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APRIL/MAY 2023

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Cover photo by Rob Brown

30 Make a Teak Patio Table

This stylish design is a lot of fun to build and looks great on the patio. BY ROB BROWN

editor'sletter

I made the table you see on the cover of this issue last summer. It was the first time I'd ever used teak for a project and I was pleasantly surprised at not only how it machined, but also how great it looked when the table was complete. The rich browns, reds and golds in the wood brought a lot of character to the table.

I also had a lot of fun building the table. Actually, two tables, as it doesn't take that much longer to build two than one if you build them at the same time. I enjoyed the process of designing the table, machining the rough lumber, cutting the angles, creating the joinery and bringing it all together before wiping on a few coats of finish. I find relatively small projects like this rewarding. They don't require a massive amount of material, don't take up loads of shop space and aren't awkward or heavy to handle alone. Obviously, we don't always enjoy every step of the process while making a piece of furniture, but it's a rare build that doesn't give me a lot of satisfaction when I stand back to admire the finished piece.

When building this table, take care to be mindful of the angles. There really are only a few angles on the legs, and they're tapered too, but angles can start to play tricks on you if you're not able to picture them in your mind. The article, complete with exploded 3D illustration, materials list and a host of process photos, will take you through the steps needed to end up with a table (or two) you can be proud of. Patio season is just around the corner so start planning to making a few projects for the outdoors now.

Speaking of building projects for outside, Chris Wong shares some tips on how to design and build furniture that will resist rot and stand the test of time. And speaking of standing the test of time, Bruce Kemp has a fascinating story about how the craftspeople at Parks Canada build the giant gates that keep the historic Rideau Canal operational. These gates are an impressive part of Canada's history.

If it's still too cold to even think about the outdoors where you are, we have articles covering how to tune up old hand tools, install drywall and make a tic-tac-toe board. The latter article was written by an inspiring young woodworker named Evan, who's written a few articles for us before. It's great to see young people enjoying woodworking, too.

—Rob Brown, Editor



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CAST IRON CONSTRUCTION



Ouch!

I just read your weekly column on the splinters you got from Baltic birch. I feel your pain. I recently completed a stairway and railing project and made the mistake of building it from red oak. Splinters were a regular occurrence. It got to the point where I'd just casually stop halfway through an operation, pull out the splinter and return to machining without even thinking about it. There were a few tips in the comments section of your column regarding protective gloves to wear, so I will definitely be making a few purchases shortly. Like you, I prefer to not wear gloves in the shop as the loss in dexterity inhibits marking lines and handling some hand tools. I have a large red oak wainscoting project coming up that will match the stairway, so I have to be prepared!

Keep up the entertaining and informative weekly columns. I enjoy receiving them every Friday.

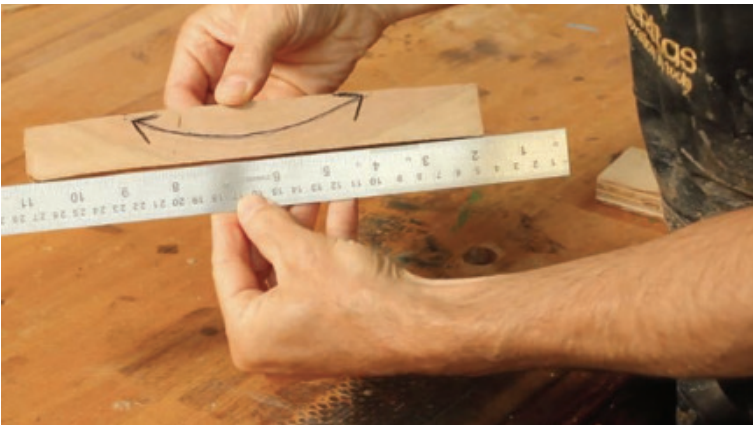
Scott G.
Via email

Hi Scott,
Red oak might even be worse than the Baltic birch I've been dealing with for the past few weeks. Gloves are certainly an option to protect yourself, but many gloves are no match for the larger, stronger splinters oak deals out. I'm sure there's something on the market that will protect your hands while you do the rough milling and machining needed when dealing with solid wood.

My ShopNEWS column on splinters has elicited 15 comments so far, which might make it the most commented on column since I started writing them over two years ago. To my surprise, nobody called me a wimp!

To subscribe to our weekly ShopNEWS e-newsletter with the link to my column, go to our website, click on the "Community" tab on the menu bar and then select "Email signup."

— Rob Brown, Editor



Great back catalogue and videos!

I just became a subscriber and realized that this gave me access not only to all the back issues, but both video series. Being a new woodworker, learning the hobby isn't easy, but having access to all of this information is exactly what I needed. For example, I never knew what the term "4/4" meant in reference to purchasing solid wood, but that topic was covered perfectly in the "How Solid Wood is Sold" video. After watching it I checked out "How Sheet Goods Are Sold" and "Different Cuts of Wood." These videos answered so many questions I didn't even know I had!

Kelly G.
Via email

Hi Kelly,
I'm glad you not only became a subscriber, but also realized what a great collection of informative woodworking videos we have on our website. Subscribers can view them all for free. We have 12 videos covering how to make common woodworking joints and 50 videos that detail all sorts of woodworking topics from lumber purchasing and breakout to hardware and finishing. There's something here for everyone. And like you said, these videos will answer questions you didn't even know you had. Enjoy! — Rob Brown, Editor

The Hamilton Woodworking Show is LIVE!



The Hamilton Woodworking Show will be back live in a new location – Riverside Exhibition Centre at the Caledonia Fairgrounds, Ontario, October 20 to 22, 2023. Attendees can expect to shop the show floor for all things woodworking with over 70+ woodworking booths. The main stage will feature Vic Tesolin and Steven Der-Garabedian live all weekend long building a project from start to finish. Attend seminars from top woodworkers live and online. Plenty of onsite free parking. For more details visit WoodShows.com.



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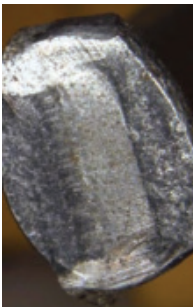
Tool Reviews

FLEX 24V drill driver/ impact driver kit
Impressive build quality, great features and excellent performance make this a first-rate choice in a pro-grade power tool kit.

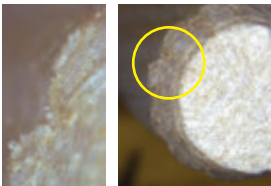


DEWALT 10" jobsite table saw with scissors stand
Think you need a full-size cabinet saw to make furniture and cabinetry? Think again.

View these reviews and more at:
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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 June/July issue.



Previous issue:
1/4" diameter
fluted dowel



Reader’s Gallery

Maker: Leandre Landry
Location: Memramcook, New Brunswick
This country kitchen cabinet was built for a family friend. It’s made of solid pine with wainscoting inserts for the doors, ends and back. The doors have mortise and tenon joinery while the gables were joined using #20 biscuits and glued together.

Free Plan

Garden Shed – From Concept to Completion
This versatile addition is a personalized sanctuary and stylish storage, covering a host of needs. It’s also a really satisfying one- or two-person project.
Visit CanadianWoodworking.com/readers-photos/ to see other readers’ projects and to submit your own.



Product Watch

Pfister TopPfit
We think that Pfister’s innovative TopPfit technology is a game changer when it comes to installing a new kitchen faucet. The top-down installation enables most of the work to happen above the sink, resulting in less frustration and body contorting than having to do most of the work in a small cabinet below the sink. The only under-counter work required is attaching the faucet to the water lines.
A typical installation can be done in about a minute. For more information visit pfisterfaucets.com.



Video Links
canadianwoodworking.com/videos

Canadian Quotes:
Tom Fidgen

How to Apply a Beautiful Shellac Finish



Events

2023 Canadian National Wildfowl Carving Championship
June 2-4, 2023

For the past 31 years, the Grand Valley Woodcarvers have put on a carving competition in the Waterloo, Ontario, region. To learn more about the competition, and to submit your entry, visit CanadianNationals.net.



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String Trimmer



String trimmers (a.k.a. weed whackers or weed eaters) are available as **corded electric, battery powered** and **gas** models that can have 2- or 4-stroke engines. Cordless and corded models are lighter, much quieter, require less maintenance, non-air polluting and less expensive than gas models, though they are somewhat less powerful. While most trimmers are handheld, heavier models (in particular professional-grade gas trimmers) can have a shoulder strap or harness and large two-handed handles. The shafts (a.k.a. shanks) can be straight or curved, which some people find easier to maneuver. Any trimmer can be used as an edge trimmer simply by tilting it to one side. This can be tiresome if you have a lot of trimming to do. On some models the trimmer head can be rotated into a vertical position to make edging much easier. Some newer models are attachment-capable, allowing you to remove the trimmer head and replace it with other landscaping accessories such as a pole saw, hedge trimmer, chain saw or leaf blower. Trimmers have either an automatic string feed mechanism or bump (a.k.a. tap) feed feature. With a bump feed trimmer, you have to tap the head on the ground when the string gets too short; centrifugal force pulls the string from the spool. String (a.k.a. line) is typically made of nylon and available in different diameters and shapes. Some trimmers have spools that feed two strings making them better suited for heavier patches of grass and troublesome weeds. Trimmers referred to as brush cutters use blades rather than string and are designed for cutting shrubs and saplings.

Power source: corded (120 AC), battery (18V – 36V), gas
Cutting path: 12" to 15"
String thickness: about 0.065" to 0.110"
Price range: \$50 to \$900

Get the Most Out of Your String Trimmer

Learn how to use the trimmer

The way you hold the trimmer and the speed at which you run it vary depending on whether you're trimming, tapering or edging. Don't be a know-it-all; read the user manual.

Use the right size string

Use the string size recommended by the manufacturer. String that's too thin can reduce cutting power, while string that's too thick can strain the motor.

Use quality string

If the string on a trimmer you purchased breaks too easily, upgrading to a higher quality string will work wonders.

Can you handle it?

Large trimmers can be quite heavy, upwards of 15 pounds, and awkward to handle. Choose a trimmer that you can easily handle for your yard size.

Be safe

The string on a trimmer spins at several hundred miles per hour and can dislodge rock shards and the like into the air. Always wear eye and ear protection along with leg coverings and gloves.

Photos by Manufacturer Illustration by Len Churchill

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Top 10

Great Woodworking Projects for the Outdoors

With warm weather just around the corner it's time for woodworkers to turn their attention to making the most of summer with a new project or two. Start now and you'll soon be outside enjoying a few of these projects on the patio.

BY ROB BROWN

- 1 **Serving Tray** — Everyone needs a tray to carry drinks and snacks outside. This small project might allow you to try a few new jointing techniques or use some figured wood.
- 2 **Outdoor Dining Table** — Whether it's made of teak or spruce, a patio dining table will see a lot of action. Spruce 2x6s on top of a simple base will do the trick, though if you have no other outdoor projects on the go you might want to get fancy and use white oak, teak, cedar or ipe to make a centerpiece for family and friends to gather around.
- 3 **House Number Plaque** — A customized plaque to mount your house number on will surely turn heads. Go the extra mile and scroll a wood number. Search the internet for an interesting type-face, but make sure the number is still recognizable.
- 4 **Birdhouse** — This simple, fun project will attract birds of all species, and bring colours and songs over the seasons.



- 5 **Flower Box** — Whether they're hanging below a window or sitting on your deck, flower boxes will bring life and colour to any home.
- 6 **Garbage / Recycling Centre** — If the area around your garbage can and recycling bins leaves something to be desired, build a simple structure to hide them.
- 7 **Mailbox** — This is a fun little project that will allow you to add some interest to an otherwise simple entranceway or footpath.
- 8 **Yard Game** — Whether it's for kids or adults, yard games are simple to make and keep your family and guests entertained. Cornhole, ring toss and wooden bowling pins are easy to make. If these sound too small, oversized Jenga, Connect-Four or Plinko will bring on the big laughs.
- 9 **Plywood Bike Jump** — I made a 16" high by 42" long bike jump out of plywood and spruce for my son a few years ago and it sure kept him busy. In fact, the neighbourhood kids all seemed to come out of the woodwork that summer. Helmets and grassy landings are mandatory.
- 10 **Pergola** — It's a big project, but a pergola will go a long way in defining a space in your yard for relaxing or entertaining. With a few pointers to get you started, this project is easier than you think.

ROB BROWN
rbrown@canadianwoodworking.com



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RELATED ARTICLES: Visit our website for project articles on serving trays, outdoor dining tables, birdhouses, flower boxes, mailboxes and pergolas.

Photo by Rob Brown

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Tom Fidgen

... on music, woodworking and how they make a great match.



Owner / instructor at The Unplugged Woodshop,
a hand tool-only woodworking school in Toronto, Ontario

TheUnpluggedWoodshop.com
[#TheUnpluggedWoodshop](https://www.instagram.com/TheUnpluggedWoodshop)

I grew up on Cape Breton Island and always had a passion for making. Right out of high school I signed a record deal and spent the next decade writing and recording music. I toured from coast to coast, but whenever I wasn't on the road playing music I would be back in Nova Scotia making stuff. A simple bench for the backyard, a patio for a friend's place, a timber frame cabin in the woods. Always writing and playing music, always making and creating



Music and Woodworking – This guitar cabinet in Tom's teaching studio showcases some of the guitars he has made.

things from wood. The two seemed to go hand in hand. That didn't seem to be unique to me as many of my musician friends also worked wood and made stuff. In fact, two of my band mates from the early '90s also went on to careers working wood. The bass player studied guitar making at the Roberto Venn School of Lutherie in Arizona and the drummer from that same band is now a high school shop teacher back on Cape Breton. All three of us went on to careers working wood and considering we were only a three-piece, that's some pretty good odds!

Fast forward another decade and I started building wooden boats. Most of the work in those days was done with power tools but during the fitting out process, when the power tools were put away, I fell in love with hand tools.

Not long after, I also began building custom furniture. At the time, I started to write about building furniture using only hand tools. This was in the early 2000s before smart phones, Facebook or YouTube. I would tell people I wrote a blog and thoroughly enjoyed the process of writing and documenting my path using hand tools for woodworking and design.

Photos by Tom Fidgen

A few years later, I signed a publishing deal with F&W Media and my first book was published in 2009. *Made by Hand: Furniture Projects from the Unplugged Woodshop* became a best-selling book and a year later I signed my second publishing deal with The Taunton Press.

In 2011, *The Unplugged Woodshop: Hand Crafted Projects for the Home and Workshop* was released and almost immediately I started getting invited to teach in woodworking schools around the world.

From the Yukon to Australia, Jerusalem to Germany, I spent a number of years teaching hand tool woodworking in schools. Every month a new school in a new city, a different country and often on a different continent. This afforded me the unique opportunity to see what really worked and, perhaps more importantly, what didn't. I studied business models and curriculums and eventually decided to open my own woodworking school.

In 2016, *The Unplugged Woodshop* opened its doors and we've been pretty much sold out since. I enjoy sharing my passion and experience with students who come from all over the world to study with me. We've had students from New Zealand, Australia, India, China, Europe, Mexico, South America and, of course, the U.S. and Canada. Everyone with their unique stories and skill sets. Men and women, from 18 to 68 years old, from all walks of life.

During these past seven years since becoming a small business owner in the biggest city in Canada and, like everyone, navigating the last three years of pandemic life, I've been able to maintain a steady amount of commission work. Lots of custom furniture as well as some pretty unique projects. One was a carved plaque for Massey Hall, the iconic theatre here in Toronto that recently underwent a massive renovation. The plaque was commissioned by the theatre as a thank you to Allan Slaight, the philanthropist who donated a large amount of the money needed for the renovation.

Having a background in music, playing guitar for 35+ years and being a furniture maker for the last 20, it was inevitable that



these two worlds would someday collide.

The winter before COVID began, I had a student from Buffalo who encouraged me to try my hand at making a guitar. This had, of course, been on my radar since my old band mate studied lutherie back in the early 2000s. With my young student's encouragement, I decided it was finally time. I purchased a few books, bought a few special-purpose tools and supplies, and started building my first guitars.

Three years later, I'm still building guitars. Still with only hand tools and currently working on guitar number 10. To say this has been a life-changing event would be an understatement. I basically go to bed thinking about guitar making and it's the first thing I think about in the morning. The melding of these two passions makes perfect sense.

The road from hand tool furniture making to luthier wasn't a huge stretch, although like any new discipline, it comes with a learning curve. Most of the hand tool work is the same except the tolerances are a little tighter. I'm also much more aware of wood species, wood cuts, extremely sharp tools and perhaps the biggest thing, relative

On the Go – Sketches, books and projects all made by Tom add ambiance to his teaching studio in Toronto, Ontario.

humidity. All of these things get amplified (no pun intended) when building musical instruments.

We have the luxury of "close enough" in timber framing, furniture making and general carpentry, but close enough doesn't cut it when it comes to musical instrument making. It has been a welcome challenge and I can already see there's a lifetime of learning ahead.

For the past two years, on my days off from teaching, I've been studying with a luthier on the west side of the city. I finished my first guitar under his guidance and mentorship and am now ready to start designing my own.

Working with wood, making and creating, writing and designing—these are creative elements that keep me inspired and motivated. Every day is another new challenge and I truly welcome the journey.

Whatever it is you make, I encourage you to try something new. Get out of your comfort zone. Make something different, push your boundaries and challenge yourself as you strive to be better. Master your tools, keep them sharp and get yourself a hygrometer so you can monitor the relative humidity in your workshop. Sharp tools, relative humidity and nice wood. What more can we ask for?



Go Online for More

VIDEOS: Visit our website for a slideshow of Tom and some of his work.

RELATED ARTICLES: Bill Maniotakis (*Apr/May 2018*), Christina Hilborne (*Dec/Jan 2018*)



Rebuilding the Gates on the Rideau Canal

When things work there's no point in messing with them. That's been the case for the wooden locks designed by Colonel John By and installed on the Rideau Canal 190 years ago. Parks Canada craftspeople working in the Rideau Canal's Smith's Falls Gate Shop are keenly aware of this and do their best to work with the same level of skill and historic precision as their predecessors when replacing the first control gates hung in 1832.

Photos by Bruce Kemp

BY BRUCE KEMP

The Rideau Canal was built in response to possible American incursions following the War of 1812. Britain was afraid American troops would choke off the St. Lawrence River and lay siege to the main British port on Lake Ontario in Kingston. England's answer to the threat was to assign Royal Engineer Lieutenant-Colonel John By to survey and develop a plan to bypass the big river altogether.

By's concept called for an end run through the hinterland using a series of rivers, lakes and canals to establish a navigable link between Kingston and Ottawa. This new waterway would carry tow barges and steamboats laden with goods and passengers from Lake Ontario to the Ottawa River and then on to Montreal in relative safety. After travelling through the countryside north of the St. Lawrence, By realized he could develop a slack water canal system. This type of canal goes around obstacles like rapids and waterfalls with slack or calm water channels fed by water diverted from the rivers. The key to each lock's success or failure was the giant wooden gates controlling the water in the limestone lock chambers.

British experience

The engineering expertise for this project already existed in England as did the carpentry skills to make the plan a reality. This large timber construction and the type of gate built for the Rideau was the same used in Britain at the time – rail and plank. The canals in the U.K. were all rail and plank, albeit smaller as the British canals themselves were smaller.

"In the 1830s it was the military who built the gates," Joe Adams told me one day during a lunch break at the Parks Canada Gate Shop. Adams is the acting foreman in the Parks Canada Gate Shop and an avid historian. As we got to know each other over the course of four months, I was surprised at the level of historical interest all the guys in the shop had.

Plank and rail gate construction, the kind used on the Rideau, features a number of rails suspended between two enormous uprights – the heel and mitre posts – with splined planks let into the face of the gate vertically to form a broad water-resistant surface. There are also stacked gates like the ones built for the Trent/Severn Waterway, which have two side uprights with squared logs fitted between them horizontally.

"James Fitzgibbon was the first [master] carpenter and was in charge of everything," Adams says, sounding like he's talking about an old friend. "Apparently he was even more of a perfectionist than Colonel By. He travelled the whole length of the canal and he had contractors and Royal Engineer military carpenters working on it."

There is no school for this kind of timber construction. It's all hands-on. Fitzgibbon's knowledge was passed down from one generation of gate builders to the next and still is. Adams learned the trade from Ken Gale, who was working there when Adams started.

At the time building started, everything was made out of wood, from ships to lock gates, to bridges, to gun carriages for cannons. "Kingston had a huge naval dockyard, too, and that's where By got his timber from," Adams says.

Adams thinks the timber was procured there and then floated up the Cataraqui River to the different lock stations and assembled on the bank right beside them. At first the carpenters building the gates

were military men. They learned their skills from the ship builders who built barges and sailing vessels along estuaries like the Thames.

The original construction material in Canada was white oak. Because of the general demand for this species the forestry was eventually in danger of collapsing. Today, Adams and his building crew – Matt Churchill, Josh Bennett, Scott Botham and Adam Raison – work with large, squared Douglas fir logs. The wood is sourced from Ennadai Woodworks in Golden, B.C.

Building gates starts with lumber selection and milling.

Adams isn't sure where the timbers are harvested in B.C., but he believes they're at least second- or third-growth trees. He can usually tell age based on the growth ring count, which dictates the quality and durability of the wood.

"Eleven rings per inch is what we ask for. Sometimes, just so we don't have to ship a whole trailer load back, we'll accept a little lower ring count. You wouldn't want to go below eight rings per inch." The density of the ring growth dictates how long the gates will generally last because they're submerged in water most of the year. "We accepted a lower ring count years ago and that's why we're now replacing those from 10 years ago." Older, slower growing trees with high rings counts last the longest – upward of 20 years. Those with the wider ring counts degrade fast.

Timbers are ordered over-sized for a number of reasons. Checking becomes an issue in the summer months if the stock, or finished gate, is stored outside in the direct sun. The timbers are ordered two to three feet longer to take this into account.

Huge timbers

Everything about the construction of these gates is massive. Adams starts with huge baulks of timber. Mitre posts are 16" × 16" and heel posts are 16" × 18" when they come in. The top and bottom rails are 15" × 20".

Dimensions in the gate shop are still calculated in feet and inches, because the original plans are drafted in those measurements and converting them to metric would be time consuming, expensive and no more accurate.

Adams and Parks Canada engineers try to preplan their ordering. The gate shop builds gates throughout the summer and over the winter. The spring months, before the canal opens for the season, and after it has closed to traffic in the fall are reserved for installations.

Dealing with the raw materials

The load of pre-cut gate planks that arrives at the gate shop on one of the first days I visited were the wrong dimensions, and the dadoes for the steel splines were placed too low, leaving Adams faced with a work-around before he even started.

Initially the timber, if it's acceptable (which is the majority of the time), is laid out in the shop on two 18" × 18" rails that are permanently fixed to the floor. Churchill positions them with a forklift in the order at which they will finally come together when the gate is assembled.

Each piece has its own milling specs. Adams cuts the logs to near finished size in one pass. This is done on a big, gas-powered Clarke bandsaw mill. Arcs and tenons also need to be sawn into the rails.

With the timber suspended on the tines of the forklift, Botham slips a 6" wooden elevator block under the near end of the wood. This allows Adams to cut tight to the arc with the 2" blade. Once he reaches the halfway point, the forklift comes back in and turns the timber around, then they repeat the process. This process leaves the top of the rail with a peak rather than a smooth radius. The final curve will be finished with hours of electric hand-planing and belt sanding in the shop.

Large joinery

While the timber is still on the bandsaw, Adam cuts the tenons. The technique demands the same precision a cabinetmaker would shoot for, only on a much larger scale. The tenons measure 15" x 5". The final step in the process is to cut a wedge-shaped batten off the mitre post. This lets one gate close tightly with its mating gate. With this cut, Adams has to compensate for ground settlement in the lock chamber itself by taking an additional, irregular slice off the timber. Being nearly two centuries old each chamber develops its own personality. The guys in the shop have learned those and compensate for them.



Rough Shape – The camber on the front faces of the gate rails are shaped on the Clarke bandsaw mill by sneaking up on the final shape. This is one of the first steps in making the gates



Helping Hand – Here, Joe Adams uses a gantry crane to roll and position the massive workpieces for shaping.

Once the rails and posts are rough-dressed, they go back in the shop where Adams and Churchill begin the layout for the mortises, sluice gates and bull nose of the heel post. The layout is finicky. There are a lot of fine measurements to take into account and the skill level required to make those measurements come to life goes beyond craftsmanship to bordering on artistry. Adams works with a standard carpenter’s framing square, tape measure and a collection of templates to set up the plunge cuts for the mortise work. He uses a pencil to mark the cuts, but Churchill prefers a pen for a more definitive line. Neither uses a Sharpie-type pen because it stains the wood. The mortise cuts are then sawn through with a plunging chainsaw. The mortise and tenon is the standard joinery on the project. Mortises are cut into both uprights and the rails all have tenons,



Trimming to Length – Scott Botham uses a Mafell Z6X Ec plunge cut chainsaw to trim the oversized timbers to finished length.



Final Shaping – The final shaping of the cambered rail faces is done with a powered hand planer.

which will be kerf-wedged in the final assembly. Because each piece weighs 2,000 pounds, it’s not possible to move them around the shop by hand. The shop is equipped with a 15,000-pound gantry crane on rails and it’s the only way to handle the work. As Adams and Churchill set to work on the layouts, Botham begins the process of planing the rails. He uses a Makita 6-3/4" plane like a scrub plane to traverse the work surface diagonally with 1/32" passes. Every few minutes he checks how flat and square the rail is. It takes him more than a week to plane and sand all the rails to shape.

Built in pairs

The crew builds two mating gates at a time. Churchill takes the lead on one and Adams does the other. The first upright posts they work on are the heel or “quoin” posts. Quoin post is an old term handed down from the earliest builders, and refers to the rounded



Quoin Post – The mortises are laid out on the quoin post and are lined up to accommodate the tenons in the rails, which still have to be cut.



Correct Curvature – The curve on the edge of the quoin post needs to be consistent and accurate. Here, Joe Adams uses a belt sander to fine-tune the curved surface.



Take the Plunge – The openings for the gate valves are made with a plunge cut chainsaw.



Templates to the Rescue – A template is used to check the shape of the quoin post while it’s being brought down to its final shape. Much of the work done in the shop is repetitive, so templates are used to speed the process and work more accurately.

shape let into the lock chamber walls in which the gate pivots on its pintles and gudgeons. To make this work, they begin cutting a bull nose. The size of the post makes it impossible to shape it in any other way than by hand.

First, they make sure the timber is exactly square before fastening a plastic template to the end. This has the precise radius drawn onto it and they use this to trace the finished round on both ends. Then, using a framing square, 45° angles are marked on the front and back face of the work which they link with a chalk line stretched end to end.

The fir is dry. This wood requires a lot of power to cut and it dulls blades quickly. Churchill takes a Makita 16 5/16" circular saw with a 60 tpi Diablo blade to cut the angle along the entire length of the workpiece. It requires strength to handle this large saw, as it weighs 32 pounds. Cutting the entire length takes nearly 10 minutes.

Once the initial angle cuts are complete, a new set of angles at 22.5° are scribed on the ends of the timber and they repeat the chalk lines. The timbers are pared down this way until Churchill can start smoothing the 16" radius of the bull nose into the work. It requires hours of planing and sanding, and checking with another template before the workpiece is as perfectly round as a dowel on steroids.

Meanwhile, Botham finishes planing the radii into the rails and begins truing the tenons up for insertion into the heel and mortise posts. With each tenon properly dimensioned, he cuts the kerfs for the wedges, then goes on to cut enough wedges for the joints.

Hardware

With the heel post done, Churchill and Adams begin setting up to inset the steel pintles and gudgeons. Using the gudgeon itself as a template, and supported by two opposing wedges, the centres are carefully marked. The retaining band that strengthens the lower end of the post is also used as its own template. Because the gudgeon is too heavy to hold up and adjust, fine tweaking for centring is done by tapping the opposing wedges together or pulling them apart until the steel sits in the correct position. Then its profile is traced onto the end of the post.



Wedges to Fine Tune Position – Wedges help the craftspeople align the gudgeon on the end of the quoin post before cutting the recessed area where it will fit into the quoin post.



Huge Tenons – Josh Bennett begins the cuts to make the huge tenons on the ends of the gate rails. These are the main joints that keep the gates together.



Sanded to Perfection – Matt Churchill checks the dimensions of the band mortise in the quoin post with a template. The fit gets adjusted with a belt sander equipped with a coarse grit belt.



Drill Out Some Waste – Joe Adams begins clearing the waste to form the gudgeon mortise on one of the quoin posts with a saw-toothed drill bit.



Make Way – Waste from the centre section of the quoin post, where the steel gudgeon will fit, is removed with a 1-1/2" framing chisel.

First, the end cut is made with a 2-1/8" diameter saw tooth bit. The process becomes more like mining for gold than cabinet making. This clears out the majority of waste wood. Hand chisels are

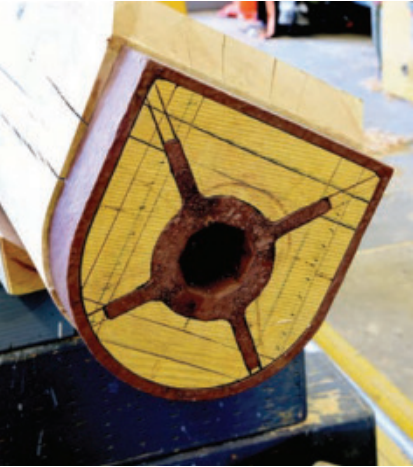


Wrapped in Steel – A circular saw is used to machine stop cuts into the end of the quoin post in preparation for placing the steel band around the perimeter of the end. This band will keep the end of the quoin post from splitting and weakening while it's in use.



Drive It Home – Using a weighted wooden mallet so he doesn't damage the gudgeon, Matt Churchill drives the steel hinge part home in the mortise that was cut for it.

used to manually pare the interior of the hole. Depth and width are measured using a combination square. With the central cavity finished, the star-like arms of the gudgeon are cut in, as is the dado for the retaining band.



The fit for these two pieces is so tight that installation is done with a sledgehammer.

Ready for Action – The hinge joint on the end of a quoin post is now complete.



Hand Tools Are Flexible – Hand tools, like when used to build furniture, are very flexible. Here, Joe Adams cuts the mortises to accept the metal railing stations in the top of the gates. These are fastened in place with galvanized bolts.



Square It Up – After removing most of the waste with a saw-toothed bit, the mortises to accept the wear bars are finished by hand with a chisel.

Once the metal work is in and the gate goes back in the water, the wood surrounding the metal will swell and lock it tight. Churchill inlays five brass strips measuring 1/2" × 2" × 6". These are rub strips that let the heel post turn freely while being held in place by a collar attached to the lock chamber deck.

Initial assemble

The gates are now ready for the initial assembly. Botham has nailed protective steel guards onto the upright posts where chains from come-alongs will be wrapped around. Then Adams and Botham start to pull the gates together using three-ton come-alongs and aided occasionally with the gentle tap of a 12-pound hammer. Everything goes smoothly until the final fractions of an inch require a more determined fitting. Out comes Bam-bam. Bam-bam looks like something out of the Flintstone cartoons, but works on the same principle as a medieval battering ram – brute force slamming against a reluctant tenon joint. The final fit is finished with three or four swings.

The earlier problem of the wrong-sized gate planks is now on Adams's plate. His solution is elegantly straightforward. Rather than whine about it, he and Botham begin milling new planking from stock they have in the yard. It takes two days to cut the planks and run them through the shop's 20" thickness planer. The final step in the process is to rout new dadoes into the planks for the steel splines. Adams attacks this job with a Makita router guided by an adjustable fence. The dadoes are all cut in a couple of hours and the steel splines driven home. Fasteners in the gates are mainly galvanized ship nails and bolts. Depending on the location in the gate, through-bolts and carriage bolts are used to fasten the hardware. None of this metal is left raw – it's painted with rust-proofing paint. The bolts are hot-dipped galvanized as well. Before the planks are set in place, the mullion blocks – the 6" verticals between the rails – and rods are inserted. These serve to stiffen things up. Planking starts from one edge – the heel post side – and is laid from the outside in. Each plank is tapped into place with the shop's ubiquitous 12-pound hammer, held there with 4' long bar clamps then fastened down with an air hammer and ship nails. The final



Wear Bars – Brass wear bars await insertion in the mortises cut into a quoin post.



Extended Life – The five wear bar mortises are now complete. When the gate opens and closes the wear bars will dramatically reduce wear on this surface and extend the lifespan of the quoin posts, and therefore the gate.



Bam-Bam – This shop-made tool – essentially a wooden battering ram – takes three men to use. It coerces all the large mortise and tenon joints to fit tight.



Chains for Assembly – Here, the crew positions the chains they will use to bring the gate together.

fastening is done with a series of L- F- and T-plates made from 3/8" steel and fastened with bolts. The last step before moving the gates out of the shop is to insert the sluice boxes. These are steel boxes inserted into the lower face of the gates and sealed with gaskets. Rods descending from the swing bar rail work the mechanism to open and close them on demand. There are two types of gates on the Rideau Canal – wet and dry. A wet gate has sluice boxes built into it and a dry gate has the sluices built into the masonry walls with a small channel feeding them rather than in the face of the gate. Geography dictates the choice. Wet gates were often used when the land wouldn't let



Final Pieces of Hardware – The steel safety rail is being installed in the hand cut mortises on the gate top.

the builders develop the necessary viaducts for the wall-mounted sluices. Wet gates are also more cost effective. The smallest gates they make in the shop each have 28 bolts while the larger units may have as many as 80 bolts to hold them together. The largest gate in the system is a 10-rail gate at the bottom of the Ottawa flight locks.

Time to move things outside

When the canal shuts down for the season Adams's crew begins the job of moving the gates out of the shop and yard to their final destinations. One set of gates is sent to Hartwell's Lock in the centre of



Tight Joints – The workers bring the parts together with chain falls and brute strength. When the process is finished, the joints fit like a glove and will only get tighter as the water swells the wood.



Ready to Travel – A finished gate awaits transport to Hartwell's Lock in Ottawa.



Easier, But Not Easy – Even with today's heavy equipment, installing lock gates isn't an easy job. This was all done by hand 100 years ago.

Ottawa. It's a stunning fall day and the work goes smoothly. First on the to-do list is de-watering the lock chamber. Emptying the lock leaves a mucky pile of zebra mussel shells that requires four trucks to haul away. Along with the shells, there's the funky odor of river bottom, but that doesn't make a difference to the hundreds of walkers and cyclists who stop by to sidewalk superintend.

The gates are delivered right to the lock and within a crane-boom span of where they will be installed. The old gates are lifted out and the gate shop boys do the final prep work by cutting a bevel on the mortise post with a chainsaw mill. The difference is the ability to adjust the cutter bar to an exact angle using a mitre gauge built into it. Adams and Bennett adjust the cut to 114° and begin to slice the batten off. Churchill follows with a broom and Botham trails him with a paint tray and roller. Everything goes smoothly and the gates are in place after four days.

Float them

Beveridge's Lock station presents a different set of challenges. The lock gates can't be delivered directly to the work site. A too-narrow gravel road barely lets the 210-ton crane pass, but its tight bends keep the gates from making it through to the work site at the second lock station. Eventually, the old gates will be cut into sections for removal.

Getting the new gates to the lock station involves dropping them into the water at the mouth of the Tay Canal, an offshoot of the Rideau leading to the town of Perth. Despite weighing nearly eight tons, the gates float with the topsides dry. A workboat and crew from one of the Parks Canada scows is on hand to tow the gates into place.

The one-kilometre trip from the drop point to the lock is a slow one. There are only the two mating gates making the trip, but Adams gets impatient with the time it takes for the first tow and begins poling the second gate upstream. It pushes along easily despite its tonnage.

The gate shop crew prepares to haul the old gates out to make room for the new ones. These gates are saturated. The crane has a weigh scale built into it and when the second gate is lifted, the news comes back that it clocks in at an astonishing 25,000 pounds. Humongous for an eight-rail gate, but it's been in the water since 1987.

The gates need to be positioned with the lower pintle inserted into the gudgeon in the quoin masonry on the edge of the lock chamber. Then they're fastened into place using the collar that was let into the top end and attached to the spider (a steel retainer set into the masonry) so the gates can swing freely.

Once the gates are fastened in place the swing bar is dropped on. These bars are wider and have multiple purposes. They act as a walkway across the top of the gates, and are hosts for the controls that operate the underwater sluice machinery that opens and closes to let water in and out of the lock.

Along with the Tay Canal, the Rideau has 47 locks in 24 stations. The job of maintaining and replacing gates is ongoing throughout the year. It's a highly skilled job that can only be learned by doing it under the guiding hand of a veteran lock gate carpenter. As it stands now, Joe Adams and his confederates in the Parks Canada Gate Shop are keen to continue to pass that tradition on to the craftspeople who will come next.



Paddle it Home – Joe Adams poles one of the new gates along the Tay Canal to deliver it to Beveridge's Lock.



Final Resting Place – Matt Churchill and Josh Bennett drop one arm of the Beveridge's Lock gate into place.

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19 Tips for better Drywall Installation

Photos by Rob Brown

Installing drywall isn't the hardest job in the world, but it takes time. With these tips you'll move along efficiently and be choosing paint colours before you know it.

BY ROB BROWN

A bit of drywall knowledge will go a long way. So will a helper. Having extra hands around when installing drywall is a huge help. If installing drywall is new to you, or you just don't feel confident in your skills, you might want to choose a partner who knows a bit about the process.

These tips won't make installing drywall on a cathedral ceiling super easy, but they will go a long way when it comes to standard wall or ceiling drywall installation.

1. Start with a clean floor

It's sometimes helpful to lay sheets of drywall on the ground to measure or cut them. If there's even one screw on the ground it will make a dent in the drywall. Even if it is on the back face of a sheet, it will cause a weakness in the sheet. Keeping your work area clean is good practice anytime, but especially so when installing drywall.

2. Drywall the ceiling first

Installing drywall on the ceiling is the hardest part of the job, but the reason to start at the ceiling isn't just to get the trickier part out of the way. If you install the ceiling first, the wall drywall can overlap it when it gets installed. You can butt the wall drywall up to meet the ceiling, leaving a gap at the floor. The gap at the floor will be covered by baseboard, so that's not a problem.

Also, when you install drywall on the ceiling there will be sections between joists that aren't screwed in place. Butting the wall drywall up to the ceiling drywall will help support the unsecured ceiling drywall.

3. Consider getting a second pair of hands

As I mentioned before, a second set of hands can help, especially when it comes to the ceiling. It can sometimes be a challenge working around someone's schedule, but doing so even if it's just for the ceiling portion of the job will lower stress levels and leave you with a better result. If after the ceiling is done you want to work solo that's your choice.

4. "Like" edges go together

The two long edges of a sheet of drywall are tapered in thickness. This taper starts about 2" away from the long edge and reduces the thickness of the edge by about 1/8". This is so when the tapered edges on two sheets of drywall meet it will be easier to tape and mud, creating a smooth, invisible joint.

A joint is easiest to mud when two tapered edges meet, but that's



Keep It Clean – Screws, nails and other items laying on the ground will damage drywall and slow the process. Even tools left on the floor can cause drywall to break if a sheet is laid on top of them.



Start Up Top – Cover the ceiling with drywall before moving to the walls. Wall drywall will help cover up some of the gaps around the perimeter of the ceiling during the difficult portion of the job. Wall drywall will also assist in supporting the ceiling drywall around the perimeter of a room.

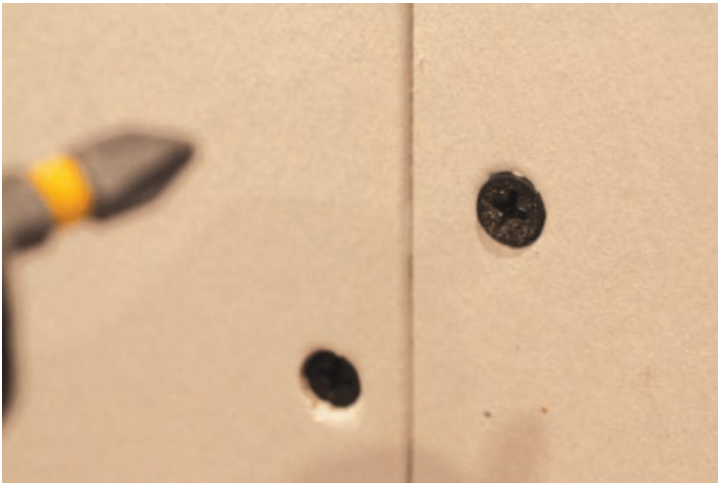


Tapered Edges – The two long edges of drywall taper by about 1/8" over 2". This is so the main drywall joints are easier to fill and smooth out after installation. Factory tapered edges should generally go side by side, and any edges you cut should also be placed side by side, if possible.

not always possible. Whether it's to reduce waste or because you need to butt the 4' wide edges of drywall together (very common on a ceiling) you'll have to deal with joining non-tapered edges eventually. Mudding and taping is easiest when you butt either two tapered edges together or two non-tapered edges together.



A Few Pencil Marks – Adding a few pencil marks to a piece of drywall before it goes up will go a long way in helping you get the first few screws in place to secure the sheet. This is especially true when working alone.



Just Right – Driving screws too deep will weaken their ability to hold the drywall in place. Driving screws not far enough will cause problems with mudding, priming and painting.

5. Mark sheets with stud lines

Making a light pencil mark on the piece of drywall you're about to install makes it easier to locate the studs once the sheet is against the wall or ceiling. This is especially true when you're working alone. Having a few studs located when you're balancing and positioning a large piece of drywall is tricky enough. Trying to guess where a stud is makes the process even more frustrating and difficult.

You don't need to mark all the studs; a few main studs or other framing members will likely do. This can also be very helpful around windows, doorways or other unique areas of framing.

6. Start screws before lifting a sheet into position

Very helpful when you're working alone, this tip is also helpful for when the area where you're going to install a specific sheet is tricky, for whatever reason. Working in a stairwell, around windows or on a ceiling might make a piece of drywall challenging to position and secure. If three or four screws are already started in



Trim After – Installing a sheet of drywall, then cutting the window and door openings, is often the easiest approach. There's a much lower chance something will go wrong this way, whether that's the sheet breaking during installation or you cutting the opening in the wrong location.

the drywall before you lift it into place you won't have to fuss with fiddly screws or where they should be driven.

7. No protruding screws

A drywall job means you'll likely drive a thousand screws or more. Each screw is a small area that will have to eventually be filled and sanded down the road. A screw head that's seated just below the outer surface of the sheet of drywall is fairly easy to fix. A head that's protruding 1/32" above the surface or even perfectly flush with the surface is going to provide you with nothing but frustration in the future. Once drywall mud covers it, you'll eventually sand the dried mud off, revealing a shiny head. Paint will never fully hide it and that screw will stick out like a sore thumb until it's fixed.

On the other hand, a screw that's been driven too deep, and has broken the paper face of the drywall, will be weak and may let go of the drywall down the road. This is where a happy middle ground is best; not too shallow, not too deep. I'd aim for about 1/16" below the surface of the drywall. Most drills and drivers have a chuck that adjusts to limit torque, so experimenting on a scrap piece may give a setting that stops driving at the desired depth.

If your plan is to fix all the protruding screws before mudding that will take a surprising amount of time. While you already have the driver bit in the screwhead do yourself a favour and sink it properly the first time.

And while we're on the topic of drywall screws, make sure they are driven perpendicular to the drywall's surface, or one side of the head could be too deep even though the other side is still proud of the drywall's surface.

8. Screw depth: the exception to the rule

When driving the first two or three screws of a tricky sheet you might want to temporarily leave their heads slightly above the surface of the drywall. Somewhere around 1/32" to 1/16" will do. This will provide a bit more strength to support the entire sheet until you're able to sink a few more screws and be sure the sheet is



Close, But Not Perfect – When installing drywall you need to be close, but perfection isn't needed. In fact, using tolerances that are too tight can get you into trouble. Any closer around this outlet might have caused the sheet to crack.



Cut, Don't Rip – This outlet was cut a bit too tight and when the sheet was pressed in place a small piece broke, which in this case isn't the end of the world. Resist the temptation to pull the broken portion off, as it will likely cause the problem to get bigger.

going to stay put. Just make sure to return to those first few screws and drive them home properly.

9. Install drywall, then cut door and window openings

Cutting weird openings into drywall before you install it can make it very weak, causing it to break as you position it. Leaving a sheet whole (or mostly whole) will allow you to fasten it to the wall safely. As long as you know where the general opening is, you can cut into it and remove the waste after the sheet is fastened to the wall. An oscillating multitool is great for making these sorts of cuts, as you can even run it along the stud or other structural material surrounding the window or door opening. A simple drywall saw will also do the trick.

10. Make notes

Speaking of making note of where openings are, one great way to remember where studs, openings or other important things are is to write them down on a piece of drywall scrap. Sooner or later you'll have scraps around so use them to jot down a few basic measurements in trickier situations. Often studs are easy to find, but when working into corners or around window and door

openings it's best not to trust your memory.

This approach can work wonders even before a sheet is installed. While it's on the ground waiting for an outlet hole to be cut, take a few measurements where the box is located, then bring the scrap to the sheet and locate it on the sheet before cutting.

11. Perfection isn't necessary

Some tasks require tight tolerances. Drywall isn't one of those jobs. It's rare you have to be overly accurate, and doing so only slows you down. Being too accurate also leaves the door open to having to shave 1/8" of material off a piece of drywall for it to fit properly. Tape, drywall compound and other drywall accessories allow you to cover up any small gaps later in the project. Knowing how accurate you need to be is the difference between constantly being frustrated about having to recut something and having the project move along nicely.

12. Don't force it

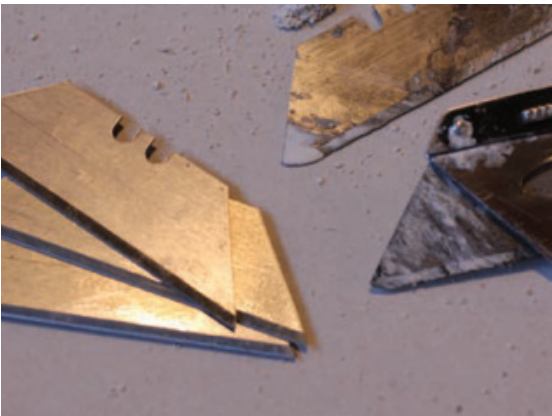
When you've cut your electrical outlet opening and have the sheet in place, don't press the sheet into place with excessive force. If the sheet isn't going into place against the studs properly, remove the sheet, double check your box location and make any adjustments before putting the sheet back into place. Often the opening was cut even just 1/16" too small or to the side, causing problems. Forcing it into place will usually result in a crack and a much larger problem that needs fixing.

13. Don't tear the paper

Whether it's the area around electrical outlets, windows and doors, or even at the edge of a sheet that was cut, resist the temptation to tear any loose drywall facing off the sheet. It will almost always run into the sheet of drywall, rather than towards the edge, causing more problems down the road. Use the same knife you've been using to score the drywall to remove that piece of drywall facing that's taunting you.

14. Keep it sharp

Maybe it goes without saying, but a sharp knife is going to work a lot better than a dull one. It will also reduce frustration and time wasted. Either keep extra blades nearby to make a quick change when needed, or simply snap off the dull portion of the blade and expose a new, sharper edge. A new, sharp blade will immediately bring a smile to your face, not to mention speed up the task and improve the quality of your cuts.



Sharp Point – A sharp knife will go a long way to ensuring clean, accurate cuts.



Start Small – Use a narrow drywall knife to apply the drywall compound to the clean joint. A wider tool will help you even out the inconsistencies after a coat or two has been applied.

15. Don't overlap joint tape

It can be very tempting to run the vertical and horizontal tape over each other, but that will create a thicker area of the joint that's more difficult to cover up and prepare for primer and paint. Run tape in one direction (across or up and down the wall) then apply tape in the other direction, stopping to cut this piece of tape when you reach the first piece of tape.

16. Narrow to wide

When applying drywall compound (also called "mud") to the joints, start with a narrow drywall knife (4" will likely work well) and with future coats increase the width (up to about 12" wide). This will allow you to fill most of the joints at the start of the process with the narrower knife, then feather the edges of the joints with a wider knife at the end of the mudding process.

17. Not too much mud

The point of mudding is to level the joints and create strong joints for priming and painting. Don't leave excessive mud on the wall when mudding, as it will only have to be sanded off, creating more dust and taking more time. It might also cause you to run out of mudding compound prematurely. Like screw depth, there's a happy medium when it comes to how much drywall compound to use. It might take some time to figure that out, but for now know that more isn't necessarily better.

18. Mudding is a process

Don't get the idea in your head that you can fill the entire joint in one pass. You will either apply so much drywall compound that it will crack as it dries, won't dry properly or just take ages to dry. It also just simply won't fill the joints flat and prepare them for paint. Even the best drywallers take a few steps to mud the joints. Three application stages is something to aim for, but if you need another pass or two of mud that's not a problem. Think of mudding like applying a quality finish to a piece of furniture; you generally need a few coats of proper thickness, rather than one extra thick coat, to give you a lasting finish that will



Many Applications – This photo was taken late in the process of applying drywall compound. It's hard to tell in this photo, but the wide seams are flat and even and there's not a lot of excess compound on the wall. Less drywall compound means less sanding, less dust and being able to move to the next step more quickly.

look and feel good. Making sure the joints are invisible now will pay off down the road with a job well done.

19. Prime, then check

After you finish the task of drywalling, and you return from the paint store, apply a coat of wall primer. When dry, go over the wall with a portable light to check for any dings, cracks and other imperfections so you can patch them. The slight sheen of the primer will help you find the areas that need a touch of drywall compound before you apply the paint. This is also a step that can be taken before applying the primer.



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Photos by Rob Brown Illustration by Len Churchill

Removeable Tray Top

Teak Patio Table

Teak—known for its ability to stand up to the elements—coupled with this classic design will create a set of tables you can enjoy for decades to come.



BY ROB BROWN

When designing these tables I started off by determining the size I needed for our patio. Width, depth and especially height are all specific to your needs and can be adjusted. I wanted each table to be just a bit lower than the arm of our Muskoka chairs.

I put together a full-sized drawing of the table's front view, made a few tweaks, then set to work on a full-sized maquette. My 11-year-old son and I used 2×4 material to build the table as it was drawn. After looking at it from all angles, and testing it out in the yard, we made a number of changes. I decreased the height by 1-1/2", made the legs narrower, reduced the width of the top frame, added gentle round overs to the legs and lower stretchers, and thinned out all the parts for a more refined look. I updated my full-sized drawing so I could refer to it during the build. With all the angles and tapers to this table design, the drawing increased my accuracy and ensured minimal waste. When dealing with a valuable wood like teak the last thing I want to do is waste wood or end up with an ugly piece of furniture.

I ordered my teak through Mys-Teak.com. They provide sustainably grown plantation teak from Costa Rica and oversee the entire process from planting and nurturing the trees to sawing and shipping. All of their teak is FSC certified. It was shipped by CWP Architectural Lumber in Mississauga, Ontario, one of their Canadian distributors, so it arrived quickly and without high shipping costs.

Working with teak

Teak is extremely weather, water and pest resistant, making it great for outdoor projects. Teak's high oil content helps it stand up to the elements over time.

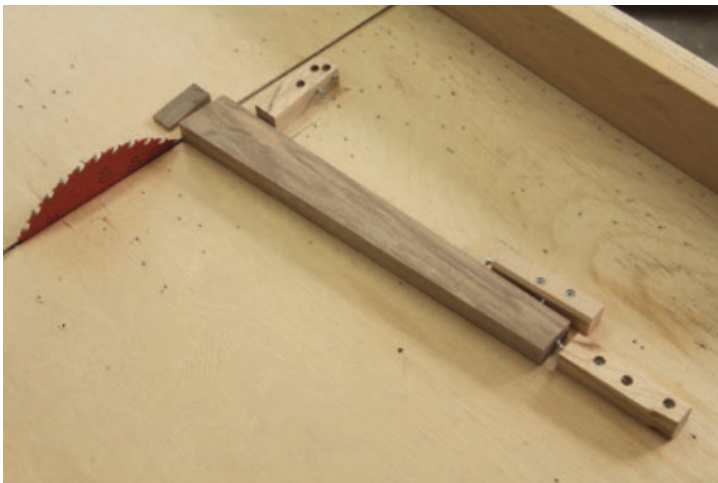
In terms of its workability in a workshop setting, the teak I used was an absolute joy to deal with. Carbide tooling had absolutely no trouble with this tropical hardwood, though I've heard



Make a Mock-Up – Brown started by making a full-sized model of the table so he could get a better idea of proportions and dimensions. Although the model was close to what he wanted, he made a number of small adjustments to it before cutting into the teak. This ensured valuable material wouldn't be wasted.



Taper the Legs – After working directly from the full-sized drawing, and marking the taper on one of the legs, Brown fixed some stops to his crosscut sled and machined the tapers.



More Angles – Stops with screws in them make it easy to adjust the angle of the workpiece to hone in on the correct angle. This same process is repeated to cut the angle on the other ends of each leg.

Gluing Teak

Since teak is oily, special care needs to be taken when gluing it. Glued properly, a teak joint will be stronger than the teak wood itself. Due to its oil content, wipe teak with acetone and allow it to dry before gluing. This takes very little time, as acetone evaporates quickly. The acetone will remove much of the oil right at the surface of the joint and allow the adhesive you use to adhere to, and often penetrate, the wood.

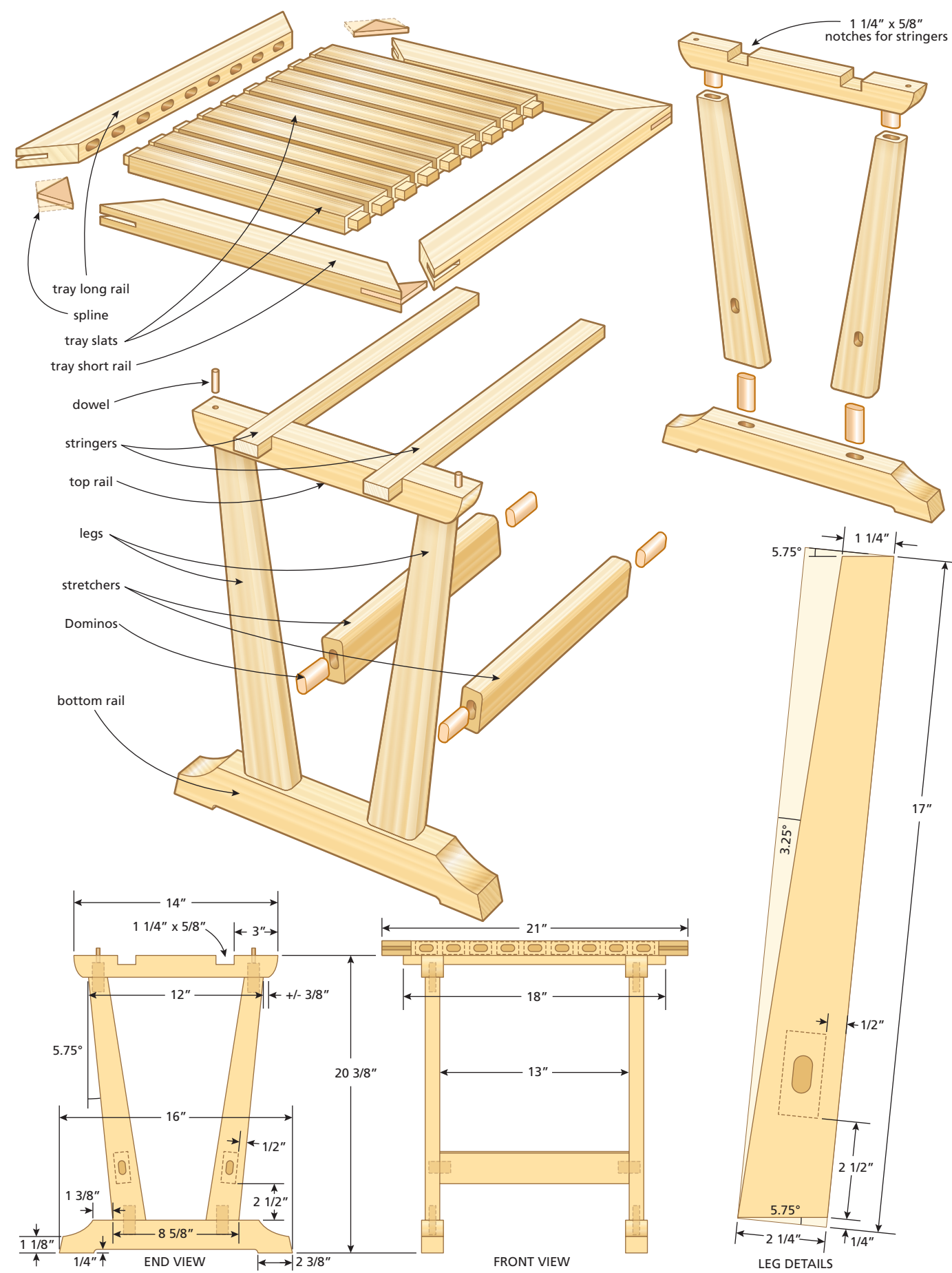
Adhesives need to be considered as well. Titebond III is what I used for these tables, though Gorilla Glue, Titebond II and epoxy also work well on teak. If you use teak for an exterior project like this table, make sure to use an adhesive that will stand up to water it will be exposed to.



Testing, Testing – Brown glued together a bunch of teak offcuts, let them dry overnight and did a quick test. Half of the joints were wiped with acetone before they were glued, while the other half weren't wiped with acetone. He used Titebond III for this test. Here Brown taps them with a hammer to see how easy they are to break and where the fracture occurs.



Telling Details – The batch that wasn't wiped with acetone (left) all broke directly at the glue line. The batch that was wiped with acetone didn't fail at the glue line. In these cases it was the teak wood that failed (right). This doesn't mean teak is weak, it means acetone helps creates a glue joint that is stronger than the wood surrounding it, as is the case with virtually all other woods.



Materials List

Part	Qty	T	W	L	Material
Legs	4	1	2-1/4	17	Teak
Top Rails	2	1-1/2	1-1/2	14	Teak
Bottom Rails	2	1-1/2	2-1/4	16	Teak
Stretchers	2	1	2-1/8	13	Teak
Stringers	2	5/8	1-1/4	18	Teak
Tray Long Rails	2	1	2	21	Teak
Tray Short Rails	2	1	2	16	Teak
Tray Slats	9	7/8	1-1/2	12	Teak

teak can wreak havoc on high-speed steel tooling. The specific gravity of teak is 0.55 g/cc. For comparison's sake, teak is slightly harder than black cherry but much less dense than hard maple.

Breakout

I planned this stage much more thoroughly than I usually do. Not only is teak not cheap, but it's such a beautiful and valuable wood I wanted to make sure I ended up with as little waste as possible. I used chalk to mark and label the parts before breaking them out and dressing them to dimension.

Legs first

The legs are tapered, so I broke out one blank for each pair of legs, then marked

an angled line on the blank and cut the two legs to rough size on the bandsaw. Next, I cut the legs to a constant length that was about 3/4" longer than the finished leg. You need to do this because when cutting the tapered side of each leg, as well as the angles on both leg ends, it's much easier if the leg blanks are all the same length. I used my crosscut sled, equipped with a few stops and hold downs, to taper the legs. Since the two long edges of the legs aren't parallel you need to reference off the correct side while cutting the angled side and ends on the legs. What side you use doesn't matter, as long as you set up the angled crosscuts properly. With all the legs tapered, I adjusted the stops on my crosscut sled to first cut the



Use the Drawing – The full-sized drawing will allow you to more easily work with the angles that make up the base of this table. Here, Brown marks the location of the mortises in the legs and upper / lower rails.

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first end of the leg to the correct angle, then readjusted the stops to cut the other end. I used my full-sized drawing to obtain all these angles, though you can refer to the illustration included in this article.

Top and bottom rails

I cut these parts to length, but left the ends square for now, as that was easier to machine joinery on. I used my Festool Domino XL to machine 12mm slots in both the legs and top / bottom rails. If you don't have a Domino there are many other options when it comes to joinery. Hand cut or routed mortise and tenons or a few 3/8" dowels at each joint would all work well.

With the leg-to-rail joinery cut it was time to machine two notches in the upper edges of the top rails. These notches will accept the upper stretchers once the table is assembled.

Mark and shape the ends of both the top and bottom rails. The underside of the bottom rails gets relieved in the centre of each workpiece.

Stretcher joinery

I used my Domino XL to cut mortises in the faces of the legs to accept the lower stretchers after the first sub-assembly was complete. Depending on how you're cutting these joints it might be easier to do that now. In hindsight, it would have been easier and more accurate for me to machine these joints before I completed the next step, rounding over the four edges of the legs.

With the leg joinery complete you can ease their four edges with either a 3/8" or 1/2" radius round over bit. Even a 1/4" radius bit will provide a softer look and feel if that's the only size you have.

First sub-assembly

At this point you can break the edges on these parts, sand their surfaces and prep for assembly. A quick wipe with acetone is needed. I used a thin piece of wood wrapped in a piece of cloth that was soaked in acetone to get inside each mortise. Each mortise only takes a few seconds, as it doesn't need much scrubbing. After a dry run to ensure the parts fit nicely, cover the joints in glue, bring the parts together and use clamps to seat the joints. Set each assembly aside to dry.



Add Curves – After sketching a rough curve onto the lower rails, Brown uses a French curve template to refine the curve before cutting it on the bandsaw and sanding it smooth.



Time for Joints – Brown used his Festool Domino XL to machine the mortises in the legs and upper / lower rails, but there are many other ways to machine this joint.

Stretchers and stringers

Rip the stretchers to final width, cut them to length, machine the mortises in their ends and round over their four edges. Next, cut the upper stringers to size and ensure they fit into the notches cut into the tops of the upper rails. It's also nice if you shape the ends of the upper stringers, rather than leave them square, for aesthetic purposes.



Notch the Top Rails – Notches in the upper surface of the top rails will accept the stringers.



First Sub-Assembly – Bring the legs and upper / lower rails together with glue and clamps.



Mortises for the Slats – A Festool Domino makes quick work of the mortises, though a router can also be used. Even dowels would properly secure the slats to the mitred frame. Brown carefully marked each mortise with pencil.

Tips and Techniques

Machining a keyed mitre joint

Mitre joints have a clean, tidy look to them. The main downside is their strength, which is less than a standard edge joint or mortise and tenon joint. This may not always cause problems, but when more strength is needed you can add solid wood keys to the mitre joint. Essentially, a groove is cut into the mitre joint then a strip of solid wood is inserted and glued into the groove. When dry, the waste is removed. This adds face gluing and mechanical strength to the joint. It also allows you to use a contrasting wood for a unique look if that approach fits the design of the project.

To cut the groove, make a simple jig that slides along the rip fence on a table saw. The key is have the jig sit stable at 90° to the blade to allow the user to push the jig and workpiece across the blade. The fit of the jig to the fence needs to be snug, but not so tight it's hard to move.

Although you can easily use a hand saw or bandsaw to take off the key waste, if you have enough to do it's worth a dedicated setup. Clamp a plywood sacrificial fence to the rip fence so it sits above the table saw's surface at slightly less than the thickness of the workpiece you're going to machine. This tray is 1" thick, so Brown left a 7/8" gap between the table saw's surface and the plywood fence. Next, adjust the rip fence so the left face of the plywood is flush with the left edge of the blade's teeth. Adjust the height of the blade so it cuts off the keys and run the parts past the blade.



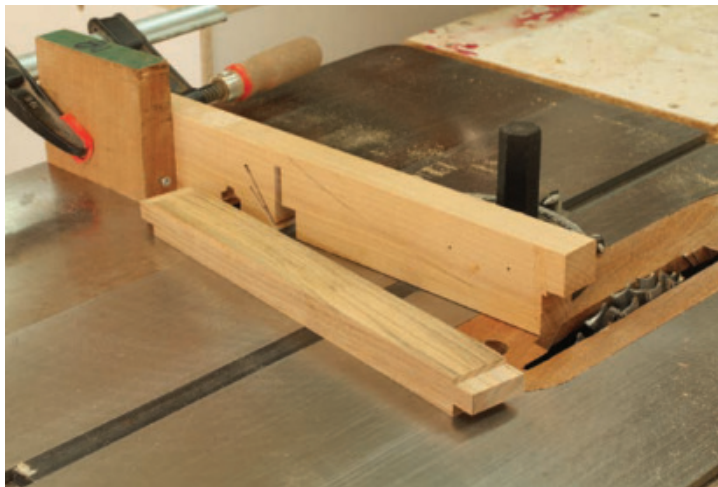
A Key Jig – A simple jig, consisting of the main plywood surface, a few pieces of material to guide the base on a table saw's rip fence and a pair of fences fixed to the base forming a 90° angle will assist in cutting the grooves to accept the keys.



Cut the Grooves – With the workpiece sitting in the jig at a 45° angle to the surface of the table saw, the workpiece can be run across the blade to produce a groove for the solid wood key.



Trim the Keys – A sacrificial fence, clamped to the fence so it sits just above the table saw's surface, will allow you to quickly and accurately trim multiple keys flush to the edge of the workpiece.



Slat Tenons – By using a stop block with a screw that will reference off the ends of each slat, Brown was able to set up the position of that screwhead stop once and machine all the shoulders and cheeks. The only adjustment needed was to raise or lower the blade depending on whether he was machining the upper face, lower face or sides of the slats. Machine these tenons so the upper face of the slats finishes flush with the upper face of the mitred frame.

Final assembly

Dry fit the stretchers and stringers with the sub-assemblies to ensure everything fits. Wipe the joints with acetone and apply glue to the mortises and tenons before bringing the parts together with clamps and ensuring the assembly is square.



Cut the Tenons to Width – Although the mortises have round ends, the tenons can finish with square ends. Machine the tenons to width so they fit in the mortises nicely.

Build the tray

This is just a mitred frame with slats between two of the long frame members. Again, I used my Festool Domino XL to join the slats and the frame, though dowels or routed mortise and tenon joints are also fine options. A lot of strength between the slats and frame isn't needed, though strong mitred joints are necessary.

Start by machining the frame members to size and mitring their ends. The length of the slats needs to be considered fairly carefully. The distance between the shoulders of the slats needs to be equal to the distance of the short edge of the shorter frame members. If the slats are even 1/16" too long the frame mitres won't fit together accurately. It's possible to use a couple dowels or floating tenons to join the slats to the frame, as opposed to machining tenons on the ends of the slats.

I opted for tenons on the ends of the slats that fit into the Domino mortises in the frame, which meant I had to machine the slat tenons carefully so the distance between the shoulders was equal to the shorter edge of the short frame members. I machined the slats and cut the tenons on their ends now.

I routed a large round over on the bottom two edges of the slats and a small round over on the top two edges. A dry run ensured all the slats fit into the mortises. I had to use my shoulder plane to fit some of the tenons. All the parts were sanded before the tray was assembled.

When dry, I added a 1/4" thick key to the mitre joints for some added strength. I used a jig on my table saw to cut the kerfs, then dressed a length of teak, cut triangular pieces from it and glued them into the kerfs. Once dry, I trimmed them flush and routed the underside of the tray edge on all four sides. I also added a finger groove for grasping the tray. Once I chucked a round bottom bit into my plunge router, I used a simple straightedge to guide the router. A stop block was added to either end to limit the travel of the router. A few passes made short work of each groove.

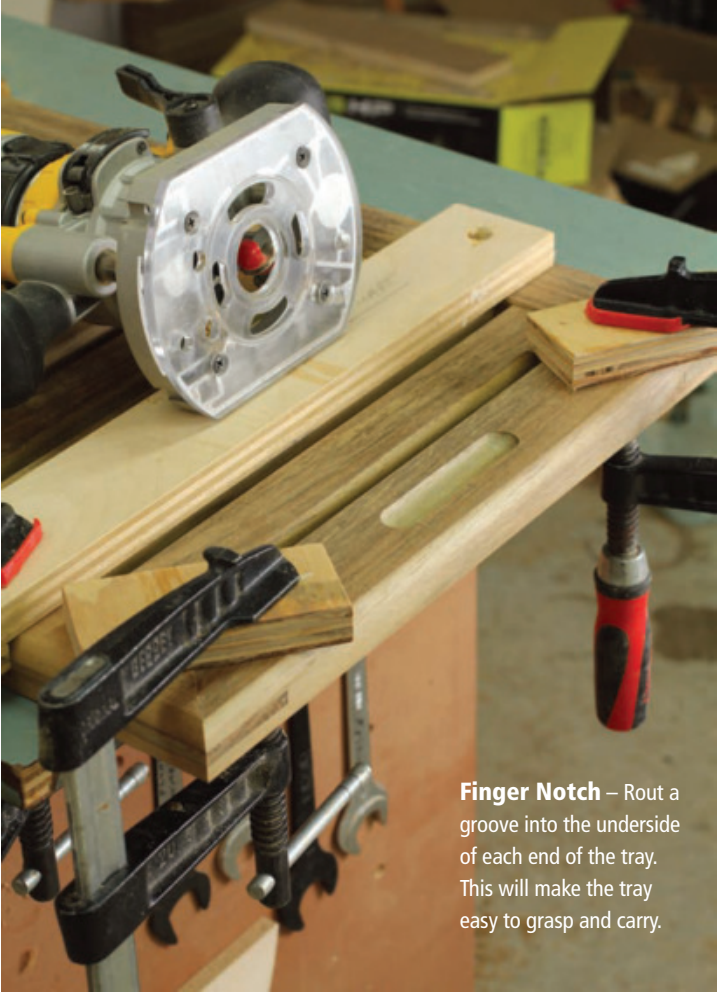
Dowels were used to keep the tray in place. I tried to ensure they were in the perfect position so the tray could be installed in either direction, but to be honest I wasn't close enough. (I'll get to how I sorted that out shortly.) I marked four holes in a sheet of plywood that were square and aligned with each other. I drilled them out on the drill press, then used that plywood template to



Dry Assembly – Test the fit of all the slats in the frame members and mark the slats accordingly. Very light hammer taps should be enough to seat the slats in their mortises.

bore four holes in the upper rails. I ensured I didn't drill too deep by using a stop that limited my travel. I made a length of 1/4" diameter teak dowel rod and cut pieces to length, then chucked them in my drill to heavily ease one end of each shorter section. This would allow the tray to be placed more easily. I then glued them in place. I used the same plywood drilling jig to bore four holes in the underside of the top.

After checking the tray in both positions, I realized it fit nicely one way, but it stuck slightly the other way. To compound this



Finger Notch – Rout a groove into the underside of each end of the tray. This will make the tray easy to grasp and carry.



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Square Template – To ensure the dowels are in the correct position, Brown made a plywood template to assist with boring all the holes in the two tables he made. It might be just as easy to drill them without the template and mark the tray and base so you know how the tray should sit on the base.

situation for me was the fact that I built two tables, and the trays fit best in only one orientation of one table. Rather than have to fight with it for the rest of my life I carved one small notch into the underside of one of the handles, then added one notch to the top of the table, on the same side as the notch in the tray. Now, while holding the tray I'll be able to feel what side the notch is on, then see the notch on the table to position the tray the proper way. I added five notches to the other table and tray. Different numbers of notches in the two tables allow me to easily tell with my fingers what tray goes with what table.

Applying a finish

The folks at Mys-Teak gave me some tips about applying a finish. Although many finishes will work well, if I wanted to ensure the teak didn't turn silvery grey after a few years the best approach would be to use teak oil to finish the table. Other finishes wouldn't keep the natural colour of the teak as well as teak oil does. There's nothing wrong with teak turning silvery grey, but I was trying to keep it more natural looking. Another tip Mys-Teak told me about was to put the finished table in the sun for a while before applying a finish. Teak naturally comes in a variety of tones but the sun will not only even this out, but add a rich honey brown colour to the wood. Even a few hours in the sun will make a difference. Once a finish is applied (especially teak oil) the sun's rays will have less of an



Add Some Notches – If you make more than one of these tables, do yourself a favour and carve some notches into the underside next to the handle and add matching notches on the top of the base. This will allow you to tell what tray goes where while carrying drinks and snacks to the patio.

effect on the colour of the wood. The application process was fairly straightforward. I used a rag to apply the teak oil on all the surfaces of the table. I also used a small brush to get into the corners. These two techniques were used interchangeably. While working, I wiped off any excess oil after a few minutes. Timing isn't crucial while working with a penetrating oil, which reduces my level of stress while finishing. A couple coats were added, and then left to properly dry for a few days before I put the table out in the yard, beside our Muskoka chairs.



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BUILDING OUTDOOR WOODWORK TO RESIST ROT

BY CHRIS WONG

While it's true that trees thrive in the great outdoors, the material woodworkers know and love isn't perfect for living outside. Wood used outdoors needs to be carefully protected if it's going to last, because its one big enemy is rot – something indoor wood doesn't usually face.

While many of the tools, techniques and materials used to create outdoor furniture and structures are the same as those used in making indoor woodwork, there are some differences that must be respected in order to ensure it has a long life.

What causes rot?

To prevent rot, it's important to know what causes it. Rot is an advanced level of decay that can be identified by discolouration and softening of the wood. It requires four elements to develop:

- 1. Oxygen** – approximately 20% (this is why waterlogged wood does not rot)
- 2. Temperature** – somewhere in the range between 4° and 40° C, with a prime range between 24° and 32°C

3. Moisture – at least 20% moisture content, with around 30% being the sweet spot which is at, or slightly above, saturation point of the wood fibres so the cell walls are saturated but the cell cavities are practically empty

4. Food (cellulose for brown rot, cellulose and lignin for white rot) – the sapwood of most species of wood is a good food source and isn't very resistant to fungi, and the decay resistance of heartwood varies widely from species to species

By removing any one of these four requirements, rot progress is prevented and the fungus goes dormant. However, if at any time all four are present, decay will pick up where it left off and advance.

How can we prevent rot?

Option 1: Reduce oxygen to less than 20%

Unless we're building furniture for use below the waterline or outer space, this is very difficult and not at all practical. Even a carefully selected and applied finish will not stop oxygen from getting into wood.

Option 2: Keep temperature below 4°C or above 40°C

If you happen to live in a part of the world where it never gets above 4°C or below 40°C, it may bring you a little slice of happiness knowing you don't need to worry about rot. But for the rest of us, we shall keep looking for a good rot prevention method.

Option 3: Guard the food source

The heartwood of most species is naturally more decay resistant, so avoiding the use of sapwood can be a good starting point. The heartwood of some species is more resistant to rot than others, containing extractives that are either repellent or toxic to fungi. Many oily or exotic woods, such as cedar, redwood and teak, fall into this category, as do some hardwoods we are all familiar with such as black walnut and white oak. Some common woods with little or no resistance to decay include beech, birch, ash, hemlock, ponderosa pine, red oak and maples.

Unfortunately, not all of us have the budget or desire to use black walnut or teak for our outdoor projects. Applying a chemical wood preservative to wood can be an effective way to deter decay. There are numerous options, but the most important thing to understand is that penetration is key because if the preservative doesn't penetrate, it doesn't protect. Some species of wood are more receptive to this sort of treatment, and end grain absorbs more readily than long grain. We can buy pressure-treated lumber at lumberyards in which the chemicals have been forced into the wood by positive pressure or vacuum pressure. Wood preservative is also available for application by brush, dipping or soaking.

Whether you buy pressure-treated lumber or treat it yourself, it's vital to apply wood preservative to any surfaces that are cut, drilled or otherwise shaped since penetration is usually limited to the outside 1/4" or less and any machining you do to the lumber is likely to cut through the preserved wood. Remember to treat the wood before it is put in place; getting preservative into joints and around screws and bolts is extremely difficult at best.

One last note: even wood that has been carefully treated with a preservative is rot resistant, not rot proof.

Option 4: Keep moisture content below 20%

Keeping wood below 20% moisture content is an effective way of preventing rot, which is why rot is not usually an issue for interior woodwork. This is the most effective way to prevent rot and what we'll focus on below.

A quality exterior finish will go a long way to keeping moisture out of wood's pores, but it won't form a true waterproof barrier between the elements and the wood so other techniques should also be used. Also, even the best exterior finishes wear off and expose wood to moisture. Reapplying a finish when necessary will go a long way to protecting the piece of woodwork from the elements.

For items like patio furniture, the best way to make them last is to bring them inside or keep them sheltered during the wet season. Outdoor structures like decks, stairs, planters and pergolas need to stay outside for obvious reasons. They require different techniques to keep the moisture content down. Rain will increase the moisture content of the environment and everything it falls on. However, most exposed surfaces will dry quickly enough that decay is unable to make much progress, so fortunately putting canopies over all woodwork isn't necessary.

What we do need to be aware of are areas where water sits, or is trapped, allowing more time for it to absorb into the wood. Trapped

How Destructive Are UV Rays?

The ultraviolet portion of the solar spectrum degrades wood. This process is called UV weathering and will wreak havoc on the wooden projects we make for the great outdoors. The sun's rays mainly damage the organic polymer between the walls of the wood's fibres. This process causes the fibres to lose structural rigidity, and then they decompose. Once the wood breaks down, the finish that's on the wood will crack and degrade, allowing moisture to get into the wood and cause rot. A specialized finish that will stand up to UV rays is critical in preventing the finish from breaking down and exposing wood to even more moisture.

There are many exterior finishes on the market. Evo Home Finishing has a product called Uvio, which is part of their Ligna product line. It's an anti-UV primer that delays the effects of sunlight on wood. This is a colourless product and must be top coated with a water-based finish. They recommend applying their Hybri-Deck, which is a water-repellant penetrating oil, on top of the sealer for maximum protection. Hybri-Deck is available in a wide range of colours. Visit EvoFinition.ca/en/ for more information.

Livos Canada has a couple of exterior products that will go a long way to protecting exterior structures and woodworking projects from UV rays. Alis Decking Oil and DonnosOutdoor Wood Oil are both formulated to stand up to the elements and are available in a wide range of colours. Visit Livos.com for more information.





Naturally Resistant – Teak (top), cedar (middle) and white oak are all species of wood that are naturally very resistant to rot. Using these woods doesn't mean you can design a piece poorly, but they will certainly give you a leg up compared to most of the other woods on the market.

water is harder to see and to remove, so the key is to anticipate where it may occur and address it in the design phase. Two 2x4s ganged together may be cheaper than a 4x4, but they have a lot of potential to trap moisture between the two pieces. To prevent or reduce pooling water, slope horizontal surfaces by at least 1° and position any cupped boards cup-side down. In cases where pooling water can't be avoided, such as on deck joists, apply a metal or elastomeric sheathing prior to laying decking. Applying a water-repellent finish is a great way to reduce moisture absorption.

When laying decking consider that wide gaps allow tree debris to fall through more easily than narrow gaps, and don't butt the ends of boards tightly together. Be careful when screwing down deck boards because overdriving a fastener will dimple the wood, leaving a cavity in which water can pool. Consider attaching boards from the edges or from below to prevent this problem. This also creates a longer-lasting, aesthetically pleasing deck without any visible metal fasteners on the top surface to burn unsuspecting bare feet on hot summer days.

In addition, plants and debris on wood surfaces tend to attract and hold moisture. Elevate plant pots off decking with feet, and



Treatment Options – There are many factory treatments for woods that will increase their ability to remain rot free for years to come even though they're outdoors.



Cut and Paste – Once mitres were cut in the ends of these deck boards the cuts were treated with preservative to slow rot.

don't let vines or other plants grow on wood structures, unless that's their purpose, like a trellis. Line wooden planters with a barrier to keep wet soil away from the wood and place them on gravel or concrete instead of directly on soil. Capping posts can be an effective way to shed water and has the added benefit of covering the end grain which absorbs water more quickly than long grain. Don't forget that the bottom of posts will



Not Too Deep – When screws are driven below the surface of the wood the resulting cavity is great at collecting water and bringing it into the wood, increasing rot. Screws driven so their heads are flush with the outer surface of the wood reduce the chance of rot.

also readily absorb water, so it's best to keep them elevated off a surface that can hold water by using pier blocks or gravel, for example. If you're building outdoor chairs, cabinets, planters or other woodwork consider adding a metal or plastic foot to the underside of any wood that comes in contact with the ground. This will greatly reduce moisture wicking up the end grain and encouraging the rotting process. Although there are many uncontrolled variables outside, building outdoor furniture and structures that will last a long time doesn't require expensive equipment, materials or complex techniques. Just remember that careful workmanship, design and material



Top It Off – End grain will soak up water faster than any other surface of wood. Fence posts, for example, could be capped with wood, plastic or metal caps to keep water from getting into the wood and starting the rotting process.



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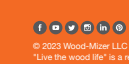
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Old Tools Made New

Photos by Carl Duguay (Photo Lead by Rob Broyna)

Restoring old tools is fun, educational and economical.

BY CARL DUGUAY

There are several good reasons for restoring old hand tools, such as planes, spokeshaves, chisels, handsaws and the like, particularly for those new to the craft. It's a great way to learn about hand tools and how to maintain them. You can also assemble a decent kit of tools at a fraction of the cost of buying new. And it's a good feeling to take something that was meant for display or disposal and give it a new working life.

There are a lot of name brands of older tools, among them Stanley, Miller Falls, Sargent, Buck, Greenlee and Marples. Planes from the mid-1930s to late-1950s are generally good value.

Depending on the condition of the tool and the type of restoration you want to do ("maintain originality," "make fit to use" or "make like new") you could spend as little as half an hour to most of a day on a restoration. I go for "make fit to use" as I'm not a tool collector. My goal is to get the tool into serviceable condition as quickly as I can so I can get back to work.

What to buy

Ideally you want to personally inspect any tool before you buy it. If you buy "sight unseen" make sure you're dealing with a reputable seller. Tools that are cracked, severely chipped or deeply pockmarked with rust should be avoided. Surface rust is nothing to be concerned with. Check to see if the sole is reasonably flat, and in particular pay attention to the areas just behind the mouth, toe and heel. Missing or damaged components (knobs, totes, blades, lever caps and the like) can be replaced easily, though it involves extra time tracking down the parts and an additional cost.

Where to find old tools

Most of my finds are by word-of-mouth and from garage sales. Many of the tools I see at flea markets and antique stores are priced in line with vintage tools, regardless of their condition. Woodworking clubs are another good source (and a great way to meet like-minded people). If you're in a rush to find something to restore, or you've exhausted local sources, try an e-commerce site such as eBay, Facebook Marketplace or Kijiji. I'm not a collector, so I steer away from tools that are pegged as antiques or collectibles.

The following steps are what I did to restore a Stanley Bailey No. 4 hand plane. The plane, for which I paid \$25, was in fairly good condition. Including the bath to clean off rust, it took about four hours to restore. There's no need for you to follow these steps slavishly; use them as a general guide. If you're restoring a spokeshave, chisel or other tool these steps should help as well.

Photo evidence

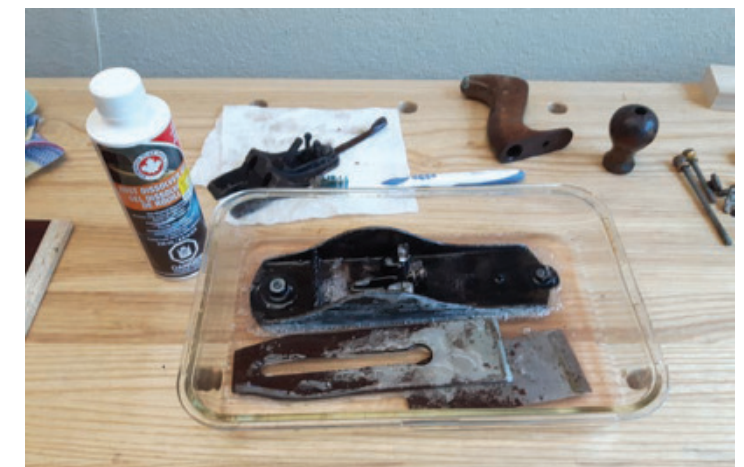
If this is your first time taking a hand plane apart, before you disassemble it take a few photos to remind yourself of how it goes



Take It Apart – Remove all of the screws and threaded parts to allow you to have a close look at them and start the cleaning process.



No Major Problems – A few stains aren't the end of the world. Deep pits or cracks, on the other hand, are harder to deal with. This is the underside of Duguay's plane before he set to work breathing new life into it.



Get Rid of Rust – Using Rust Dissolver Gel, Duguay gives the parts a bath to remove as much rust as possible. Some scrubbing with a toothbrush part way through the process speeds the removal.

back together. The parts may look weird to a new woodworker. A few photos, both of the entire piece and a few closeups of how the pieces fit together, will help guide you. There are also lots of schematic drawings online for you to view if needed.

Remove the rust

Once disassembled, I use a wire brush or wire wheel to remove as much rust as I can. I then give all the metal parts a bath. Use either a glass or plastic container and pour in enough rust solvent to



A Flat Sole – Flattening the sole, or at least at the toe, mouth and heel, is a critical part of improving an old plane’s performance.

cover the parts. I’ve tried various vinegar/baking soda concoctions in the past, but I find they take a long time to work. I now use Rust Dissolver Gel (Homehardware.ca) that does the job in 30 minutes. Halfway through I vigorously brush all the parts with an old tooth-brush or bristle brush. After the bath it’s time for a good rinsing in hot water.

Flatten the sole

While some woodworkers like to flatten the entire sole, I only flatten in three spots – about an inch at the toe, a quarter to half inch behind the mouth and another inch or so at the heel. This will ensure the plane sits flat on a work surface. I start with Sia PSA-backed sandpaper (KMStools.com). They’re 2-3/4" by 16-1/4" long and come in a range of grits. The grit I start with depends on the condition of the sole. For this plane I began with 100-grit working up to 180-grit. Every so often I check the sole with a machinist square. Once it’s flat in those three key spots I switch to 3M aluminum oxide sheets (Leevalley.com). These sheets are available in grits down to 0.3 micron, last a long time and are inexpensive. I use the 9, 3 and 1 micron sheets.

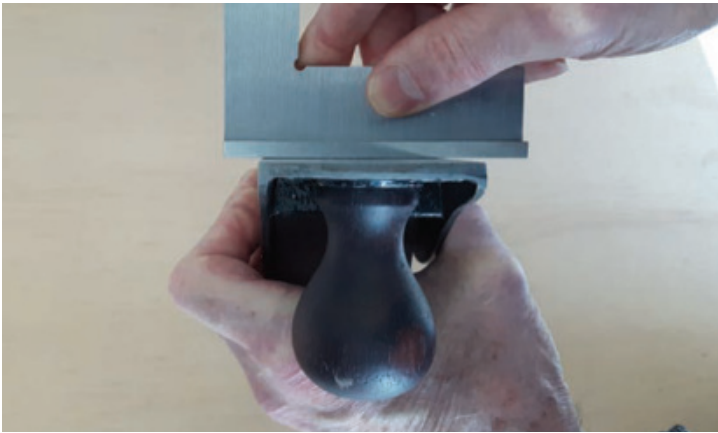
Depending on the condition of the sole it can take a fair amount



Rust Is Mostly Gone – After the rust bath the parts are looking a lot better. They’ll also function more smoothly



Refurbished Sole – Although the sole isn’t perfect, it doesn’t need to be. The odd stain or imperfection can be overlooked. Note Duguay spent some time on the sides of the plane to allow the plane to be used with a shooting board.



Flat Across the Sole – Check that the sole is flat across its width and length with a straightedge.



Blade Upgrade – Although you may very well be able to salvage the old blade and bring it back to life, a new blade (shown on the left) can also be purchased for just about every older hand plane out there.

of time and energy to get good results so you need to be patient. I also clean up the sides of the plane. If the sides are square to the sole you can use the plane with a shooting board for squaring up the ends of wood and finalizing rough-cut mitres.



Remove the Old Finish – Paint and varnish remover will get rid of the old, cracked finish and leave you with a smooth surface on which to apply a new finish. This not only looks great, but it also provides you with a smooth, comfortable grip on your tools during use.

Deal with the blade

I find most blades that are serviceable need to have the bevel re-established before being sharpened and honed. I use a wet sharpening system, but any method will do the job. On quite a few of the tools I’ve refurbished the blades are either missing, bent or in too poor condition to salvage. Rather than looking for an old replacement blade I always opt to install a new blade. For plane blades I turn to Toronto-based IBC Tools (Ibctools.ca). The blades are precision ground and hold an edge nicely. They’re slightly thicker than the original Stanley blades so you may have to file the mouth a bit wider. It doesn’t take much time. You just need to file a small amount and check the blade fit frequently. A benefit with the IBC blade is that the extra thickness reduces blade chatter.

Deal with wooden parts

If you don’t mind the original finish on the tote and knob leave as is, otherwise strip and refinish. You could also try your hand at making your own parts if they’re worn, broken or tired looking. A

Old vs. New – Just a few hours of work results in a shiny tool, smooth handles and a sharp blade. You’ll definitely notice an improvement in performance, not to mention the updated plane will look much nicer on the shelf above your workbench.



Widen the Mouth – Widening the mouth might be needed in order to allow the right amount of a gap between the blade and the sole of the plane.

durable polyurethane finish looks good, though it can cause blisters if you use your plane for extended periods of time. A penetrating oil will allow your skin to move more freely over its surface while in use, even if it doesn’t look as clean and shiny as a film finish. The choice is yours, though.

Clean all the parts

I clean up all the other metal pieces using the 3M sheets. I want the front edge of the lever cap and chip-breaker to be smooth and flat. Same goes for the top surface of the frog, against which the blade sits. These parts need to be smooth and clean for the plane to work properly, though this isn’t as crucial with most of the other parts. Once everything is cleaned up, I spray all the metal parts with Boeshield T-9 (Leevalley.com), an anti-rust protectant. About once a year I disassemble all my planes and apply another coating.

Re-assemble and test

Re-assemble the components, adjust the blade and give it a whirl. Invariably you’ll need to do some fine tuning to get everything working just right. This often involves making minute adjustment to the position of the frog so it’s lined up flush with the back of the mouth.



CARL DUGUAY
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MAKE A TIC-TAC-TOE BOARD

Playing tic-tac-toe is a fun family game. Making one can be just as fun.

BY EVAN

You can make a tic-tac-toe board any size, and use any hard-wood, as long as it's square. My finished maple board was 8-1/4" x 8-1/4" x 3/4". Large boards displayed in the living or dining room are fun to play. Smaller travel versions would be great to have on long road trips.

Make it square

I dressed the board flat, then squared it up on the jointer and saw.

The important thing is that the wood blank needs to be square. I used epoxy to fill two 3/8" wide vertical and two horizontal grooves to make the lines on the board. I laid out the grooves to be

routed so they left even gaps between them. I used my router table to rout the grooves, setting the fence to leave me with even gaps. If you don't have a router table, you can use a handheld router instead, though you have to ensure the router is guided properly while making the grooves. This isn't advisable on a small board. A table saw, using either a dado blade or multiple passes, is also an option. Whatever your approach, use caution if you're making a small board.

After routing the grooves, I cleaned them out to get rid of any sawdust. Next came the epoxy to fill the grooves. There are different types to choose from. The drying time will depend on the type of epoxy you choose. Since this project wasn't a rush, I chose to use a deep-pour epoxy resin which requires three to five days to cure.

Photos by Evan

Read the epoxy instructions carefully. Before I poured the epoxy, I taped all four edges with packing tape to prevent the epoxy from leaking out. Make sure the edges are sealed well.

Colourful options

With epoxy, you can choose any colour pigment you want. A pinch or two's worth of pigment should do. I used black so it would contrast well with the maple. I calculated the amount of epoxy needed for each strip by using length x width x height divided by 61. This will give you the exact amount of epoxy in litres needed for each strip. Next, I multiplied the number of litres by four to give the total amount of epoxy required for all four strips. Mix up the epoxy and pigment for five to 10 minutes and pour

it into the grooves. Once you pour the epoxy, let it dry. If you don't want to use epoxy, you can make a contrasting wood inlay to fill the grooves. In this case, you'll have to machine two grooves, add in the wood inlay and let it dry before machining the two other grooves in the opposite direction.

Sand it smooth

Once dry, sand until the board is flush. I sanded the board to 120 grit using my drum sander which made the process faster. If you don't have a drum sander, a regular hand held sander will do. I trimmed the board edges very slightly and glued on walnut strips to cover them to give the board a clean, classic look. My trim was just under a 1/4" thick. I cut four



Cut the Grooves – A router table can be used to cut the epoxy grooves. You could also use a table saw. Just be extra careful when machining a small board. In that case you might want to leave the workpiece long and machine the grooves before cutting the blank to finished size.



Square It Up – Make sure the solid wood blank is square so the gaps between the series of lines will be equal.

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Sand It Smooth – When the epoxy has cured, sand the surface smooth.

pieces of trim to rough length and then cut 45° angles on their ends and glued the trim onto each side of the board. I used 23g pin nails to attach the trim, though you could probably get away with just a simple edge joint, even on the end grain portions. I let it dry and sanded the trim flush.

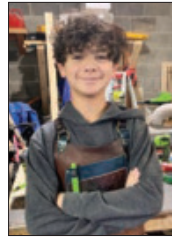
I then sanded the board to 500 grit. If using rubber feet on the bottom, drill the holes first, and then oil the board. I used a hard-wax oil, as it's easy to apply, durable and adds a nice colour to the wood. Before screwing in the rubber feet, I wiped off the excess oil.

To create the “X”s and “O”s, I used 1/4" maple plywood. I printed a template for the “X”s and “O”s and cut them out using the bandsaw. Next, I gave them a quick sand to smooth out the edges and painted them black.



Add Edges – Solid wood edges made of contrasting species will dress up the board and give it a finished look.

Evan is a 15-year-old woodworker from Toronto. He started his business when he was 10 years old and donates a portion of each of his sales to SickKids Foundation. When he's not busy in school or in the shop, he loves to go to camp.



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Festool DTSC 400 cordless delta sander
Precise and efficient sanding on hard-to-reach surfaces, edges and corners
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Create adjustable shelves with ease

Festool DTSC 400 Cordless Delta Sander

BY CARL DUGUAY

Delta (a.k.a. triangle, detail, ironing board) sanders are designed to complement larger random orbital sanders in the workshop and on the jobsite. They have a triangular-shaped sanding pad that makes them perfect when you need to sand into corners, on edges and other hard-to-reach spaces. And of course, you can use them on larger surfaces as well. Their short orbital sanding motion produces a smooth, almost scratch-free, finish, making them ideal for sanding between coats of finish.

I tested the fully decked out I-Set kit (#575707). It comes with two 18V Bluetooth-enabled batteries, rapid charger, AC adapter, 13-foot Plug-it power cord, long-life dust bag, wrap-around bumper and SYS-COMBI 2 Systainer. The AC adapter enables you to plug the sander into a standard 120V electrical outlet when portability isn't needed or when you're doing a lot of sanding and don't want to bother with constantly recharging the battery. There's also an I-Plus model (#576367) that doesn't include the AC adapter and extension cord for those of you who eschew corded tools of any kind, and a bare-tool basic model (#576358) for those who already have an Ergo-I 18V battery. You can't use standard Festool batteries with the DTSC 400 (though you can use any Festool charger).



Photo by Festool

The reason is that the low-profile design of the sander necessitated a longer battery that slides into the tool's handle rather than sitting atop the sander.

With the 18V 3.0Ah battery installed you get 30 minutes of continuous runtime at full power – somewhat longer if you step down the speed. The brushless motor delivers an orbital sanding motion with a 5/64" stroke and dial-selectable speeds from 6,000 to 10,000 oscillations per minute. The short sanding stroke delivers a very fine finish with a scarcely perceptible scratch pattern. Sander speed is controlled with a six-speed dial. There's also a series of micro settings between each dial position that enable you to step up the speed in small increments. Thanks to electronic speed control there is no loss of speed under load – just consistent sanding from start to finish.



Dual Power Sources – We generally all enjoy cordless power when possible, but there are times when connecting to a power source is the best approach. An AC adaptor is available that will connect the sander to constant power, if needed. The battery is also Bluetooth-enabled, automatically turning on your Festool dust extractor when the sander is turned on. (Photo by Carl Duguay)

The DTSC 400 stands 6" high and with either a battery or AC adapter installed weighs in at just over 3 lbs., 4 oz. It's coupled with a nicely balanced design and rubberized grip, and I found that I could easily control the sander with one hand and use it for extended sanding sessions without undue hand or forearm strain. I don't think it would be too awkward to use on vertical surfaces, either. When sanding the insides of cabinets there is sometimes a tendency to butt the sander up against adjacent sides. The included edge protector prevents this from happening.

Dust collection is fabulous – the best that I've seen on any sander. In addition to the holes in the bottom of the sanding pad (common to virtually all sanders), there are a series of small dust extraction ports along the sides of the sanding pad that suck up dust and deposit it in the dust bag. The dust bag is quick and easy to



Keep It Clean – Not only is the dust bag easy to remove, it works very effectively as part of Festool's extensive dust collection system. Notice the installed edge protector that keeps the sander away from any edges when needed. (Photo by Carl Duguay)

empty and looks like it will last quite a while before needing to be replaced. You can, of course, connect a Festool dust hose to the sander. And if you have a Festool Bluetooth-integrated dust extractor it will start automatically when the sander is switched on.

At its lowest speed I measured the sound level at about 68 decibels and around 79 decibels at the highest speed setting, which is comparable to other sanders I've used. Vibration is minimal at the lowest speed setting but more noticeable at the highest setting, though in my experience, still within a reasonable level for a sander.

In use, the DTSC 400 delivered consistently superior results. Dust extraction is as good as you can get. Coupled with its light weight and ergonomically designed barrel-style grip it's super comfortable to use.

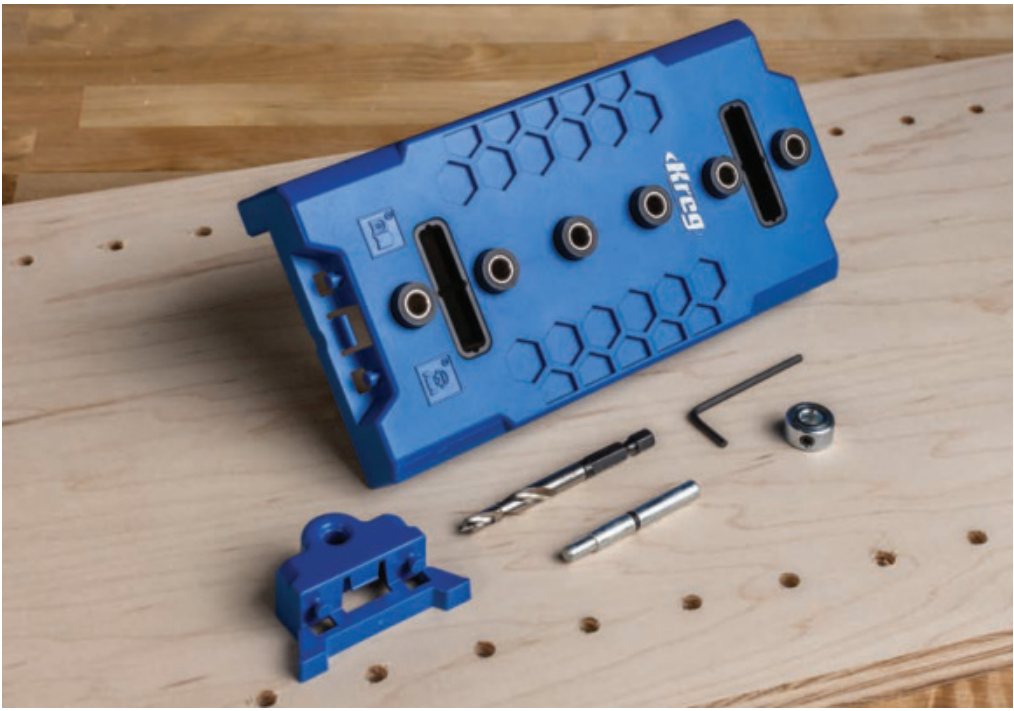
If you're looking for a dependable pro-quality finish sander, you can't go wrong with the Festool DTSC 400.

Festool DTSC 400 Cordless Delta Sander
MSRP: Basic \$399; I-Plus \$729; I-Set \$889
Website: festoolcanada.com
Tester: Carl Duguay

Kreg Shelf Pin Jig

BY ROB BROWN

When it comes to storage, adjustable shelves offer lots of flexibility. Whether they're in kitchen cabinets, bookcases, built-in wall units or smaller wall cabinets, the ability to adjust the height of a shelf will allow the cabinet to change as your storage needs change. The trick is drilling all those holes evenly and accurately so they look good and don't cause shelves to rock or shift in use.



(Photo by Kreg)

Kreg, which has produced some wonderfully simple and functional jigs over the years, has recently updated their shelf pin drilling jig. I tested out both their 5mm and 1/4" jig. I prefer the 5mm jig, as it's easier for me to find mating shelf pins. They both work the same, but ensure you can purchase the proper-sized shelf pins for the jig you're using. This jig bores holes 32 mm apart, which is the industry standard.

There are a few options when it comes to locating the jig on the workpiece. The included fence ensures holes are drilled parallel to the edge of a workpiece. In terms of locating holes a certain distance away from the top of bottom of the gable, you could align it with the top or bottom of your workpiece, drill a single hole, then use the locating pin to re-locate the jig with the hole you just drilled. Sounds complex, but it's very easy in practice. Another option is to mark a line on your workpiece and align the jig with it. Both methods work well. The bottom line is you need to locate the jig using the same method while making each of the four rows that will hold the shelf pins to ensure they're all even. Once the jig is aligned you can clamp it in place and grab your drill.

Hardened-steel sleeves, long enough to guide the bit perpendicular to the surface of the workpiece, are one of this jig's main strengths. They're durable for long-term use. They're also long enough to guide the bit perpendicular to the workpiece as you drill. Speaking of the bit, the supplied brad point bit is much better at boring clean holes than a standard twist bit, but to boost its performance ensure your drill is rotating at a high speed before boring your holes and don't press the drill in too quickly. The stop collar on the bit will go a long way to ensuring you don't bore through the other face of the workpiece and ruin it.

Once at least one hole has been bored, the locator pin can be used to reposition the jig so you can drill more holes. Each time you drill holes, the jig should be clamped in place, but only light pressure is needed, as the grippy surface on the rear face of the jig does a good job at keeping the jig from moving during use. I even used the jig a few times without clamps and it worked fine. If you're drilling shelf pin holes in an assembled cabinet it's not always going to be possible to clamp the jig in place. If you regularly need to drill more than six holes, a second jig can connect to the first, giving you a full run of 12 holes to drill.

Once the first row of holes is bored you can swap the fence from one side to the other to bore holes parallel to, and a certain distance from, the other edge of the workpiece. You do have to be careful you don't just rotate the jig 90° so the fence can reference against



Easy Drilling – With the fence installed on the jig you can easily position the jig, clamp it in place and drill the shelf pin holes. To bore the holes for the rear shelf support, simply remove the fence.

the opposite edge, as the hole heights won't be aligned, causing a shelf that rocks. I did have trouble swapping the fence from side-to-side at first, but once I got the hang of how it worked it was fine.

I used this jig on frameless-style cabinets, but the fence can be removed entirely for use on face frame cabinetry. All the accessories, including the Allen key for setting the depth collar location, are stored on the underside of the jig, keeping everything close at hand.

If you build storage cabinets with adjustable shelves this jig is your answer to drilling adjustable shelf pin holes. It's a well thought out design with lots of features, making it invaluable for these sorts of projects. It also seems to be a high-quality product that should stand the test of time.

Kreg Shelf Pin Jig
MSRP: 1/4" or 5mm Jig US\$39
Website: KregTool.com
Tester: Rob Brown

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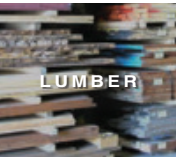
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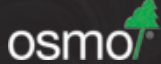
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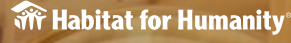
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Giving New Life to an Old Table

After watching countless restoration videos online I decided to try fixing up an old vintage table myself.

BY JAMES JACKSON

One of my guilty pleasures after the kids have gone to bed is to stay up watching restoration and repair videos online. I don't know why, but there's something very satisfying about watching someone rescue a piece of furniture from the burn pile or the side of the road, stripping the old finish, repairing the broken pieces, and making it look like new again.

That's what was partially going through my mind last April when I bought a beat-up old table at a farm auction for \$12.50 when I was actually looking for a lawnmower. I wanted the challenge of bringing it back from the dead and giving it a new purpose.

Eventually I finally had a few days to sit down and get to work. The experts online make the entire process look a lot easier than it is.

My first challenge with the table, which is about 30" tall with a 19-1/2" x 27" rectangular top, was erasing the decades of weathering that had transformed the wood into a dark grey mess.

I'm still not sure what species it is. The top is made up of strips that look like a mixture of maple and oak. The wood had changed colour after being exposed to the elements while sitting in the barn for decades, so I spent a few hours slowly going through the grits and sanding the piece from 60 up to about 240 to allow the natural wood grain underneath to shine through once again.

This task, I might add, is usually accomplished online in mere seconds thanks to handy time lapse montages.

The next task was to clean up the old bolts and the drawer pull that were caked in dust and corrosion. I tried soaking them in a jar full of warm, soapy water but after a few hours it didn't really seem to do anything. My wife suggested using a scouring cleaner called Bar Keepers Friend, and after just a few minutes of scrubbing with an old toothbrush they came out looking pretty good.

Then I had to deal with the tabletop itself. It had a black stain about the size of a coffee mug in the corner and it smelled slightly of oil. The sanding didn't erase the stain as much as I had hoped, leading me to think oil had dripped onto the top and soaked fairly deeply into the wood. The top was also slightly bowed upward at the edges.

I suggested to my wife that I put the tabletop on my CNC and use the router to flatten the top and (hopefully) deal with the black stain, but to my surprise she said not to bother - she liked the character the imperfections added.

Before reassembling it all again I had to deal with the busted drawer. It still moved fine, but the bottom had broken and rotted out. I disassembled it entirely, made a new plywood bottom, glued it all back together, then tacked it with brad nails. It was the first time I'd ever tried anything like this, but it was something I'd watched repeatedly online and it was probably the smoothest part of the entire process.

I reattached the legs to the tabletop and sprayed it with two coats of polyurethane for added protection, then let it air out in the garage for a few days before bringing it inside.

While it wasn't as easy as the experts make it look online, it was a fun weekend project and it's earned a second life as a plant stand in my kitchen.

JAMES JACKSON
james.d.e.jackson@gmail.com



Illustration by Mike Del Rizzo





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Tom Fidgen

Glass Cabinet

Fidgen made this piece using lots of reclaimed materials. The antique glass was salvaged from an old French door in Cape Breton, the teak for the top came from an old house in Toronto and the mahogany was found in a door factory dumpster. Even the different species of drawer fronts arrived in Tom's care from friends or past projects.



Turn to page 12 for more quotes.
(Photos by Tom Fidgen)

