Top 10
TOOLS FOR CURVES

5 Smart
THERMOSTATS

FREE
Drill Bit
POSTER

OCTOBER/NOVEMBER 2017
ISSUE #110

CANADIAN Woodworking & HOME IMPROVEMENT

DEVELOP YOUR SKILLS • TOOL YOUR SHOP • BUILD YOUR DREAMS

Build a MODERN COFFEE TABLE p.16

Upholster a Simple Cushion p.38

4 Approaches to Home Insulation p.34

Pore Fillers and How to Use Them p.42

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- Know Your Tools
- How To Use a Mortiser

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DEVELOP YOUR SKILLS • TOOL YOUR SHOP • BUILD YOUR DREAMS

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OCTOBER/NOVEMBER 2017

FEATURES

DEPARTMENTS

COVER STORY

Cover photo by Rob Brown

editor's letter

rbrown@canadianwoodworking.com

In my Editor's Letter in our June/July issue I wrote about how a simple shelf improved the storage situation in my shop a great deal. I was surprised by its functionalility, and how it gave me easy access to some often-used power tools and accessories, making my shop time more productive. When we recently bought a new sofa for our living room I thought I might try the same thing with a new coffee table. I set out to design something that would fit in aesthetically, but would also add some storage for a few specific items that didn't yet have a true home. A few fun days in the shop, and now I have a great coffee table as the centerpiece of my living room. Read about how I built it in this issue. You should also check out the companion article covering how I created a foot cushion that can be fixed to the surface. Now, there is a comfy addition!

If you're up for some more comforting reading, I think you'll like two other articles about keeping your home warm during a cold Canadian winter. Our *Home In On* column covers the different types of insulation that are on the market today, while our *Home Improvement* column shows you a few things every homeowner can do to enjoy a warmer home this winter. Act now and you will be warmly rewarded all winter long.

Continuing our free poster offer that we started in our last issue, we focus on the types of drill bits and their function, and share some technical information about the subject. We also have a detailed article on the common, but not so simple, twist drill bit. There's a lot to learn about a very popular shop tool.

Alfons Laicher, a furniture maker on Vancouver Island, is the focus of our *Canadian Quotes* column, while the best tools to assist with adding curves to you work are featured in our *Top 10* column. And if you've ever wondered about hollow chisel mortisers, read our *Know Your Tools* column, then get the inside scoop on how to setup and use one in a separate feature article.

Rob Brown

CANADIAN Woodworking & HOME IMPROVEMENT
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Issue #110

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- Overall size: 64" W x 40¼" D x 35½" H
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CSA C US 177335

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- Precision-ground cast-iron table with wings: 40"W x 27"D
- Capacity: 3" @ 90°, 2⅛" @ 45°
- Rip capacity: 26" right, 8" left
- Footprint: 20½" x 20½"
- Approx. shipping weight: 508 lbs.

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- Spindle travel: 3¼"
- Number of speeds: 5 (550, 880, 1520, 2490, 3470 RPM)
- Drill chuck: 1/64"- ⅝"
- Swing: 33½"
- Max. head swivel: 360°
- Table tilts: 90° left & right
- Table: 12 3/16" diameter
- Overall height: 64½"
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- Spindle travel: 3"
- 2 interchangeable spindles: ½" and ¾"
- Spindle openings: 1¼", 3½", and 5"
- Spindle speeds: 7000 and 10,000 RPM
- All ball bearing construction
- Max. cutter diameter: 5"
- Powder-coated finish
- Approx. shipping weight: 221 lbs.

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18" OPEN END DRUM SANDER

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- Minimum board length: 6"
- Minimum board thickness: ⅛"
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letters

Inspirational Plan

Back in 2007 I purchased Issue #45 (Dec/Jan 2007) because of the Haida-inspired whale mirror project on the front cover. Although I had never done intarsia before, living on the west coast and seeing this project resonated with me, and I vowed to someday teach myself how to scroll saw, and to build that project. I recently retired and decided to honor that vow. I used the internet and various books to teach myself, started the project last year, and just finished it.

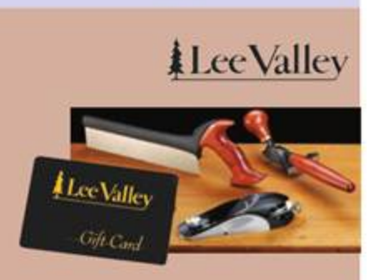
Thank you for that pattern. I also encourage you to find and publish other Canadian-themed intarsia projects, but most of all – to encourage your other retired or elderly readers; this was my first project – I got a great deal of satisfaction and enjoyment out of building this mirror frame, and if I can do it, then you certainly can too.

Jay Prill
Via email

Subscription Draw Winners

Merle D.
Westville, NS
has won a Bench Grinder from KING CANADA.

John A.
Victoria, BC
has won a $250 gift card from **Lee Valley**.



Subscribe or renew now for your chance to win!

We love your column, Don!

I don't normally do this but I have to let you and your magazine know how much my family loves reading your articles. We skip right to the end to read your stories first. We often grab an issue waiting in our local Home Hardware or school library, just to read your stories and laugh together. We routinely pass them along to our friends. Great job.

Vanessa J.
Via email

shopnews

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Portamate Miter Saw Work Station

Whether you need a portable miter saw stand, or extra work surface, the compact Portacube, from Portamate, is the perfect addition to your work space. Its compact footprint of 31" × 29" stores easily in almost any workshop. The built-in extension wings give you up to 7' of working surface when fully extended. One of the most unique features is the rotational tabletop. The universal tool mounts allow it to fit almost any miter saw up to 26 1/2" wide. When you're done with your cuts it easily rotates your miter saw back into storage. Visit **www.portamate.com** to learn more.

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Tool Reviews

Laguna P|Flux 1.5HP HEPA Cyclone Dust Collector

Bessey IBeam Heavy-Duty Clamps

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

Free Plan

Scratch Stock

This shop-made tool is great for many tasks, and is a lot of fun to build. Visit the FREE PLAN section, under the RESOURCES tab on our website, to view this and many other free plans.

Apps

WoodH$_2$O

Quickly calculate the equilibrium moisture of solid wood to avoid wood moisture problems. It's an easy-to-use calculator with solutions for common wood moisture-related problems.

Woods to Know

Sassafras

Easy to work with both hand and machine tools, Sassafras has good dimensional stability. The heartwood is a medium to light brown, sometimes with an orange or olive hue, that tends to darken with age. The sapwood is a paler yellowish brown, though it isn't always clearly demarcated from the heartwood. It bears a strong resemblance to ash and chestnut, and has a distinct, spicy scent while being worked.

Events

Lumber Talks in a Lumber Town	The Woodstock Woodworking Show	Canadian Woodworking West	WMS 2017: Canada's Premiere Woodworking Event
Sept 8 - 10, 2017	Sep 29 - Oct 1, 2017	Oct 4 - 5, 2017	Nov 2-4, 2017
Ottawa, ON	Woodstock, ON	Abbotsford, BC	Toronto, ON

Best Build

Check out the **Woodworking** section of our forum for our latest "Best Build" thread – a greenhouse. This month's winner, Lisa Chemerika, wins a **Planter and Tiller Set** from **Lee Valley.**

To find out more about this project, go to: **forum.canadianwoodworking.com** or simply go to **CanadianWoodworking.com** and click **FORUM**.

Video Links

www.canadianwoodworking.com/**videos**

Canadian Quotes: Alfons Laicher

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Forum Thread

Backyard Drainage - French drain and drywell

mikey6417
Ajax, ON
I've done some research on the web about French drains and understand that commonly the drain should route out to the front and discharge from there on. I got a quote from a contractor that another option, instead of running all that pipe to the front, is to have the French drain discharge to a dry well in the backyard. Is this a bad idea or is it always best to send that water as far away from my property as possible?

---

iamtooler
Montreal, QC
Where the pipe discharges doesn't change the length of pipe that surrounds the house, it is purely a site specific decision. A dry well would be fine if it will always be dry, again site specific.

---

mikey6417
Ajax, ON
Thanks for the great feedback everyone. I'm not too sure how good the soil drainage is. I was just afraid that the option I got from the contractor was more that they were being lazy and didn't want to dig all the way out to the front.

---

beakie
Gores Landing, ON
Don't worry so much about front/back yard, or getting as far away as possible. Are you in town or country? Neighbours downhill of you? Where is the natural slope of your property in relation to current water "issue"?

Rick Thom
Colborne, ON
I suggest you discuss with your local Buildings Department and ask for their advice since drainage control is normally a municipal responsibility, particularly in urban centres.

Also, check out these home improvement threads at *forum.canadianwoodworking.com*

- What to do with new driveway cracks
- Wood windows vs. vinyl
- Low raised deck design: boxed vs sandwiched

Product Watch

Bosch 18V Blower

Keep the workshop and jobsite dust and debris free with the Bosch GBL 18V-71. It delivers 71 CFM of air at 167 mph – enough to clean up any mess. When paired with a 6.0 Ah batter it delivers up to 54 minutes of runtime at low speed. The kit includes a standard nozzle, nozzle extension and a small diameter nozzle with a debris-collection tube.
BoschTools.com

Broan Sensonic Speaker Fan

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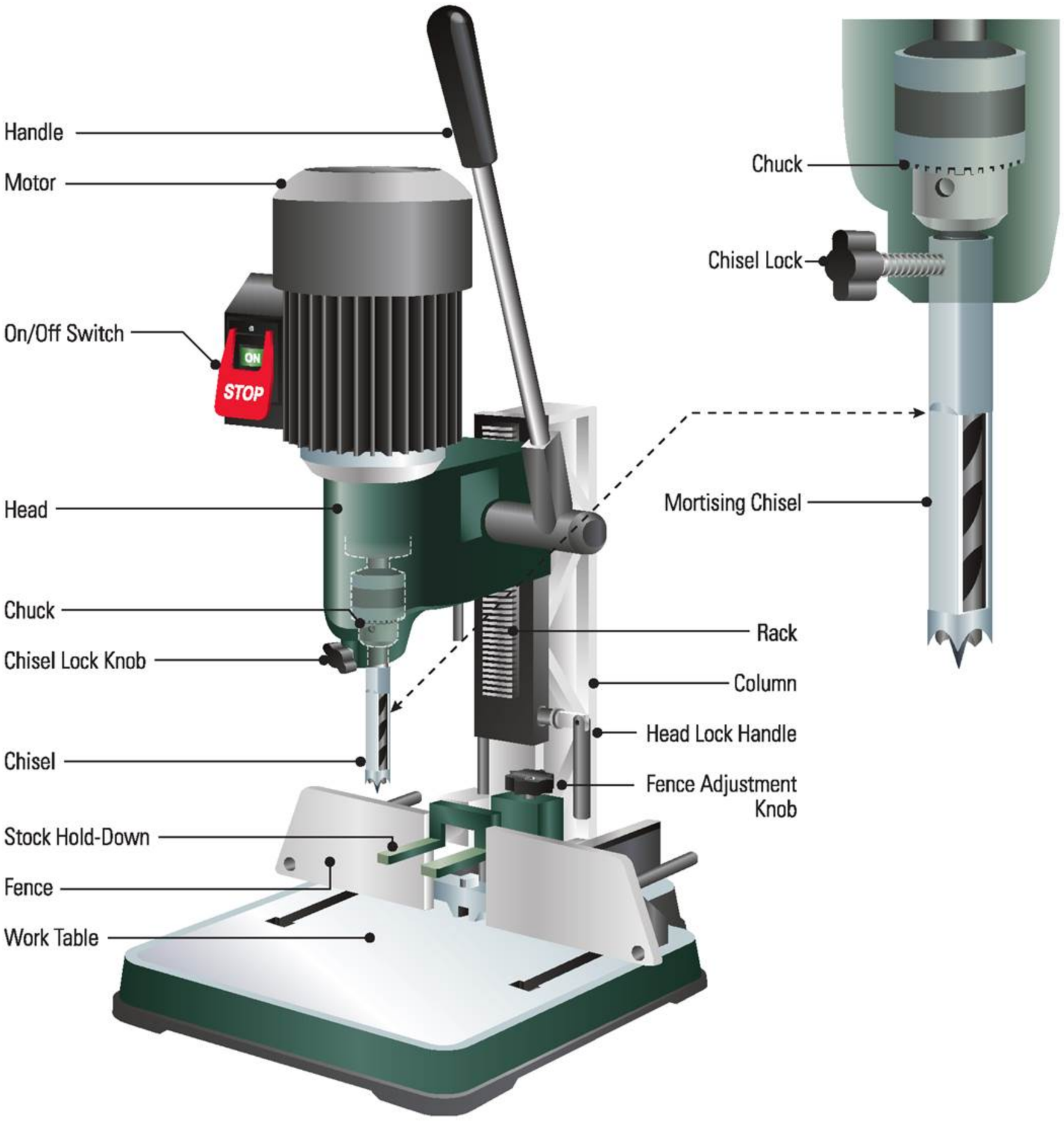
Hollow Chisel Mortiser





A hollow chisel mortiser consists of a metal frame, a motor that rides up and down the frame via an articulating handle, and a chuck to which a mortising bit is attached. If you work primarily with mortises up to 5/8", a 1/2 HP motor will suffice – otherwise opt for a 1 HP model. Features to look for include: a large work table (some have side extensions to better support long stock); a solid fence that is square to the table and easy to re-position without getting out of alignment; a quick-release tool-free hold-down to secure the stock; an accurate, quick-to-adjust stop for setting precise mortise depths; an adjustable handle that moves the column up and down smoothly; and a chuck that is easy to access when you need to change the bit. Some high end models offer titling heads for cutting angled mortises.

Price: $500 – $800
Motor: 1/1 HP
Chisel Capacity: 1/4" – 1"
Plunge Depth: 3-1/2" – 9"
Fence to Center of Bit: 3" – 4"
Top Brands: CWImachinery.com, General.ca, Grizzly.com, KingCanada.com, RikonTools.com, PowerMatic.com

Get the Most Out of Your **Hollow Chisel Mortiser**

Buy Quality Bits

Invest in premium bits; they'll last longer and cut cleaner mortises. Sources: Dimar-Canada.com, Fisch-Tools.com, LeeValley.com.

Align the Bit

Proper alignment of the chisel and bit is important to ensure that mortises are drilled properly. The bit should be about 1/16" below the chisel tips.

Learn to Sharpen

The chisels tend to dull faster than the bit. Use a cone sharpener to keep the chisels razor sharp.

Add Some Depth

A mortising bit doesn't cut a perfectly flat-bottomed mortise. Be sure to cut mortises about 1/8" deeper than the tenon length.

Cut Alternate Holes

Cut the first hole in the center of the mortise, the next holes on the right and left ends, and then work back towards the center.

Photos by Carl Duguay Illustration by Len Churchill

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topten

Top 10 Tools for Adding Curves to Your Work

Straight lines are relatively easy to create in a shop setting. Curves are more of a challenge to produce, though they can add a lot to the overall look of a project. Learn about some of the tools used to lay out and cut curves in a workshop so you can add them to your next project with confidence.

BY ROB BROWN

1 Layout Tools – In order to lay out proper curves, an assortment of tools should be at a woodworker's side. A compass, trammel points with an appropriate length of wood, French curves, flexible curves, plywood or solid batons and even randomly sized objects around the shop can be used to lay out beautiful curves.

2 Sanders – It's possible to use disc, edge and belt sanders to add curves directly to a workpiece, but it's more likely they would be used to shape curved templates that could then be used with a router to shape a workpiece.

3 Router / Trimmer – Used with a template, or with a circle or elliptical cutting jig, a router is a very common tool for producing curves. When used with templates, a flush trim or template bit is used; otherwise a straight bit is the best choice.

4 Band Saw / Jigsaw – A band saw or jigsaw both work wonders when it comes to quickly cutting rough curves. They aren't as accurate as other methods and sometimes aren't appropriate for larger quantities, but they leave a curve that can be faired with hand tools or sanders.

5 Hand Planes – Metal compass planes, though not common, can be adjusted to the radius needed, while custom shop-made wood planes are fun to build and very helpful to have around when fairing edges. Even a block plane is helpful on some gentle curves, as it will remove just the high spots.

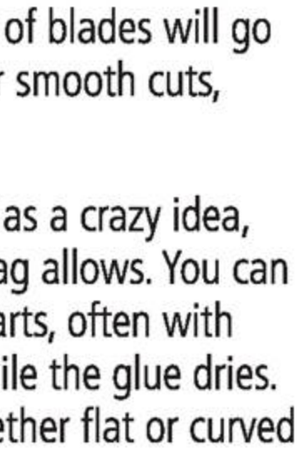
6 Spokeshaves – This multifunctional tool is great when smoothing edges and fairing curves as it allows you to slowly sneak up on the curve you want, and it provides a lot of flexibility. A spokeshave also allows the user to produce more three-dimensional shapes with ease.

7 Rasps / Files – For fairing curves off a band saw, a sharp rasp or file works great and is a lot of fun to use. They tend to remove material relatively slowly, unless you're using a very aggressive rasp, and this is often a good thing. Rasps and files are great for shaping three-dimensional curves.

8 Coping / Fret Saw – A helpful saw for cutting smaller, rough curves, it can also cut very tight curves that can be sanded and shaped with finer tools. An assortment of blades will go a long way to assisting you with fast, rough cuts, or smooth cuts, depending on the situation.

9 Vacuum Bag – Before you write this off as a crazy idea, think of the curved opportunities a vacuum bag allows. You can form curved aprons, panels, legs and many other parts, often with just one form to press the wood layers together while the glue dries. A vacuum bag also excels at pressing veneer – whether flat or curved – onto a substrate. One of my very favourite tools.

10 CNC Machine – While not an option for many, a CNC machine will cut curves onto flat parts with incredible ease and accuracy. They have a heavy up-front price tag but will bring a smile to your face when curved parts of just about any shape are required. Making accurate templates is child's play with a CNC machine.



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rbrown@canadianwoodworking.com

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Photo by Rob Brown

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BY ROB BROWN

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www.alfonsfurniture.com

Location and size of studio – Victoria, BC, 750-sq. ft. studio

Education – I was educated in Germany, where I did an apprenticeship as a glazier and window maker, and one in furniture and cabinetmaking. After several years of being a journeyman, I completed an advanced program that was required to start my own business and to train apprentices.

How long have you been building furniture?
My training in furniture making started in 1984. I became a journeyman furniture maker in 1987 and have been building furniture ever since.

What sort of furniture do you specialize in?
I enjoy all sorts of jobs, from furniture repair to kitchen cabinetry to custom-designed furniture.

In order, what are the three most important items in your shop apron?
I don't wear an apron, but in my pockets would be a pencil, my folding ruler and a tape measure.

Do you prefer hand tools or power tools?
I'm not a purist. I use hand tools when I have the time and if it makes sense to use them. If it is more expedient to use power tools, I use them.

Inherited Vintage Stanley Sweetheart or fresh-out-of-the-box Veritas?
I like the old tools. I have an old Stanley compass plane. I don't use it very much, but it has a special place in my tool cabinet.

Flowing curves or geometric shapes?
It used to be geometric shapes, but with more experience the flowing curves find their way into my creations. But there is not one or the other; it depends very much on the piece of furniture.

Favourite wood?
Western maple has so much character, but I also enjoy working with walnut and cherry and pear. Pear has sentimental value for me because I brought some with me when I came to Canada from Germany.

Least favourite wood?
I am not a fan of the exotic woods like teak.

Leaf Table – Laicher made this poplar, beech, walnut and western maple table on speculation, but it ended up in his living room. He got the idea to make a table shaped like a leaf while on his way to lunch one day when he noticed a birch leaf on the ground.

Photos by Dave Aharonian www.daveaharonian.com

quotes

My studio is on the second floor of an old building built around the turn of the century. The building is a maze of little studios.

The first thing I do on arrival, which is usually about 8 a.m., is turn on my radio headset to CBC. Then it's down to work at the bench or machine. Lunchtime usually involves walking for about 20 minutes to a café.

I prefer classical music. I think I get some inspiration from the music. Occasionally I find myself waltzing around the shop.

I recently bought a Festool Domino cutter. It's fun to use, and it's very versatile.

I get my design inspiration from books, and particularly from historical design. I am constantly aware of my surroundings, and nearly anything can be inspirational.

I am happiest working with my hands, being creative and enjoying the autonomy offered by being a sole proprietor.

Start by working for someone else first and make your mistakes there. When you have acquired some practical knowledge, then consider going on your own if you want to.

While most of my clients are as excited by my products as I am, there have been a few times when the project hasn't met the expectations of my clients. Understanding 'why' is always difficult.

Mid-century modern design has seen its day again. I used to like live edge furniture, but it is overdone now.

Over the years I have moved to more curved designs as my confidence has grown.

The media needs to provide more exposure for craftspeople. Programming like that seen on HGTV is actually counter-productive, as it raises peoples' expectations that craftsmanship takes no time at all.

I like Biedermeier design in general. The pieces are some of the first commercial designs created for the masses. Consequently, the designs are simple but retain the elegance of the period in Austria and Germany. Josef Danhauser's designs are stunning. I am amazed by the craftsmanship of builders of that era, as they were innovative and used techniques like veneers that were new at that time. I also like David Roentgen, who created cabinetry that was a mechanical marvel.

The Internet will either help furniture makers have access to customers, or it will kill us because people have more access to mass-produced furniture.

Biedermeier Chairs – Made of pear wood brought with him when he immigrated to Canada from Germany, Laicher made these chairs after seeing them in a design book. They're still the basis for most of the chairs he makes to this day.

Advanced technology is a two-edged sword: It helps us to make new innovations in our designs, but it also makes the process more industrialized.

Getting paid what the piece is really worth can be frustrating.

A couple of years ago I built a hall table in the art deco style out of walnut, thuya burl and maple inlay. Building the table was very inspirational and enjoyable. I entered it in a local art show, and it sold to a collector.

I believe that Canada is becoming less welcoming as the demographics change. Young people have different values, re-decorate more often and seem to want the latest fad in design. They don't seem to appreciate good craftsmanship.

The most important Canadian piece might be the farmhouse table that brought families together through history right up to today.

ROB BROWN
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SLIDESHOW: Visit the "Videos" section of our website to view a slideshow about Alfons Laicher's work.

heirloomproject

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

Build a MODERN COFFEE TABLE

This mitred coffee table includes clean lines, storage and a chance to add some interesting, visible joints. It also provides a comfy place to put your feet up after a hard day's work, if you choose to add a dedicated cushion.

BY ROB BROWN

We recently purchased a new sofa, so I anticipated my wife's next question: "What sort of coffee table are you going to make us?" We wanted something with clean lines and some storage. The option to put your feet up at the end of the day was also a plus.

Materials

I opted for PureBond plywood, by Columbia Forest Products, for this project, as it's formaldehyde free and is harvested responsibly. I had the 4' × 8' sheet ripped in half in-store so it would fit into my vehicle and would be easy to handle once I got it into my shop.

I used solid maple edging to cover the plywood edges. To add some contrast, and to match my existing décor, I chose black walnut for the base.

Start with the plywood top section

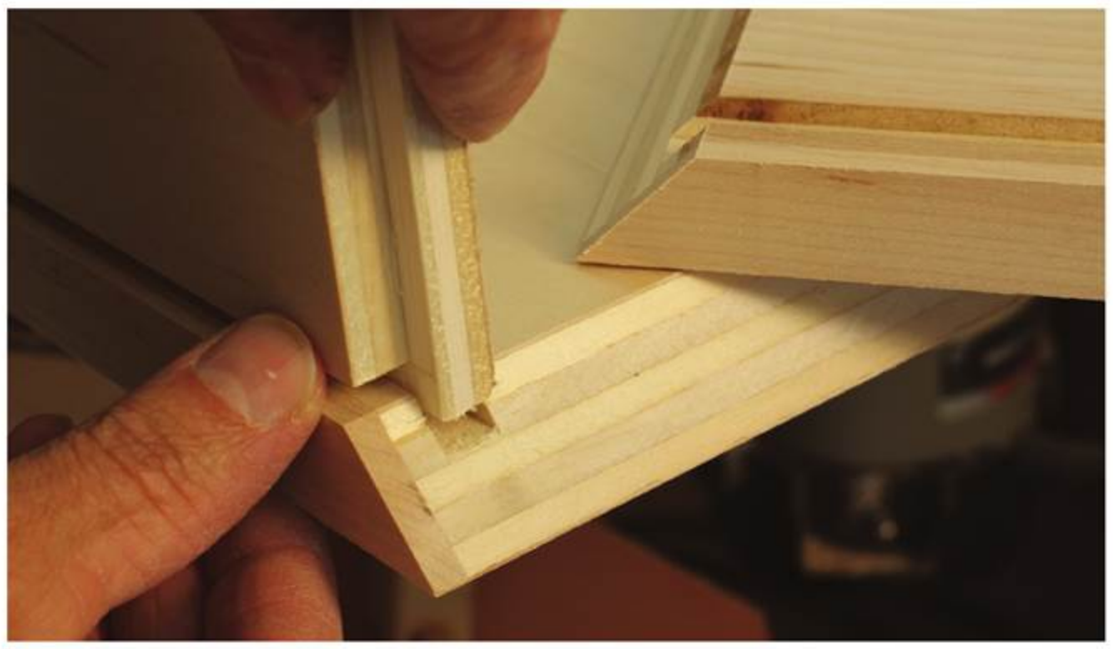
I cut the sides and top from one continuous piece so the grain would wrap around the piece. At this point the long blank was still 8' long, while the other was about 41" long. I ripped enough 1/4"-thick solid edging to cover the front and back edges of these blanks, then glued them in place using masking tape. When

Photos by Rob Brown Illustration by Len Churchill

Flush Them Up – A router with straight bit, equipped with a simple piece of plywood covering about half the router's footprint, make easy work of flushing up the solid wood edging. The bit is set slightly above the lower surface of the plywood base.

Easy Bevels – Once the rip and sacrificial fences are set up, Brown makes all the passes where bevelled edges are needed. Setting up the fence takes a few minutes but allows the user to cut quick, accurate mitres.

Stopped Grooves – Brown uses stop blocks clamped to his rip fence to position the bottom and top for stopped grooves. He butts the trailing edge against the rear stop block, lowers the workpiece onto the blade, and cuts the 3/16"-deep groove.



Back Panel – With the outside case parts cut to size and grooved for the back, the back panel can be cut to size and rabbeted. The tricky part is getting the visible gap between the back and case parts even.

dry I used a 3/4" straight bit in my router, and a piece of 3/4" stock that covered about half of the base of my router to help me flush the solid edging to the plywood faces. With the bit set slightly higher than the bottom of the plywood base, I ran the router around the edge, being careful not to tip the bit down into the workpiece. Afterwards I belt sanded the solid edging flush.

I then crosscut one end of the longer blank, cut one of the sides to final height, marked and cut the top to length, then trimmed the final side to length. I made sure to mark the pieces so I could assemble them how they were cut from the sheet. I also cut the bottom to the same length as the top.

Grooves to accept a small spline to secure the divider are next. This was just to position the divider during assembly. I ran a 1/8"-wide × 3/16"-deep groove in the inner faces of the top and bottom. They were both stopped a few inches away from the front and back edges. I did this on a table saw, with a block clamped to the rip fence to start and stop the cut. I positioned the part, with the trailing end on the table saws' surface, then slowly lowered the workpiece onto the blade and made the cut. A pair of splines were then machined to fit the groove.

Magic bevels

If you'd rather cut your bevelled edges a different way, go right ahead and do that now. I prefer this method as there is only one setup, and then I can bevel every edge I need to quickly and accurately. To view the details see "Related Articles" at the end of this article for an in-depth description of the process.

The divider

Measure between the bevelled edges, on the inside of one of the side panels, to determine the length of the divider. Trim it to length, then run a groove in either end to accept the spline. These grooves are also stopped a few inches from the front and back.

The back

Though you can do away with this part, it does add some strength to the table. A rabbet is machined around the edge of the back, and the resulting tenon fits into a groove on the inner faces of the top, sides and bottom panels. It would have been easier to cut the rabbet on the inner face of the back, though they would have forced me to machine the groove in the top, sides and bottom far too close to their back edges. Instead, the back panel has to be accurately measured and cut, so an even gap appears between the back and the four adjoining panels.

I ran a 1/4"-deep × 3/8"-wide groove in four case pieces, and made sure the inner edge of this groove was located 7/8" away from the back edge of the parts. This will leave the 3/4"-thick back inset 1/8" from the solid wood edging. Now I cut

the back panel to size and machined the rabbets on the four sides of the back, leaving a small and even gap on all four sides once the case is assembled.

At this point I cut the divider to final width, then sanded the interior faces of the case parts as well as the exterior face of the back.

Dry assembly

Start by laying the four main case parts face down on a long, flat piece of sheet stock, and butting their mating edges up against each other. Apply strips of masking tape across each of the joints, making sure the tips of each joint are precisely aligned. The tape should be tight enough to pull the joint together during assembly, but not so tight the tape breaks. Dry assembly is the perfect time for practicing.

With three of the four joints taped, flip the parts over, install the back and splines and carefully wrap the parts together. An extra set of hands comes in handy here. Before the parts come together, position the divider and splines. Block planing a small chamfer in the edges of the splines might allow for easier assembly of the divider joints.

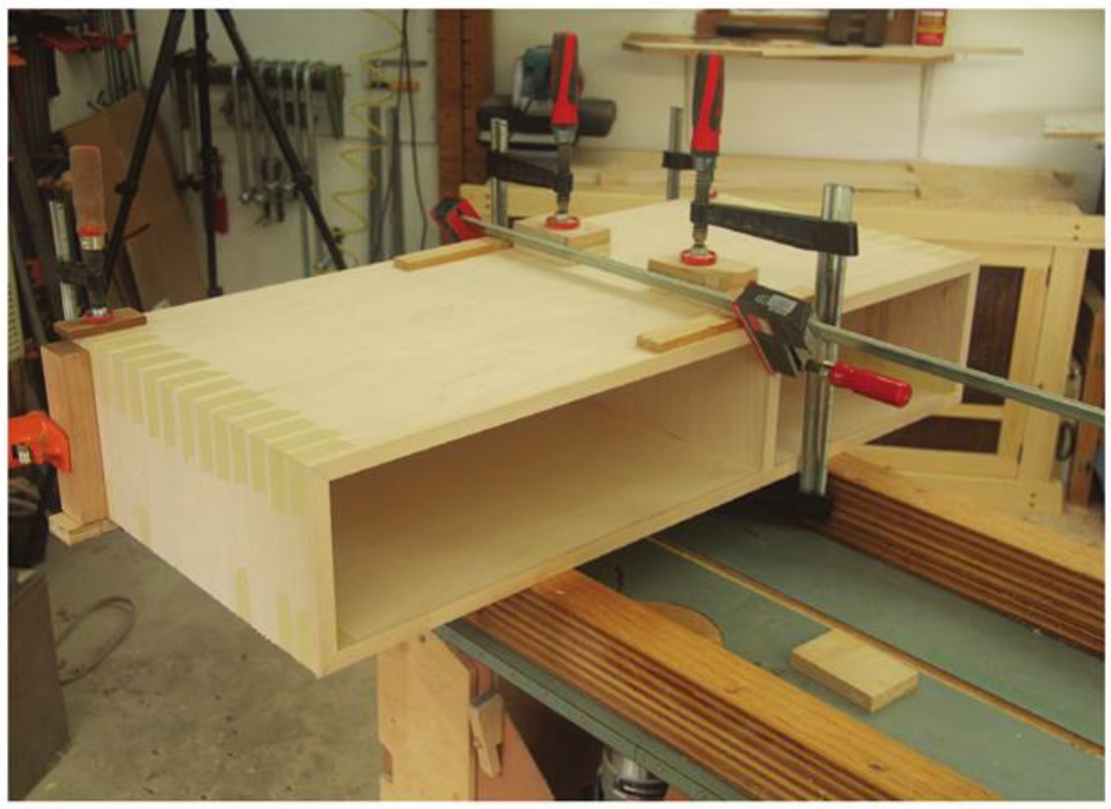
Final assembly

With the parts lying inner face up, apply some glue to the bevelled joints, back grooves and splines, then bring the parts together one last time. Apply tape across the final bevelled joint, and use clamps where necessary to bring the case together. Be careful when using clamps on the bevelled edges, as uneven pressure will quickly throw these joints off.

Tape, Clamp and Flip – Brown adds masking tape across three of the bevel joints that make up the case, then clamps a few straight pieces of scrap to both sides of the joints and flips the whole assembly over so it can be glued and assembled.

The base

Legs that met the front and back aprons and 90° would be much easier to machine, but I liked the look of the angled legs. I set out to use a fairly standard mortise and tenon on an angle, but realized mitering the leg / apron joints would complement



Case Assembly – With the glued case pieces, the back and the divider assembled, some tape across the final bevel joint as well as some carefully placed clamps bring the joints together for good.

the bevelled case corners much better. Constructing the base a simpler way is the best way to simplify this project.

I had a medium-sized piece of 8/4 black walnut, and was able to source all my parts from it. I dressed the board to about 2", then cut the four legs, two aprons and two stretchers from the board oversized. In fact, I cut two leg blanks about 10" long × 5-1/2" wide, and was later able to obtain two legs from each blank.

Four tapered legs

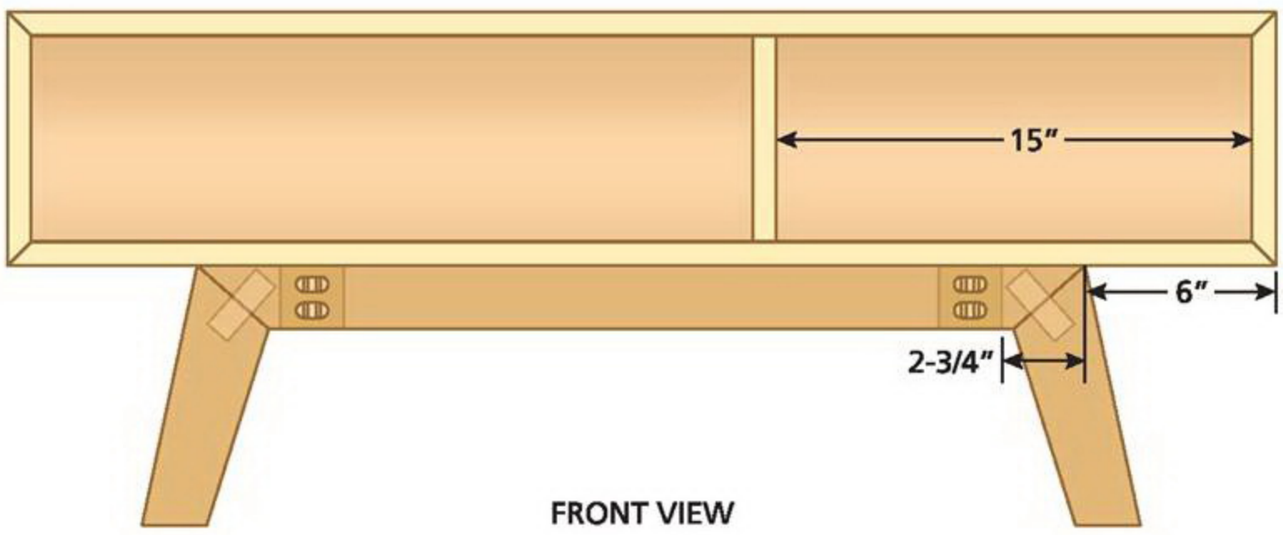
Because the legs are too short to safely joint, I ensured one edge of each leg was straight, then I marked and band sawed each leg from the blank. The exact taper on the inside edge of the legs isn't crucial, as long as the legs look pleasing. I then cut the taper on my table saw with a simple shop-made taper jig. The legs were longer than needed, but they would be trimmed to length after they were fixed to their mating apron.

Base mitres

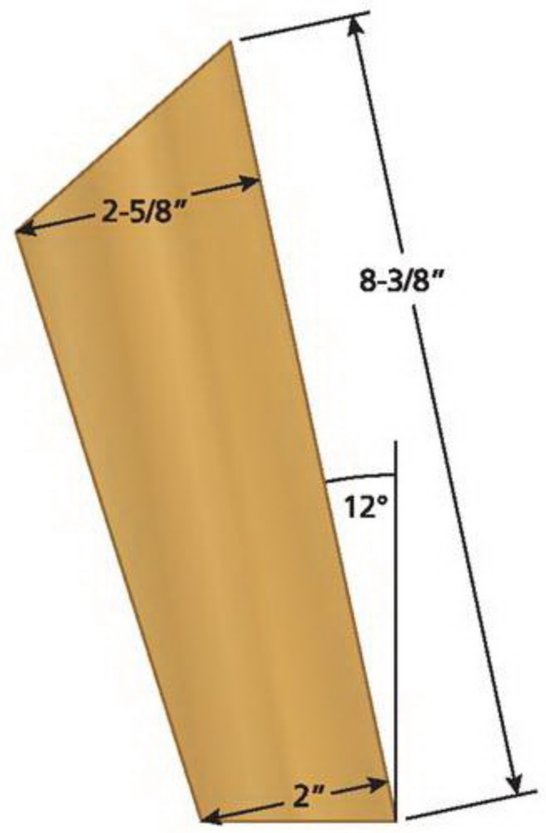
Because the upper section of the legs and the entire length of the apron are different widths, and because we're not aiming for a 90-degree joint, the mitres have to be carefully measured. I placed the apron on my bench face up, then placed one of the legs on top of the apron at the angle I wanted. I added a mark on the leg, first where the outer face of the leg crossed the upper edge of the apron, then added a second pencil mark where the inner edge of the leg crossed the lower edge of the apron. I connected these two marks to form the line where the legs needed to be cut. A few wood stops screwed to my cross-cut sled, with a screw driven into their sides, makes for a solid and adjustable way of positioning each leg while it gets cut to length on an angle. I added at least one hold-down clamp to ensure the pieces wouldn't move while being cut.

With the legs cut to the proper angle, I placed them back on top of the apron, re-aligned the joint, and then marked where the apron would be cut. The same stop blocks were

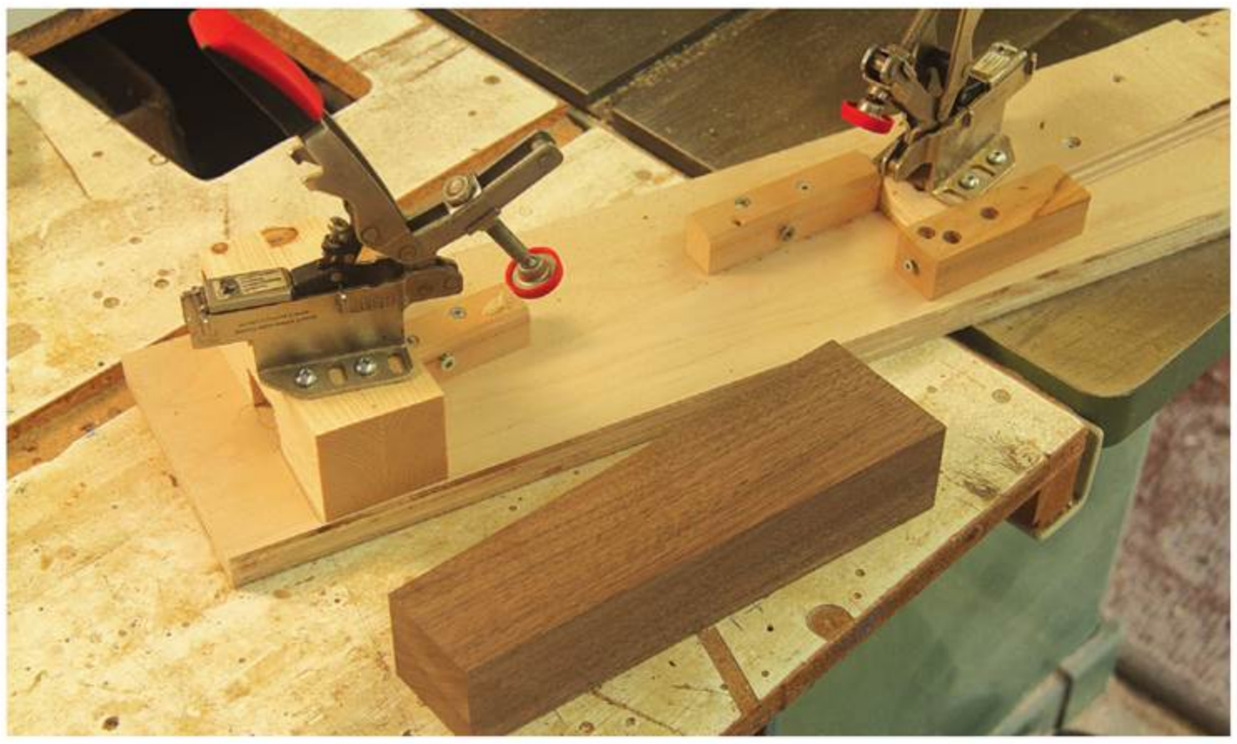
CASE BACK DETAILS



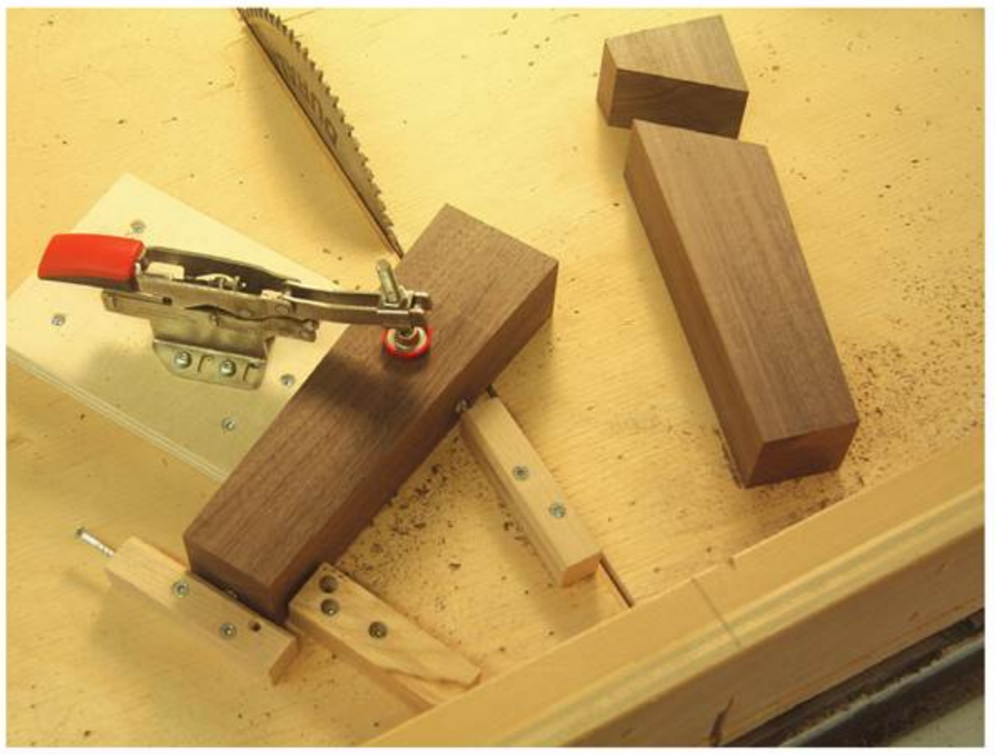
FRONT VIEW



LEG DETAILS



Quick Taper Jig – Using a piece of scrap plywood for a base, Brown screws some stop blocks and a hold-down device to the scrap. The stop blocks have screws in their sides that can be adjusted to fine-tune the angle at which the workpiece gets cut. The edge of the plywood scrap runs against the rip fence to make the cut.



Angled Mitres – With some stop blocks secured to his crosscut sled, Brown can secure the workpiece with hold-down clamps and make consistently clean and accurate cuts. Both the legs and aprons can be cut this way, but with two different set-ups.

re-positioned on my crosscut sled and both ends of the two aprons were cut.

Assemble the base

These mitre joints would have a medium amount of strength if glued properly, but I decided to add a pair of Dominos per joint, both for alignment during assembly and joint strength. I positioned them towards the inner portion of the joint, in order to keep them from protruding through the outer edge of the legs. A bit of math, then a pencil line across each mitre joint to assist with positioning my Domino XL, and I was off to the races. I used 12mm-thick × 100mm-long Dominos. The dominos were machined to extend slightly further into the legs, as there was enough material, but even with the mortise depths in the apron reduced, they slightly protruded through the upper face of the apron. Not a big deal, as the case would cover that up.

To apply enough force with clamps while assembling the leg to apron joints, an angled clamping block was glued to the outer side of the legs. The angle was cut so one face of the clamping block would be parallel to the joint line. To provide the other face to clamp against, I cut a piece of 2" × 1" stock slightly shorter

Materials List

Part	Qty	T	W	L	Material
Case Top	1	3/4	17-1/2	40	Maple Plywood
Case Bottom	1	3/4	17-1/2	40	Maple Plywood
Case Sides	2	3/4	17-1/2	8	Maple Plywood
Case Divider	1	3/4	To Fit	6-1/2	Maple Plywood
Divider Splines	2	1/8	3/8	To Fit	Solid Maple
Case Back	1	3/4	To	Fit	Maple Plywood
Solid Edging	1	1/4	3/4	To Fit	Solid Maple
Legs	4	2	2-3/4	8-3/8	Solid Walnut
Aprons	2	2	2	28	Solid Walnut
Stretchers	2	2	2	13-1/2	Solid Walnut
Loose Tenons	8	12mm	To Fit	4	Solid Maple
Wedges	16	To Fit	12mm	1-1/2	Solid Walnut

Hardware List

Name	Qty	Size	Details	Supplier
Felt Pads	4	To Fit	Adhesive Backed	Misc.
Domino Tenons	8	12mm × 100mm		Misc.

Solid Joints – Brown uses a Domino XL to cut mortises in the aprons and legs. With a bit of practice, this is a fast and accurate way to produce very strong joints.

Angled Glue Blocks – To ensure clamping pressure perpendicular to the glue line, Brown added angled blocks to the outside surface of the legs. The two lines drawn on the face of the legs assists with positioning the block.

Attach the Legs – Using a long strip with an angled block on either end, Brown glues two legs onto an apron at once. Clamping the strip at both ends ensures it stays in place.

than the top of the aprons, which could be clamped to the apron during assembly. Two angled blocks were clamped to this strip at the right location, so when the apron / leg assembly was glued, clamping pressure could be applied perpendicular to the joint.

I applied glue to the joints and brought everything together. When dry, I repeated with the other apron / leg assembly. To remove the angled block from the side of the leg, I trimmed it with my Japanese ryoba saw, then hand planed the face smooth.

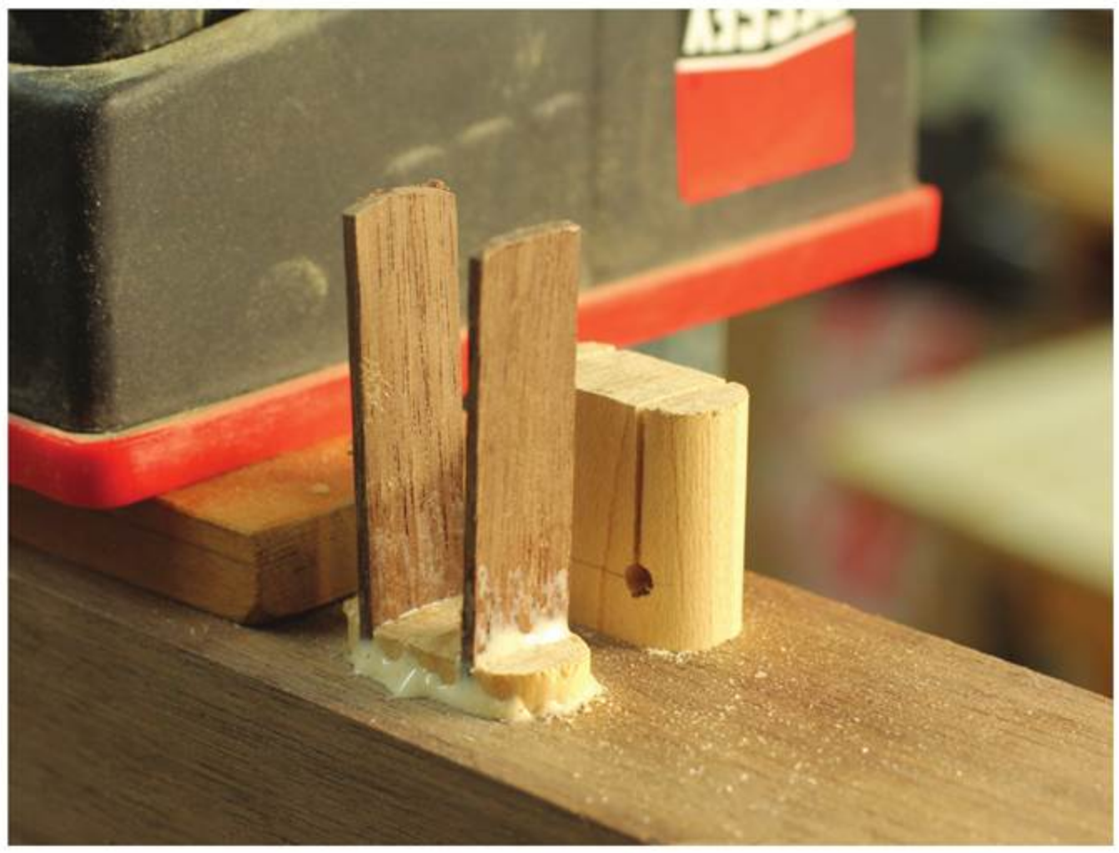
To secure the two apron / leg assemblies to each other I opted for a through tenon in a contrasting wood to jazz up the look. I dressed the stretchers to final dimensions, marked a centerline where they would mate with the aprons, set the Domino XL to create equally spaced mortises and cut the eight mortises. I always referenced off the top of the apron and stretcher, so the upper surfaces of these pieces would be flush. I also machined the mortises in the apron from the front face, so any tearout where the bit exited the cut would be covered by the stretcher.

Through Tenons – Two mortises need to be added to each joint to secure the apron assemblies to the stretchers. Working from the outside in ensures any tearout from the cutter exiting the stock will not be seen.

Grooves for the Wedges – With the loose tenons cut to fit the mortises, they can be drilled and kerfed for the wedges. Ensure the kerf your handsaw leaves isn't too thin, as thin wedges will break when installed in place

Create the loose tenons

I planed maple to final thickness then ripped them to fit the overall width of the mortises. The mortises were 12mm wide, but the closest roundover bit I had was 1/4" diameter. I rounded the four edges with this bit on my router table. I then cut the loose tenons about 1/4" longer than needed, used a sanding block to ensure the fit was good, drilled 1/8"-diameter holes where the base of the wedge kerfs would finish, then cut the wedge kerfs in the outer end of the tenons. I created a thin strip



Lots of Loose Tenons – To assemble the base joints, Brown first inserts a dry loose tenon into each joint, then he proceeds to glue the other mating loose tenon in place, followed by another loose tenon to complete that joint. While assembling the base, he keeps the aprons against the stretchers with a pair of clamps. In this photo the dry loose tenon just needs to be removed and glued in place to complete this joint.

of wood the same width as the mortise, and the same thickness as the kerf, then cut the strips about 1-1/2" long and tapered their ends so they would easily fit into the kerfs.

Add the stretchers

To ensure the joints were lined up, I inserted one unglued loose tenon into each of the four joints, then clamped the stretchers between the aprons. I then applied glue to one mortise and tenon, hammered the tenon home and tapped in two walnut wedges. I then removed the unglued tenon from this joint, glued it in place and tapped in the walnut wedges. I repeated this with the other three joints. When dry, I trimmed the tenons and sanded them all flush.

Sand and finish

To secure the case to the base I bored four 1/2"-diameter screw head clearance holes into the underside of the aprons, then drilled four 3/16" diameter thread clearance holes through the apron so the #10 × 1-1/2"-long screw heads could protrude into the bottom of the case without coming through. I then sanded the upper case and base, and eased all the edges.

I selected Varathane's Professional Satin Clear Finish in an aerosol can for this table. I've used it on many similarly sized projects, and it offers ease of application, no clean up and great protection for higher-use items. It takes a while for each coat to dry, but I just apply a coat at the end of the day. Three coats, sanding between each coat, is usually enough.

After the finish has cured for a few days, I use #0000 steel wool and paste wax to buff the finish smooth and to an even lustre. I applied a peel-and-stick pad to the bottom of each leg to avoid scratching my living room floor, then screwed the base into the case. You can stop right here, and put your new coffee table to use, or you can add a padded pillow to a portion of the table to allow a comfy spot for your feet to rest after a hard day's work. If you want to go this route, read the article in this issue about how to upholster a simple foot rest that looks great and is super comfortable.

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Smart Wi-Fi Enabled Thermostats

Use your mobile device or desktop computer for optimal control of your home's temperature.

BY CARL DUGUAY

Smart thermostats provide all the basic scheduling features of programmable thermostats, and, depending on the model, they can provide the ability to:

- Control and monitor your home's temperature remotely from your mobile device, desktop computer or smart speaker, such as Amazon Echo, Google Home or Apple Home Pod.
- Monitor and adjust temperature based on outdoor temperature and indoor humidity.
- Learn your temperature preferences and adjust thermostat settings accordingly.
- Monitor and adjust temperature depending on which zones (rooms) you're using, and when you enter and leave the home.
- Integrate with other smart devices in your home, such as lighting, shades, locks, and appliances.

Photos by Manufacturers (Lead Photo by Lyric)

- Control who has access to your home's thermostat.
- Receive alerts when the temperature falls or rises above a certain level.
- Provide you with historical usage data and other relevant information.

If you're an avid DIYer with some experience replacing or installing new electrical receptacles and switches, you should have no problem installing a smart thermostat. Otherwise, it's best to hire an electrician to do the work for you. Installation is a 15- to 30-minute job. Once installed, most smart thermostats will automatically connect to your Wi-Fi router. You'll also need to install the thermostat's app on your mobile device to configure and manage its various features.

The C-Wire

Most home HVAC systems (whether comprised of a single furnace or some combination of furnace, air conditioner, heat pump) are connected to a thermostat that draws 24V of power (referred to as a *low-voltage thermostat*) from a transformer generally located on the furnace. Homes with a baseboard and/or radiant heating system are usually connected to a thermostat that draws 120V of power (referred to as a *line voltage thermostat*). When purchasing a smart thermostat, you need to know how your existing thermostat is powered, as most smart thermostats are only compatible with 24V systems.

On a 24V system, the thermostat sends its signals to the HVAC system via a set of three or more bundled wires. Usually one of those wires is the common wire (C-wire), which smart thermostats use. Occasionally there is no C-wire (particularly with older HVAC systems), in which case you (or an electrician) will need to add a common wire. This involves replacing the wire bundle that runs from the thermostat to your HVAC, a fairly straightforward procedure. For those systems without a C-wire, the Ecobee 3 provides a Power Extender Kit that connects to your HVAC system, enabling you to use the furnace fan wire in place of the C-wire. The Nest doesn't require a C-wire, but will use it if present. One of the few companies to offer line voltage smart thermostats is Sinopé Technologies.

Zoned Systems

In some homes, the HVAC system uses a series of valves and dampers to control the temperature independently in different areas of the house. This is referred to as a *zoned system*. If you have a zoned system there will be a separate thermostat controlling each zone. In a situation like this, you won't be able to replace all the thermostats with a single smart thermostat – you'll need to purchase separate smart thermostats for each zone. Even though most smart thermostats are compatible with multi-zone systems, none can control more than one zone.

Dual Fuel Systems

Some homes have a heat pump that takes care of most of the heating and cooling, and a gas or electric furnace that kicks in during the colder months, when the heat pump operates less

EcoBee3

This Canadian product has received a lot of positive feedback from consumers. It's compatible with just about any heating and cooling system, whether the system uses a C-wire or not. The EcoBee relies on sensors to control temperature. There's a built-in sensor, and it comes with one remote wireless sensor that you can place anywhere in the home (you can add up to 32 additional sensors). It also uses geofencing to detect when you leave or return to the home. Initially you'll need to set up a temperature schedule (or use the default schedule provided by EcoBee). The EcoBee uses its sensors and geofencing to manage this schedule when you move about the home and when you're away from home. It's one of the few smart thermostats that is ENERGY STAR certified. There is a Lite version of the EcoBee3 that doesn't provide support for accessories such as HRVs, ventilators, humidifiers, and dehumidifiers. The upcoming EcoBee4 will feature built-in Amazon Alexa voice control.

efficiently. Usually both are connected to the same thermostat. This is a dual fuel, or hybrid system, and only The Ecobee, Nest and Sensi Touch are compatible with them.

Smart Algorithms

Algorithms are essentially mathematical instructions embedded in the microcontroller inside most smart thermostats, used to control various operating features – such as instructing the thermostat to turn the air conditioner on if the indoor humidity increases to a specific level, or to turn the heating down when you leave the house. The Nest is most closely associated with the concept of self-learning algorithms designed to learn about your temperature preferences on their own. With most smart thermostats you program your daily temperature preferences – waking, during the day, coming home, going to bed, weekends, and the like. With the Nest, once installed you still have to adjust the thermostat to your preferred comfort levels a few times a day during the first few days, but it quickly 'learns' those preferences and automatically adjusts the temperature as required.

Remote Sensing

Some thermostats have built-in sensors that illuminate the display as you approach the thermostat, measure room temperature and humidity levels, or detect when you leave a room. Only the EcoBee3 uses wireless remote sensors that detect where you are in the home, and will adjust the temperature accordingly. It also enables you to add up to 32 different sensors throughout your home.

Lyric T5

Honeywell has nine different Wi-Fi enabled smart thermostats, three of which are part of the Lyric line. The Lyric T5 is the newest version. It features geofencing and the usual seven-day scheduling, along with smart alerts – for example, telling you when to change the furnace filter. You can use the Lyric app or the touchscreen to control the features. It doesn't work with dual-fuel systems and lacks a built-in motion sensor. However, it's one of the least expensive models to purchase.

Nest Version 3

Nest is the granddaddy of smart Wi-Fi thermostats and is generally viewed as the benchmark against which other models are compared. It learns your temperature preferences and your schedule of coming and going, how quickly your home heats up and cools down, and pairs that information with local weather conditions to maintain an optimal temperature throughout your home. Like the EcoBee, it uses geofencing, has scads of features, and works with all the major smart devices and systems except Apple's HomeKit and Samsung's SmartThings.

Touchscreens

It's convenient to be able to control the majority of a thermostat's features via a touchscreen as well as through the app. Screens vary in size and clarity, and some light up as you approach them. Some default to a nightlight mode at nighttime.

Geofencing

Geofencing is a feature that uses GPS to enable a thermostat to know when you leave your home, and when you're within a specified distance from home, so that it can better regulate temperature. This means that you don't have to program the thermostat to turn on or off at times you typically enter or leave your home, or activate an 'away' mode – as long as your mobile device is connected to the smart thermostat. However, if there are multiple residents, then each will need to be connected to the thermostat's app for geofencing to work properly.

Compatibility

If you use a smart-home hub or smart speaker, then you'll want to select a compatible smart thermostat. This facilitates integrating with any other smart devices in your home. Only the Sinopé lacks any hub connectivity; all others are compatible with at least one hub.

Sensi Touch Wi-Fi

The Sensi works with dual-fuel systems and uses geofencing. It has one of the largest high-definition colour display touchscreens, which might be of special interest to anyone with visual issues. It also meets the new Energy Aware standards requiring plus or minus 1 degree of accuracy in temperature control.

Sinopé TH1120RF-3000

This Canadian company has thermostats for both low- and high-voltage systems, as well as for radiant floor heating systems. Their products run off the Sinopé 'neviweb' platform, and you need to purchase their GT125 Web Interface for Wi-Fi compatibility. This model offers a basic set of functions, including a clock and temperature display and a 7-day schedule with up to six different temperature periods per day. However, it lacks a built-in sensor and doesn't use geofencing.

Model	EcoBee3	Lyric T5	Nest Version 3	Sensi Touch Wi-Fi	Sinopé TH1400RF
Price (Canadian)	$299.99	$179.99	$279.00	$239.00	$98.95 1
Warranty (Years)	3	1	2	3	3
Dual Fuel (furnace/heat pump) Compatible?	Yes	No	Yes	Yes	No
Requires C-wire?	No 2	Yes	No	Yes	Yes
Uses Algorithmic-based Learning?	No	No	Yes	No	No
Motion Sensor: Built In	Yes	No	Yes	No	No
Motion Sensors: Remote	Yes	No	No	No	No
Touchscreen	Yes	Yes	Yes	Yes	No
Geofencing	Yes	Yes	Yes	Yes	No
Apple HomeKit Compatible	Yes	Yes	No	Yes	No
Amazon Echo/Alexa Compatible	Yes	Yes	Yes	Yes	No
Google Home Compatible	No	No	Yes	Yes 3	No
Samsung SmartThings Compatible	Yes	Yes	No	No	No
	EcoBee.com	YourHome. HoneyWell.com	Nest.com	SensiComfort.com	SinopeTech.com

[1] Plus $89.95 for the GT125 Web Interface for Wi-Fi compatibility.
[2] A power extender kit is supplied if there is no C-wire present.
[3] Through the Wink Hub

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Apollo PRECISION-6 wins the Visionary Award at AWFS 2017

The Apollo Twin-Turbo Precision-6 won the Visionary Award for Product Innovation in the Power Tool category at AWFS 2017 show in Las Vegas. The key benefit of the TWIN-TURBO PRECISION-6 is that it provides the highest atomizing pressure of any system in the world and the lowest overspray, with 80+% or better transfer efficiency. Backed by a 2-year limited warranty, the PRECISION-6 closes the gap between air assisted airless technology and TrueHVLP™ Turbo Spray Technology. The PRECISION-6 even enables painters to atomize high viscosity, high solids paints and coatings with the soft, warm air from turbo technology, thus reducing the amount of coatings sprayed and ultimately reducing pollution, all while maintaining production speeds. To learn more about Apollo's sprayers visit **www.hvlp.com**.

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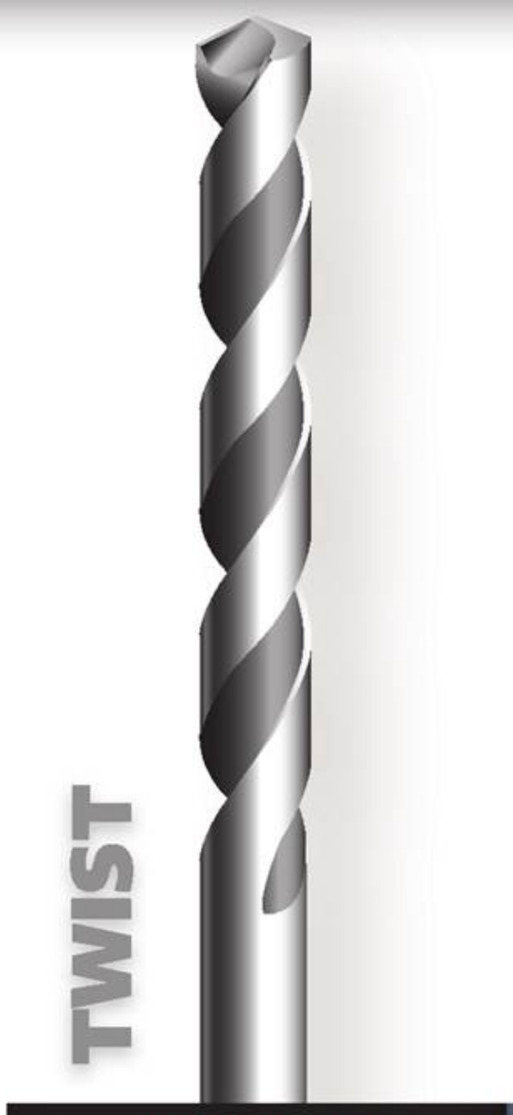
What Drill Bit Should You Choose?



MAIN USE

General purpose when hole quality is not critical.

Usable on all woods, metal, plastic. 1/64" to 1" in 1/64" increments. Various coatings extend cutting life.

MAIN USE

Maximum screw holding ability.

Bits match screw profile. Sized for #6, #8, #10, #12 and #14 screws. Generally used with matching countersinks.

MAIN USE

Everyday wood bit for clean, accurate holes.

Pointed tip prevents skating on wood surface. Side spurs cut fairly clean holes. 5/64" to 1".

MAIN USE

When hole quality and accuracy is critical – up to 1" diameter.

Precise, clean-edged, flat-bottomed holes. Various rim configurations. 1/4" to 1".

MAIN USE

When hole quality and accuracy is critical – over 1" diameter.

Precise, clean-edged, flat-bottomed holes. Generally used in drill press. 1/4" to 1-1/2"

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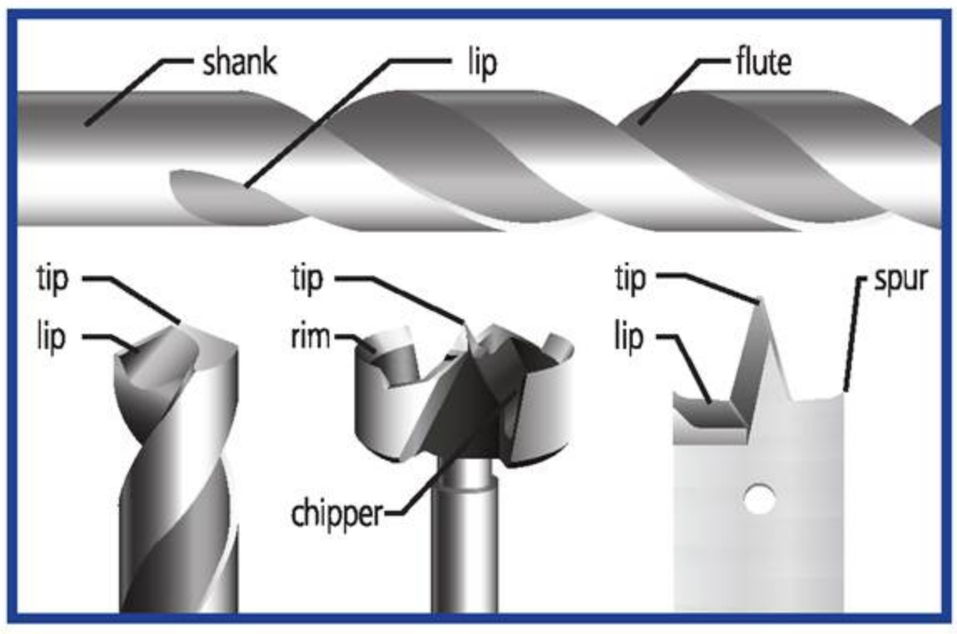
Tips:

- When available, choose High Speed Steel over High Carbon Steel bits.
- Start holes with an awl to prevent bit wandering.
- Generally, as bit size increases, decrease drilling speed.



From the editors of CANADIAN Woodworking & HOME IMPROVEMENT

SPADE

MAIN USE

Quick holes in soft and hardwood.

FEATURES

Quick cutting. Tips can be pointed or threaded. Blades can be flat or curved. 1/4" to 1-1/2".

AUGER

MAIN USE

Deep holes in softwood, dimensional lumber.

FEATURES

Threaded tip draws bit through wood. Aggressive cutting. 1/4" to 1-1/2" up to 45" long.

HOLE SAW

MAIN USE

Largest size holes in wood, metal, plastic.

FEATURES

Used with a mandrel. 1-1/4" to 6".

HOLLOW MORTISE

MAIN USE

Drill and square holes at the same time.

FEATURES

Consists of bit and chisel. Used on mortising machines or mortise adapter for drill press. 1/4" to 1".

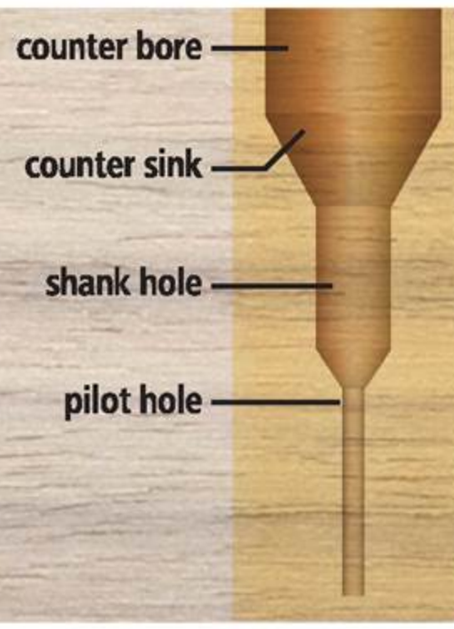
MASONRY

MAIN USE

Brick, stone, concrete.

FEATURES

Carbide tips extend bit life. Use with impact and hammer drills. 1/4" to 1".



Countersinks/Counterbores:

Countersinks cut cone shaped holes to accommodate screw heads. Counterbores cut flat bottom holes so screws can be set below the surface and plugged with a dowel.

Centering Bits:

These guides make it easier to center bits in hinges. Available with bits for #3 to #10 screw sizes.

Tips:

- Prevent overheating by backing-out bit frequently to remove debris from the hole.
- Store bits apart or in bit organizers to prevent edge and tip dulling.
- Most bits can be economically re-sharpened.

Home Insulation Options

Optimizing the energy efficiency of your home includes proper insulation.

BY CARL DUGUAY

According to Statistics Canada's 'Survey of Household Spending', the average Canadian home spends about $2,500 on total energy costs. On average, 60 percent of that amount – $1,500 smackers – goes to heat and cool the home. That's a fair chuck of pocket change. Fortunately, there are a few things you can do to lower your overall energy costs, and keep more of those hard-earned dollars in your pocket – seal, insulate, and maintain.

Topping up the insulation in ceilings, or adding insulation to crawl spaces, attics and basements, is by far the most effective thing you can do. But without sealing around the usual places – windows, doors, receptacles, and plugs – and the less obvious places – plumbing vents, junction boxes, wiring access holes, behind kneewalls, rim joists, and attic access doors – you'll be working at cross purposes. Before you add any additional insulation to your home, take the time to inspect for possible air leaks, and 'plug and seal' them with caulking and/or expanding foam spray. To make it easier to find where your home is losing heat, you can have an infrared scan taken. Contact a local energy auditor or insulation contractor.

Adding insulation won't just save you money – it will make your home cozier, help reduce noise infiltration, increase the value of your home, and appease Gaia by reducing your contribution to greenhouse gas emissions.

An avid DIYer can install any type of insulation except spray foam – it's bulky, messy and difficult to spray well. However, for fairly small jobs you can purchase disposable tanks of one- or two-component polyurethane foam. Loose fill insulation is easier to install, though it requires the use of a blower (which you can rent) and a helper to fill and operate the blower hopper. Rigid (foam board) insulation is commonly used in basement renos. It's not difficult to install, but more involved. Foam board is usually attached to walls with general-purpose adhesive, and then all the seams are taped. Framing is overlaid, the stud cavity is filled with batt or spray insulation, and then drywall or some other sheathing is used to finish the walls. Batt and roll insulation is the easiest to install, though you have to be diligent about doing it properly – not leaving gaps or voids, not overly compressing the batts, and not installing them too loosely between studs or joists. The only equipment you need is gloves, long-sleeved shirt, respirator, and utility knife.

This article provides basic information on the most popular types of insulation commonly available from building supply centers across Canada, along with a handy chart of R-values, to get you set on the right track. If you decide to hire a contractor, ask for references, and make sure you get a written

Lead Photo by Owens Corning

estimate. Don't hesitate to ask them to explain how they'll install the product, whether they air-seal while insulating, and make sure you check over the work once it's completed.

Batts and Rolls

Available as fibreglass, and rock wool (aka mineral wool or stone wool) batts, in 16" to 24" widths, 48" long, and from about 3-1/2" to 6-1/4" thick (7-1/4" for rock wool), and in rolls of the same thickness, 15" to 48" wide and up to 100' long. Generally used unfaced, but also available with a vapour retarder attached to one side – usually Kraft paper or foil. When properly installed, neither of these products will slump appreciably, and they'll hold their R-value indefinitely.

Traditionally both fibreglass and rock wool contained formaldehyde as a binder. Health Canada recommends an exposure limit of 40 ppb (parts per billion). Most insulation today has very low levels of formaldehyde – Certainteed products, for example, are in the 11 to 15 ppb range. Quite a few companies, including Johns Manville, Owens Corning, and Roxul, offer formaldehyde-free insulation that uses an acrylic binder.

Fibreglass, the most widely used insulation in Canada, is the economical choice. It's air and vapour permeable, non-combustible, and won't rot. It doesn't support mold growth, but when it does get wet, it takes a while to dry out. While it does serve as a sound absorber, it's not an effective sound blocker. However, there are various insulating products, like CertainTeed's NoiseReducer and Owens Corning's QuietZone batts that are specifically designed to help reduce sound transmission.

Rock wool is the premium choice. It's made primarily from basalt rock and granulated blast furnace slag, spun into fibers, and can have up to 90% recycled content (compared to fibreglass which can have up to about 70%). It's noncombustible, vapor permeable, water repellant, fire and mold resistant, and has good sound-absorbing qualities. Because it's stiffer and denser than fibreglass, many find it easier to install.

Sources: CertainTeed.com, JM.com, KnaufInsulation.ca, OwensCorning.com, Roxul.com

R-Value

You'll see the term **R-Value** bandied about quite a bit. Essentially it measures how well a material resists the flow of heat. The higher the number, the better able it is to resist heat flow – which is what you want. Thicker insulating materials will have higher R-values, and different types of insulating materials of the same thickness may have different R-values. R-values are often listed per inch of insulating material. For example, fibreglass batts have an R-value of around 3 to 3.7 per inch of thickness, while closed-cell spray foam has an R-value of about 6 per inch.

Type of Insulation	R-value/inch
Batts & Rolls	
Fiberglass	3.0 - 3.7
Mineral wool	2.8 - 3.7
Loose Fill	
Fiberglass	3.0 - 3.7
Mineral wool	2.8 - 3.7
Cellulose	3.0 - 3.7
Rigid (Foam Board)	
Expanded Polystyrene	3.6 - 4.4
Extruded Polystyrene	4.5 - 5.0
Polyisocyanurate	5.6 - 6.7
Spray	
Cellulose	3.0 - 3.7
Open-cell Polyurethane	3.6
Closed-cell Polyurethane	5.5 - 6.0

Fibreglass Batts – The most commonly used type of insulation in Canada, fibreglass batts are an economical choice and are fairly easy to install. (Photo by CertainTeed)

Vapour Retarder – A Kraft paper or foil vapour retarder is sometimes attached to one side of fiberglass batts. (Photo by CertainTeed)

Rolled Fibreglass Insulation – Rolls of fibreglass insulation are available in long and wide dimensions, and are great for covering large, flat areas. (Photo by Owens Corning)

Loose Fill (Blown)

This is the same material as in fibreglass and rock wool batts, but it's in a crumbled or chopped form so that it can be blown into hard-to-reach places. It's widely used in attics, often over a base layer of batts, as it does a super job of filling in crevices. There is also a cellulose-based product made of recycled paper along with various natural additives, that serves as a fire suppressant and also controls mold and dust. On the downside, cellulose does absorb moisture and can hold a lot of water.

Sources: Cellulose.com, CertainTeed.com, JM.com, OwensCorning.com, WeatherShield.ca

Rigid (Foam board)

Available as expanded polystyrene (EPS), extruded polystyrene (XPS) and polyisocyanurate (ISO) in boards 24" × 96" and from 1/2" to 2-1/2" thick. They're typically used to insulate basement walls (both inside and out), and they provide a superior air barrier if the seams between sheets are carefully sealed with caulk

Blow It in Place – Blowing fibreglass or rock wool insulation into an area can be very efficient, though a helper is needed to feed the hopper. (Photo by Owens Corning)

Premium Batts – Rock wool is stiffer than fibreglass, and can be easier to handle and install. It's easily cut with a knife. (Photo by Roxul)

Insulated Siding

Another way to add extra insulating value to your home is with insulated vinyl siding. It usually has a layer of EPS foam board fused onto the back of the siding, and adds an extra R3 to your walls. However, it costs more than conventional siding, and because the seams of the insulated siding are not taped, it doesn't make the home more airtight.

Insulation Boards – Extruded polystyrene, commonly found in blue or pink, is strong and dense, and does a pretty good job at blocking moisture. (Photo by Dow)

or tape. Most EPS and XPS boards contain the highly toxic fire retardant hexabromocyclododecane (HBCD), while EPS doesn't contain the ozone-depleting hydrochlorofluorocarbons (HCFCs) found in XPS. However, at least one company (Dow) has shifted to a nonhazardous polymer fire retardant.

EPS is the least expensive, the most vapour permeable and has the lowest R-value. It's usually white, and food and beverage coolers used to be made of this type of material. XPS

High-Quality Boards – Polyisocyanurate board ranges from 1/2" to 2-1/2" thick, and typically has a foil facing on both sides. This product is great for blocking vapour and has a very high R-value. (Photo by IKO)

(the common blue or pink foam board) is stronger, denser, and blocks moisture better than EPS. ISO typically has a foil facing on both sides, which serves as a vapour barrier, and it has the highest R-value of any insulation (less so in very cold temperatures). It's more fire resistant than EPS and XPS, and doesn't contain HBCD, but is much more water permeable. Note: Roxul's ComforBoard is not a foam board, but rather a rigid sheathing made of rock wool.

Sources: Dow.com, IKO.com, JM.com, OwensCorning.com

Spray

Available as open-cell polyurethane (OCP) and closed-cell polyurethane (CCP), both are good air and dust barriers – the foam expands to create an airtight seal that won't shrink, compress, settle, or biodegrade. Sprays also do a good job of reducing sound transmission. OCP has about half the R-value of CCP, and it is permeable to moisture and impermeable to air. CCP is considered the most effective of all the types of insulation, and the most expensive. It's a very effective vapor retarder, impervious to moisture, and provides greater structural strength than OCP. However, it contains environmentally harmful hydrofluorocarbons (HFCs). Neither contain any recycled content. Because of the difficulty of application, it's typically installed by insulation contractors. One- and two-component CCP foam kit systems, such as Tiger Foam, are available for small spray jobs.

Sources: Dow.com, JM.com, TigerFoam.ca, Touch-n-Foam.com

Resources:
National Association of Insulation Manufacturers of Canada – naimacanada.ca
Thermal Insulation Association of Canada – tiac.ca

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INFO: DIFFICULTY – **1/5,** LENGTH/TIME – **1/5,** COST – **3/5**

Upholster a Simple Cushion

With only a few items from a fabric store, and no experience, you can make a simple, customized upholstered cushion for a piece of furniture.

Photos by Rob Brown

BY ROB BROWN

Upholstery is a whole different ballgame than woodworking. But because this specific upholstery task didn't seem too hard, I figured even though I had no experience at all I could probably get a decent result without too much work. Turned out I was right. The finished cushion works well, looks good, and it took me well under an hour to compete.

Visit the fabric store

I selected a piece of 2"-thick rubber foam, which was more expensive than the other options but was the perfect density for this project. I added a few layers of polyester craft batting over top of the rubber foam. This was sold in a larger size and is fairly thin, so I was able to fold it into three layers for my cushion. These layers provide a more even look and shape to the finished cushion.

Next was the fabric. The hard part was selecting the colour and pattern. Let the people assisting you at the fabric store know what you're using the fabric for, and they'll be able to help you choose an appropriate fabric for the project. Make sure to choose something that won't fray easily when you wrap it around, and staple it to, the plywood base. In hindsight, I used a fabric that was a bit too stretchy, and I had to add a lot of staples. I would opt for a thicker fabric next time. All told, I managed to keep the price tag for fabric, rubber foam and batting under $100.

Start with the plywood base

Cut a piece of 3/4"-thick plywood to the width and length you want the cushion to be. I left 1/2" between the edges of the cushion and the edges of the table. Next, slightly ease all the edges of the plywood base. I opted for a 1/8"-diameter roundover bit in my trim router, but sanding the edges heavily would also work.

Lay the plywood base on top of the rubber foam and cut the foam to the exact same size as the base. I used a plane blade, as it was sharp and could cut deep enough. Next comes the batting. Lay the rubber foam over the plywood base, and measure from the underside of one side of the base to the bottom of the other side, then add about 1" to that dimension. Repeat for the other direction, then cut the batting those sizes. I removed a 2" × 2" square from all four corners of the batting, in order for it to more evenly wrap around the corners.

Add the fabric

Cut the fabric to size next. You want it to cover the upper surface of the cushion, wrap down all four sides, and extend at least 3" under the plywood base. Because I was afraid I would cut the fabric too small, and ruin it, I left a few extra inches on each of the four sides.

Place the fabric face down on a flat, clean surface, then add the batting, rubber foam and plywood base on top, centered over the fabric. Pull one edge of the fabric up and over an edge of the plywood and tack it in place with a few

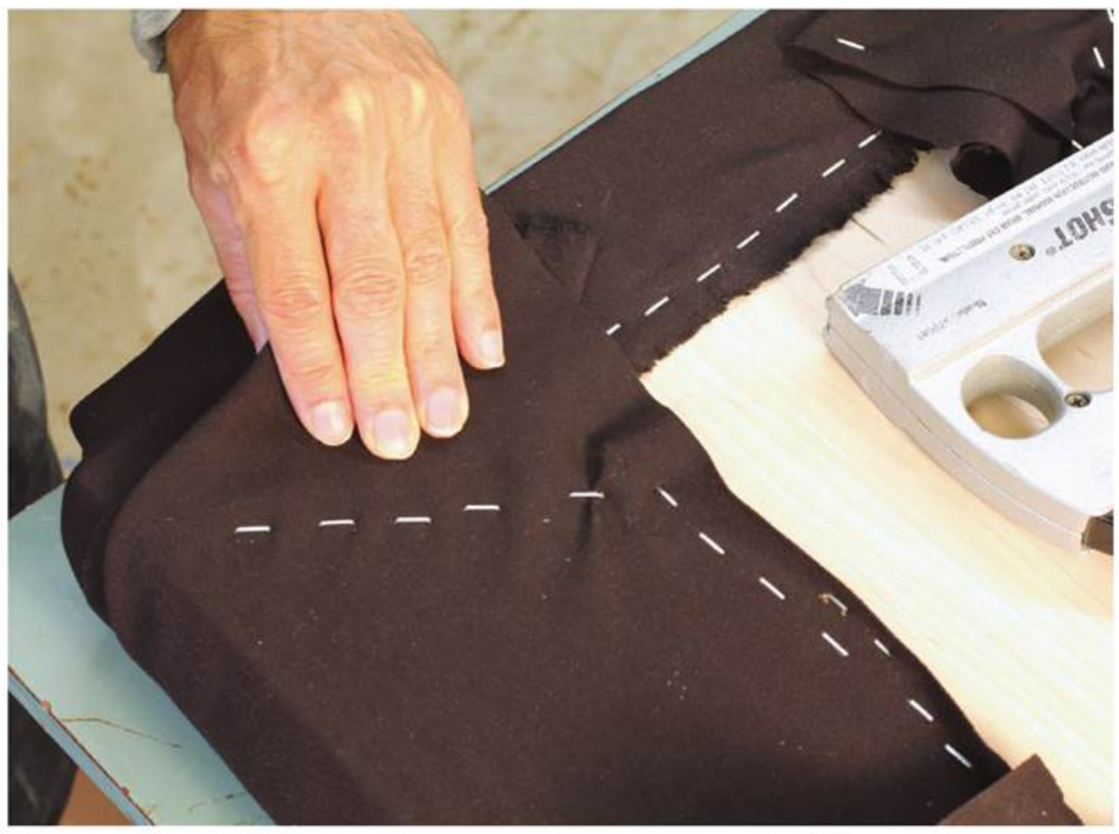
Ease the Edge – A trim router, equipped with a small roundover bit will make quick work of any sharp edges on the plywood base.

Trim the Rubber Foam – Use a sharp knife or plane blade to trim the foam to the same dimensions as the plywood base.

Measure for the Batting – Measure from the one underside of the plywood to opposite side, then add an extra inch so the batting can slightly wrap underneath the plywood base.

Tack the Fabric in Place – A couple of staples in each side will position the parts of the cushion in place (left), before adding more staples across all four sides to secure the fabric for good (right). Don't staple within about 1" of the corners for now. Use a hammer to fully seat the staples as you work, and be sure to use staples that will not protrude through the plywood base.

Tighten the Corners – Brown pulled the fabric over each corner and stapled it in place.



Even the Corners Out – Being careful to leave a nice visual transition at the outer edge of each corner, Brown folds the fabric, pulls it taut, then staples it in place.

staples. Unless your fabric is really stretchy, you likely don't have to pull it as taut as you'd think. Repeat for the other three sides, then carefully check if the fabric is tight enough. If either too tight or not tight enough, you can remove the staples and start over.

With the four sides started you can then add a few more staples around each of the four sides, working around the base and pulling the fabric evenly. Don't staple the fabric too close to the corners.

Dealing with the corners

There are a few ways to approach the corners, but as long as you finish with even, tidy, taut corners I don't think there's a wrong way. First I pulled the fabric that was

Remove Excess Fabric – For the cushion to sit nicely on the table, some of the fabric might have to be removed. Just be careful not to remove too much, as you can weaken the corner area, causing the fabric to fray or come undone.

Finish it Off – Fold the other half of the fabric over, check the pleat on the outer edge of the cushion, then staple the section down.

centered over the corner taut, and stapled it in place. Then I adjusted the fabric between the corner and the straight sections so it was snug, and there was an even pleat on the edge of the cushion, and stapled the fabric in place, before repeating on the other side of this corner. There was a bit too much fabric near the underside of the corner, so I used scissors to remove a bit; just don't remove too much, or there won't be enough fabric to be properly secure the corners. Repeat with the other three corners, and you're done. Use a hammer to ensure the staples are driven into the plywood base fully.

The underside of my cushion didn't look professionally done, to be quite honest, but since it was going to be fixed to the table nobody would ever know. I'm happy with the finished look, but I've already caught myself thinking of what fabric I'll use when I re-upholster the cushion in a few years. At that point I'll likely be able to reuse the foam and batting, so new material with be my only cost.

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RELATED ARTICLES: **Build an Upholstered Foot Stool** ***(Apr/May 2012),*** **Crafting a Window Seat** ***(Dec/Jan 2011)***

Turns out Rob made a great bed for his two cats, and his kids enjoy sitting on this cushion to play with Legos at the table. It's only once he gets his kids to bed that he has a shot of using this cushion, though he has to beat his wife to it.

POREFILLERS

To get a glass-smooth, highly reflective finish on open-grained wood, such as ash, elm, hickory, mahogany, oak and walnut, use a pore filler.

BY CARL DUGUAY

Let's start with a caveat: pore (aka grain) filling is completely optional, even on open-grained wood – it's essentially an aesthetic choice. If you want to obtain the kind of mirror finish associated with guitars and pianos, then filling the pores makes the job so much easier. Otherwise, skip the pore filling and go ahead with your usual finishing regime.

Pore fillers are typically used on large, horizontal surfaces – the tops of tables, desks, sideboards, dressers and the like. While you can apply a filler to vertical surfaces such as legs and side panels, because these surfaces are less prominent, it's just as expedient to apply a glossy finish or rub out your chosen finish.

Once the filler (and optionally any stain) is applied, you proceed to apply your topcoat, and then to get that glass-smooth look, you end off by rubbing out the finish.

There are two ways to fill the pores – with your finish of choice, or using a commercial filler. If you use a finish to fill the pores, you'll need to apply a number of coats, allowing each coat to dry thoroughly, and lightly sanding between each coat. Five or more coats wouldn't be out of the question to fill the pores. However, with a filler you'll only need to apply one or two coats of the filler. I've used both methods and find that it's quicker to use a filler. The filler won't shrink over time as some finishes tend to, you won't have to apply and sand as many top coats, and you'll use less finish overall.

You can purchase both oil-based (OB) – also referred to as solvent-based – and water-based (WB) fillers. Both can be thinned if it makes application easier – OB fillers with mineral spirits or naphtha (some manufacturers have their own thinners) and WB with distilled water. OB fillers have a longer working time than WB fillers, which gives them an advantage when working on very large surfaces, but they

Photos by Carl Duguay Illustration by Len Churchill

take longer to dry. WB fillers take stain better, sand somewhat more easily, and they clean up with water.

All fillers consist of some kind of filler material such as silica or clay, and a binder, such as varnish (for OB fillers) or acrylic (for WB fillers). OB fillers are generally available in a neutral (light beige) colour or pre-coloured, generally in the darker tones. There is one OB filler that uses shellac as the binder. WB fillers are milky in appearance but dry clear, imparting only a slight change in the wood tone.

Applying a Filler

Fillers aren't overly difficult to apply, and if you're careful it's not a messy job. The main task is to pack the filler into the pores and remove any excess filler before it dries on the wood surface. The pore structure of the wood you're filling, and how careful you are in filling the pores, will determine how many coats you need to apply and how much coverage you can expect to get. I've found that

Under or Over? – In what order you apply a filler and stain will change the final look dramatically. If you apply a filler first, it reduces the surface area and texture of the wood, making stain adhere to the wood less, and causing a more even colouring. (left) Applying a stain first, then the filler, will highlight the visibility of the pores before sealing them, so you can get an even look with the topcoat. (right) These two samples of red oak show how different the final look can be.

Closed and Open Grain

Rub your fingers lightly across the surface of a freshly planed maple or cherry board. It feels so smooth that you might be tempted to skip sanding altogether. Take a close look, and you can barely see the pores in the wood. That's because the grain structure is very tight, so we refer to them as closed-pore, closed-grain, or fine-grain wood. Do the same thing with oak or ash, and you'll feel the difference – the surface feels discernibly rough, and on close inspection you can see deep pores on the surface. These are referred to as open-pore, open-grain, or coarse-grained wood. To get an ultra smooth surface you want to fill up those pores.

on average I get good results with two coats of filler.

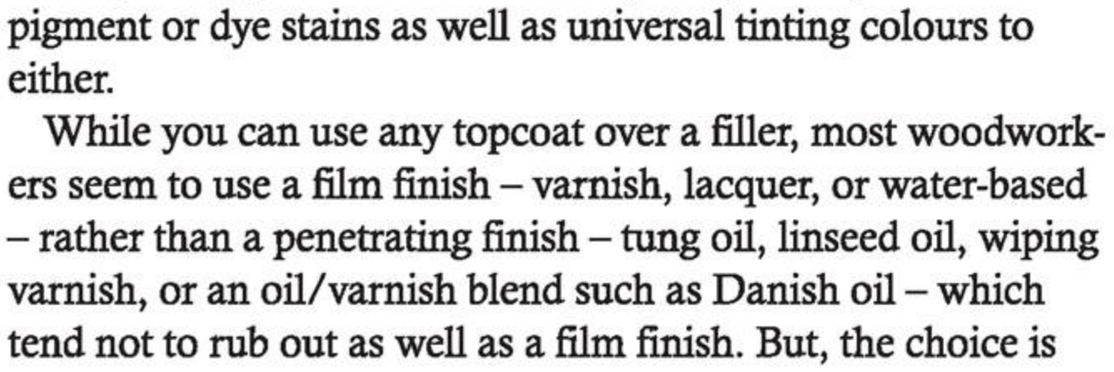
OB fillers come as a thick paste that you'll need to stir until it reaches the consistency of peanut butter. You'll need to re-stir the filler every time you use it. Most require a bit of thinning with mineral spirits before applying. WB fillers (and the shellac-based filler) usually don't require stirring or thinning.

Sealing the wood prior to filling makes cleaning off the excess filler easier. You can use a 1-pound coat of shellac, or a thinned coat of your chosen topcoat under either type of filler. The sealer raises the grain, so once it's dry, lightly sand with 320-grit.

If you plan to stain you can do so before or after applying the filler. Applying a stain under the filler will accentuate the pores. If you use an OB stain under a WB filler, make sure the stain dries completely before applying the filler, and then follow this up with a sealer before filling the pores. You can also apply a colourant to most fillers (make sure to use a water-soluble dye or pigment with WB fillers). In general you can use pigment or dye stains as well as universal tinting colours to either.

While you can use any topcoat over a filler, most woodworkers seem to use a film finish – varnish, lacquer, or water-based – rather than a penetrating finish – tung oil, linseed oil, wiping varnish, or an oil/varnish blend such as Danish oil – which tend not to rub out as well as a film finish. But, the choice is yours.

We all develop preferences when it comes to finishes, and it's no different with fillers – some people prefer OB fillers, others can't praise WB fillers enough. If you've not used either before, it makes sense to buy the smallest quantity available just in case you end up not liking the product. And, as with any new finishing product, test it on some scrap material before committing to your final project.



Clear or Visible? – The Behlen filler is the only product Duguay tested that adds a prominent colour to the wood's surface. The greyish Behlen filler highlights the pores, while the other fillers leave virtually no colour change.

Here is the sequence of steps that I follow when applying a filler. With experience you'll come up with a procedure that works best for you.

- Finish sand the work surface.
- Apply a sealer coat, and let dry thoroughly (overnight is best).
- Lightly sand with 320-grit.
- Apply a stain (optional) and let dry thoroughly (overnight is best).
- Spread filler over an area you can comfortably work, and pack the filler into the pores of the wood using a piece of coarse fabric, squeegee, or an old credit card.
- Once the surface begins to haze over, wipe off the filler at a 45-degree angle to the direction of the grain. WB fillers dry so fast you won't have to wait for hazing to occur.
- Let the surface dry as specified by the manufacturer.
- Sand the surface with 320- or 400-grit paper to remove excess filler.
- Repeat as required to ensure pores are filled – typically two coats will suffice.
- Apply your chosen topcoat.

Six Options

There are considerably more WB than OB fillers on the market, perhaps because they are so easy to use, clean-up is a breeze, they deliver excellent results and they're virtually VOC free. I looked at six popular brands – 2 OB and 4 WB. Only two of these fillers (AquaCoat and Target) are available from Canadian retailers, which makes the other products disproportionally expensive, given the shipping charges and dollar conversion. Still, these products have a long shelf life, and if you only use a filler occasionally ordering from the US shouldn't be a deterrent.

I tried each of the fillers on red oak using the steps listed above. It wasn't a huge surprise to find that all the fillers did a good job. They sand easily and with two coats show no shrinkage. All the resulting filled surfaces were butter smooth, and apart from the Behlen, super clear. I was somewhat surprised that dry times vary so much among the WB fillers – from

30 minutes to four hours. But, water dries quicker than oil. However, if you'll be using both OB and WB products together during your finishing regime, it's probably worth adding on a bit of extra dry time anyway. The AquaCoat and CrystalLac fillers come in containers with twist lids, making them easier to re-seal. There was virtually no odour from the WB fillers, and only a mild odour from the Behlen. Even though the WB fillers have low VOC levels, you should still wear a respirator when using them.

Behlen Pore-O-Pac

Shellac.net

$26.80US/946ml, approx.
$71.25CA (includes shipping)

Shelf Life: 3 years

Dry Time: Overnight (8 hours)

Tintable with: Furniture Powders, Master Colors, Japan Colors

Topcoat: Any OB finish

Behlen recommends thinning, 4 parts filler to 1 part solvent. It's available in neutral, medium brown walnut, and mahogany colours. The neutral filler, which I tried, was quite noticeable in the pores, so it's best used when you plan to stain the wood. Of any filler, it has the longest working time, making it the best choice for very large surfaces. It sanded out very easily, and completely filled the pores with one application. The industrial version of this filler is sold under the Mohawk brand name. Behlen also makes a WB filler.

Seal-Lac

ShellacFinishes.com

$36.95US/946ml, approx. $86.10CA (includes shipping)

Shelf Life: 2 years+

Dry Time: 4–5 hours

Tintable with: Aniline dye or alcohol-based stain

Topcoat: Any oil-based or water-based finish

I'll admit a slight bias for shellac, as I've been using it exclusively for over three decades on the inside of drawers, display cabinets and boxes. It rubs out beautifully, and is the traditional component in French polishing. Seal-Lac is comprised of de-waxed super blonde shellac (plus other solids and natural resins) and has the consistency of a 3-pound cut of shellac. It dries very clear, was easy to sand, and imparted only a slight amber tone to the wood. The nice thing about this product is that it also acts as its own sealer.

Aqua Coat

AquaCoat.com

$28.50CA/473ml (excludes shipping, from LeeValley.com)

Shelf Life: 1 Year +

Dry Time: 1/2–1 hour

Tintable with: Any water-soluble dye, Universal Tinting Colors

Topcoat: Any OB or WB finish

Of the four WB fillers I found the AquaCoat the easiest to apply. It has the consistency of custard – the others are more watery – which I found noticeably extended the working time. It also has the quickest drying time, which means you can lay on the second coat if necessary, to get the job done sooner. It sanded easily and dried crystal clear.

Shelf Life: 1 Year
Dry Time: 3–4 hours
Tintable with: Water-based dyes and pigments
Topcoat: Any OB or WB finish

Moser's has a fairly thin consistency, so it's unlikely to ever need thinning. It has a slightly shorter working time than CrystalLac and AquaCoat and requires the longest dry time. Regardless, it went on well, was a cinch to sand and dried crystal clear.

CrystaLac

www.crystalac.info/

$26.99US/946ml, approx.
$70.35CA (includes shipping, from WoodWorker.com)

Shelf Life: 5 Years +

Dry Time: 1–2 hours

Tintable with: Any water-based paint colourant/latex colourant

Topcoat: Any OB or WB finish

This filler has the consistency of heavy cream. It went on nicely, and took only a bit longer than the AquaCoat to dry. It was easy to sand and dried super clear. It has the longest shelf life of any filler. This is the company that makes Brite Tone Instrument Finish, which is widely used by luthiers.

Target Emtech HSF5000

TargetCoatings.com

$28.00CA/946ml (from WoodEssence.com)

Shelf Life: 2–4 years
Dry Time: 2 hours
Tintable with: Water-based universal tinting colours
Topcoat: Any WB finish

J.E. Moser Grain-Fil

WoodWorker.com

$32.99US/946 ml, approx.
$79.61CA (from WoodWorker.com, includes shipping)

Target calls this a high-solids filler that also acts as a sealer, which may be the reason it completely filled the pores with a single application on the test boards. It also has a fairly thin consistency, and it sands easily. Available in neutral (which dries clear) white and gray. This is the most economically priced filler.

CARL DUGUAY
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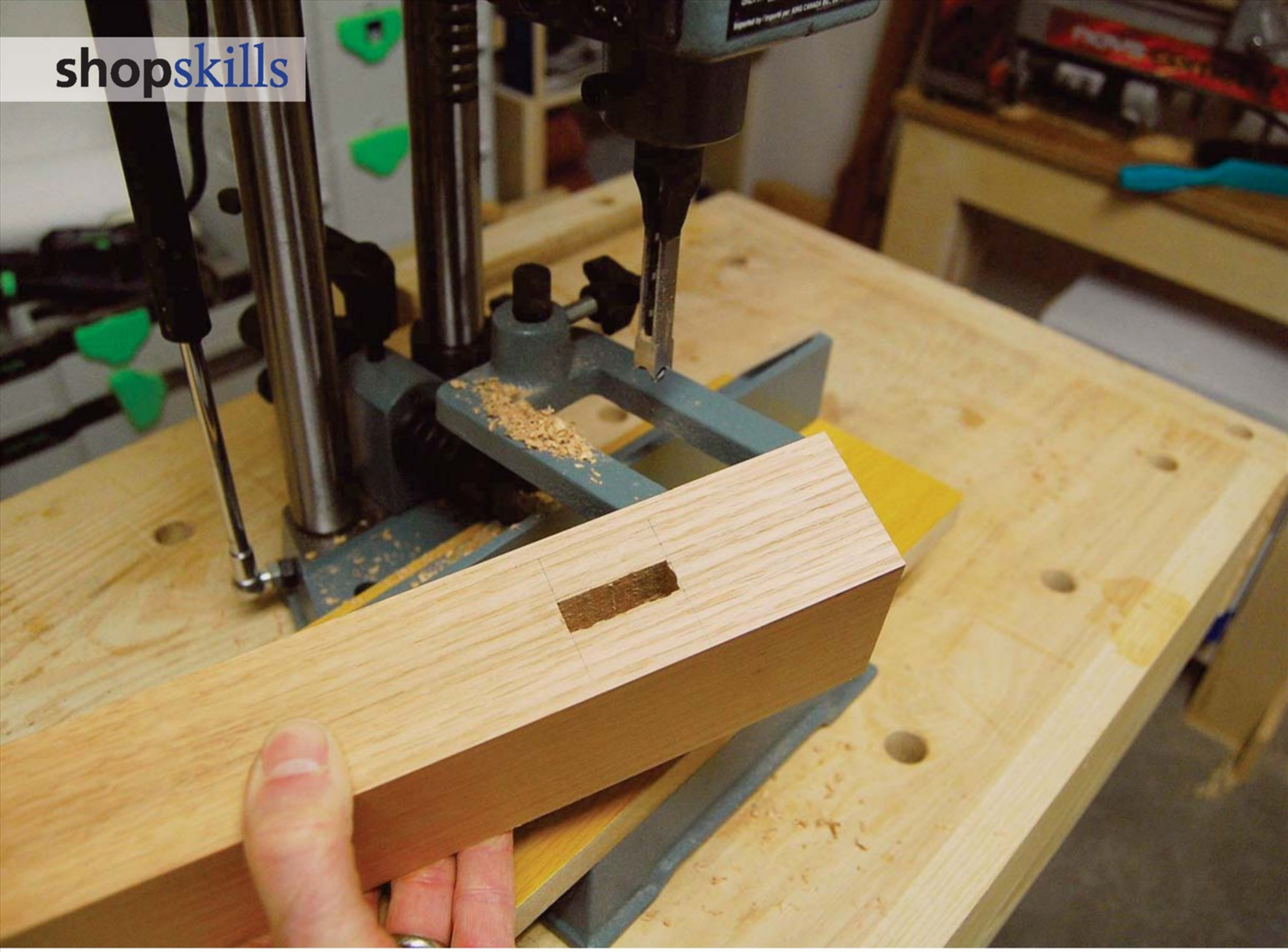


How to Use a Benchtop Hollow Chisel Mortiser

With a benchtop mortiser, you really can drill square holes.

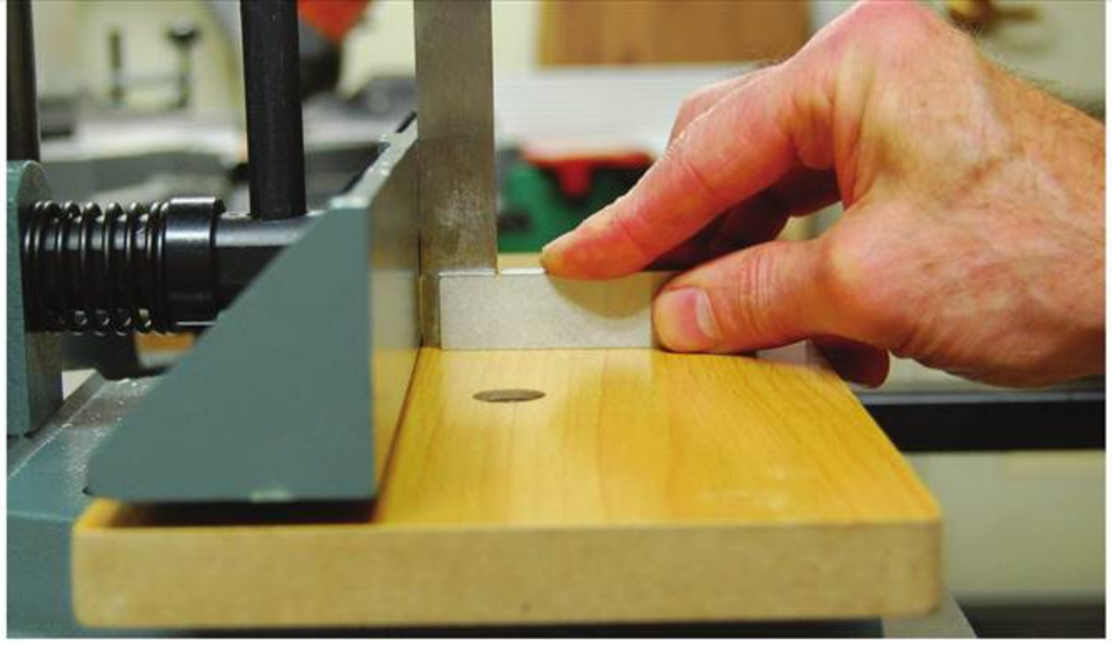
BY CARL DUGUAY

Photos by Carl Duguay Mortiser Courtesy of King Canada

There are many approaches to cutting mortises. When you only have a few to make, or you have a lot of time to spare, you can cut them completely by hand, using a mallet and mortising chisels. If you need to cut a lot of mortises you can speed up the process by using a combination of hand and power tools. One option is to drill out the mortises with a hand drill or drill press. Another option is to mill the mortises with a hand-held router or table-mounted router and a mortising jig; with either of these methods you may want to square up the walls of the mortises with a mallet and chisel, though it's not imperative.

A hollow chisel mortiser allows you to bypass the mallet-and-chisel work, yet still end up with square-ended mortises. These machines also make quick work or mortises once set up. They come in both stationary and benchtop formats. Unless you work in a production environment, churning out dozens or hundreds of mortises every day, a benchtop machine will do just fine. If you typically cut mortises under 5/8" wide, then a model with a 1/2 HP motor that accepts 5/8" shank bits will do nicely. For mortises 3/4" and larger you'll want a model with a 1 HP motor that accepts 3/4" shanks.

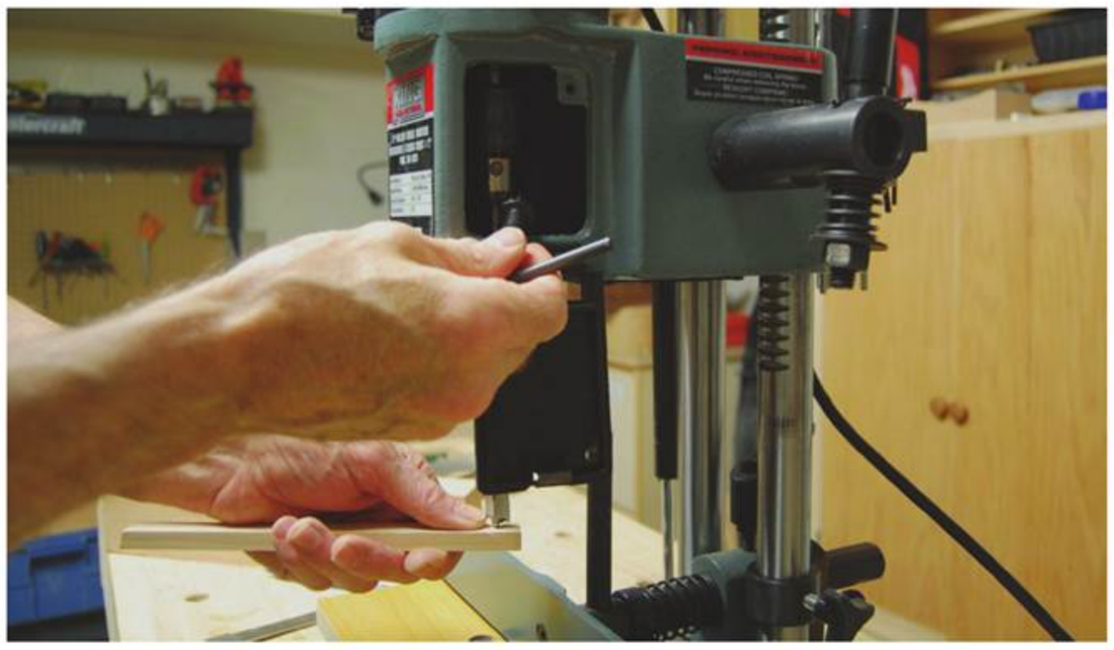
You can think of them as specialized drilling machines that use a unique two-part bit – the hollow mortise chisel and bit. The chisel is a square hollow metal tube with beveled facets on all sides, which squares up the hole that's created by the bit (aka 'auger') that telescopes through the tube.



Proper Alignment – Ensure that the fence is square to the work table – if not, you may have to shim the table.

Square to the Fence – When installing the chisel always check that it's square to the fence. Orient the chisel windows to face sideways, to help with chip ejection.

Set the Offset – Place a 1/16"-thick spacer at the top of the chisel, push the chisel up against the bushing, and then tighten the chisel locking screw.



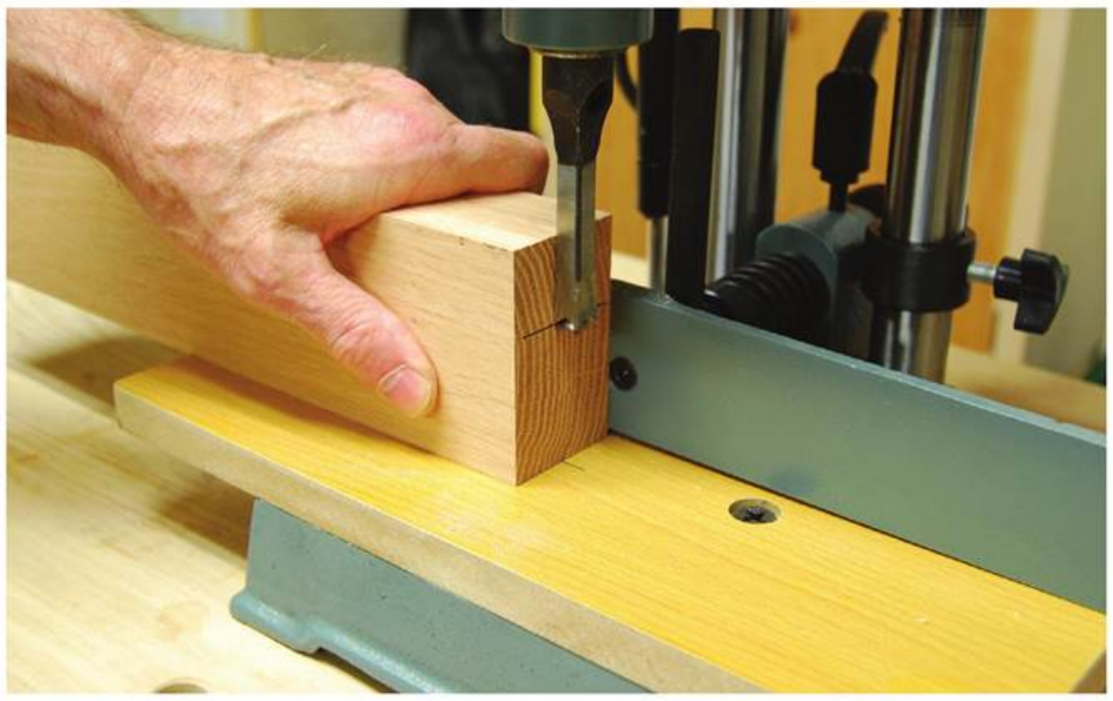
Flush the Tips – Using a piece of wood lift the bit all the way up and secure it in the chuck.

Good bits are crucial

Just like on a table saw or router table, the quality of cutting tool you use is of primary importance, and the key to cutting consistently clean mortises with a benchtop mortiser is using premium chisels. A good set of four basic chisels (1/4" to 1/2") will cost a couple hundred dollars but is well worth the investment. You can easily sharpen the chisels with a cone sharpener, or send the bits out to a reputable sharpening service.

Create the Bit Offset – Loosen the chisel locking screw, push the chisel up as far as it will go, and then re-tighten the chisel locking screw. Now the bit should protrude 1/16" below the chisel.

Set the Mortise Location – Position the fence so the tip of the bit registers on the center line of the mortise.



Depth of Cut – Adjust the chisel and bit set to cut at least 1/8" below the bottom of the mortise to allow for glue build-up during assembly.

Setting up a mortiser

There are two key things to keep in mind when setting up a benchtop mortiser. The first is alignment. Ensure the fence is square to the table, and the chisel/bit is square to the fence in all directions. I recheck these details every time I use the mortiser. Second, when installing the mortising chisel, ensure the bit extends slightly below the tip of the chisel so the two components don't rub together, and there's room for the chips to pass up through the chisel and out the side windows.

Don't ram down the swing arm when you start the cut – allow the bit to do its job of drilling into the stock, then increase downward pressure advancing the chisel into the evacuated hole. And don't skip lunch – you'll need to put a lot more arm muscle into each stroke than you do on a drill press.

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Winterize Your HOME

DIY tips to make your house less drafty this winter

BY ALLAN BRITNELL

They say there are only two sure things in life: death and taxes. We Canadians can count on a third: the dog days of summer will eventually be followed by some bitter winter nights. Before Old Man Winter envelops us, here's a top-down look at some DIY tasks for winterizing your home so you have a more comfortable – and energy conserving – season.

Attic insulation

Your attic acts as a toque on top of your home. A thin hat with a few holes in it is fine in the early fall, but in the dead of winter you want a thick, tightly knit covering to keep your head warm. Same goes for your house. Depending on the age of your home, you could have little to no insulation in the attic. If it's loose, blown insulation, there may be areas where it's piled up high, and other shallow depressions where the insulation has settled.

The only way to know for sure is to pop your head up in the attic and check. If you do see highs and lows, grab some lumber or plywood to lay across the joists so you have a platform to work from, and use a rake to even things out.

When it comes to insulating attics, the more the merrier. The current Ontario Building Code, for example, calls for R-50 in newly constructed homes. Extra insulation will also help keep your home cooler in the summer, by blocking the

Illustrations by Len Churchill

heat, keeping it from radiating down into the house.

The easiest way to boost your existing insulation is to buy some bags of fibreglass or mineral wool insulation and lay the batts on top of what's already there, fitting them snugly against each other so there are no air gaps. Anyone who's ever handled insulation knows that it's itchy, so you'll want to wear long sleeves, gloves and a dust mask. (This is definitely not a mid-summer chore.)

Just make sure you don't block the soffit vents along the very edge of the roofline. These allow air to flow in and out through the roof vents to prevent moisture and mold from building up in the attic.

If you'd rather spend less time in the tight confines of the attic, Owens Corning also has a DIY product for adding more blown insulation. You can rent an AttiCat insulation blower from most building supply stores, along with the bags of insulation that work with it.

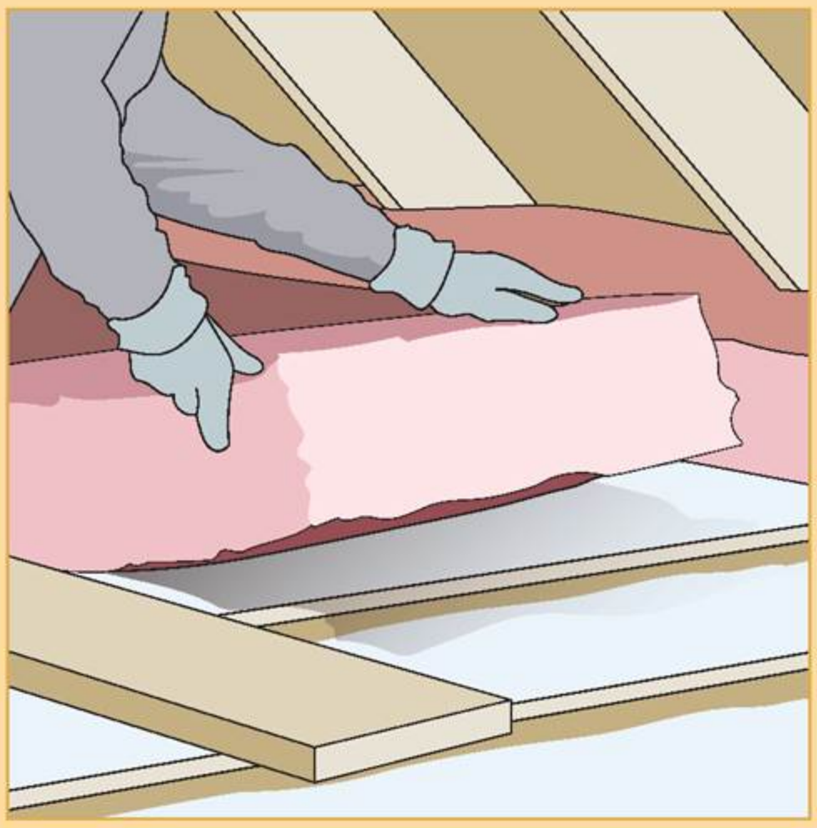
If your attic access hatch is just a piece of thin wood, you should attach some insulation to the top side of that, and line the edges of the opening with weather stripping for a tight seal.

Windows and doors

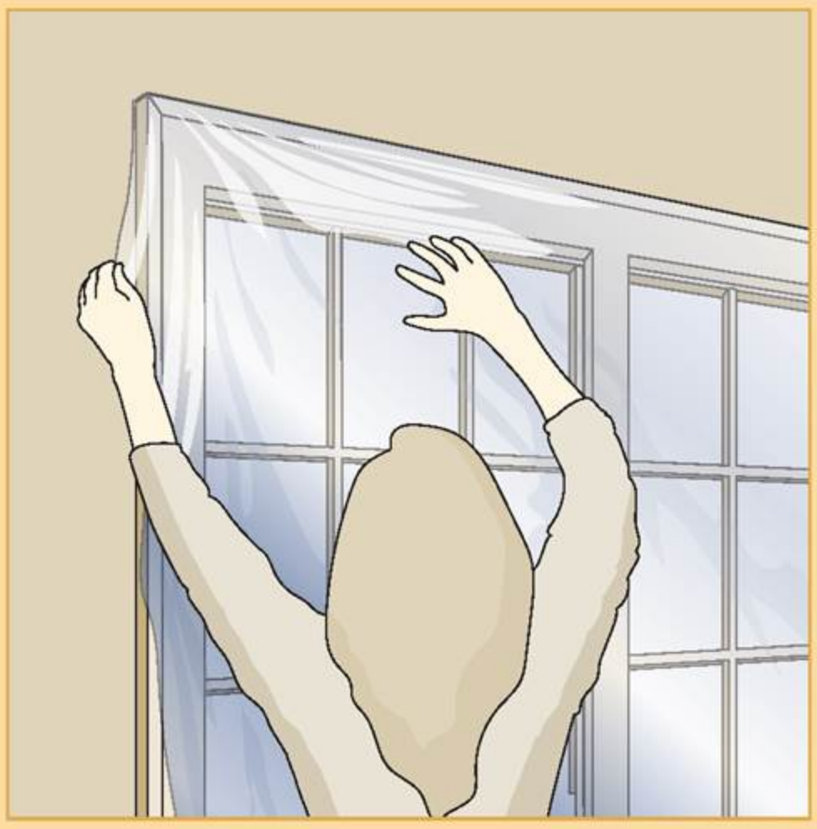
Along with light and views of your property, windows also let in a lot of cold air. If your windows are really old individual panes of glass, or newer ones where the thermal seals have failed (condensation between the glass panes is a common indicator of a broken seal), it might be best to install new windows. Depending on where you live, you may be eligible for a rebate (see "Rebate Rewards").

If replacing your windows isn't in the budget, there are a couple of low-cost, temporary options. The cheapest, and frankly, unsightliest, is to cover them for the winter with sheets of clear plastic film. Hardware stores sell kits with various sizes of plastic and the double-sided tape to affix it, that you then heat-shrink to fit. The other downside with these is that you can't open the windows for fresh air during those mid-winter Chinooks without damaging them.

For something more permanent and reusable, you can add storm windows on the outside, or buy custom-fitted inserts that install on the inside.



Add Up Top – To add insulation to your attic you can first ensure the insulation that's there is properly placed. Then, if need be, add more batts of insulation on top of the existing insulation. Ensure there are no gaps between the batts for the best protection from the cold.



Quick and Easy – Though it might not look the best, and it has to be repeated annually, adding plastic film to your windows provides protection from winter's cold and wind. Double-sided tape is applied around the perimeter of your window's interior, the plastic film is applied to the tape, the film is trimmed flush, and then you can use a hair dryer to shrink the film so it's less visible.

Fill the Gaps – Even small gaps around the perimeter of your windows can let a lot of cold in. Applying caulking around the exterior of your windows is an easy and quick way to keep your home warmer next winter.

One of the most common areas for air leaks in a home are the gaps around window frames and doorframes. Here's

Fresh Air

As wasteful as a drafty home is, the leaks do provide one beneficial side effect: fresh air circulation. That's why modern homes with continuous air barriers on the exterior, and code-rated or higher insulation need to have a heat-recovery ventilator (HRV). These units work in conjunction with your furnace, using the stale air circulating through the house to pre-heat fresh air drawn from outside before running it through the furnace. In order to qualify for government grants and rebates (see "Rebate Rewards"), you usually have to have a home energy audit. The auditor will be able to tell you if all the energy conservation measures you've undertaken warrant adding an HRV to your home.

a tip for tracking down the drafty spots in your home: On a windy day, light an incense stick and go from room to room holding it close to windows and exterior doors (and baseboards, more on those in a minute). Any time the smoke billows, take note of the draft to be sealed.

Use colour-matched caulking to seal around all the edges of the window frame, inside and out. If you haven't used a caulking gun before, practice laying down a few beads on some scrap material first so you get the hang of it. Cut the tip of the tube so that you get the narrowest bead possible to fill the gap. Once you reach the end of the area to be caulked, use a moistened finger to press it in and smooth out the finish.

Exterior doors *should* have an airtight seal within the frame. Before we finally broke down and replaced our front door, I could see daylight between the door and frame. Despite my best efforts to seal the gaps with weather stripping, the 50-plus-year-old wooden door was just too warped to fix. We bit the bullet and replaced it with a modern, airtight fibreglass door.

If you're not ready to replace your old door, adding an exterior storm door in front of it can act as an effective air barrier. Otherwise, there are a variety of options for adding weather stripping around the door. The cheapest and easiest option is peel-and-stick foam strips, but be warned, they'll likely only last a season or so before they start to come unstuck. A better option is a rubber compression strip mounted on a sturdy metal backing. This goes along the top and sides of the door. At the base, you'll need a door sweep to seal the gap between the bottom of the door and the sill.

Weather Stripping – Weather stripping that seals the sides and tops of your exterior doors will go a long way toward keeping the cold and wind out, especially in older homes where gaps have appeared around the doors. Cheap weather stripping is easy to apply, though it will likely only last for one season. Weather stripping with a metal backing is harder to apply but lasts much longer.

Walls and ceilings

In a really drafty home, you may be able to see dust bunnies rolling along the floor like tumbleweeds. While today's

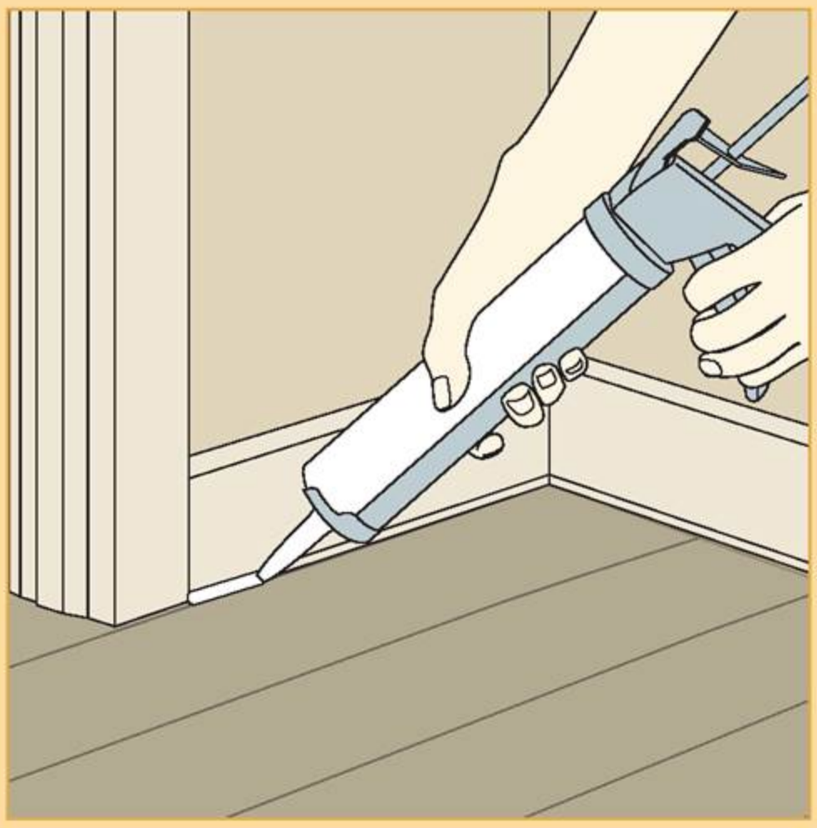
Rebate Rewards

Depending on where you live, you could be eligible for rebates from various levels of government, your utility company, or building material manufacturers for installing energy conserving products. Environment Canada's Office of Energy Efficiency has a searchable online database of current rebate programs at oee.nrcan.gc.ca.

building code calls for a continuous air barrier around the exterior of the home (thus the house wraps such as Tyvek that you see on new construction projects), most homes were built prior to this requirement. The older the home, the more likely there are gaps for air to filter in through the walls. All these gaps add up. You may recall a commercial starring David Suzuki a few years ago where he made the point that the cumulative drafts in an older home are, on average, the equivalent of a basketball-sized hole in your wall.

A bead of caulking along the top and bottom of all the baseboards helps seal off the room from drafts. The idea is to seal off each room so any air that does filter in through the exterior wall gets trapped in the cavity behind your interior walls instead of seeping into your living space. If you feel a draft coming out of the electrical receptacles, there are foam inserts that fit behind the cover.

Next, walk around the outside of your home and inspect the areas where the pipes for natural gas and wiring for cable or phone lines enter the home. Odds are, the caulking around those has dried out, leaving gaps. If the gaps are larger than about 1/4" wide, you're best to back fill them using a can of spray foam insulation. Once that dries, cut away the excess and cover up with caulking.



Tiny Openings – There are times when sealing gaps above and below your trim help to seal the interior of your home from the elements. Wind has a way of working itself into the tiniest of openings and will bring with it cold air.

Seal Up the Pipes – Any utility pipes that enter the home have to be sealed properly to keep the cold out. Gaps larger than 1/4" can be filled with spray foam, while smaller gaps can be closed up with caulking.

Basement

A home with an unfinished, uninsulated basement is like going through winter without boots: cold will radiate from the ground up, chilling you to your bones. If your basement walls are uninsulated or only partially insulated, that's step one. Framing a wall is a fairly easy task for an experienced woodworker. Fill the gaps between the studs with insulation, install a sealed vapour barrier (the poly goes on the inside/warm side of the studs), then cover with drywall.

Even if the basement is mainly used for laundry and storage, a raised subfloor keeps your feet off the bare concrete and blocks the cold from radiating up from the ground and into your home.

Note that if the floor is unfinished dirt or a cracked concrete slab, your family could be at risk of radon exposure. Radon is a naturally occurring, odourless, radioactive gas that seeps up from uranium deposits in the soil. You can buy a disposable radon testing kit to find out if you're at risk. A properly sealed basement floor is the best protection against exposure.

ALLAN BRITNELL
abritnell@sympatico.ca

Allan has bumped up the insulation and sealed drafty windows and doors at each of the three homes he's lived in.

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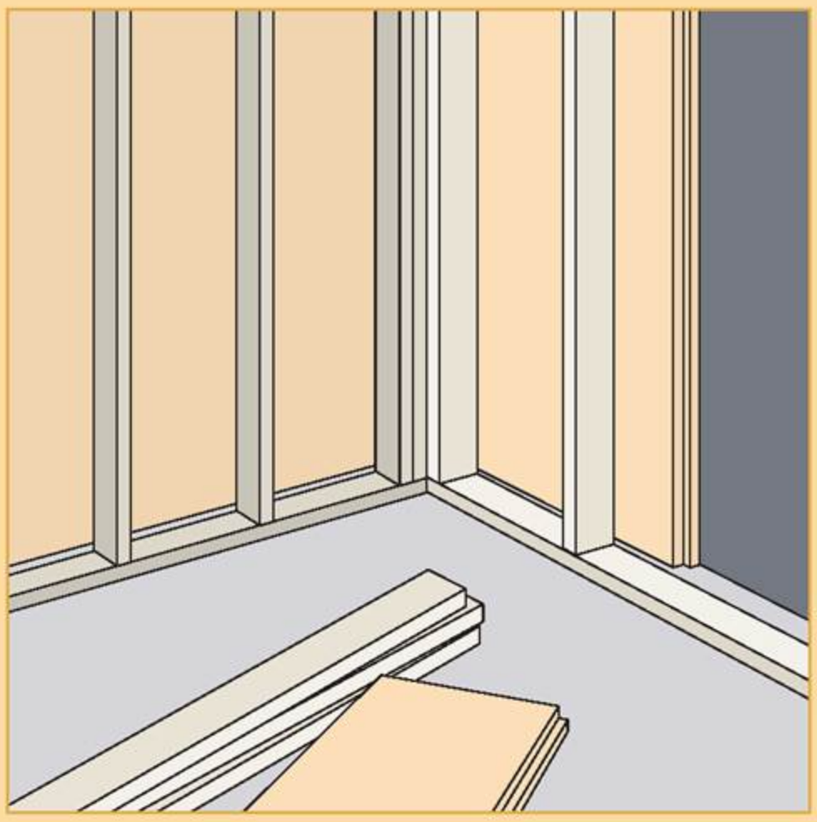


The Basement – Adding insulation to your basement walls will go a long way toward keeping your basement, and the floor of your main level, feeling warmer.

Subscription Draw Winner

Jay Wanless of Toronto ON

Jay tells us that he has just started woodworking, has never owned a router, and was actually planning on buying one - so this will be a welcome addition to his currently growing set of woodworking tools

Jay does mostly DIY wood projects and home-improvement projects for himself, and is planning on building some small furniture, cabinets, etc. in the near future.

A BIT About Twist Drills

You may never look at a humble twist drill bit the same way again.

BY MARK SALUSBURY

In 1861, Stephen A. Morse of Massachusetts invented the twist drill, patenting it in 1863. Based on the simple screw mechanism attributed to Greek mathematician Archimedes (287–212 BC), who undoubtedly adopted the form after seeing cast bronze axial screw pumps of Mesopotamian origins (from 700–600 BC), Morse's drill design has varied little ever since.

Morse's concept was to improve upon the highly ineffective spade drills that were in use at the time. His design meant the chips and swarf were pulled out behind the cut, making drilling faster, and with higher-quality results.

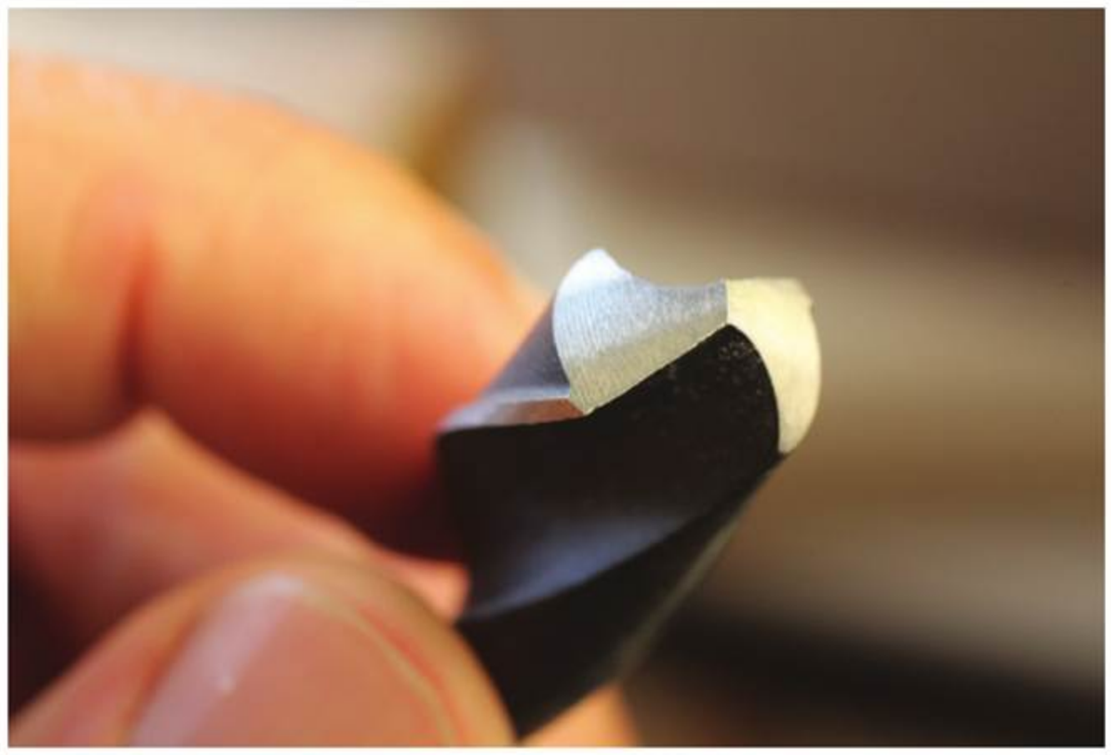
Originally made by milling straight flutes into carbon steel rods which were heated and twisted to form the helical flutes, now the helix is ground into solid round steel blanks and heat hardened. High-speed steel (HSS) became available around 1900, greatly improving strength, heat and wear resistance. While carbon steel drills had to be run and fed slowly to prevent annealing due to overheating, HSS can be run at higher speeds, shortening boring times, improving drilling quality, and lowering tool sharpening and replacement frequency.

The sum of its parts

A seemingly simple tool, the twist drill is a really complex device composed of a number of complimentary elements. The ***shank*** is the surface gripped by the drill chuck. During heat treatment, the bit is held by the tip of the shank so it's generally softer and less brittle than the body and cutting edges.

The ***body*** extends from the ***heel*** to the ***point***. The core of the body is the ***web,*** which typically occupies about 25% of the drill's diameter and tapers gradually from the point, getting thicker at the heel. Surrounding the web are the ***lands,*** within which are ground the ***flutes***, the helical grooves which extract the debris of drilling (called ***swarf***). To minimize friction between the lands and the wall of the hole being bored, the lands are relieved, creating ***the margin of the land*** where the

Photos by Rob Brown, Illustration by Len Churchill



The Business End – It's much more than just a sharp lip. The tip of a twist bit is a complex group of elements that have to come together properly to work well.

Sharpen it Up – Twist bits get used for many tasks, and can get dull. Sharpening a twist bit with a dedicated device, like a Drill Doctor, creates a bit that cuts like new. (Photo by Mark Salusbury)

land meets the flute. The only portion of the bit with the drill's full diameter is measured across the margin of the land behind the drill point, as the margins are tapered from the tip to the heel, typically about 0.0005–0.00075 of an inch, per inch of drill length.

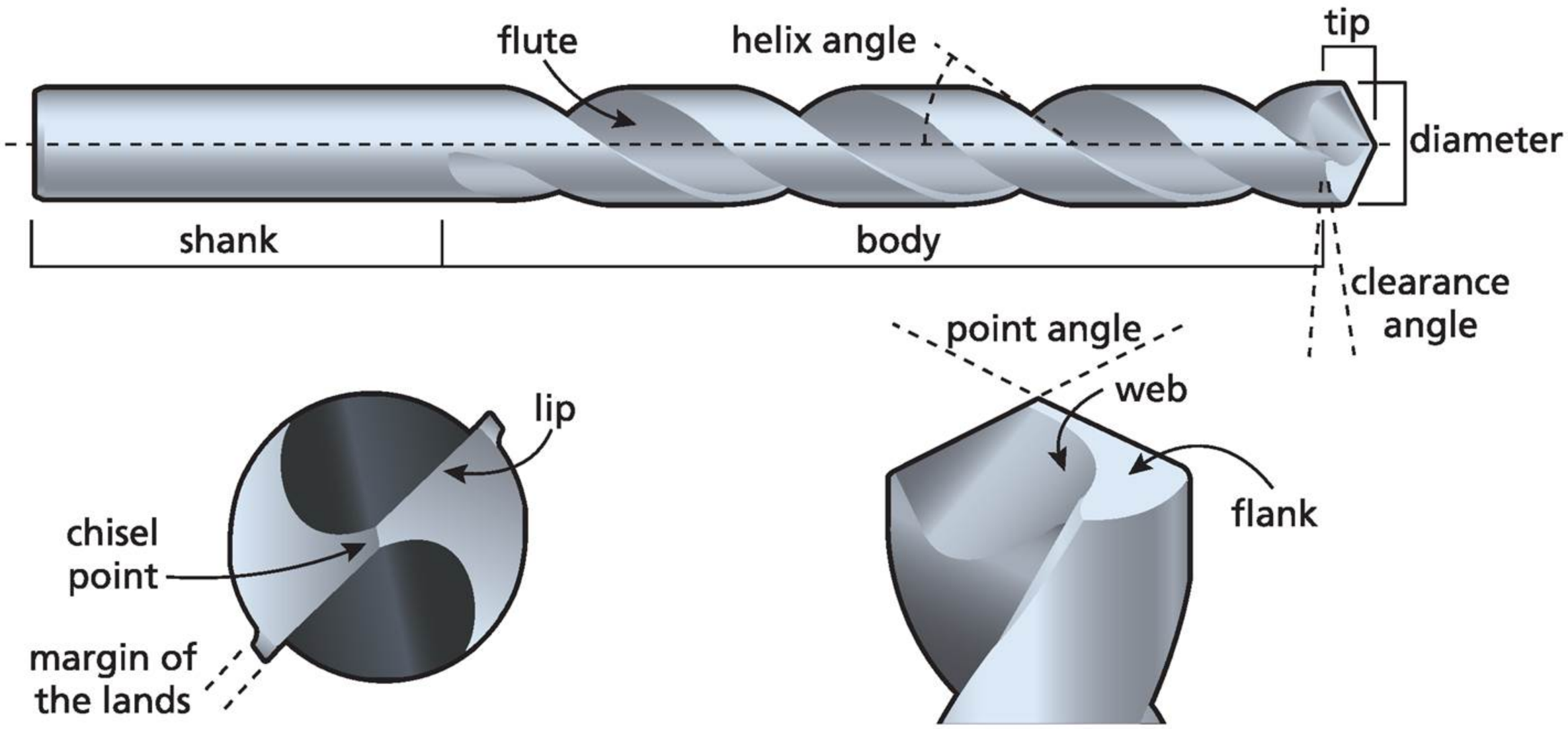
The ***helix angle***, the angle of the twist of the flutes relative to the bit's axis, is generally +/- 30°, or what's called a ***standard helix***, offering optimal swarf ejection, drill rigidity and cross-sectional strength. Specialized high-helix (40°) and low-helix (12°) drills exist for difficult-to-bore materials.

The hardest-working part of a twist drill is the ***chisel point*** or simply ***point***; it's also the most complex element. The chisel point is formed of the ends of the web and the ***flanks***, which are the ends of the lands. The ***lips*** are the cutting edges of the flanks. The chisel point and lips are created by sharpening effectively.

There are two standard ***point angles***, 118° for most applications and materials and 135° for harder, more resistive materials. However, point angles are often altered to suit specific jobs and/or materials for optimum results.

Behind the lips, the ***lip relief angle*** provides clearance for the lips to work effectively, supports the cutting edges for optimum life, and resistively helps control the feed rate.

The chisel point doesn't cut into material; it compresses, extrudes and displaces the material, creating a depression for the cutting edges to expand into. To ease the point's job, for easier, cleaner entry and to reduce the chance of bit wander, the point can be ground to a ***split point*** when sharpened. This creates a narrower point, a pair of short cutting edges at the tip of the bit ahead of the cutting lips, plus increasing clearance behind the lips, lessening entry resistance. Split point bits are particularly effective in larger bits.



Keenness counts, big-time

Drills should be sharpened many times during their life; a dull bit not only performs poorly but compromises precision and finish, foreshortening its own life. Sharpening a twist drill involves grinding only the tools flanks and cutting lips. The grind must be applied from the cutting edge back across the flank in a conical manner. This produces a keen cutting edge and maintains the point angle plus the relief angle in one pass. This grind is then duplicated for the second flank, creating a perfectly centred chisel point.

An easy-to-set-up sharpening jig is valuable to complete this task; the simpler the better, so maintenance is a pleasure, not a chore. Of the several dedicated jigs commercially available, from my experience, having once worked in the cutter grinding industry, the Drill Doctor jigs are the most satisfying. I've enjoyed their model 750X for years, quickly and repeatedly grinding keen, perfectly centred bits at either 118 or 135° with full conical relief angles or split points with quick, easy setup.

The long and short of it

Length has a bearing on a bit's rigidity and tendency to wander plus its strength and potential for breakage. The common compromise is the ***jobber length***, whose flute length is between 9 and 14 times the bits diameter. The ***screw-machine*** or ***stubby length*** is the shortest, originally designed for screw machine use and useful where compactness and strength are needed. The ***mechanic's length*** is longer than a stubby and shorter than a jobber, so-called because they fit into small spaces, are durable and have a good flute length. ***Long*** or ***extra length*** and ***aircraft length*** are the longest twist drills. Both have lengths up to 18" but differ by their flute length; extra length bits are fluted along their entire body, while aircraft length bits are only fluted about the same length as a jobber bit, making them more rigid and less likely to break. Both these are best used after first pre-drilling as deep as is practical with a jobber bit of the same diameter.

Size matters

Diameter sizing for twist drills can be as exacting as you need it to be, and

Indexed Sets – It's most economical to purchase twist bits in a set, though you can purchase individual bits, if needed.

most bits are available individually or by an ***index*** or boxed range of diameters.

Throughout North America, ***fractional inch*** or ***imperial*** sizing is common, with a typical index ranged from 1/16 (0.0625") to 1/2" (0.5") in 1/64" increments, with bits individually available from 1/64" to 2" diameter.

Number and ***letter*** sizes are widely used in industry and also fractional in sizing; they are based on the Stubs Iron Wire Gauge or Birmingham Gauge, the first such standard adopted in Britain in 1884 and still recognized in the USA by Act of Congress. For practical purposes the ***numbers*** index from #60 (.040") through #1 (.228"), individually available from as small as #80 (0.0135"). ***Letters*** continue on, indexing from A (.234") through Z (.413").

The ***metric*** sizing system is gradually replacing number and letter sizes; a typical metric index would contain diameters from 2.6 mm through 5.9 mm in 0-mm increments and available sized from 0.25 mm through 50.5 mm.

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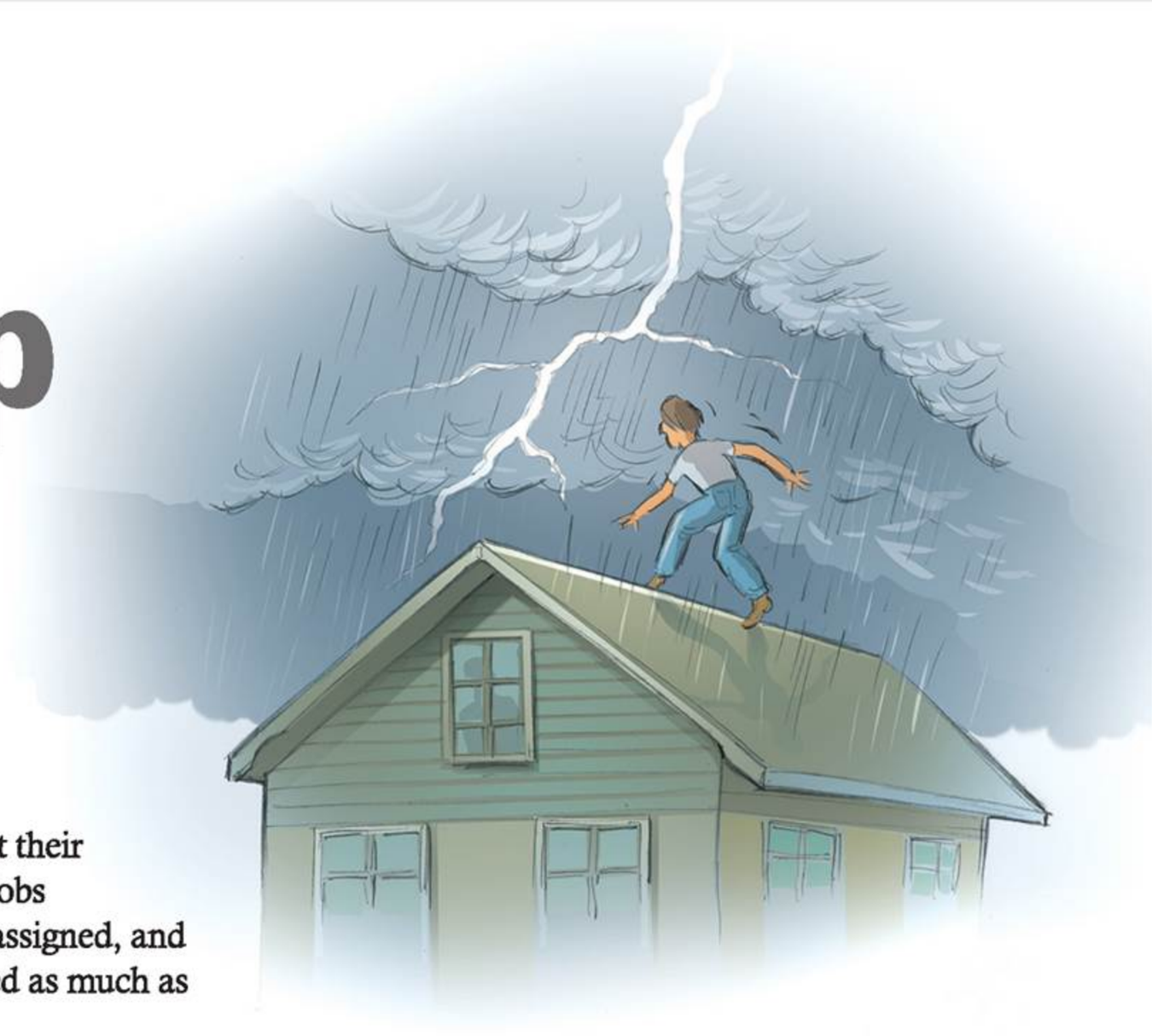
Summer Help



A son-in-law arrives to help with some home improvement projects during the summer. What could go wrong?

BY DON WILKINSON

Last summer my son-in-law, Geoff, brought his entire family from Manitoba to help me put on a new roof and maybe add an addition to my house. To be honest, I was hoping that I'd be helping him while he did most of the work; after all, I'm a lot older than he is.

My dear wife pointed out that I was perfectly capable of reroofing the house myself since I had been a roofer when we got married, lo those many decades ago. She also took the time and patience to point out that I had managed to build not one, but two houses for the family, so I should be able to stick a simple little enclosed porch onto the front of our bungalow. It seemed to me like she actually wanted her son-in-law to have a real vacation.

I then pointed out that my son-in-law owed me big time for having taken my Number-One-Daughter away from me, even though I'm still debating whether that should be counted as a mark *for* or *against* him. Then she reminded me that he had given us three wonderful grandchildren. I won the argument when I reminded her about the fourth.

The entire family showed up around mid-July. After the obligatory hugs and handshakes had been dealt with, and sleeping pods for the children were established far enough away that I wouldn't hear them (but close enough that their mother would), jobs and duties were assigned, and order was restored as much as possible.

In anticipation of their arrival, I placed the ladder against the eaves, fully charged the compressor, and strung and draped the air hoses over the peak of the roof, ready for the son-in-law to get up there and finally get to work. The rest of us were heading for the beach. Believe me, a hot roof in the Okanagan in mid-July is no place a sane person wants to be.

Apparently, I am not quite as sane as I thought, because my wife informed me that I was gladly remaining at home to help with the removal of the three layers of old shingles. I informed The Boy that he wished to stay and help as well. The old shingles tore up surprisingly easily with the judicious use of a spade, a wrecking bar and some muscles a lot younger than mine. I utterly exhausted myself carrying liquid refreshments all the way up the ladder to the roof to the ungrateful wretches. They were lucky it was only a single story house – otherwise I would have simply turned the hose on them.

Once a section of old shingles was torn off, The Boy and I would gather them up and happily toss the piles off the garage roof and (mostly) into the large bin conveniently placed just out of easy reach. My eldest grandson was helping his father by handing him shingles as needed and supplying him with *my* shingle nails for the air-nailer I had to remind him to buy. I couldn't believe he had simply assumed I would be supplying an air-nailer AND the nails for it. He should feel lucky I provided the compressor.

Eventually, and through no fault of my own, the roof was finished and admittedly looking pretty good, almost as if he knew what he was doing up there. I stood out on the front lawn and carefully studied every square foot of the roof for flaws and mistakes, but eventually my wife and Number-One-Daughter insisted I put the ladder back up and let the son-in-law down.

Early the next morning I was awakened by the type of heavy downpour you can only get from an Okanagan summer storm. Before anyone else could arise I grabbed a bucket from the closet and poured several inches of water in it. I then dumped more water on the kitchen floor and placed the bucket in the middle of it. Then I screamed!

The poor guy spent almost three hours on the roof in the pounding rain as lightning danced around his head while he searched for the elusive leak before I started to feel a little bad for him and finally admitted there wasn't a leak at all.

He packed up the kids, and they left shortly after the rain stopped, cutting their Okanagan vacation short. I'm still trying to decide if that was a win or not.

Apparently, I'm mean-spirited. No one has a sense of humour anymore.

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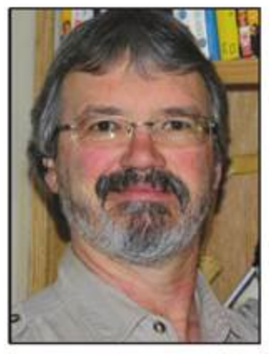

Illustration by Mike Del Rizzo

Skill Development

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Alfons Laicher

Fine Line

Made of mostly edge grain walnut with a thuya burl and inlays in maple, this table sold at the Sooke Fine Art Show. Laicher remembers the build fondly, saying "When I made the table I was working on a cabinet commission that was rather boring and I had little motivation. At about four in the afternoon I allowed myself to work on the table and I became a different person. Instantly I was motivated and the energy flowed. I could have worked the whole night."

Turn to page 14 for some quotes from Alfons.