and install. Simple is usually better. Keep function as the main focus and you'll thank yourself later.

2 Use the Proper Materials – Most people think sheet goods fall short of solid wood in just about every category when building anything for the home, but this isn't the case. Sheet goods are available in many forms, thicknesses and finished surfaces, and can easily be cut to just about any dimension with basic tools. While it's true that 4' × 8' sheets can be hard to transport, not to mention handling and cutting them once they're in your shop, there are ways around those challenges. Choose the right type of sheet good for your project and you'll see large advantages in many areas of both the build and the finished project.

I'm not saying solid wood should never be a part of a closet organization system. Using it for some (or even all) of the trim is a great approach, and using solid wood for door frames also has huge positives. Solid wood edging can provide great durability to what would otherwise be a weak edge of a sheet good. The bottom line is that you should know the pros and cons of the materials available so you can purchase the right products, use them to your advantage and end up with the best finished project possible.

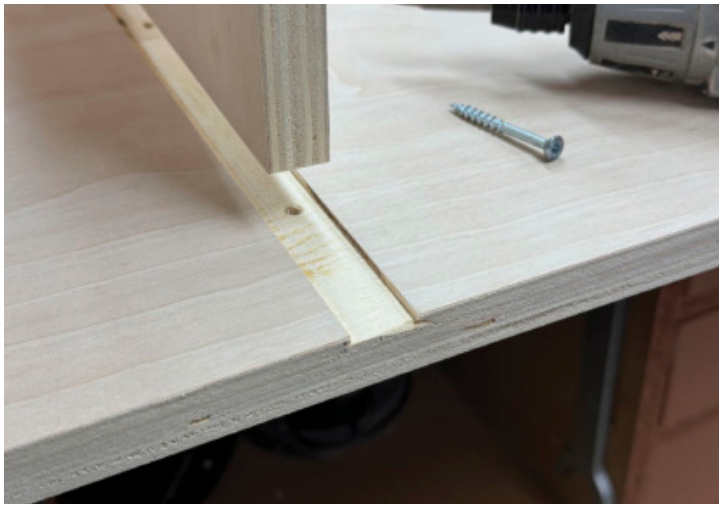
3 Panels, Not Cabinets – Working with large cabinets is rarely easy. Whether it's assembling them, handling them in your shop, transporting them to your home, bringing them up a set of stairs to the closet or fitting them into the closet opening, there's always a challenge around each corner. In order to simplify machining, transporting and installing, build a closet storage system from panels rather than cabinets. On top of all these considerations, cabinets generally require more material than panels.

The only time I build with cabinets is when they're relatively small. Creating a 12" wide by 4' high cabinet won't give you too

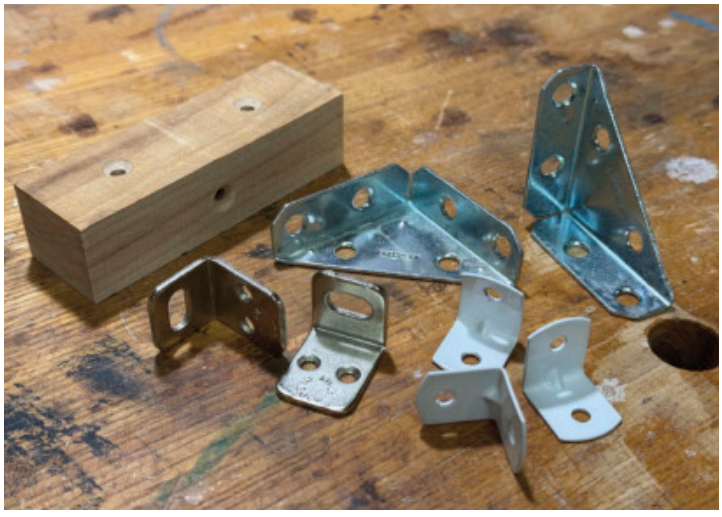
many problems and it may even make the task of installing the system easier.

4 Know When Accuracy's Needed – When working in a large closet, some dimensions will be relatively flexible, while others will be critical. Drawer widths need to be machined accurately or the drawers won't work. Trim should line up closely to look good. Having said that, many other parts don't need to be machined to tight tolerances, as other parts can be referenced off them and then cut to size. Every part is different, and knowing when accuracy is needed and when it isn't will save you time and energy.

5 Select Joinery Wisely – A hand-cut dovetail or mortise and tenon joint can look great as part of a jewelry box or a display cabinet, but these types of complex joints aren't needed in a closest organization system. They only make machining and assembly more stressful and difficult than necessary. Rabbets, dadoes and grooves to house mating pieces of sheet stock are usually all that's needed to create a small glue surface on a workpiece or to add some location assistance for assembly. Save the complex joints for your next furniture project.



Shallow Dadoes – Brown prefers dadoes and rabbets that are only about 1/8" deep, as they will provide ample location assistance during installation, yet don't weaken the panel very much at all.



Cleats and L-Brackets – Shop-made wooden cleats and store-bought L-brackets make installation much easier. If you're careful about where you locate them, they're usually not visible.

When determining how deep to machine joints like rabbets and dadoes, I almost always keep them quite shallow. A 1/8" deep rabbet will offer enough of a physical rebate to locate and accept a mating panel, while it will also keep the panel the rabbet is machined into as strong as possible. For example, a 1/2" deep rabbet joint only leaves about 1/4" (actually less, as most 3/4" thick panels are closer to 11/16" thick) on the panel, making it very weak.

6 L-Brackets and Cleats Are Your Friends – Cost effective, strong, fast, reversible: What's not to like? Well, they are more visible than other types of joints and certainly not as beautiful. To keep these pieces of metal hardware out of view, place them on the underside of lower fixed shelves and on the upper side of upper fixed shelves. This approach will work to keep the panels secured to the walls without the hardware being visible. The main downside to this is driving a screw into the upper face of a panel, then loading that panel with weight, will cause much of that weight to be supported by one screw, rather than the L-bracket.

Another approach is to determine the location of an L-bracket on the floor, for example, and secure half of the L-bracket underneath the gable / divider and then screw the panel to the upper half of the L-bracket for a more invisible look. If you really wanted to create an invisible joint, you could potentially screw a slim hardwood cleat or metal bracket to the floor, then machine a groove in the end of a panel that would fit over the bracket or cleat and position the panel.

Solid wood cleats also work well for many joints and have the advantage of being paintable or stainable to match the rest of the workpieces.

7 Having Hardware Helps – Buy the hardware you're going to use on the project first, though know you can also make some changes down the road, if needed. This is especially true if you're using baskets to store items on shelves, as you'll need to know the dimensions of the baskets to leave a proper gap between shelves. Also, shelf pins should be on hand to know what diameter of hole to bore for them.

8 Include Four Types of Storage – Shelves, hanging rods, drawers and fixed work surfaces are the four main types of storage features that can be used in a closet organization system. Including a mix of all these storage types is a safe starting point, but everyone has their own preferences for what type of storage they want. Some may want lots of drawers, while others prefer shelves.

Doors can be added to reduce visual clutter, though do so carefully as doors need clearances to work properly, and in small areas like closets this might be problematic.

9 All Squared Up? – Before starting to break out material, check for square between mating walls and between wall-to-floor joints. You might need to make adjustments to work with a joint that's too far off square. Building a wall scribe that will be positioned

Collect the Hardware – Having hardware on hand at the start of the project will make the whole process smoother and easier. Slides need certain clearances, shelf pins require holes of precise diameters and many types of hinges need exacting clearances. Realizing you made a mistake late in the game is an awful feeling.

at the end of a group of panels, and can be trimmed to the correct angle, might have to be added into the design. Having adjustable feet could be the difference between a well-fitting install and large gaps. It's also possible to scribe the panels themselves to fit into a floor-to-wall joint. It's easiest to know what you're up against in the early stages of a project, rather than get surprised later.

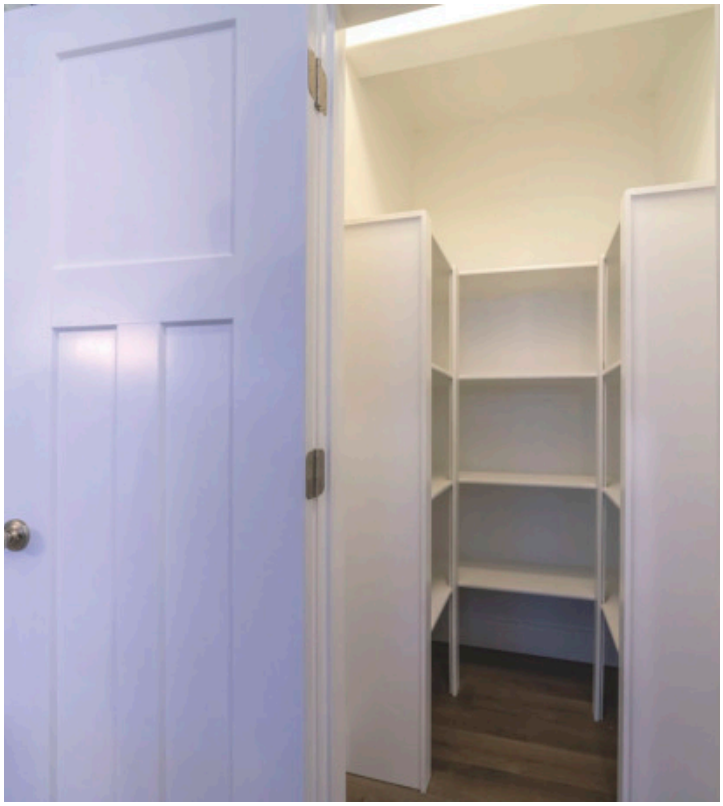
10 Not All Joints Need to Be Flush – We all like perfectly flush joints, but they're hard to accomplish when assembling large panels. Rather than leave a joint that's meant to be flush yet isn't, choosing to leave a joint that's staggered by at least 1/8" will often give you a cleaner look. An offset of 1/32" looks like a mistake, but an offset of 1/4" often looks like it's on purpose.

Including a reveal or setback hides imperfections and gives you a bit of flexibility during the installation process. These offset joints can be between mating panels, between trim and panels, or between pieces of trim that are butting up against each other. There are even times when leaving the joints staggered by 3/8" or more is the best approach, as this could allow you enough flexibility to work with floors that are out of level, walls that aren't plumb and cumulative small errors that occur when assembling the parts.

Even solid wood headers being glued to panels can have their edges eased or chamfered before the headers gets glued to the panel, as there will likely be a hairline crack that becomes visible down the road. The lightly chamfered edge will camouflage that crack.

11 Maintain Flexibility – Adjustable shelves will allow you flexibility with the items you're trying to store, especially if you're using baskets or larger plastic storage containers on the shelves. It might be a good idea to stay away from smaller drawers and drawers with a very dedicated function, as once needs change they may become useless.

Check for Square – Before you even begin the project, check the floor-to-wall and wall-to-wall joints for square. Either shaping the panels to roughly fit or machining a rabbet in their edges so you can scribe them more easily will help make installation easier and the final product more attractive.



Too Tight for Doors – Some closets are too small to have doors or drawers incorporated into them, as they protrude into the area where the user stands and monopolize the space. Nearby cabinets may even physically interfere with doors and drawers in some instances. (Photo by Dreamstime)

Tell the Story – A simple story stick, made from a long length of plywood or solid wood, will allow you to work out some of the more critical dimensions, then have those dimensions on hand to refer to during the build. A bit of extra work up front will make the project flow nicely.

To-Scale Design – Gables, shelves, work surfaces, clothes rods and many other details can be laid out directly on the floor and walls with masking tape. It's a good way to review design details with future users who are having trouble visualizing the design on paper. The dimensions and details can be easily changed by moving masking tape at this stage.

Making Mouldings – Store-bought moulding is a simple approach, though if you need a different size or style, shop-made moulding is the best approach. Often small pieces of trim, which are easy to machine on a table saw and router table, can be pieced together to create larger, more complex mouldings.

To keep the overall design flexible, consider not gluing some or all of the panels together so they can be more easily adjusted and re-machined if your storage needs change down the road.

12 Do You Have Room? – Doors and drawers need room to move. The last thing you want is to be forced to back up against another cabinet every time you open your sock drawer. Consider how tight the space is and how easy it will be to open and use the drawers and doors before settling on a design.

Other tight spots in a closet organization system include inside corners. It might be best to leave drawers and doors away from corners and go with open shelves or hanging rods.

13 Draw It Out – Even the simplest designs can benefit from a to-scale drawing, from both an aesthetic and functional point of view. You don't necessarily need to draw every detail, but getting a good overall view of the project before you start will pay off later.

Story sticks might also be helpful during the build phase, especially for larger, more complex projects.

Applying masking tape on the ground can help you "see" the design in real life. If you're still having trouble visualizing the size and scope of the project, grab a few larger pieces of plywood offcuts from the shop and place them where some of the gables might go. Another approach is to use large pieces of cardboard to stand in for the panels. They'll give you a sense of size without being hard to machine or carry.

14 Buy or Make Trim? – There are pros and cons to each approach; sometimes it's a mix of the two that will work best. Store-bought trim is easy and quick. There are times when it can be the economically smart choice, too. Shop-made trim excels when you need custom trim for either a unique look or a specific dimension.

Router tables come in very handy when making custom trim. Piecing multiple sections of simple trim together, in order to make more complex trim, is almost always the best approach.

15 Use Jigs for Accuracy – There are some operations that require lots of repetition and accuracy. Drilling the backs of doors for European hinges, drilling doors and drawer fronts for handles, or boring shelf pin holes in gables or dividers are all risky without a good plan. Jigs, whether shop-made or store-bought, are great for maintaining accuracy and avoiding mistakes.

16 Consider the Future – Going with a princess theme for a four-year-old's closet might be fun for now, but could give you problems in the near future unless you plan carefully. Trends go out of style quickly and people change as they grow. A bold colour can be painted over, but a structural element is harder to modify in the future.

17 Basements May Be Wet – If you're installing a closet organization system in a basement, use materials and a design that can tolerate potential water damage. It might be a good idea to

Jigs and Patterns are Safer – This shop-made shelf pin hole jig can assist with ensuring all the shelf pin holes are drilled correctly. Repeatable tasks are often made simpler with jigs.

keep all of the panels and parts at least a few inches off the ground. When it comes to selecting materials, solid wood will stand up to a small amount of water much better than particleboard or MDF, but that will likely only benefit you up to a point. If your basement fills with 12" of water, things get ugly quickly.

Even designing a basement storage system that gives you room to store larger plastic waterproof bins on the floor, then starting the shelving or drawers above them, will give you insurance against water damage.

18 High or Low? – As a general rule, plan on storing seldomly used items as high as possible, commonly used items in the middle and medium-use items at the bottom. Obviously, there are exceptions to this rule, but having regularly used items at chest level is a good starting point.

19 Finish First – It's not impossible to apply paint, stain or a topcoat to a unit after it has been installed, but it's not the easiest approach. Consider finishing the panels before installation – even priming and painting one coat, then using caulk on an installed project before adding one more coat of paint, will save a lot of time and energy. Stain / clear coating beforehand will also save energy, though you have to be careful about chipping or scratching

Light It Up – Lights can play an important role in closet organization systems and how well they work by illuminating the contents of drawers, shelves and nooks. With the strip lighting options available today, there's a solution out there for you. (Photo by Dreamstime)

the panels during installation. It could be beneficial to fit many of the main / larger panels to the closet, then apply a finish to them, before installing them for good.

20 Add Some Lighting – Improving the lighting in the space is something that should be considered right from the start. Closets can be dark, and only very rarely have a natural light source, yet these are the areas where we spend time making decisions about what to wear.

Improving the main light source is one approach, but definitely consider not using a single light, as that will create shadows and dark areas in many of the shelving areas and drawers. This is especially true once you stand directly in front of the shelf or drawer you need to see into. Having a lighting system that includes a few lights spread around the area will allow you to see everything that's stored.

Consider task lighting, especially if there's some sort of main worksurface, like a make-up area. Anywhere there will be a mirror, you'll need good lighting, though it's important to add lighting in other areas, too.

21 Lighter and Brighter – Going light with the paint / stain colour will likely be better, as the lights in most closets are not great and natural light is greatly reduced. Light colours best reflect light around the room and give a sense that the area is larger than it is. If you do want to go with a black walnut organization system, be sure to add ample lighting to the area.

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Garage Storage Hacks

A collection of tips and tricks to organize what's often the messiest space near the house.

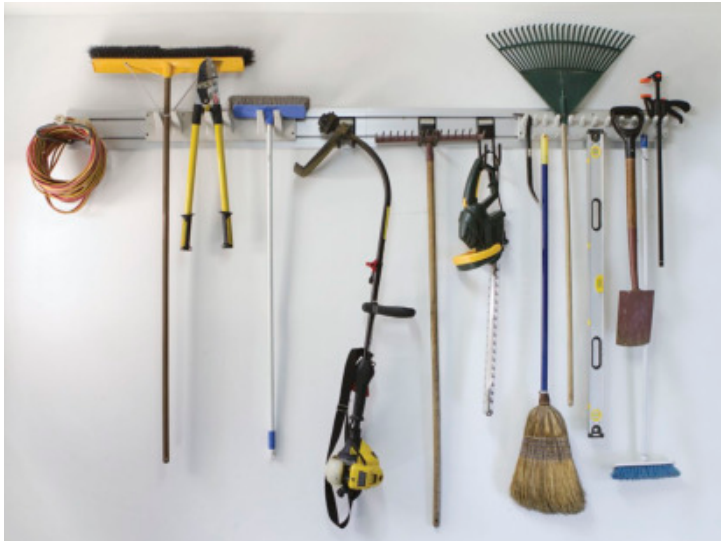
BY ALLAN BRITNELL

I have a rather quirky, very specific memory from one weekend when I was about 13 years old. That Saturday, my parents press-ganged my brother and I into helping clean out the family's cluttered two-car garage. After a long day, and several trips to the dump, my dad actually had enough room to park his minivan in the garage. That was the one and only time that ever happened, as the garage quickly became a dumping ground again for anything that didn't have a home inside the house.

Now, at my own home I have a lovely, extra-wide single-car garage in the backyard. Alas, our car is a little too wide to fit down the narrow, shared driveway between my house and the neighbours', so our garage is really just a glorified shed for storing bikes, sports gear, gardening tools and our patio furniture over the winter. But I figured if it's just going to be a storage space, it might as well be an organized storage space.

A garage is a difficult space when it comes to storage. Some items in a garage don't get moved or used for a year or more. Leftover pieces of flooring you want to keep on hand just in case come to mind. Other items, like bikes and bike helmets, may get used regularly during a specific season. I find it's best to have a specific location to easily store the more often-used items, and take care to return those items to that spot when you're done with them. For example, if you or your kids often ride bikes, having cubbyholes for helmet storage and a way to easily access your bikes will work

Photo by Dreamstime.com



Keep It Simple – Although this simple hanging rack was purchased, starting with a 2×4 and adding hooks, screws and nails as needed will give you a great place to store all sorts of different tools. (Photo by Dreamstime.com)

Out of the Way – Storing larger items, like this car roof box, up high keeps the more easily accessed floor area free to use for day-to-day items. (Photo by Allan Britnell)

nicely. On the other hand, if you rarely ride your bikes, storing them up high might be the best approach for you, as these bulky and cumbersome items won't get in the way and regularly fall over. Garage storage is different for everyone.

Hooked on hooks

The simplest way to store yard tools so they're out of the way but readily at hand is to mount threaded hooks on the walls. These are perfect for hanging tools with closed handles. They're available in a variety of lengths. I try to keep my equipment organized by use – snow shovels on one hook, gardening tools on another.

Installation is a snap: drill a small pilot hole and then manually screw the hook in place. The inside of my garage is unfinished, making it easy to attach them to a stud. If yours is finished, you'll need a stud finder to track down the mounting locations.

Beyond yard tools, I love using wall-mounted hooks to hang all sorts of things in my garage. I hang tennis rackets along with the kids' hula hoops on one, I've tried various types of hooks for hanging bikes (more on that in a moment), and I've even used one as a jury-rigged paper towel dispenser.

Yard tools without handles

Of course, rakes, brooms and many types of shovels don't have a closed handle on the end. There are a few different options for dealing with those, including store-bought racks that you can snap them into.

But with my exposed wall studs, the simplest and most cost-effective solution was to mount a piece of 2×4, parallel to the ground, about 3' up from the floor. With that brace in place, slip your rake, broom, hockey sticks and so on behind it, handle-side down.

For finished walls, you can create individual tool supports from a length of 2" to 4" diameter PVC. Cut 3" or 4" lengths of pipe, cutting at a 45° angle on both ends. Drill pilot holes through the angled bits to prevent cracking, then drive screws through both holes with the angled bits running vertically along the wall. Again, mount each about 3' above the floor. When you're done, slide your tools, handle-side down, through your DIY PVC brackets.

Serious Tire Storage – Tires are big and heavy. A proper rack will go a long way to keeping your garage organized and safe. (Photo by Dreamstime.com)

With a bit of creativity, any woodworker could start with a 2×4 and create a long storage rack for larger yard and other miscellaneous tools by adding a series of hooks, screws and nails. Have your yard tools on hand so you can space them apart with appropriate gaps as you work your way down the 2×4.

Roof box storage

Designing a suspended storage system for our car's roof box was one of my finest MacGyver moments. We bought the box the year we decided to go on a family ski trip to Quebec, knowing that it would also come in handy for lugging our camping gear in the summer. But once I bought it, I realized that I needed to figure out a way of storing it when it wasn't attached to the top of our vehicle. You can't rest it upside down, and the hooks on the bottom that clamp on to our roof rack bars have to be elevated so they don't bend. I could have rested it on a couple

of 4×4s on the ground, but that would have eaten up too much floorspace.

Then I remembered my tiedown straps. A quick trip to the local big box store to pick up four heavy-duty threaded eye hooks and I was ready to test my plan. I drilled four pilot holes into the rafters, spaced slightly wider than the width of the box, and lined them up with where the hooks on the bottom of the box were.

To mount the box, I loosely sling the tie-down straps around the four hooks under the box and slowly ratchet it into place. I hang it close enough to the rafters so that I, at 6' 2", can walk under it without bashing my head. To get the box down, simply loosen the tie-downs until you can lift it free.

If you don't have a car roof box to worry about, a similar system would also work for storing a number of other bulky items such as kayaks, paddleboards or even a patio umbrella. This type of storage approach works best for items you aren't going to use too often, as it's not super simple to put objects up or take them down. Having said that, if the item you need to store is large enough, you might have no choice but to use this approach every time in order to get it off the garage floor.

Tire storage

The same year we bought the roof box for our first family ski trip, we finally took the plunge and bought winter tires. (In retrospect, that was an expensive holiday!) But, again, I didn't want to lose a lot of floorspace to store a stack of off-season tires. The simple solution was a store-bought, wall-mounted rack. Since I opted to buy a set of rims for the tires, I needed a fairly heavy-duty rack. When you're shopping for one, make sure the load rating exceeds the weight of your heaviest set of tires. (Winter tires are usually smaller than all-seasons.)

Bonus advice: One tip I learned while doing some research for this article is that tires shouldn't be stored near equipment that emits ozone, including sump pumps, battery chargers and electric motors, as the ozone can deteriorate the tires.

Bike storage

For the longest time we had four bikes leaning on each other against one wall of the garage. Invariably the bike that you wanted to use was the one at the back. So, I finally bit the bullet and bought some wall-mounted hangers for them. I opted for a model that mounts high on the wall studs and then you hang the front tire of the bike from it. The wall space I had available wasn't long enough for me to hang the bikes parallel to the wall, so they stick out from it. The other downside is everyone needs to be strong enough to lift their own bike off the rack if there's no adult around.

Simple and Strong – Plywood and 2×4s work together to create cost-effective, yet virtually bomb-proof shelving. Large plastic storage bins work in tandem with the shelving to store items of many shapes and sizes. (Photo by Rob Brown)

Another approach to storing bikes is a large but simple hook attached to the studs. The front tire can be lifted up and set on the hook, and as long as the rear tire has an even, flat surface to rest on it will likely balance just fine.

If you've got a high ceiling in your garage and want the bikes completely out of the way, search for some hoist system options that use pulleys to raise and lower one or more bikes from the rafters.

Ceiling Bike Storage – Hanging bikes from the ceiling keeps them even more out of the way, though it's virtually impossible for young kids to take their bike down to use. (Photo by Rob Brown)

Cushions and miscellaneous items

The dedicated woodworkers reading this magazine might cringe at the thought of using plastic shelves, but I find their mobility highly versatile. Our patio sofa came with cushions that seem to absorb rather than repel rainwater, so I needed a sheltered place to store them in inclement weather. They all fit on one set of shelves. I have another shelf that I use to store smaller items on, including sports balls, garden tools and our camping equipment, using buckets and bins to keep things tidy. A thick black marker will allow you to label all the bins, though if you think you'll change what's in the bins you could always apply masking tape to the bins first and write on it, then remove it and re-label the bins when the contents change.

Of course, feel free to build your own custom shelving but I've found that as our needs change – the kids get bigger bikes, we add new patio furniture and so on – this is where these portable shelves go above and beyond as I can just slide them around to accommodate a reconfigured floor plan.

If plastic shelving isn't your cup of tea, rough plywood and 2×4s make for some fantastic storage shelving, as they're relatively cheap and surprisingly strong. They can also be easily cut to whatever length and width needed with basic tools like a circular saw, jigsaw, mitre saw or hand saw.

Ripping the plywood to either 12", 16" or 24" widths will get you started. The width you go with depends on how much depth you can dedicate to the shelving system and how large the items you're going to store are. Next, use the 2×4s to add some structure to the shelving system. Lap joints, secured with 2-1/2" long screws, will provide a very strong shelf. Once it's done, secure it to the stud wall with long, heavy screws and L-brackets.

When in doubt, go stronger. The weight of all the items on the shelves will add up quickly, and the last thing you want is for the shelving unit to collapse from all the weight and have everything land on the windshield of the family car.

Drawers for smaller items

If you're storing all sorts of smaller items it might be a good idea to add a few drawers here and there. A bank of drawers under a worksurface or shelf runs the risk of becoming a "junk drawer," though if you keep it organized it will safely and neatly store a lot of things at your fingertips.

Plywood construction might do the trick nicely, though even heavy-duty plastic storage drawers might work. It all depends on the weight of the items in the drawers and how much abuse you think the drawers will take.

Use the rafters

If your garage has rafters, consider using those as extra storage areas for long items such as lumber, pipe, etc. In our previous garage I was able to store a hard plastic, 4' diameter children's pool up there. Just be careful to not add too much load or you'll compromise the structure.

Also, keep in mind that some materials, such as drywall, will sag so they shouldn't be suspended from the rafters.

All right, the garage is finally organized. Now get out there and enjoy the rest of your weekend.

A long-time freelance contributor to Canadian Woodworking, Allan Britnell is now the Editor-in-Chief of NewsCanada.com.

ALLAN BRITNELL

INFO: DIFFICULTY – **2/5,** LENGTH/TIME – **2/5,** COST – **4/5**

SIMPLE, COST-EFFECTIVE WALL UNIT THAT WILL LAST FOR DECADES

Photos by Rob Brown Illustration by Len Churchill

Big projects don't need to be overly expensive as long as you can be flexibile with design and materials. Learn how to build a full-sized wall unit without breaking the bank.

BY ROB BROWN

As I'm sure you know, material prices are high right now. Whether it's solid lumber, sheet goods, hardware or finishing products, the cost of completing a project isn't cheap. It's one thing to buy enough materials to complete a small box or cabinet, but it's an entirely different story when purchasing materials to make a large wall unit to store a lot of household items.

I needed to add storage to a basement rec room recently, but the price of materials gave me a shock. It also inspired me to come up with a bit of a minimalist approach to designing and building storage. I wanted to see if I could use the least amount of materials as possible, but create a lasting and functioning wall unit. After a few months of use, I think I've succeeded.

What's really needed?

This really is a "choose your own adventure" situation. There's no one right answer for what materials to select, or what sort of design is perfect for everyone. Consider what's important for your project, then design, buy and build accordingly.

I had to think outside the box while designing this wall unit, and included only what was truly necessary. Backs usually offer a lot of torsional rigidity, but I figured as long as I fixed many points of the gables and shelves to the wall so it can't go anywhere, my storage unit didn't need a back. The lack of a back meant the wall would be visible behind the open unit, but I just painted the wall white to match the material I was using.

Speaking of material, I opted for white melamine particleboard for the cabinets. I don't love melamine, but the cost savings for a part of the wall unit that is rarely seen made it a no-brainer. And it's light in colour, which makes the whole unit brighter on the inside. Making the doors out of white melamine particleboard was also an option, but I decided to spring for maple veneered plywood which I could stain to match some of the other interior cabinetry elsewhere in the basement.

I used fully adjustable European hinges, which aren't cheap. They are, however, long lasting and will allow me to adjust the doors to have even gaps and look good. If you really want to save money, hinges are one of the main things to focus on, as buying this many hinges adds up quickly. I will warn you, however, that other styles of hinges will likely give you a headache if you're installing lots of doors, but could work nicely for just a few doors.

Another approach to doors is to simply not include many, or even any, of them. They go a long way to tidying up the overall look, but other than that they aren't overly functional. Door material is expensive and they require some labour on your end to machine, finish and install properly. They also require hinges and pulls, which are pricey.

Drawers are great storage devices, but they do require a fair amount of material and labour. I opted for the middle ground, and installed four large drawers in the lower, middle section of the wall unit. One-half-inch thick white melamine made for sturdy drawers that will function for a long time. I ended up using full-extension slides to be sure we could easily access the full depth of the drawer box. Three-quarter extension slides would have been a cheaper option.

Even the handles and pulls for this project came in at close to $200. We selected a style that matched the existing hardware elsewhere in the room. You could machine finger holes into both doors and drawers, so they can be opened without hardware or make wooden pulls to save money.

Joinery selection

Certain forces act on joints. Racking, twisting, tension and rotation are some of the most common forces that furniture and wall units will encounter. The forces acting on the joints we make are a large part of the decision-making process when it comes to selecting what joints to use in a project. Strong forces acting upon the finished piece call for strong joints. When the forces aren't overly strong, a weaker and often easier to machine joint can be used.

The joints on this wall unit aren't necessarily considered overly strong, but the forces acting upon this wall unit will be surprisingly small, and there's one main reason for this. The gables and top, as well as many of the shelves, will be fixed directly to the wall. This removes all the potential for racking, twisting, tension and rotation from the unit. This allowed me to use what are otherwise fairly weak joints to fix all these parts together securely.

The upside to using these joints is that they're fairly easy to machine. These joints also make it relatively easy to assemble the unit once I'm at home, away from the shop. I could have assembled these parts as individual cabinets and screwed them to each other at home once they were in place, but that would have created yet another challenge; bringing cabinets into the house, down a tight stairway, making a tight turn and then standing them upright in a room with a low ceiling. All of these challenges were eliminated by making this wall unit from panels, rather than assembled cabinets. Making cabinets and screwing them together side-by-side also requires more materials, and therefore expense, which is the main thing I was trying to keep down on this project.

Dadoes and rabbets are the main two joints I used. They offer decent location assistance while assembling the parts and provide surfaces for the glue to adhere to. I generally machined these joints on my table saw with a dado stack, but they can also be machined with a router, straight bit and straightedge.

Buy some material

I have a large cabinet saw in my shop, and have the skills to break out parts from a full sheet of material. The challenge is moving these sheets around. They're large and heavy. I went to my local supplier with a cut list and they were able to make a couple of cuts on each of the panels. This allowed me to fit them in my vehicle, move them into the shop without hurting my back and further machine them with relative ease. A bit of planning goes a long way here.

I bought enough 3/4" material with which to make the bulk of the wall unit, and some 1/2" thick material for building the drawer boxes. I also bought the 3/4" maple plywood that the doors and drawer fronts would be made with, keeping the parts labelled so I could ensure pieces from the same sheet ended up being oriented beside each other so the grain and colour was continuous. If you can't find 1/2" thick material for the drawer boxes, 3/4" material would work well, too.

The edges of white melamine particleboard can be covered with an iron-on edge tape, also made with white melamine. Both melamine sheets and the iron-on edge tape come in colours other than white. I bought a 250' roll for this project.

I also bought the full-extension slides, European hinges and shelf pins at this stage. It's never too early to purchase the basic hardware you'll need for a project.

Some technical details

I designed my wall unit in two halves, as moving one very wide wall unit into place would have been difficult. Because the unit was being installed between two walls about 124" apart, the two halves are about 60" wide each.

The gables run the entire height of the wall unit cabinets and have a rabbet in their upper and lower edges to accept the top or bottom and a dado about one-third of the way up their height to accept the fixed shelf. Because there are numerous vertical and horizontal parts that need to mate accurately, and the depth of the rabbet and dado joints need to be considered, it's important you have a clear picture in your mind of how the parts are going to connect with each other so you know how long to cut the different parts. There's not usually a true right or wrong way to design these joints, and every situation is a bit different.

Rips and crosscuts

I started with the gables, vertical dividers, fixed shelves, bottoms and tops by ripping them to final width. I labelled the parts as I went to keep them straight in my head.

Although many people would machine the dadoes and rabbets, then measure and cut the mating members to length, there's nothing wrong with doing it the other way around with a bit of planning. This is what I did, as it allowed me to cut all the main cabinet panels to length before installing a dado set in my table saw.

I only wanted to machine shallow dadoes and rabbets, as that approach would leave the most material on the parts, giving me stronger material at each junction. I opted to cut these joints 1/8" deep. This meant I needed to do a bit of math to figure out how long I needed to cut the gables. The gables were 3/4" thick, but I subtracted 1/8" (for the depth of each rabbet) from both sides to leave me with 1-1/4" overall. This meant the tops and bottoms needed to be 1-1/4" shorter than the overall width (60") of the assembly. I now cut the tops and bottoms to 58-3/4" long.

Next up were the vertical dividers. Using the same formula, I crosscut them to 1-1/4" less than the overall height of the assembly. Last, but not least, are the two fixed shelves per assembly. Using the same joint depth, I worked out the length of the fixed shelves to be 29-1/8".

Again, these are the numbers I was dealing with. Your overall width, joint layout and rabbet / dado depth may very well differ from mine. The examples above are just so you can work through the math on my wall unit and understand what my logic was, then use that approach to lay out your wall unit.

Simple Joinery – Shallow dadoes cut across the melamine panels will assist you in two ways. First, they will provide location assistance when assembling the wall unit on-site. Second, they will provide a surface to glue, so the wall unit will be strong once assembled. Dadoes can be cut on the table saw with a dado set, or with a router and straight bit.

All of these details were recorded on a piece of paper that I referred to frequently while cutting the gables, vertical dividers, fixed shelves, bottoms and tops to final length.

Rabbets and dadoes

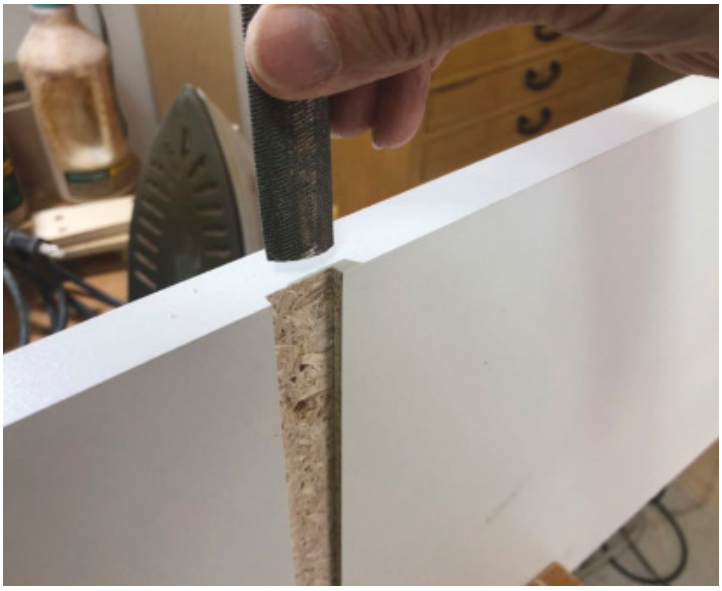
Once the parts were cut to finished dimension, I installed a dado blade in my table saw that would machine a groove the same width as the material I was using. Shims were needed between some of the dado set cutters. Take the time to end up with a groove that captures the joining panel just right. Too tight and assembly will be a nightmare. Too loose and gaps will be visible.

While machining these rabbets and dadoes I ensured the workpieces ran along the fence evenly. If the thought of machining dadoes across large panels like these scare you, opt for a router, equipped with a straight bit, and guide it with a straightedge. Moving the blade, not the workpiece, is often a good approach, especially when dealing with large workpieces.

Shelf Holes – Brown used his Kreg shelf hole jig to make a plywood shelf hole template large enough to drill all the holes in each panel he made without having to adjust the jig and potentially make mistakes.

Not Too Deep – A simple wood stop over the drill bit will limit the depth of the hole so you don't drill through the other side of the workpiece. The depth of hole can be fine-tuned by adjusting the position of the bit in the drill's chuck.

Reduce Chipping – During assembly, the edges of the dadoes will chip if they're not lightly eased. Doing this also reduces the risk of cutting your hands on these sharp edges. Notice the part label on the exposed particleboard, letting Brown know how the workpiece will be oriented in the final assembly.



Tape, Then File – Once the iron-on tape has been applied to the exposed edges, Brown used a file to clean up the areas around the ends of the dado and rabbet joints.

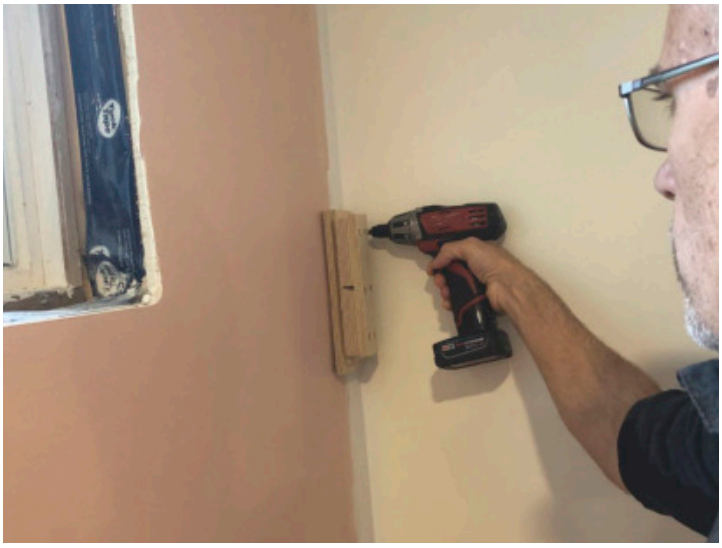
Important to remember

As you can imagine, accuracy is critical when cutting the workpieces to length and when machining the rabbets and dadoes. With all the parts referencing off each other, small mistakes can cause large problems down the road.

Shelf holes

Adjustable shelves are easy to add and will give you flexibility over the years. I used a jig to machine a series of holes in a longer

Level It Up – Brown uses one of the longer panels to check the base for square during installation. Notice the pre-drilled holes in the dado and rabbet joints in the panel.



Side Supports – Stop blocks attached to studs on the side walls go a long way to assisting with positioning the panels, but also give you a solid point to screw into when installing the panels. Ensure they're plumb with each other and your installation will be smooth.

piece of plywood. This made it less likely that I'd make a mistake as I worked and also sped up the process.

There's nothing wrong with adding shelf pin holes all the way up where the shelves are going to be located, though I prefer a more modest approach. Drilling three holes about 12" apart, approximately where each shelf will go, is fast and looks cleaner than a whole row of holes. It is less flexible, though.

Once the jig was made, I clamped the plywood jig to the gable or vertical divider and used the correct diameter bit to bore the holes. To ensure I didn't go all the way through the workpiece and blow out the other side, I used a simple wood stop around the drill bit to limit travel of the bit. A piece of tape is one option, though the wood stop is foolproof. I have a few different thicknesses of stops that fit over different diameter bits, and the bit can be adjusted within the drill's chuck to give you the correct depth of hole. To ensure the holes on both sides of a shared vertical divider don't get drilled in the exact same location, I shift the jig on one side of the divider about 1/2" towards the front or back of the workpiece when I'm clamping it in place.

Tape time

Iron-on edge tape will do a good job of quickly covering the exposed particleboard edges of melamine. I taped the front edges of all the parts, then used a file and sharp knife to notch the tape where the dadoes were.

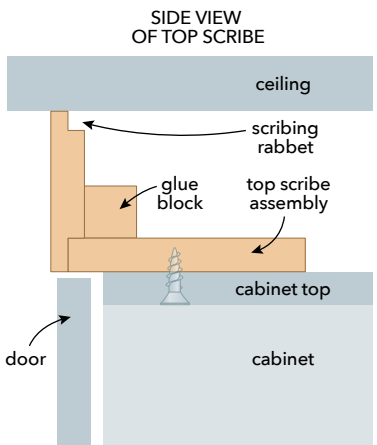
Drill screw clearance holes

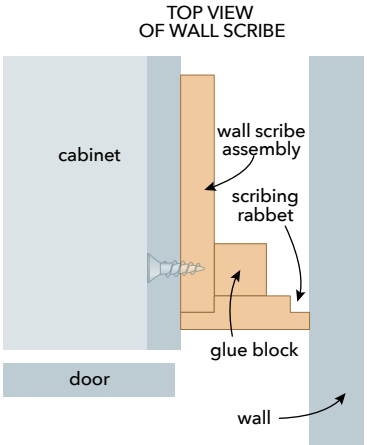
These panels were eventually going to get screwed together on-site. To make that process cleaner and more accurate I drilled screw clearance holes through the centre of the dadoes now, then lightly countersunk their outer faces to accept a screwhead. The main panels that make up this wall unit were now ready for installation, though they needed a base to sit on.

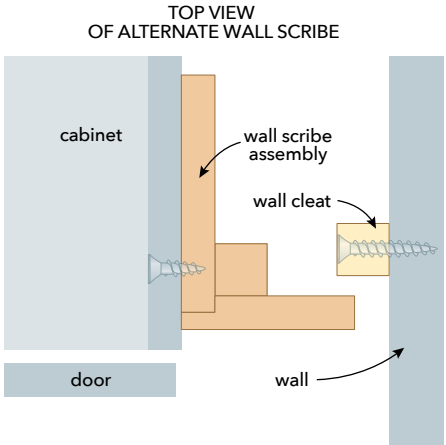
Build a base

A long, full-width base made levelling the entire unit easier. In order to not need to finish the base nicely, I made the base, then added a face to cover any screws and rough joints. It was also much easier to scribe the face to the floor and walls to reduce any gaps and provide a clean, finished look.

The structural part of the base was made of two half-width sections that stretched to within an inch or so of either side wall. They







A Strong Base – A base that can be positioned in place, then shimmed to be level, will give you a solid foundation on which to build the rest of the wall unit.

were screwed together on-site and levelled so the main cabinets could be assembled on top of them.

I ripped the fronts, backs and sides of the base to 4" wide, then added a rabbet in one long edge of each piece to accept another piece of 3/4" material. I also machined rabbets in the ends of the front and back pieces so the sides could be joined to them. The joinery and construction were very basic, yet strong enough to support the storage unit and all its contents. There was no reason to get fancy with the structural portion of the base.

I glued, pinned and screwed the base fronts, backs and sides together, then cut and installed 3-1/4" wide centre dividers as well as top inserts at both ends and the centre of each base section. The top inserts would allow me to screw downward through the cabinet bottoms.

Last bits and pieces

Scribes to attach to the front of the base, above the cabinets and any walls the unit will butt up against were next. Before you start cutting, you'll have to decide on what materials you will use where. There's no true right and wrong in this scenario, as every situation is going to be different. I opted to use white melamine for the upper scribe and face of the base. The reason for this was twofold; it would match up with the ceiling and floor nicely and I had enough of it around the shop. Often, the practical approach selects materials for me. I was going to use stained maple plywood for the doors and drawer fronts, so I used the same material for the wall scribes. Thankfully, I could cut a few strips from the door material, as each pair of doors I was going to need were only about 32" wide.

The face for the base is easy; a couple lengths to total the 11' span would be butted together in the middle. The small joint would be carefully filled with DAP to make it less visible. These two pieces would be pinned in place with 23-gauge brads, then the holes filled.

The pair of top scribe assemblies were a bit more complex. As opposed to the base scribe, I needed to attach another piece to the top scribe at 90° so I could screw up through the cabinet tops, into the top scribe assembly, in order to position it precisely and keep it in place. A rabbet on the long edge of the top scribe, with a 4" wide piece of plywood glued and pinned to it, would work nicely. A few glue blocks to maintain a square, strong joint completed the top scribe assemblies.

The wall scribes were made in essentially the same way as the top scribe assembly. The maple plywood scribe received a rabbet, to which another piece of plywood was fitted and joined to. I stained and top-coated them at this point.

One thing to keep in mind when making both the top and wall scribe assemblies is that a portion of the sides of these scribes will be seen. This will be even more visible with the top scribe, as when the doors are opened about 3/4" of the scribe is visible, compared with only a very small section of the wall scribes. Because this wasn't going to be overly visible on either of these pieces, I just used matching material for the return, then applied some iron-on tape to the edge of the face piece that would be visible. For the melamine top scribe assembly, I used white melamine tape, and for the maple wall scribe I used maple tape.

An important note to make fitting these four parts much easier: Before gluing up any of these assemblies, cut a rabbet in the edge of the material that will need to be scribed to the wall, ceiling or floor. This will mean you only have to remove about 1/4" (or less) of material, rather than the full 3/4" width of the material. You would even be able to hand sand some of these parts to fit while on the jobsite.

To the jobsite

Whether you've made these parts in your basement workshop, detached garage or across

town in your friend's space, it shouldn't be too much trouble transporting everything. Even the largest panels will fit in most vehicles. This is one of the benefits of working with panels, as opposed to cabinets. You'll also find getting all these parts into a tight basement much more relaxing.

A quick check on how flat the floor is and how straight the walls are is a good first step to assembly. Really, this should be done before you make any sawdust, so you know if anything overly weird would need to be dealt with. Now is more of a refresher.

Start at the bottom, with the base. I screwed the two base halves together, put the base in place, then used a level to determine how far off I was. Some shims helped me obtain a flat foundation to build on top of. The front of the base would be set back a few inches from the fronts of the doors. You could screw the base to the floor, though because I was dealing with a concrete basement floor, I opted to secure the base to the studs and bottom plate.

If I was going to build this wall unit again, I would use kitchen cabinet leveller feet to support the panels. They get screwed to the underside of the bottom panel (or cabinets, if that's how you've built the unit) and can be adjusted to level the wall unit. You can also purchase small clips that can be screwed to the rear face of a toe kick, allowing the toe kick to quickly and easily get attached to the front levellers.

In hindsight, I should have at least fit the base face piece at this point. I could have set it in place on the floor, sitting against the front of the base, then marked and scribed it to the floor and wall. If the top of this piece was still higher than the upper surface of the base, I could have very easily marked it with a pencil and trimmed it undersized by about 1/8". I waited until the panels were in place on top of the base, which made fitting the base face piece much more tedious.

Assemble the panels

I was building my wall unit in two halves, then screwing them together once they were on top of the base. Every situation is different obviously. I knew the overall width of the cabinets, so a bit of math provided me with the thickness of space blocks that needed to be screwed to the wall. Ensure the blocks are plumb with each other. These blocks gave me a positive stop to screw the cabinets to.

I glued and screwed the joints on one of the cabinets together, then tilted it up into place on the base and moved it against the stop blocks. A few screws into the stop blocks gave it some stability. I checked for level, then added a few more screws into the base.

Since there were no backs on these units, I used L-brackets to fix the top and fixed shelf to a few of the studs. Now the cabinet was very solidly fixed to the wall.

At this stage I added stop blocks on the other wall so I'd have something to screw into. The gap between these stop blocks and the first cabinet should be slightly larger than the cabinet that was going to fill the gap, but only barely. Bevelling the leading edge of the stop blocks will help you with getting the next cabinet in place.

Next, the other cabinet got assembled and brought into place. First, it was fixed to the first cabinet so the fronts of the gables were flush, then more screws were added into the spacer blocks, base and studs.

On Its Face – Rest the panels on their faces and attach the fixed shelves, tops and bottoms to them. When everything is assembled, it can be tilted up and into place on the base.

Drawer Parts – Simple rabbets and dadoes secure the drawer box parts together. Using the same material for the sides, fronts, backs and bottoms means only one setup is needed.

Handle Holes – Brown used a Kreg hardware drilling jig to locate and bore the holes for the handles.

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Install the wall scribes

Screw clearance holes can be drilled in the outer gables, the wall scribes fit and then slid into place, before using screws to fix them in place for good. I set them back from the cabinet fronts by an inch or so to help them visually disappear. Another option is to bring them out flush with the faces of the doors to create a wall-to-wall look. If that's your approach, I would wait until the doors are installed and adjusted before installing the wall scribes, so you can keep the faces of the scribes flush with the doors.

Stage one is complete

Notice I haven't mentioned the doors or drawers yet. Normally, with assembled cabinets, I would have made the drawer boxes and the doors and drawer fronts by now, but since this situation was slightly different, I decided to make them after the panels were assembled.

I measured the door and drawer openings and went back to the shop.

Doors and drawer fronts first

Because these would need to be finished, I opted to build them first. They were very straightforward. I cut them slightly undersize, taped their edges, bore for European hinges and sanded them.

While cutting, I kept doors in pairs as they were cut from the sheet so the grain and colour would be more harmonious. Labelling them makes things easier in the long run.

A bit of foreshadowing here. Double check the dimensions of the doors and drawers on the existing cabinets. You wouldn't want to make any mistakes at this point, especially considering the price of sheet goods.

Drawer boxes

Made of 1/2" thick melamine, the joinery on these drawers is straightforward. Rabbet joints fix the drawer sides to the fronts and backs. The same sized rabbets let in the drawer bottom. If you happen to have some 3/4" melamine left over from building the panels, I'd use it to for making the drawer boxes.

Once the parts were machined, I assembled them and let them dry, and then taped their top edges. I attached the drawer portion of the slide to the drawer box next.

I like to bore screw holes in the drawer box fronts to make drawer front installation smoother on the jobsite. I make sure to use a clearance hole that doesn't allow the screw to move within it loosely. Instead, I undersize the hole slightly so once the drawer box is installed I can thread in a screw so it protrudes out the face of the box by about 1/8", then with the drawer box hung on the slides and closed, I can position the drawer front correctly (in relation to the other drawer fronts and doors) and press it onto the drawer box. This leaves small dimples where the screw holes should be drilled. If needed, an awl helps make those dimples larger so a small drill bit can create screw location holes in the rear face of the drawer front. And as a general rule when installing drawer fronts, work from the bottom up, so you can simply place a spacer on top of the drawer front below the one you're installing, and place the next drawer front on top of the spacers to locate it, while you press it into place to create the next set of dimples.

Install the drawer boxes

Hang the cabinet portion of the slide and test fit the movement of the drawer boxes. Once any adjustments are made to ensure the drawer boxes are running smoothly, you can move on to installing all the doors and drawer fronts.

Doors and drawer fronts

I start by hanging the doors. Fully adjustable European hinges make it easy to fine tune the gaps between doors. And if a situation is dire, you can always re-mount a hinge's base plate. Be sure to purchase the correct European hinges for your situation; full overlay, half overlay and inset are the most common types of hinges, and very likely what you'll need for your wall unit. Adhesive bumpers on the backs of doors keep them from making loud noises every time they're closed. Another approach is using soft-closing hinges, though they are more expensive.

As I mentioned before, I press the drawer fronts onto protruding screws to locate and secure them in place. I also work from the bottom to the top. Align the drawer fronts as accurately as possible, as it's not easy to adjust them. I usually start out with just two screws per drawer front so if I have to make a small adjustment I can use a few of the other screws to re-create the dimples and hang the drawer front.

At this stage it's a matter of adjusting the doors in and out, up and down, left and right to give you even gaps around the wall unit. In my case, I quickly realized I measured incorrectly and had to make a spacer to fill a 1-1/2" gap between two drawer front banks. If this had been for a paying customer, re-making the drawer fronts would have been the only option. I'm not proud of my solution, but life in our house goes on.

Shelf pins can now be added, followed by all the shelves.

The next step is to drill for all the handles. A jig comes in very handy, though it's not overly hard to build a shop-made jig to assist you. Whatever your approach, make sure to not rush it, think about what you're doing and avoid any mistakes. You've put too much into this project by now to mess it up at this point.

DAP, or some form of caulk, can now be added to conceal the slight gaps between the scribes and the ceiling and walls. If you do this step neatly the scribes fade into the background and never get noticed.

Final thoughts

I set out to build a simple but stylish wall unit to store all sorts of extra stuff we have around the house. And I wanted to do it without breaking the bank. I think the resulting wall unit meets all these requirements. Not using backs, and using panels rather than cabinets, were both decisions I'm happy with. This strong wall unit should function for decades without troubles.

ROB BROWN
rbrown@canadianwoodworking.com

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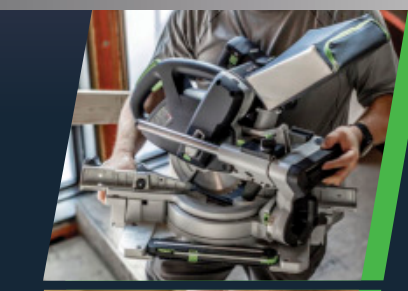

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INFO: DIFFICULTY – **3/5,** LENGTH/TIME – **3/5,** COST – **4/5**

Install Built-in Closet Shelving

Photos by Craig Kosonen

Maximize your closet space by outfitting it with custom built-in shelving.

BY CRAIG KOSONEN

This closet shelving project is easy and quick to construct, and is assembled using plywood held together with cleats, screws and brad nails. A face frame hides the cleats, adds strength and gives it a seamless custom look.

Every closet is different, and the contents people need to store also varies, so taking time to plan the design is time well spent. A mix of different storage methods is often the best approach, but every situation is different. Make it your own.

Design

Start by measuring your closet. Be sure to capture both the interior dimensions as well as the opening size.

Next, come up with a rough idea of the shelving unit you want. My wife and I wanted to dedicate half of the closet to hanging clothes and the other half to shelving. We already had existing baskets to go on the shelves, so I measured those to get an idea of the space needed between some of the shelves.

Once you have a rough design and some measurements on hand, draw the closet to scale on a large piece of grid paper. If you don't like making scale drawings, you can also mark the dimensions full size on the wall of the closet (or use CAD modelling software).

I wanted to raise the height of the clothes rod and shelf, however if I raised the shelf, I would have needed to reduce the depth of the shelf due to the interference of the closet door header. The same thing could come into play at the sides. This is why it's important to measure the closet's opening as well as its interior dimensions.

Using the height of the existing shelf as a starting point on my scale drawing, I worked downwards, creating shelf heights that would work with the baskets I intended to use. Keep in mind there is a 2" wide face frame on the shelves when drawing things out. After a few attempts, I came up with a plan with a pleasing arrangement.

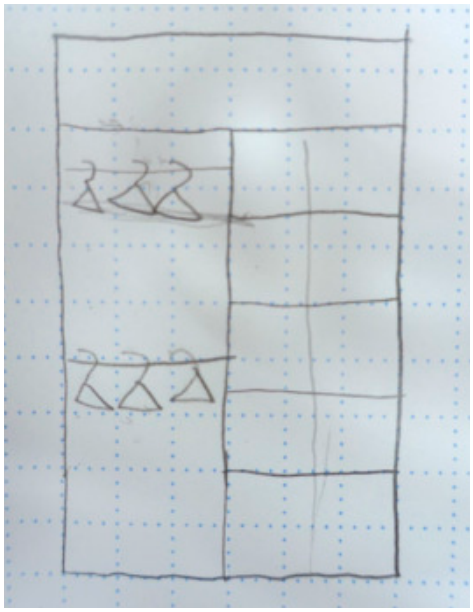
Materials & painting

Good shelving can be made with 3/4" paint-grade plywood. I used a paint-grade maple veneer ply, which takes paint very nicely, but other wood species also work well. The cleats and face frame can be any hardwood that takes paint well. I used cherry because I had some left over from another project.

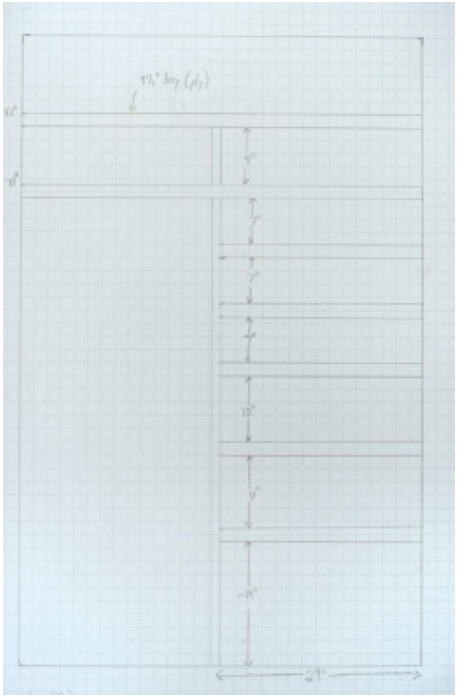
Once you have your materials, cut your components to size. A track saw makes quick and accurate work of breaking the plywood down to size. A sacrificial piece of 3/4" Styrofoam insulation underneath the workpiece supports your work on both sides and allows you to cut through without damaging your blade. Cut the face frame material to width at this time, but leave the length a few inches long as it will be fitted once the shelf is assembled. The cleats get cut to finished size at this stage.

Using your shelf components, check the closet for square. Hold up the shelf piece where it meets the closet wall corners and measure how far out it may be at the front or back. This taper cut is easy work with the track saw. Make sure the taper is opposite what was measured, a gap at the front means material removed from the back and vice versa. This can be done using a carpenter's square but having the actual shelf piece is a good visual aid. Another approach could be to use a compass or marking tool to mark a cut line directly onto the workpiece while it's held in place.

If the length of the slightly oversized



A Rough Idea – Having a rough sketch on hand of what you want while you take measurements is helpful.



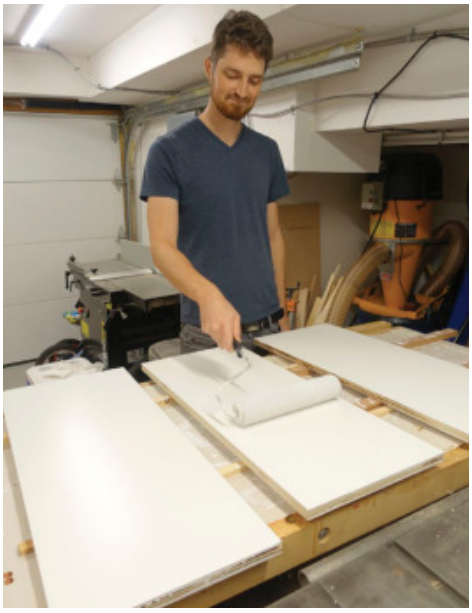
A Finished Plan – The rough sketch was refined based on measurements Kosonen had taken and drawn to scale to become his finished plan.

Break Down Your Plywood – A track saw and Styrofoam insulation make quick work of cutting the plywood to size.

component is too long to fit into the opening, use a shorter piece of scrap the same width to mark the angle, then transfer that line to the workpiece and cut it. You could even use cheap 1/8" thick board for this or cardboard.

Painting into corners is frustrating, so pre-paint all the plywood and cleats before assembly. The face frame pieces get primed at this stage, but save the painting for after assembly as there will be nail holes to be filled and painted anyway. Now is also a good time to paint your closet wall as your brand-new shelves might look out of place if the rest of the closet doesn't match. Remove the baseboard on the rear wall prior to painting, as this will get trimmed to butt up to the new shelving. On the topic of paints, make sure to get a paint recommended for cabinets and shelves, I've made the mistake of using latex wall paint on shelving in the past and anything heavy has a tendency to stick to it.

Check the Closet for Square – Use the shelf component itself as a visual aid to tell you exactly how out much you need to trim for a tight fit.



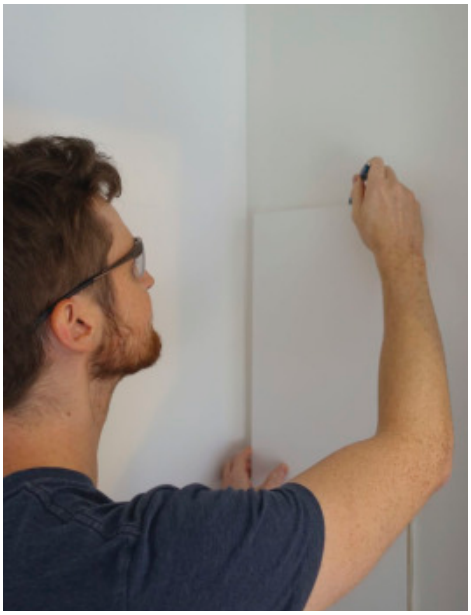
Pre-Painting – It's much easier and quicker to paint or finish everything before assembly.

Case Assembly

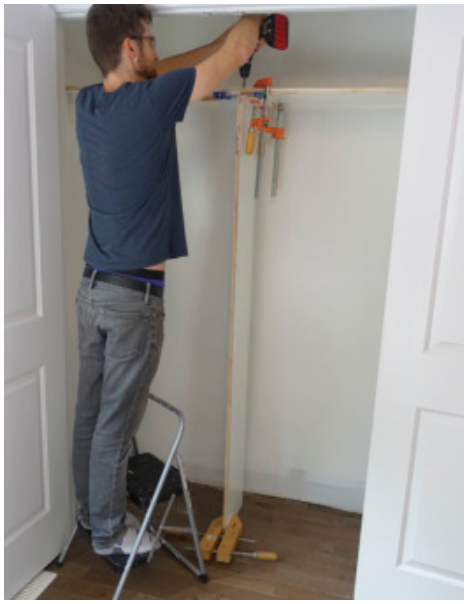
Once the paint has dried it's time for assembly. Generally speaking, start with the case, then install the face frame. Start with the larger, more structural, components and work your way to the smaller ones. Use the components themselves instead of measuring wherever possible.

Use the large vertical piece to mark the height of the lower full-length shelf. Install the cleats for the shelf, making sure they're level and the screws go into studs. Installing the large vertical partition can be an exercise in frustration and make you wish you had more hands. Employ several clamps to help with this portion. First, a large handscrew at the base of the partition will allow it to stand on its own. Second, pull the large shelf out from the wall a few inches, then clamp a board across it for the vertical to butt up against (with another clamp). This allows you to pre-drill and screw the vertical partition to the shelf. Then remove the clamps and slide the whole assembly into place. The horizontal shelf then gets secured to the cleats with a few brad nails. The top shelf and partition follow the same sequence. This is a bit easier because the partition is much smaller.

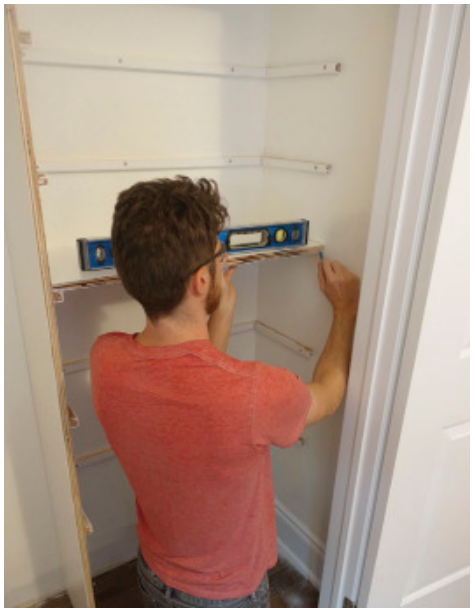
With the major components in place, it's time to focus on the smaller shelves. Start from the bottom and work your way up. First, mark the height of the shelf on the vertical partition, then level and install a cleat there. Using the shelf and a level, mark the



More Accurate Than Measuring – Use the large vertical partition to mark the height that cleats will be installed.



Helping Hands – A few strategically placed clamps make securing the large pieces easier. Stops will also go a long way to assisting you with positioning mating workpieces while you work alone, or even with an additional set of hands.

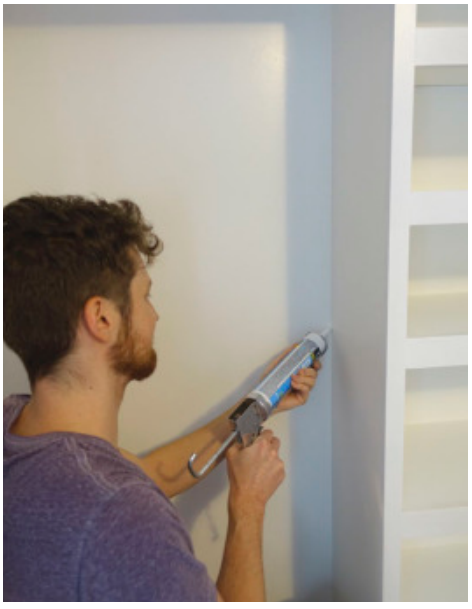


Level Each Shelf – With one cleat installed, Kosonen uses the shelf and a level to mark the location on the opposite side.

Functional, But Not Pretty – While the shelves may be functional at this point, the face frame provides a finished look.

A Simple Alignment Jig – An F-clamp and a piece of scrap provide alignment for the face frame components.

Trim the Baseboard to Fit – Having the baseboard butt up to your shelves gives a finished look.



Close Up Any Gaps – A bit of paintable caulking hides any small gaps.

height on the wall. Install the next cleat level to the line. The back-wall cleat gets lined up with the side wall cleats and installed. Note that the back cleat is optional, depending on the span of your shelves. The shelf then gets secured to the cleats with a few brad nails. Before you secure the first one, make sure the vertical partition is level, as the attachment of the shelves will anchor it in place. Work your way up and do all the shelves in this sequence.

Face Frame

The shelf may be functional at this point, but the exposed plywood and cleats don't give it the clean, finished look we're after; that's where the face frame comes in. Tackle this in the same manner as the case assembly, starting with the major components. First install the face on the large horizontal shelves, then the verticals. The face frames are held on with a bead of glue and some brad nails. Use a couple pieces of scrap wood and some F-clamps to align the face frame with the shelves and vertical partitions. Measure and cut each piece to size to ensure a tight fit.

Final Touches

Now it's time for the finishing touches. Cut the back wall baseboard to fit around the vertical partition and re-install it into place and fill the nail holes. You can also use some trim caulking on the corner seams to close any gaps. I don't fill any screw holes because the face frame hides almost all the cleats, the shelf contents also help hide the cleats and the screws for the vertical partitions are high enough they don't normally get seen. You could opt to fill them, or even use a screwhead cover, if you wanted. Put the final coats of paint on the face frame and over any filled nail holes. Once the paint has dried, it's time to install the closet rods. It may be tempting to use your new shelving right away, but make sure the paint has had a few days to fully cure before resettling your closet.

Craig's favourite projects are furniture and boxes, especially if they involve veneer work. Although he's not too picky, anything that gets him into the woodshop keeps him happy.

CRAIG KOSONEN
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Reviews

Our experts review new tools and products especially suited to the woodworker and DIYer.

Ready to Travel – Once folded up and strapped to the mobility cart, the saw can be easily taken to the jobsite or moved around the shop for storage.

Festool Table Saw CSC SYS 50

The Basic Model – This model comes with everything needed to get you going, as long as you're already a Festool owner and have the batteries and charger. There are three other categories above this model. (Photo by Festool)

BY CARL DUGUAY

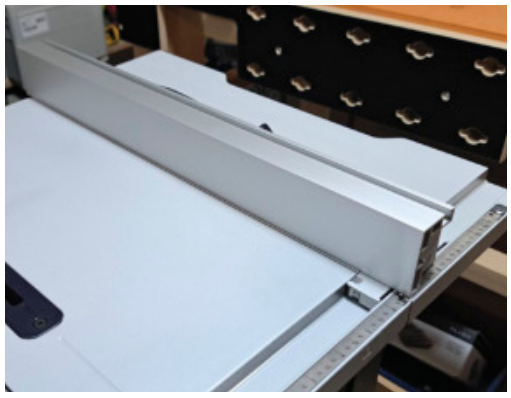
I've been working wood for more than 40 years and writing about woodworking techniques and tools for half that time. Occasionally a product comes by that seems to be in a class by itself. The JessEm Rout-R-Lift, Leigh FMT mortise and tenon jig, SawStop blade brake and Festool Domino come to mind. Time will tell, but Festool may well have hit one out of the park with their new compact, cordless **CSC SYS 50** table saw.

Not all woodworkers need a large cabinet-style table saw. If you have a small workshop, or work primarily on small projects, a benchtop or jobsite table saw can work well. However, most of these small saws lack the precision and often the functionality found on cabinet saws. Traditionally, they've been designed to meet the needs of contractors cutting dimensional lumber and sheet goods. Don't get me wrong; I've been using a DeWALT DWE7491X jobsite saw in my small shop for quite some time. But it's required a fair amount of TLC to deliver the accuracy I need to make furniture and cabinetry. While I've only had the CSC SYS 50 in my shop for the past several months, it's quickly proven to be the most feature-rich and precise benchtop saw I've ever used.

The CSC SYS 50 comes in a large Systainer that stores all the components and protects the saw when moved from shop to jobsite. The saw features a brushless motor powered by two 5.0 Ah

Photos by Carl Duguay

Ready for Action – Duguay tested the "Set" package, which includes everything a new Festool owner would need, including the mobility cart, which the saw is pictured on here. Notice the buttons and dials for the user to program and the digital height and angle blade adjustment settings.



Two Fence Positions – The rigid fence is shown here in one of its two positions. This position offers higher workpiece support and a slightly wider rip capacity.

Flip-Up Support – The fold-down table is well-supported by a pair of hinged arms. It can be quickly and easily set up so the user can make full-width rips.

batteries that deliver enough energy to easily slice through 1-3/4" hardwood. On average, I get about 60 minutes of run time before having to recharge the batteries. There is no noticeable drop in power during this time period. Recharging both batteries (using Festool's Rapid Charger TCL 6 DUO) takes about half an hour. If I were using this saw on a jobsite I'd invest in a couple of extra batteries. I was disappointed to find that Festool doesn't include a 120V AC corded power supply to use with this saw, similar to what is found on the DeWALT DHS790AT2 mitre saw. I can only hope Festool is considering this as a future accessory.

The saw uses 168mm (6-5/8") blades that leave a 1.8mm (1/16") kerf. You get a decent cut height of 48mm (1-7/8") at 90° and 34mm (1-11/32") at 45°. Blade tilt runs from -10° to 47° — anyone who does trim work is sure to appreciate this. Changing blades is quick and simple via an access hood under the sliding table. The 42-tooth blade that comes with the saw cuts like a dream, but replacement blades are painfully expensive — Diablo/Freud, are you listening?

In use I find the CSC SYS 50 to be noticeably quieter and with less vibration that other benchtop saws. As on all saws, there is a riving knife, plus a second one on the overhead guard. The table insert plate has a 7.9mm (5/16") wide throat. I found narrow stock can easily slip into the blade opening. A ZCI (zero-clearance insert) plate isn't available. And forget about cutting dadoes on this saw.

One of the major highlights of this saw is the absolutely precise programmable **digital height and angle blade adjustment**. You can save up to four commonly used combinations of cutting height and angle settings. At the turn of a dial you can raise or lower the blade in 1.6mm (1/16") or 0.4mm (1/64") increments and set the bevel angle in 1° increments. If you require precise cutting it doesn't get any better than this.

The 280mm (11") rip capacity won't be to everyone's liking, but if you use a track saw to process all your sheet goods and wide panels, as I do, it's not much of an issue. The fence can be switched between high and low configurations, is easy to adjust, rock steady when locked in position, and has a handy integrated push stick. To use the rip fence and full 11" rip capacity you need to use the fold-up extension table —most users will likely leave it in the up-position all the time. I find the rip cutting width scale a tad on the small size, making it hard to read.

The **sliding table** is another highlight on this saw. A small lever on the side of the saw enables you to release the table or lock it in place, which you'll want to do when ripping stock. I find the sliding table makes repetitive crosscutting a lot easier. The table runs perfectly smooth and vibration-free along its full length. The mini-mitre gauge is definitely one of the best I've used. It can be pivoted up to 70°, has six detents on the left and right side, and the fence is laterally adjustable. You can easily crosscut stock up to 450mm (17-3/4"). With a shop-made support stand or the optional Festool mobility cart (UG-CSC-SYS) you can safely crosscut extra-long stock. The fence is only 300mm (11-13/16") long and doesn't include a flip-stop. As a work-around, you can switch the rip fence onto the mitre gauge or just clamp a longer board onto the mitre fence, but that's a bit of a nuisance. There is a lever on the side of the table that enables you to lock the mitre gauge in place when crosscutting.

Dust collection using the supplied cloth bag is unexpectedly good, though the bag fills up quickly. Connected to a dust extractor, dust extraction is great.

There are four models to choose from. The "Basic" model comes with a 42-tooth blade, rip fence, mitre gauge, dust bag, push stick, blade guard/splitter/riving knife and Systainer. It's the one to choose if you already have Festool battery packs. The "Basic-Set" adds the UG-CSC-SYS underframe mobility cart. The "Plus" gets you two 18V 5.0Ah batteries plus dual rapid charger and Systainer (without the underframe). With the "Set" you get the complete package. Apart from blades, no other accessories are available at this time.

In my view, the positive features of the **CSC SYS 50** outweigh the limitations and omissions. I feel it works best in shops that produce smaller-scale work where cutting precision is paramount, particularly those with limited floor space. It should also appeal to finish carpenters, flooring installers, renovators and other tradespeople for whom a portable jobsite table saw is essential and who place a high priority on precision work.

Festool Table Saw CSC SYS 50
MSRP: $1,999 ("Basic" model) to $2,699 ("Set")
Website: FestoolCanada.com
Tester: Carl Duguay

Kreg Concealed Hinge Boring Jig KHI-Hinge

BY ROB BROWN

(Photo by Kreg)

When I look at a jig my main thoughts are whether it will be accurate, offer repeatable operations and leave me with the quality I need. It was no different when I looked at this jig for the first time. I do all of my boring for concealed European hinges on a drill press, as I have for the past 30 years. While there are advantages to using a drill press for this operation, what I learned was there are absolutely advantages to using this jig, too.

Setup was simple. Within a couple of minutes, I had oriented myself with all its functions. It's not a jig that will do a dozen things for you; a few basic (yet important) operations are all this jig promises, and it delivers. It will help you bore one 35mm hole to accept the hinge and two 1/16" pilot holes to locate the pair of screws to squarely fix the hinge to the door.

There are a few simple steps to take before drilling a hinge hole. First, slide on the depth-stop collar to the shaft of the supplied 35mm bit and let it drop to the larger portion of the shaft. There, secure it in place with a hex key. This location will set the depth for a 5/8" thick or 3/4" thick door. If, for some reason, you wanted to drill a deeper hole, you can just adjust the location of the stop collar farther away from the cutting end of the bit. Naturally, I checked the depth on a piece of scrap the same thickness as the doors I had to drill and was happily surprised when it fit well and didn't come through the show side of the door. The 35mm bit then gets inserted through the circular bit base, then the circular bit base gets chucked into a drill. This circular bit base helps steady the bit while boring and locate it accurately in the base of the jig.

Next, adjust the setback of the jig to locate the 35mm hole a certain distance away from the hinged edge of the door. Refer to the hinge literature for this info, or do a test fit with some scrap. Once you've adjusted the setback, you can clamp the jig in place. Most concealed hinges can be bored sightly up or down the door without a problem. Only some hinges, like those for a pocket door system, will require being bored an exact distance away from the top or bottom of the door. There's a scale on the edge of the jig if exact measurements are needed. I just added a pencil mark where I wanted the hinge, clamped the jig in place and drilled it. I will admit, this jig tended to move ever so slightly on my first few uses, but once I realized a bit more clamping pressure was all that was needed, I was off to the races.

The process is simple: install the circular bit base in the jig; bore the hole; and remove the circular bit base from the jig. The icing on the cake is next. Once the circular bit base is removed from the jig, two small holes are visible. Drill through them with a 1/16" diameter bit to bore the pilot holes for the hinge screws. Again, always test the depth of your bit before drilling into nearly completed doors.

This jig works as well as my drill press, with only a few slight differences. If you have a lot of doors to do, a drill press may be faster. But if you're dealing with large doors, it's likely going to be a lot easier to use this jig, as the door can sit in place on the bench while you move the jig and drill to each hinge location. Another advantage with this jig is that it's fast to set up and simple to adjust when drilling just a few concealed hinge holes. And if you don't have the space or money for a drill press, this is the simple and obvious answer if you want to install concealed hinges.

This jig won't replace my drill press, but it might very well become my go-to for boring concealed hinges. I even spent a few minutes making a simple rack that will locate this new jig on the wall near my other boring equipment. I'll be using it again soon.

Kreg Concealed Hinge Boring Jig KHI-Hinge
MSRP: $32.99
Website: KregTool.com
Tester: Rob Brown

A Simple Twist – The main adjustment needed before using this jig is to set the hinge setback. With a twist of a screwdriver, it's easy to adjust the setback to between 3mm and 6mm. (Photo by Rob Brown)

Two Easy Pilot Holes – Once the 35mm hinge hole has been bored, remove that bit and bore the two 1/16" pilot holes to attach the hinges. This helps keep the hinge plumb to the edge of the door and not split the material while installing the screws. (Photo by Rob Brown)

INFO: DIFFICULTY – **2/5,** LENGTH/TIME – **2/5,** COST – **2/5**

Photos by Rob Brown (Illustration by Len Churchill)

Build a Makeup Organizer

This simple makeup organizer is fun to make and will help store and keep makeup handy. It's easily customized, too.

BY ROB BROWN

My 14-year-old daughter has started to wear makeup. She's also surprisingly organized, and it was obvious she needed a simple way to store her regularly used items that would be neat, tidy and easily accessible.

Customize the design

Start off by taking a look at the items you want to store and think about the size the organizer needs to be in order to hold everything. If there's a lot of makeup to deal with you might want to make this into a three-tier design or increase the width, length or both.

Also consider the height of the items and whether they will be stored upright or flat. Some of her items would be stored standing up while others would likely be stored on their side.

During the design process my daughter and I brainstormed a wide range of ideas. Not surprisingly, considering how often I wear makeup, not many of my ideas were that great. I mentioned making one of the trays removable and designing a lid for it to make it easy to take to sleepovers. She thought items would just get messed up en route and she also had a travel bag for these sorts of things, so this wasn't needed. I thought of adding a few hooks to the sides so she could hang other items, but that didn't sound appealing to her, either. I also floated the idea of building a removable tray that would sit on top of the upper box with a series of holes in it for storing specific items like lipstick, lip gloss, brushes and other tall, thin items. According to my daughter, this wouldn't make the most efficient use of space. She even discarded an idea for a small tray that would slide on top of the upper tray to keep some of her most-used items within reach. No thanks, Dad. She likes the K.I.S.S. theory and I respect that.

In terms of my approach to joining the two trays together with threaded rods, you could also use a threaded nut let into the underside of the upper tray to fix the

Drill Some Holes – Once the washer clearance holes are bored in the trays, drill pilot holes in their centres, followed by clearance holes for the threaded rod.

A Nice Pattern – A random orbital sander will leave a nice pattern on copper pipe.

Even Cuts – A piece of scrap with a groove in it will help keep the threaded rod in place while cutting it to length. Brown used the end of the scrap to reset his saw on while cutting so the lengths of these parts were cut accurately.

threaded rods to. This would provide you with a cleaner-looking top tray, as there would be no nut, washer and threaded bolt protruding through it. She didn't think our approach would be a problem, as most of her makeup would hide it.

Best of all my daughter helped me out with this build, which was a lot of fun.

Get your material

As always, purchasing your hardware is the first step in this project. We needed threaded rod and nuts that the copper pipe could fit over. After some testing at our local hardware store, we chose a 1/2" copper pipe and 1/4-20 threaded rod and nuts. The copper pipe easily fits over the nuts. The length depends on how big you'd like your organizer to be. We bought two 36" lengths of threaded rod and one 36" length of copper pipe. I realized afterwards that making the height of this organizer about an inch shorter would have meant we could have used just one threaded rod, but since it was only a few dollars I'll leave that decision up to you. Also buy 16 nuts and eight washers.

If you prefer the look of aluminum or steel you might be able to find those materials at your local hardware store.

My daughter preferred the light look of maple, but if I had had my way, I would have used black walnut for the trays, as I think it pairs well with copper.

Start building

Begin by making the two wood trays. Cut the two plywood bases to size. Ours were 6" by 9". Mark the centre of the nut and washer clearance holes on both base pieces, 3/4" away from both sides. A hole needs to be drilled in the underside of the bottom and the upper surface of the top to ensure the nuts and washers don't protrude past the lower and upper surfaces, respectively. Use a piece of scrap the same thickness as the plywood bases to set the depth of the drill press. We used 3/4" diameter washers so we used a 3/4" diameter drill for this. Bore four holes in the underside of the bottom and four holes in the upper side of the top.

We drilled smaller pilot holes through all eight corner locations, then drilled 1/4" holes through all eight locations so the threaded rod would fit through it nicely. The first pilot holes were just to further ensure the 1/4" diameter clearance holes were centred within the 3/4" holes.

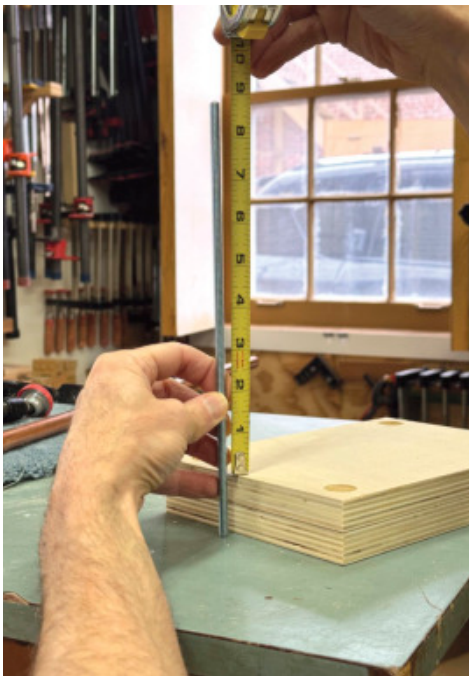
Working with metal

Working with metal is very similar to working with wood. The main differences are that it cuts more slowly and you need different types of blades to cut it.

To add patina to the copper pipe before cutting it to length, I used a random orbit sander to smooth its surface along its length. Play around with the pattern you get until you like the look. Alternatively, you could sand the pipe with straight passes for a more even appearance. Synthetically adding patina to the copper pipe with chemicals and household liquids will also look good.

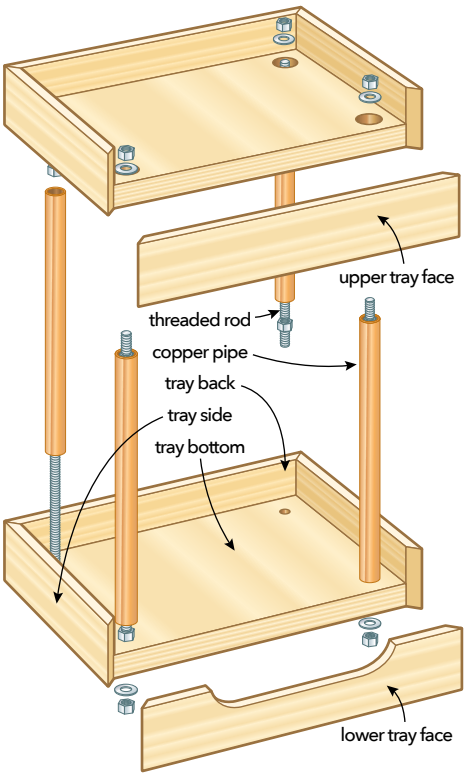
To determine the length of the threaded rod, we worked backwards from the length the copper pipe would be cut to. When cut into equal pieces, the 36" long piece of copper pipe gave us four pieces about 8-7/8" long. This meant the threaded rod needed to be 8-7/8" plus the thickness of the top and the bottom, minus about 1/16" to ensure the threaded rod didn't protrude beyond the lower surface of the lower shelf or the upper surface of the upper shelf. We cut our threaded rod to be 10-1/4" long. In hindsight, I should have cut each section of copper pipe about 1/8" shorter, so removing the last little bit from the fourth piece would have been easier.

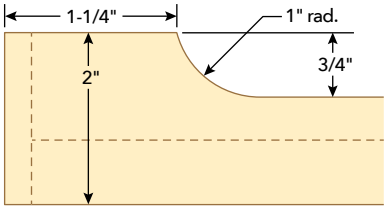
Before we cut the threaded rod, we put a nut on it so after we cut it, we could twist the nut off, helping to straighten out the threads. I used a simple jig with a groove down the centre to help hold the threaded rod while it was cut to 10-5/16". Use a similar jig and a stop to cut the four pieces of copper pipe to length. Grind or sand the freshly cut threads so you can thread a nut on and off with ease. It's also a good idea



Copper Pipe Length? – To calculate the length of the copper pipe, Brown measured the difference between the wood trays and threaded rod then subtracted an extra 1/16".

Jig and Stop – Brown uses another simple jig, but this time with a stop, to help him cut the four pieces of copper pipe to equal length. The upper piece can be cut to the exact length you want the copper pipe to finish at, then used to clamp the stop in place so the end of the top piece is in line with the end of the lower portion of the jig. The grooves in the jig parts help keep the workpiece stationary while cutting, while the ends of the two jig parts allow you something to rest your blade against while making the cut.





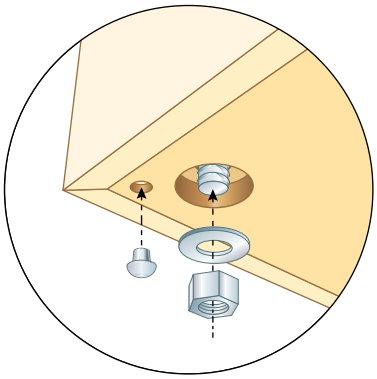
LOWER FRONT FACE DETAILS

to ease the cut ends of the copper pipe so it's not sharp.

Dry assembly

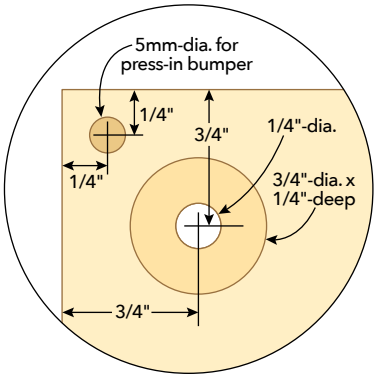
Do a rough assembly to make sure the lengths of the copper pipe and threaded rod fit. Start by securing the threaded rod to the base.Thread a nut on the threaded rod far enough so that when you insert the rod into the base tray the end of the rod is just shy of flush with the underside of the tray. Add a washer to the underside of the tray, then add a nut on top of the washer. Repeat that for all four corners.

Thread four more nuts onto the top ends of each rod. Adjust their position so that when the copper pipe is inserted over the threaded rods the nuts will be flush with the top edge of the copper pipe. Install the upper tray on the threaded rods, followed by a washer and nut in each corner. Hopefully, the threaded rod will sit just below the upper surface of the upper tray. If not, trim,



BOTTOM VIEW

Cut Some Bevels – Bevels can now be cut into the side pieces so they all wrap around the perimeter of the plywood trays nicely. Notice Brown labels the parts and plywood base so he can glue up the parts in the same location.



HOLE DETAILS

Mark the Curves – This is the front piece of the lower tray. After marking it, Brown cuts the waste off and sands it smooth.

Apply Some Pressure – Clamps and cauls will help bring the parts together snugly.

Wrap It Up – After applying glue, Brown wraps the four sides around the base.

sand or grind either the rods or pipes to the required length.

Wrap the plywood trays

Break out material for the side pieces of the two trays. Bevel the side pieces so they wrap around the two base pieces. Label the side pieces and trays so you'll be able to assemble them in the same locations later.

Machine a recess into the front piece of the bottom panel, then sand the freshly cut edge smooth. This will allow the user to more easily access the contents of the bottom tray.

Ease the inner upper edge of all the pieces so it's not sharp.

Lay out all the solid wood sides of the lower tray so their inner faces are down and their mating bevelled edges are side-by-side. Join them together with strips of masking tape. To test the fit, wrap them around one of the bases. Make cuts as needed to allow for a good fit. Repeat for the upper tray.

To glue them together, apply a bit of glue on the edge of the base and the bevel joints. Wrap the side pieces around the base. Use clamps to press the pieces onto the plywood base. Using cauls will stop the clamps from marking the bases and spread out the clamp pressure.

When dry, remove the tape, clamps and cauls. Remove the glue squeeze-out from the inside corners of the bevels. Repeat for the upper tray. Ease the sharp edges and sand the trays.

Drill 5mm holes for a rubber bumper in each of the four corners of the underside of the lower tray. This will ensure the makeup organizer doesn't scratch the surface it rests on. You could also use simple self-adhesive bumpers.

Apply a finish

Prep for a finish and apply a finish of your choice. Choose a finish that will stand up to chemicals and stains because makeup will very likely come in contact with this organizer.

If you apply finish to the copper, it will keep it shiny. If you leave it as is, it will get a darker patina over time. After the finish is dry, re-assemble your organizer.

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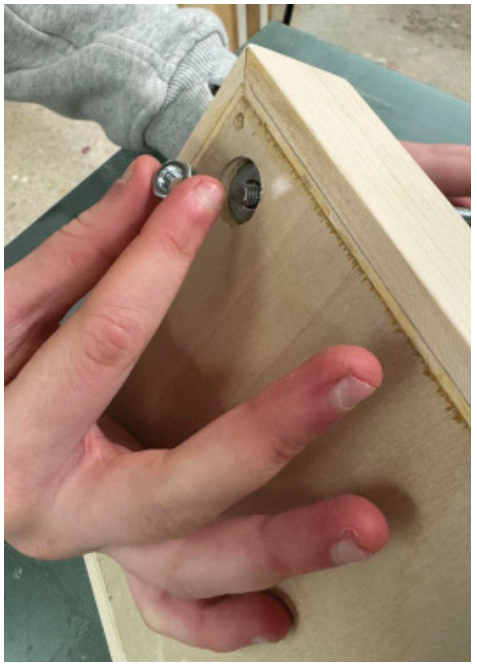

Final Assembly – Nuts and washers are added to the threaded rod on the underside of the bottom tray to start bringing the parts together for good.

Go Online for More

VIDEOS: Subscribers can view a video of how Brown machined the metal parts in this article on our website.

RELATED ARTICLES: Tea Light Holder with Planished Copper Reflector *(Dec/Jan 2019)*, Copper Countertop *(Feb/Mar 2018)*

Vandalism fells centuries-old tree in U.K.

The untimely demise of the historic and beautiful Sycamore Gap tree.

BY JAMES JACKSON

On the morning of September 28, 2023, employees of the Northumberland National Park Authority in the United Kingdom discovered a crime scene.

During the previous night, someone "deliberately felled" one of the nation's most popular and famous trees in what authorities described as an "act of vandalism."

The sycamore tree, planted around 1860 to 1890, was planted by a former landowner in a dramatic dip in the countryside known as the Sycamore Gap beside the historic Hadrian's Wall. It was approximately 15 metres (50 feet) tall and had a trunk diameter of roughly 90 centimetres (about three feet).

The tree is most famous for its appearance in a 1991 film about Robin Hood, and was named English Tree of the Year in 2016. It's also been recognized as one of the most photographed trees in the nation.

"The vandalism has caused understandable shock and anger throughout the local community and beyond," a statement from Northumbria Police said. Images of the felled tree lying atop the stone wall on the morning of Sept. 28 spread around the globe.

A 16-year-old and a man in his 60s have been arrested as part of the investigation.

Work to clean up the site began in early October, but the tree was so large it couldn't be moved in one piece. The park authority said it aimed to keep the trunk in as large sections as possible to give them flexibility for what the tree will become in the future.

A web page has even been established to update the public on the process, and to provide more history and context for the tree.

This brazen and unprovoked act of vandalism saddened me and turned what was a pretty good day (Sept. 28 is my birthday) into one tinged with sadness. What would provoke someone to cut down a historic tree of this magnitude?

I'm a woodworker and make things out of wood from trees that are cut down every day. But I also studied history and geography in university before working for more than a decade as a newspaper reporter, and stories of old, beautiful trees being cut down like this make my blood boil.

It's one thing to cut down trees that have been grown and managed for the purpose of making lumber or wood for furniture, but it's another to recklessly kill a centuries-old landmark for no apparent purpose. My father and I cut down old trees on the farm or other nearby land and use the wood for our woodworking projects, but the trees are usually dying from infection or bug infestation, were knocked down in a storm, or were slated for removal as part of a land redevelopment project or road widening.

One of my earliest memories I have from the family farm growing up is learning to climb the silver maple trees with my sister, and one of the last things I did with my dad at the farm before it was sold 25 years ago was build a treehouse.

And one of my favourite movies as a kid was "Robin Hood: Prince of Thieves," which featured the tree.

My only hope now is that they can find a woodworker with the appropriate vision and skills to take what remains of the tree and turn it into a project worthy of its history and reputation.

JAMES JACKSON
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Illustration by Mike Del Rizzo

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Brocklen Johnson

Cascadia Bench

This bench was designed for a residential entryway to invite warmth and serenity. The piece draws inspiration from George Nakashima's live edge work. Johnson even poured the custom-formed concrete planter.

Turn to page 12 for more quotes.

Photo by Rodger Mahler / Mayer Studio