



BIENNIAL
S.A.W.S.
EXHIBITION



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TRIMMERS
TESTED

p.64 **BEGINNER'S
JOURNEY**



p.32 **FREE**
WORKSHOP POSTER:
SHARPENING

ISSUE #113
APR/MAY 2018

CANADIAN Woodworking & HOME IMPROVEMENT

Power Carve SERVING DISHES

+TOP 10
POWER CARVING TIPS



▶ **Create an Outdoor
Living Space** p.34

▶ **Build a
Modern Desk** p.18

▶ **Home In On:
Entry Doors** p.40

**CNC
FEATURE:**

Introduction to
CNC Machinery

Desktop CNC
Tool Comparison

Know Your Tools:
CNC Routers

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FEATURES

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BY ROB BROWN

Take a look at some gorgeous pieces from a recent exhibition.

18 Build a Modern Desk

BY BILL MANIOTAKIS

With subtle angles, and traditional joinery, this desk is going to be turning heads for many years.

34 Create Your Own Great Outdoors

BY ALLAN BRITNELL

With a bit of design planning, and some elbow grease, you can convert your backyard into a warm weather oasis.

44 Introduction to CNC Machines

BY RICH KELLER

Like it or not, these high-tech machines have entered the world of woodworking. You might prefer the sound of your hand plane, but it's still nice to know what else is out there.



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SAWS exhibit in the skybar made by Dale Lowe

Music Stand by Mike Mulvey

COVER STORY

Cover photo by Rob Brown

26 Power Carve a Serving Dish

Learn how to use power carving tools to help shape a simple, but stylish dish. BY ROB BROWN



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editor's letter

Everyone loves new tools, and we have a few of them in this issue. These are not just new tools, but relatively new technology for many of our readers. CNC machinery has played an important role in production woodworking for years, but they're getting smaller and more affordable every year, and are now at a point where a hobby woodworker could purchase one for use in their home shop. Rich Keller introduces you to the basics regarding CNC machinery, and Carl Duguay discusses some specific CNC routers that would look (and work) great in a small woodworking shop. To round things out, we cover CNC routers in our *Know Your Tools* column.

Another new tool woodworkers will want to learn about is the Ball Gouge, by Arbortech. In the cover story, I show you the general approach I took to create a solid wood dish with this cool new power carving cutter. Most woodworkers aren't overly familiar with power carving tools and techniques, but once you get comfortable with the basics of power carving, a whole new world of woodworking will be revealed in front of you. Power carving is one of my favourite techniques, as it allows me to freehand sculpt wood into 3D shapes and add heavy texture and patterns to wood's surface.

Still on the topic of new, we have a new column for our last page. James Jackson is a woodworker and DIYer still learning the ropes. Over the next few issues he's going to share a few stories about the challenges of learning woodworking.

If new technology doesn't interest you, follow along with Bill Maniotakis as he builds a modern desk, which was entered into the Southern Alberta Woodworkers Society's recent exhibition. Speaking of the S.A.W.S. exhibition, our Community column showcases a number of pieces that were a part of the event. And if you like Maniotakis' desk, you'll enjoy our Canadian Quotes column, which features his work and some of his thoughts on the craft of woodworking.

In addition to our technology and project articles, we have a wide range of other woodworking and home improvement topics in this issue. If there's a subject you'd like to see covered in an upcoming issue, please let me know. I'm always happy to hear from readers and to fine-tune the direction of our pages to suit their interests.

— Rob Brown



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Tool Corner Blog

letters

Great Community Project!

Thought I would share a photo of the community library that I built for my daughter-in-law. I changed the roofline a little, and used icebox hardware from Lee Valley, but otherwise generally followed the article from your August/September 2016 issue. Thanks for the great project!

Regards,
Ron C
Sherwood Park, Alberta



Subscription Draw Winners

Gordon F.
Saskatoon, SK
has won a 2 speed Drill/
Driver Kit from RIDGID.



Clay A.
Coldstream, BC
has won a \$250
gift card from
Lee Valley.



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Smart Sensors Omission

Your article on Smart Sensors (FebMar 2018) included a piece on leak detection. The piece was great, and we wanted to introduce our technology. We're Eddy, a Canadian owned manufacturer of intelligent water monitoring and leak detection products. Our suite of products includes a remote and automatic shutoff (our IQ), as well as stand-alone leak detectors – all

that protect customers from water damage. More details can be found at www.EddyHome.com.

Nadine Evans
Eddy Home

*Sorry we missed your company, as we make every effort to include Canadian firms in our articles. — Carl Duguay
Web Editor, CW&HI*

Table of Contents Omission

In our FebMar 2018 issue we omitted to name the maker of the gorgeous table featured on our table of contents page. Regular contributor, and skilled maker, Steve Neil designed and built the piece. We were so impressed with the piece we forgot to mention his name. Sorry Steve!



industryupdate

Steel City Available in Canada

The launching of the Steel City brand in 2005 created a real buzz in the North American woodworking industry. In 2008, the US economy was hit hard by the financial crisis and the impact was catastrophic. After 10 years of activity, Steel City Tool Works Ltd. ceased its U.S. operations in 2015.

In Canada, the Steel City brand was still thriving with the support of its Canadian wholesaler Nordis Distribution Inc. Since then, with the original mission in mind of quality, innovation and competitive prices, production of new products has been brought back to Taiwan. It's now with pride and satisfaction that Steel City presents its remodelled line of woodworking machines, designed by woodworkers, for woodworkers.

Gaston Bilodeau, Vice-President, is looking forward to a great year. "We're proud to be a Canadian owned and operated organization dedicated to bringing the best woodworking machines the world has to offer to Canadian woodworkers. Over 80% of our line-up is now available and we expect more new and exciting products for 2018."





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- Swing: 33 1/2"
- Max. head swivel: 360°
- Table tilts: 90° left & right
- Table: 12 1/2" diameter
- Overall height: 64 1/2"
- Approx. shipping weight: 147 lbs.



MADE IN
AN ISO 9001
FACTORY

G7946 ONLY \$345⁰⁰



2 HP DUST COLLECTOR

- Motor: 2 HP, 240V, single-phase, 9A
- Impeller: 12 1/2" aluminum
- Air suction capacity: 1700 CFM
- Max. static pressure: 10"
- Sound rating: 83-85 dB
- 6" inlet has removable "Y" fitting with three 4" inlets
- Canister filter size (dia. x depth): 19 1/2" x 23 1/2"
- Bag capacity: 4.5 cubic feet
- Overall size: 37 1/2" W x 31 1/2" D x 71" H
- Approx. shipping weight: 150 lbs.



MADE IN
AN ISO 9001
FACTORY



G0548ZP ONLY \$515⁰⁰



12" BABY DRUM SANDER

- Sanding motor: 1 1/2 HP, 115V, single-phase, 13A
- Conveyor motor: 1/4 HP, 115V, single-phase, variable speed 5-55 RPM, 0.3A
- Drum surface speed: 2127 FPM
- Maximum board dimensions: 12" W x 3 1/2" H
- Minimum board length: 8"
- Sanding drum size: 4"
- Sanding belt size: 3" x 70" hook and loop
- Dust collection port: 2 1/2"
- Approx. shipping weight: 166 lbs.



G0459 ONLY \$650⁰⁰



10" HYBRID TABLE SAW WITH RIVING KNIFE

- Motor: 2 HP, 115V/200V (prewired 230V), single-phase
- Amps: 16A at 115V, 8A at 230V
- Precision-ground cast-iron table with wings measures 40" W x 27" D
- Table height: 34 1/2"
- Arbor: 1 1/2" • Arbor speed: 3850 RPM
- Capacity @ 90°: 3 1/2" • Capacity @ 45°: 2 1/2"
- Cutting capacity: 3 1/2" right, 1 1/2" left
- Overall size: 62" W x 39" D x 47 1/2" H
- Footprint: 20 1/2" L x 19 1/2" W
- Approx. shipping weight: 442 lbs.



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*110V operation requires part T23999 circuit breaker and wiring procedures that must be completed by an electrician or other qualified service personnel.



13" BENCHTOP PLANER WITH BUILT-IN DUST COLLECTION

- Motor: 2 HP, 120V, single-phase, 15A
- Max. cutting width: 13", height: 6"
- Max. cutting depth: 1/8"
- Feed rate: 26 FPM
- Number of knives: 3 (reversible HSS)
- Knife size: 13" x 1/2" x 1/8"
- Cutterhead speed: 9000 RPM
- Number of cuts per inch: 87
- 2 1/2" dust port
- Footprint: 22 1/2" L x 13" W
- Approx. shipping weight: 71 lbs.



INCLUDES DUST
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G0832 ONLY \$389⁹⁵



35TH ANNIVERSARY DELUXE 14" BANDSAW

- Motor: 1 HP, 110V/220V, single-phase
- Amps: 11A at 110V, 5.5A at 220V
- Precision-ground cast-iron table size: 14" x 14"
- Table tilt: 10° left, 45° right
• Floor-to-table height: 43"
- Cutting capacity/throat: 13 1/2"
- Max. cutting height: 6"
- Blade size: 93 1/2" (1/2" to 3/4" wide)
- Blade speeds: 1800 and 3100 FPM
- Overall size: 27" W x 67 1/2" H x 30" D
- Footprint: 23 1/2" L x 16 1/2" W
- Approx. shipping weight: 247 lbs.



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35TH ANNIVERSARY, 17" HEAVY-DUTY BANDSAW

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- Amps: 20A at 110V, 10A at 220V • Power transfer: belt drive
- Precision-ground cast-iron table size: 17" x 17" x 1 1/2"
- Table tilt: 10° left, 45° right • Floor-to-table height: 37 1/2"
- Cutting capacity/throat: 16 1/4" L of blade
- Max. cutting height: 12 1/2" • Blade size: 131 1/2" long
- Blade sizes available: 1/2"-1" wide
- Blade speeds: 1700 and 3500 FPM
- Fully-balanced cast aluminum wheels
- Overall size: 32" W x 73" H x 32" D
- Footprint: 27" W x 17 1/2" D
- Approx. shipping weight: 342 lbs.



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AN ISO 9001
FACTORY



G0513ANV ONLY \$995⁰⁰



10" LEFT-TILTING TABLE SAW WITH RIVING KNIFE AND CAST-IRON TABLE

- Motor: 3 HP, 240V, single-phase, 14A
- Max rip: 8" left, 26" right of blade
- Max. depth of cut @ 90°: 3"
- Max. depth of cut @ 45°: 2 1/2"
- Assembled table size: 48" W x 27" D
- Footprint: 20 1/2" x 20 1/2"
- Approx. shipping weight: 550 lbs.



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Tool Reviews

**Dewalt DCN680 18-Gauge
Brushless Brad Nailer**

**Rolair JC10PLUS 2.5 Gallon
1HP Compressor**

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



Events

**Wood Art
in the Cities**
Mar 16 - 17, 2018
Waterloo, ON

**Niagara
Woodcarvers 38th
Annual Show &
Competition**
Mar 24 - 25, 2018
Niagara Falls, ON

**Kingston
Wood Artisans
Symposium
2018**
April 7, 2018
Kingston, ON

**Canadian
Furniture Show**
May 25 - 27, 2018
Toronto, ON

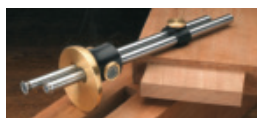
**Saskatchewan
Woodworkers' Guild
Annual Wood Show**
May 26 - June 3, 2018
Saskatoon, AB



Best Build

Check out the **Woodworking** section of our forum for our latest "Best Build" thread – an Shoe String Acoustic Guitar. This month's winner, Fred Hintz, wins a **Veritas Dual Marking Gauge** from Lee Valley.

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

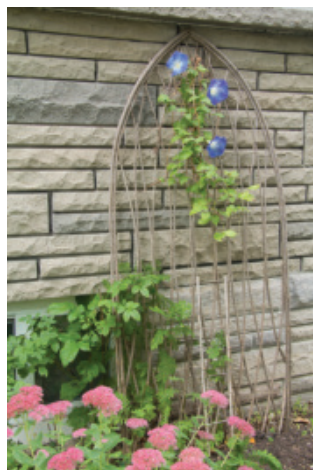


Free Plan

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this great garden accent piece.

View this plan and more at:
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Product Watch

Kibosh Rapid Pipe Repair

A pipe burst – it doesn't happen often, but when it does, the results can be calamitous and costly. But with this new product you can quickly and easily complete a temporary repair until a permanent repair can be made. It's a re-useable pipe clamp for perforated metal, plastic and multilayer pipes that can withstand 145 PSI of pressure. It's available for pipes in five metric sizes from 12mm to 22mm along with 1/2" and 3/4".

Kiboshpiperepair.com



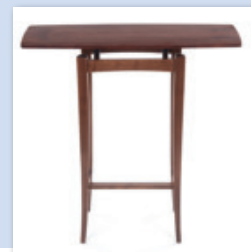
Video Links

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Woodworking
Basics, From
Design to
Finish: Series
Introduction



Canadian
Quotes:
**Bill
Maniotakis**



Forum Thread

Check out these home improvement threads and many others at forum.canadianwoodworking.com

- **Mission Style Gable Ends for Kitchen Cabinets – How to?** – When you're upgrading an existing kitchen you have to be careful all the details come together nicely. Learn how some are taking care of the details.
- **Stairs for attic** – Read about some options to work within the building code and create a set of stairs for an attic.

Got a question? Join our forum so you can ask our skilled and experienced members any home improvement question you like. It's free, and is just a click away.



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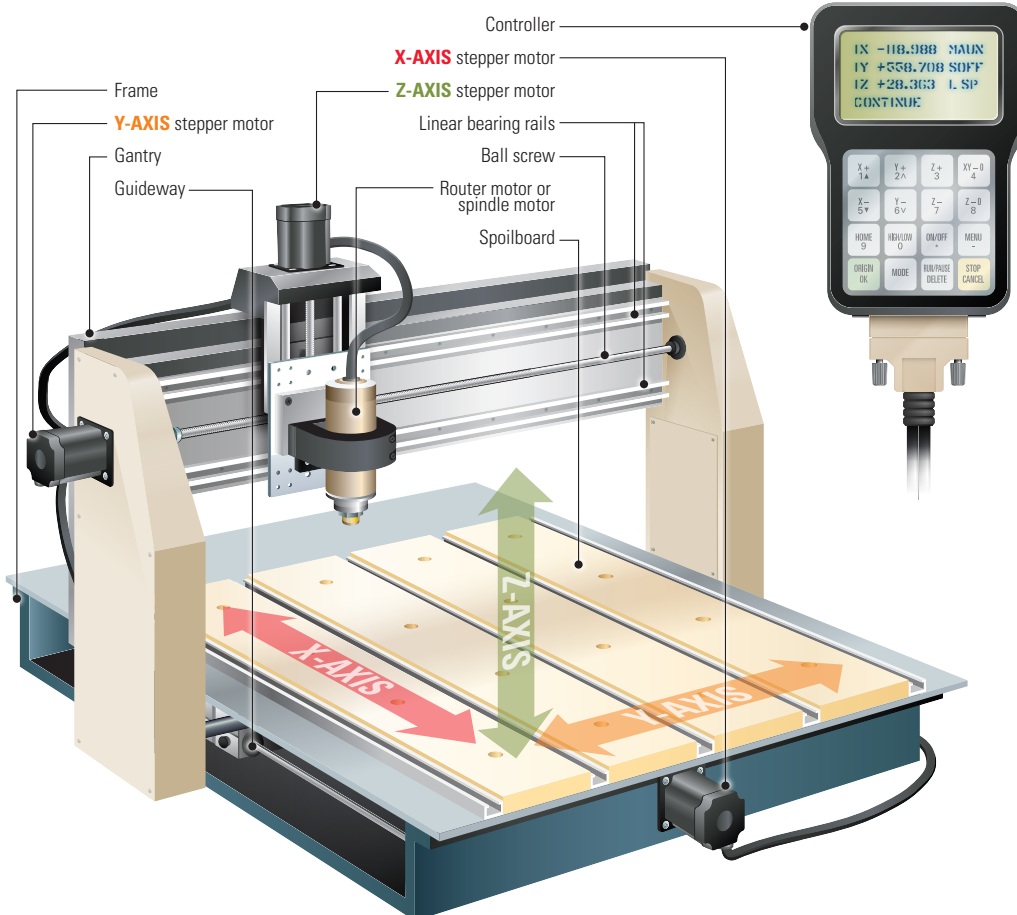
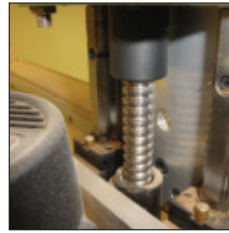
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Benchtop CNC Routers



You can think of a benchtop CNC machine as an inverted table router that is controlled by a computer. Instead of the router motor being under the table, it's on the top. The router motor (in higher end CNC this is replaced by a spindle motor) moves in three directions, called the X- (front to back) Y- (side to side) and Z-axis (up and down). These determine the maximum milling limits of the machine. CNCs are often rated by the size of their milling area. The router motor is suspended on a gantry above the work table. Stepper motors move the router motor along the X-, Y- and Z-axis. A ball screw and nut assembly (sometimes a lead screw or rack and pinion assembly) converts the rotational motion to linear movement. How quickly an item gets milled depends on both the travel speed, the speed at which the motor moves about the milling (or work) area before it begins cutting, and the cutting speed, which depends on the router speed you select, size of cutter, depth of cut, and type of material being milled. Designs are typically uploaded via a USB cable, and the CNC is controlled by means of an on-board LCD panel or hand-held controller.

Price: Kit (\$500 – \$2,000); Assembled (\$2,500 – \$10,000)

Motor: Palm router or spindle motor
X- and Y-axis Milling Area: 7" x 9" to 33" x 33"

Z-axis: 2" to 7"

Motor Travel Speed: 3/4" to 3-1/2" per second

Get the Most Out of Your CNC

Learn the Software

The key to successful CNCing is learning how to use the software. Where feasible, take a hands-on or online course. Reach out to the vast community of online makers.

Work Within the Limits

Ensure you understand the maximum and minimum routing speeds and feed rate of your machine and work within those limits.

Know Your Speed

Learn how to calculate optimal speed and feed rates and set the right cutter depth to get the best results. In general, higher speeds are for roughing, slower speeds for finish cuts, and materials of different densities require different milling speeds.

Invest in Good-Quality Cutters

Purchase good-quality cutters from reliable sources. Begin with HSS while practicing, and then move on to more expensive but durable Carbide.

Avoid the Chatter

On small CNC machines there is a greater tendency for cutters to chatter, which can cause them to bend and eventually break. Use the appropriate size of cutter for the task at hand, and adjust cutting depth to avoid excessive deflection.

NEW

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Jointers

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RIKON's jointers feature helical cutterheads with carbide 4-sided insert cutters. The cutting action of the helical design with multiple cutting edges is exceptionally smooth and efficient.



6" HELICAL JOINTER (20-106H)

- 1 HP Motor
- Motor Speed (No Load) 3,450 RPM
- 28 Carbide Insert Cutterhead with 5,500 RPM Cutterhead Speed
- 4 Cutterhead Insert Rows
- Adjustable 35" x 4-7/8" Fence
- Large 46-1/2" x 7-1/2" Table
- Carbide Insert Size 14 x 14 x 2 mm



8" HELICAL JOINTER (20-108H)

- 2 HP Motor
- Motor Speed (No Load) 3,450 RPM
- 40 Carbide Insert Cutterhead with 5,500 RPM Cutterhead Speed
- 4 Cutterhead Insert Rows
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Top**10** Power Carving Tips

Getting into power carving is like opening up an entire new woodworking world. Sculpting and shaping wood in three dimensions is fun, and will leave you with stunning projects that will turn heads.

BY ROB BROWN

1 Buy Decent Tools — A grinder with cheap bearings will rattle your arms and hands beyond belief. You will be able to stand it for a short while, but any longer and you'll be feeling pins and needles for hours afterwards. Don't break the bank, but don't cheap out here. Smaller tools and cutters will also give much nicer results when they're well made.

2 Do Your Research — Everything, from which specific grinders offer the best value when power carving to what the different types of cutters excel at, can be researched. Because power carving is something few woodworkers know much about, a bit of research will answer questions you didn't even know you had.

3 Protect Yourself — Power carving can be dangerous, especially to those new to the technique. I would start out with safety glasses, a dust respirator, a smock that isn't too loose fitting, steel toes and a full-face shield. Some wear gloves, but I always worry about getting them caught in the cutters or even slightly losing control of the grinder. Don't ever sit on a stool under the workpiece / workbench — rather, stand over it in a dynamic position.

4 Be Patient — Don't go into it thinking you will power carve a museum-quality work of art on the first day. Take it slow, as there are lots of things to learn. Also, don't get frustrated when your first completed piece doesn't look wonderful. Power carving benefits from mock-ups and some pre-thought to design, just like furniture.

5 Keep it Down — Power carving will transfer a lot of energy into a workpiece in many different directions. If that workpiece isn't properly secured it will fly, hurting it and yourself. Clamping large workpieces is rarely a challenge, but when working on smaller projects it's often a good idea to not cut the project out of a board until you have to, so you can easily clamp it to your workbench.



6 Practice First — With some cheap, knot-free stock, practice using the grinder and cutters. Don't make anything specific, but try different cuts and different angles to see the results. Listen to the sound the cutter is making. Soft, even sounds likely mean you're not overtaxing the cutter or grinder, while louder sounds may mean you're working too aggressively.

7 Start Simple — Start by not carving too deep into a blank, like a gently hollowed platter, or just adding some texture to a surface. The deeper you go, the harder things get. Also start with medium density woods with even grain, like walnut or cherry, for best results.

8 Add to Your Collection — One grinder and cutter is enough to get you going, but you may quickly want other cutters, as they can have drastically different pros and cons. Changing cutters every five minutes gets frustrating, so this is when a second grinder comes into play. A second grinder means you might want to get another cutter, which means... I think you know where this is going.

9 Sharpen Your Hand Tools — These final two points won't actually improve your power carving skills, but they will leave you with nicer power-carved projects. Once you're finished using your power carving tools, all those surfaces have to be levelled. Hand tools (small hand planes, chisels, carving gouges, etc.) are great for the initial levelling, and will work best if they're razor sharp.

10 Get Serious About Sanding — Power carving leaves a lot of exposed end grain, and unless it's sanded properly, machine marks and sanding scratches will be eyesores. Small yet aggressive sanders are wonderful for smoothing machine and tool marks, then hand sanding can perfect the surface.

ROB BROWN

rbrown@canadianwoodworking.com



Photo by Rob Brown

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Bill Maniotakis

...on retirement, finishing and the importance of building boxes.

BY ROB BROWN



Eccentricity Hall Table – While planning his entry for the 2015 S.A.W.S. exhibition, Maniotakis wanted to try something with bent laminations, so he designed this table. (Photo by Barry Blatz)

How long have you been building furniture?
15 years.

What sort of furniture do you specialize in?
Tables, jewelry boxes, cutting boards, and simple sculptural pieces.

If you were not a furniture maker what would you be?
Woodworking is a hobby, but I hope to continue during retirement. I would like to be an artist otherwise.

In order, what are the three most important items in your shop apron?
6" Lee Valley adjustable square, 6" LV ruler, tape measure.

Do you prefer hand tools or power tools?
Power tools.

Solid wood or veneer?
Solid wood, but plan to venture into veneers.

Figured wood or straight grain?
Figured for small-scale projects, but straight grain for larger projects.

Inherited Vintage Stanley Sweetheart or fresh-out-of-the-box Veritas?
Combination of new and used.

Flowing curves or geometric shapes?
Curves.

Favourite wood?
Walnut.

Least favourite wood?
Red oak.



Photos by Bill Maniotakis

Bill Maniotakis, 63 years old, Instagram: @bill_maniotakis

Location & size of studio — Studio is at home in a backyard triple garage with a 720 sq. ft. area and 10-ft. ceiling.

Education — Electronics Engineering Technologist diploma from the Southern Alberta Institute of Technology

quotes

In 2010 I built a dedicated shop in the backyard in preparation for retirement in early 2018. It's fully insulated and heated. It's 720 sq. ft. and is still too small at times. My wife likes to call it the 'Garage Mahal'.



Up till now woodworking has been limited to evenings and weekends when I can squeeze in the time. My engineering career occupied most of my time. Now I'm retired, I hope to dedicate more time to woodworking.



Inspiration comes from various places: books, magazines, Instagram posts.



I think up-and-coming makers should stick to proven classic designs until their confidence level is up to the task of creating something totally new, while looking for improvements along the journey.



Green and Green designs can be overdone, but I do appreciate the craftsmanship that goes into them.



Festool Domino floating tenons seem to be very prevalent these days. I understand the necessity for time effectiveness if one

is making a living at it, though. As a hobbyist I cannot justify the cost.



My confidence level has greatly improved lately in the last 5-10 years. Having a dedicated space to work from has enhanced my creativity and confidence. I am confident I can replicate a piece of furniture from a photograph.



I think we can bring the younger generation into woodworking by promoting box making. It allows for small, useful projects with few materials.



Woodworking exhibitions raise public interest, as evidenced in the biennial SAWS exhibitions.



I enjoy the work of Sam Maloof, Brian Boggs, Tim Rousseau, Mike Pekovich and Michael Fortune.



Silas Kopf's marquetry credenzas are great; 'Bad Hare Day' is just one example.



I think (sadly) that CNC machines will be used more extensively in the



Jewellery Box — Maniotakis made this bird's eye maple, spalted maple and wenge box for a friend's 50th birthday. He also believes boxes are a great way to introduce young people to the craft of woodworking, as with limited time and materials a nice, functional piece can be created.

future, which to me do little to promote woodworking.



Finishing products have improved lately, which enable the hobby worker to produce great finishes without having to invest in spray systems.



I like problem solving and execution of joinery.

The 'Matador' table that I built for the S.A.W.S. 2013 Fine Works in Wood Exhibition was the most challenging, frustrating and personally rewarding piece I have made to date. Unfortunately, it is stored in a crate in my shop until it finds a permanent home somewhere.



I believe that Canadians are becoming more appreciative of true craftsmanship and a small minority is even willing to pay for it.



I feel it is a maker's duty to share the processes that they have developed so that the craft creates interest and is passed down to the next generation.

ROB BROWN

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RELATED ARTICLES: Tom Gorman (Feb/Mar 2016), Jean-Claude & Talar Prefontaine (Dec/Jan 2016)

SLIDESHOW: Visit our website to view a slideshow of Maniotakis' work.

2017 S.A.W.S. Exhibition

The Southern Alberta Woodworkers Society (S.A.W.S.) is a non-profit organization based in Calgary, Alberta that encourages fine woodwork, as well as communication between its members and the public. They have been operating since 1983, and put on a biennial exhibition to showcase their members' work. The pieces pictured here were from the S.A.W.S. 2017 exhibition.

BY ROB BROWN



John Lavoie
Copper Mesh Jewel Chest
Big leaf maple burl, ebony,
rosewood, copper
18" x 12" x 6"



Dallas Gara
Cherry Rocking Chair
People's Choice
Curly cherry, curly maple
44" x 26" x 46"



Paul Fitzpatrick
Blanket Box
Cherry, walnut,
aromatic cedar
37" x 19" x 21"



Adrian Lay
Twisted
Coffee Table
First Place
Curly maple,
wenge, glass
36" x 19" x 19"



Kai Muenzer
Planetary System
Maple, walnut
27" x 24" x 57"



Juerg Salzgeber
Transcendent Warp
Third Place
Poplar, myrtle burl, glass
18" x 18" x 74"

Mike Mulvey
Writing Desk
Second Place
Walnut, walnut burl, ebony
46" x 24" x 29-1/2"



David Ross
White Oak Bench
White oak, poplar
44-1/2" x 15" x 19"



Tom Gorman Spider

Honourable Mention
Curly maple, kewazinga bubinga,
sycamore, maple, ebony, abalone shell
32" x 28-1/2" x 41-1/2"



Ted Branton Let it Snow

Peruvian walnut, maple, cherry, brass
15" x 1" x 11"



ROB BROWN

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Build a MODERN DESK

Angled legs add elegance and grace to this otherwise simple-looking desk.

BY BILL MANIOTAKIS

The design for this desk was a collaborative effort between my son Bryan and myself. His initial description was that he wanted something simple and minimalistic for his small downtown Calgary apartment. Shortly after starting work on this desk, I named it 'Simplicity'.

I prepared some 2D drawings to start

the discussion and after a number of changes between his vision, the practical building process and joinery restrictions, we agreed on the final design and dimensions. I began the process with a full-sized drawing of the side profile on 1/4" hardboard to work out the splay angles and joinery technique. I adjusted the leg splay angle from the planned 12° on the drawings to 10°, just because 12° looked to be too much, to my eye.

Milling and prep work

After milling the walnut and stickering it to acclimate for a few days, I made some 10° blocks that served a number of purposes. I used them on the drill press to drill out the mortises, on the table saw to cut the tenons, and finally as clamping cauls for the glue-up to compensate for the leg angles. By lining the angle blocks with sandpaper using spray adhesive, it provided some friction while clamping.

Joinery

I made a practice joint using a scrap piece of construction 2x4s and it helped with the setup and the joint layout. Seeing the joints full size and in real life, helped me size the real mortise and tenon joints. Since the legs are fairly narrow, there's a fine line between making the mortises and tenons large enough and weakening the legs too much.

Fitting the angled mortise and tenon joints proved to be more time consuming than I expected. Marking each joint and fitting individually, I dry fitted each side leg assembly and fine tuned with hand tools as I went along. Eventually I was happy with the fit, but I also had to deal with some joints that were too loose for normal wood glue. Using the 10° wedges on the drill press table to angle the legs, I drilled three holes with a brad point bit, then excavated the mortise using chisels. The opposing tenons were notched to fit around each other and to maximize the surface area for the glue-up. Using a 1/2" drill bit, I drilled three holes in series and cleaned out the waste, so the tenons are 1/2" x 1-1/2" x 1-1/2" long. I left a 1/8" shoulder all around the tenon for strength and to hide any epoxy squeeze out.

To mark the haunched portion of the tenon, I inserted one of the tenons then marked the shoulder of the haunch through the adjoining mortise. This gave me the exact location at which I could crosscut the haunched portion of the tenon. For the rip cut that forms the other portion of the



Mock-Up – Maniotakis made a full-sized mock-up of the mortise and tenon joint before starting on the real thing. This allowed him to design and size the joinery to provide the most strength.

haunch, I marked the midpoint of the tenon and left a bit of extra material on the tenon. I used a chisel to angle the haunched portion of each tenon and made sure to aim for a 10° angle, as each rail was on that angle. I didn't get it exact, but that is another reason why using gap-filling, slow-setting epoxy for assembly was to my advantage. With the first haunched tenon cut, I fine tuned the mating tenon to fit properly.

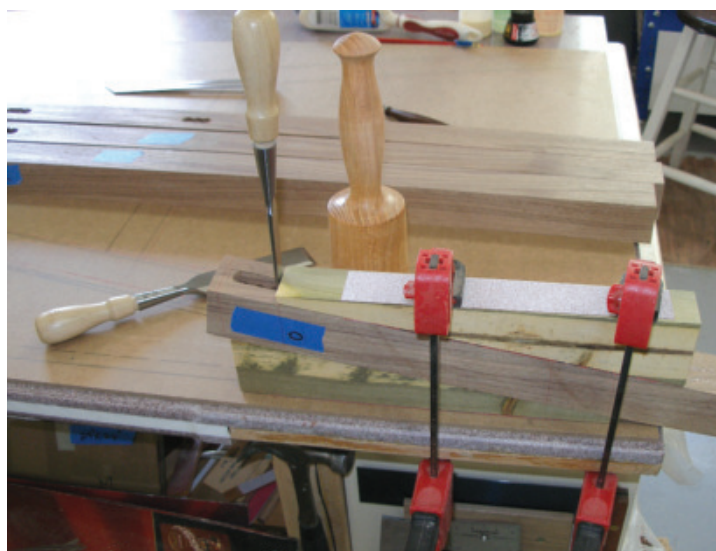


Angled Tenons – With the help of a pair of angled fences, and a couple of stop blocks, Maniotakis easily machined angled tenons on the ends of each rail.

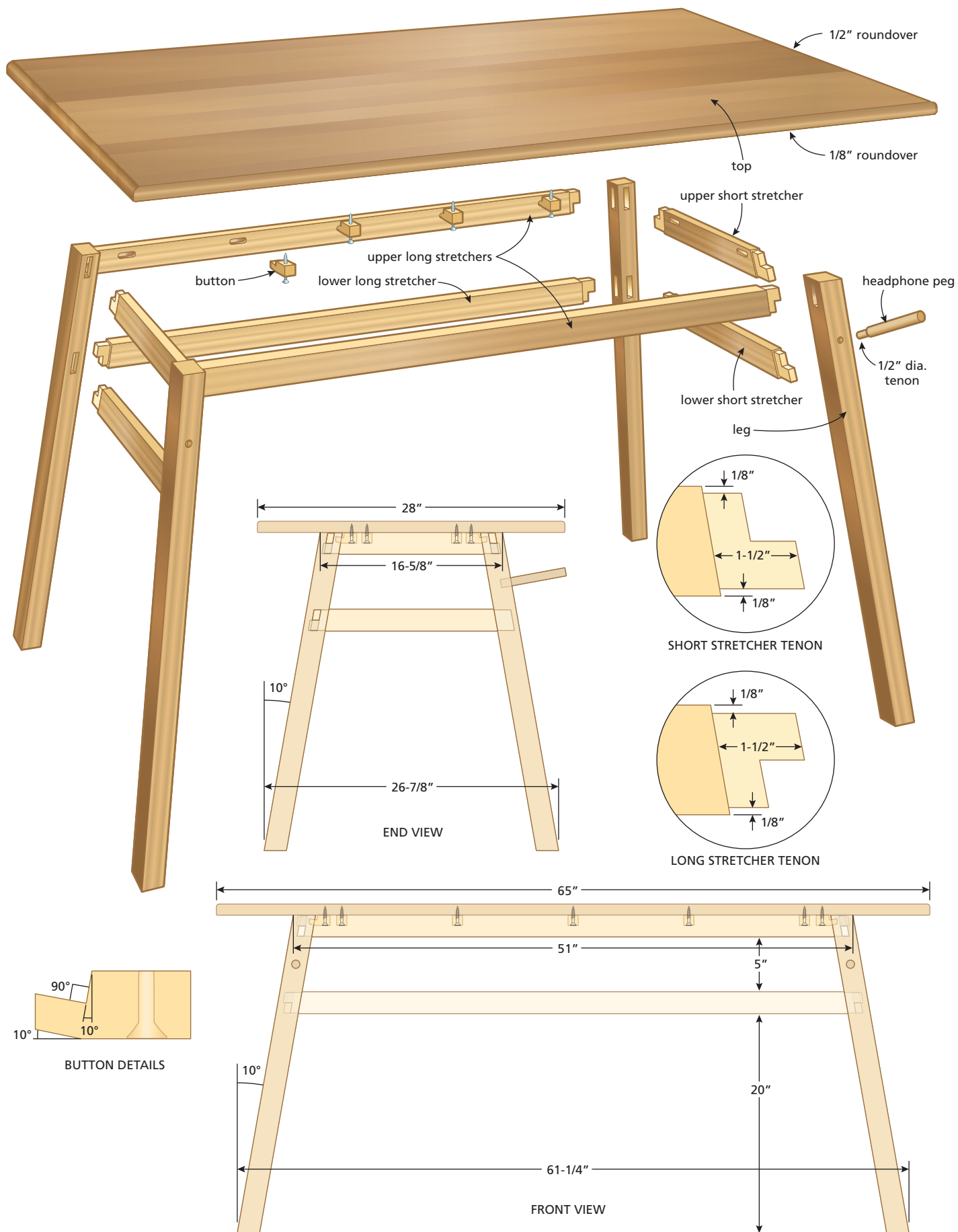
I notched the rails on the router table to receive wooden buttons for fastening the top to the base. By marking the location and length of each mortise from the visible side, I lined up the stretcher against the fence and plunged down on the spinning 1/2" router bit. Using the markings to show where the bit started and stopped, I was able to control the length of the mortises. The depth of the mortises was done in three



Lower Mortises – Once he drilled out the majority of the waste with a drill bit, Maniotakis used his angled blocks as a chisel guide to help chop the lower mortises. With the block clamped in place, he could place his chisel on the end of the block.



Upper Mortises – The angled block could also be used as a guide for the upper mortise, but in a different way. Maniotakis used it as a visual guide to position his chisel at the correct angle, but he also could have used a rectangular block positioned on top of the angled block to physically guide his chisel.



Materials List

Part	Qty	T	W	L	Material
Legs	4	2	2	32	Walnut
Upper Long Stretchers	2	1	4	50-1/2	Walnut
Upper Short Stretchers	2	1	4	17-1/4	Walnut
Lower Long Stretcher	1	1	2	52-1/2	Walnut
Lower Short Stretchers	2	1	2	19-1/4	Walnut
Top	1	1	28	65	Walnut
Dowels	2	3/4	3/4	6	Walnut

*Stretcher Lengths Are Approximate

Hardware List

Name	Qty	Size	Supplier
T-Nuts	4	1/4 - 20	Misc
Leveler Feet	4	1/4 - 20	Misc

passes, raising the bit each time, to provide better control and safety while routing.

Details

Another detail that became obvious during dry assembly was that the top of the upper rails needed to be ripped at a

10° angle, which was quickly done on the table saw with the blade tilted at 10°. It was a good last-minute catch that saved me some hand planing, had I glued up the legs first.

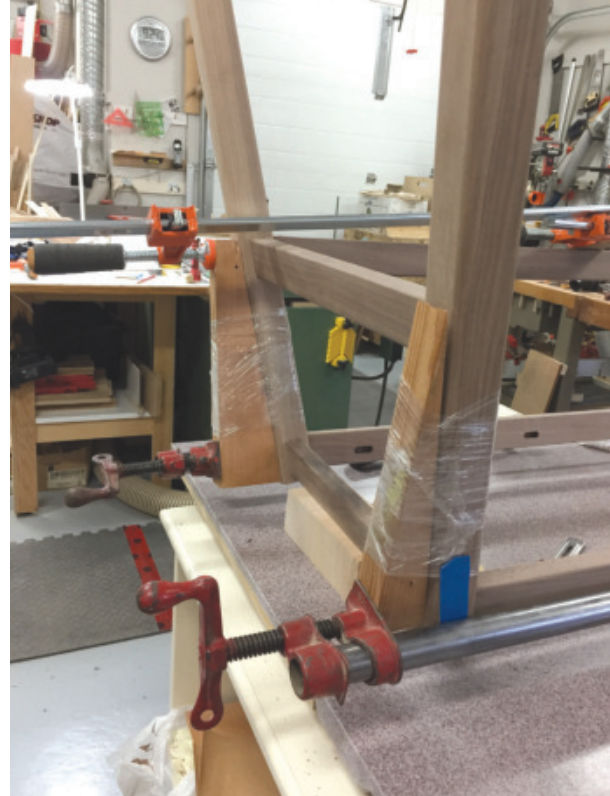
The bottoms of the legs had to be cut on a 10° angle in two directions so they would mate evenly with the floor when complete. The tops of the legs were left oversized until after assembly when they would be cut to length with a hand saw.

Another request was for a place to hang up headphones. I turned a walnut spindle on my lathe, including the 1/2" tenons used for attaching them into the legs, to make the two pegs. I then pillowed the end of each, added two small V-grooves, and used a wire to burn in the V-grooves for some visual interest. On the mounting end of the pegs I created a 1/2"-diameter tenon for attaching the headphone pegs to the legs. Corresponding holes were drilled into the front legs for mounting the headphone pegs. A slightly loose fit and gap-filling epoxy compensated for the pegs to be glued in place at the right angle in case the holes were not perfectly aligned.

Assembly

I chose to use slow-setting epoxy for a couple of reasons. Some joints were loose and needed gap filling. Epoxy also gave me a longer open time and a stress-free glue up. Epoxy isn't as easy to use as standard wood glue, but with a bit of practice the joints can be kept neat

Dry Assembly – Because the tenons fit so closely together, it's crucial to do a dry assembly in order to ensure the tenons will fully seat inside their mortises.

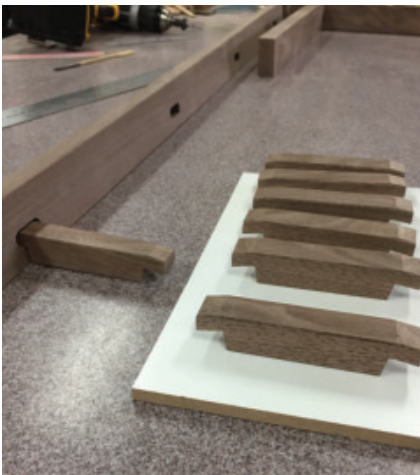


Angled Blocks – Blocks, angled at 10°, help out with machining and assembly. Here they provide parallel surfaces to clamp against.



Trim it Flush – With the base assembled, it's time to cut the tops of the legs flush with the tops of the rails.

and tidy. I didn't have enough long clamps so I had to improvise by ganging two clamps together, which worked out fine. It's true what is often said about clamps...you can never have enough.



Wood Fasteners – Shop-made wood screw blocks are made to fit into the routed grooves on the inside surfaces of the top rails. The blocks shown here will be drilled with a screw clearance hole, then cut into two smaller blocks before being screwed to the underside of the top.

Round Supports – Because Maniotakis' son was going to use this desk in part as a place to listen to music, he turned and installed pegs to hold headphones. You can skip this step if the dowels don't serve a purpose for you.



After removing the clamps the next day, I marked the top and bottom of the legs with a marking knife, relieved the knife line from the opposite angle so that my hand saw could sit against the knife wall, and cut the angles to provide flat horizontal surfaces for the top and the feet.

With the leg assembly lying upside down, it was time to make the mounting buttons, which also had to be cut at 10°. The buttons were batched in multiples from a wide piece of stock that allowed for safer table saw cuts. I also trimmed the exposed end of the buttons to 10° for a consistent look. The final width of the buttons were then ripped to size from the prepared pieces.

Down the stretch

For the leveling feet, I inserted the T-nuts, which were fitted flush by countersinking the T-nuts slightly. I experimented with the feet by spraying the aluminum on a set of four with some with black gloss paint. Bryan didn't like the

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Narrow Glue-Ups – The top boards were planed to final thickness before gluing. The boards were then glued two at a time so Maniotakis had adequate time for assembly. Dowels provided alignment and minimized the amount of material removal to flatten the top after the glue dried.

Proper Alignment – A dowel jig will help drill dowel holes accurately and quickly. These dowel holes will keep the board edges for the top even during assembly.

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Smooth the Top – To remove any irregularities you can use a hand plane and card scraper. This leaves you with a smooth top surface.

gloss look, so rubbing fine steel wool on the gloss black paint changed them to a more appropriate matte finish, which was approved.

For the desktop I selected, machined and glued up enough boards to give me the proper width and length. I glued up narrow pieces of walnut so each assembly would still fit through my benchtop planer, then dressed them flat when dry and glued them to each other. I used a dowel jig to accurately drill a few dowel holes in the sides of the boards to assist with location during assembly. This left only a slight bit of leveling, but nothing I couldn't handle with a hand plane. Once the top was glued up and smoothed, I rounded the top edge with a 1/2" roundover router bit to provide a more comfortable edge to rest arms against. On the bottom edge I routed a 1/8" roundover to relieve the sharp edge and make it nicer to the touch.

Finish

The finish I chose was Lee Valley 'Tried and True' Oil/Varnish. Applying it as directed, it resulted in a great look that brought out the beauty of the walnut grain. Two coats were applied with a soft cloth, allowed to dry for an hour and then wiped clean and allowed to dry thoroughly between coats. When the oil/varnish mixture was thoroughly dry, the



Install the Buttons – With a thin strip of wood as a spacer, Maniotakis screwed all the buttons to the underside of the top. They will keep the top secured to the base and also allow seasonal movement to take place.

top surface of the desk was given a few coats of wipe-on polyurethane for added protection. I then made a couple of natural edge coasters that were cut from a small apple wood stump to complement and further protect the surface.

What started out as a minimalistic desk proved to be more of a challenge than anticipated. This was mainly because of the splayed legs and angled mortise and tenons, which were cut in a fairly traditional method. Building this desk with legs perpendicular to the top would make this build much simpler, though I feel it wouldn't look as interesting. Consequently, 'Simplicity' is a play on words because of the joinery challenges, and it's nice to relate to specific objects by more than a generic name. Besides, it's a little more interesting to name it 'Simplicity' for the purpose of the biennial SAWS 2017 Exhibition that it was entered into.



BILL MANIOTAKIS
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Power Carve a SERVING DISH

Power carving is a woodworking technique that not many woodworkers know much about. With a bit of knowledge and a healthy dose of practice, you can add this to your arsenal fairly easily, and it will open up a brand new door for you.

BY ROB BROWN

I've been power carving for about six years now, and I absolutely love it. Flat, smooth wood can be beautiful, with its unique grain and a nice finish, but when wood is sculpted, it literally (and figuratively) adds a third dimension to it.

When I started power carving, the learning curve was pretty steep. Playing around with a few different power carving attachments with a selection of wood species gave me a good idea of what could be done. Using Arbortech's new Ball Gouge adds yet another dimension to my power carving. While most power carving attachments are great for adding gentle curves to wood, this Ball Gouge allows me to carve down into the wood more easily, producing a somewhat rounded cavity – great for bowls, spoons and the like.

Safety

Power carving isn't something you jump into head first. Like driving a vehicle, learning the basic dos and don'ts, and experimenting with some simple, hands-on techniques, is how you can stay safe and get the best results. I can't go over all the safety tips here, but we have a video on our website about using an Arbortech Ball Gouge, and I also shot a short video about how I used the Ball Gouge and a few other tools to create the cavity in this dish.

The learning curve is steep when familiarizing yourself with a new tool, and that is especially true when using this Ball Gouge. I'm an experienced power carver, but this tool was different than anything I've ever used before. It took some time to get used to. There was a bit of bouncing at first, but after some practice I got the feel for how it should be used. Just take it slow and practice a lot before starting in on the real thing.

Design

I played around with the Ball Gouge while making a few of the small household items shown in the lead photo at the start of this article. Once I was comfortable with the new tool, I started working on this dish. With a piece of 2x6 spruce cut-off I started into the prototype. I got half way through an elliptical-shaped dish, with a hollowed cavity in the center, and stopped because it was a bit boring. After looking at it a bit later I realized that maybe only about half of the dish should be hollowed out, as this would create a bit of visual tension in the piece. To me, this one change injected some energy into this otherwise boring project, and I was off. The finished dimensions of my dish were 5-3/4" wide x 12-1/4" long, but feel free to make any adjustments to suit your needs and likes.

The real thing

I started by dressing a 14"-long x 6"-wide chunk of 8/4 hard maple down to about 1-1/4" thick. To give it a bit more intrigue and visual contrast, I glued a piece of quarter-cut cherry veneer to the upper surface of the maple. When dry, I needed to lay out the outside shape of the dish, and added two additional offset lines to work towards. To do this, I cut a piece of wood 10" long, tapered both its ends to a point, and clamped it to the center of the workpiece. I could have used two nails, but one nail would have left a hole in the side of the dish on which I wasn't going to do much power carving. Some string tied to make a 22" circumference allowed me to use a pencil to trace the outer layout line. I then



Draw an Ellipse – Brown cut a piece of scrap to length, then removed some material from both ends so it came to points. Once it was clamped to the workpiece, a string was used to trace an ellipse on the blank. Sketch in two more layout lines offset 1/4" and 1/2" to the inside of the ellipse drawn with the string.



Constant Depth – Add a piece of masking tape around a drill bit so the holes stop about 3/8" away from the bottom of the blank, then drill a series of holes in one end of the cavity. Notice the two additional layout lines – stay at least 3/4" away from them when drilling the holes.

added another line offset 1/4" inside the first line, and a 3rd line offset 1/2" inside the first. The area between the 2nd and 3rd lines was going to remain there, but I had to adjust the lines at the end of the workpiece that was not going to be power carved, as I wanted to leave more of the cherry veneer at that end.

I went directly to the band saw and almost started cutting the outside shape, but quickly realized the workpiece would be much easier to secure in my vise for power carving if both its sides were square and straight. I was lucky.

Power carving

Back to my workbench, where I used the Arbortech Ball Gouge to rough out the center cavity of my dish. This is where I started recording the video I mentioned above. To make sure I didn't carve right through the workpiece, I drilled a series of holes to within about 3/8" of the bottom surface of the blank. Just stay away from the outer edge of the cavity as you drill these holes, as the edge of the cavity curves upwards near the edges.



Let the Chips Fly – With long, even passes, Brown uses the Arbortech Ball Gouge to remove material from the cavity area of the dish. Stay about 1/4" away from the inner layout line until the overall depth of the cavity has been shaped.

Fairly Even – Here the cavity is almost done, though it's still very rough. The undercut area near the perimeter is starting to be shaped, and the surface will get a bit more smoothing before reaching for some carving gouges to smooth the surface further.



Time for Hand Tools – Starting with gouges with a very curved edge, then moving to gouges with only a gentle sweep, Brown works his way around the cavity of the dish to even it out as best as he can. Sharp tools are crucial here.

Trying to stay at least 1/2" away from the inner layout line, I slowly removed most of the waste material. Any rushing here will either leave you with a shortage of wood to properly shape the dish or damage the little bit of wood that's needed to shape this area properly. This step took me about 10 minutes, as I was doing my

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Cut the Perimeter – Trim the outer waste on the band saw, then smooth that edge with a disc or edge sander.

best to stay patient. Obviously this amount of time will vary greatly depending on your skill and experience with power carving. The initial passes I make with the Ball Gouge are a bit more aggressive, as there is more material to remove, but as I got closer to the final depth each pass was made with a lighter touch, to leave as even a surface as possible.

The trickiest areas to work were where the outer edge of the cavity meets the side wall of the dish. I sized the height of the dish to work nicely with the diameter of the Ball Gouge, and as long as the passes in this area were controlled and precise, it left a fairly even transition between cavity and side wall. I was also careful to evenly and gradually shape the transition between the full depth area of the cavity to the far end of the dish, where no material was removed. This transition needed to be even to look good.

Further smoothing with hand tools

With the power carving complete, I focused on removing the tiny wood projections left by the Ball Gouge, with a small carving

Jazzing Up Your Carving

Carving wood into a sculpted, 3D shape is a lot of fun, and it can yield some stunning results. If you want to step it up a notch you might want to consider adding some colour to the piece you make. Sometimes it's just a simple approach, like adding some colour to the side of a serving dish, that's enough to capture the look you're after.

There are many approaches when adding colour to a piece, but I opted to use Varathane's Ultimate Wood Stain, in Antique Aqua. I really liked the blue paired with the lighter maple bowl. I added a simple vein line on the outside face of the bowl, between the upper and lower portions, just to visually separate the coloured surface from the natural maple, then stained right to this vein line. This gave me a really powerful and clean look.



gouge. With most of the projections now much smaller, I switched to wider gouges, with gentler curves, allowing me to bring the surface more even to the touch. Sharp tools are a must here, and will leave you with much less sanding down the road.

This step doesn't need to leave you with an ultra smooth surface, just a well-shaped surface that's about the correct depth all around, and has even and properly shaped areas near the transition between the somewhat flat bottom and the sharply curved side walls.



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Perfect the Edge – Once the dish edge has been routed, draw a series of pencil marks on the edge. Now you can use spokeshaves, files and sandpaper to fair and smooth the routed edge.



Eased Edge – Use a large quarter round bit in your router table to create a partial bullnose edge around the perimeter. Here, Brown used a 1/2" radius bit, but only used about half of the bit's edge for the cut. Be careful to keep your fingers away from the cutter during this operation.

Power, then hand sanding

I have an RO90 Festool sander, which is great for situations like this. It gets into a small space, and can be set to an aggressive mode to remove lots of material and flatten a surface. I used it to do the vast majority of smoothing before submitting to hand sanding the rest of the dish. Working up through the grits and ending with an even side wall, with simple, gentle curves, is what this stage is all about. Don't stop until the surfaces are all ready for a finish, as once the outside edges of the dish are shaped it will be harder to secure it in a typical ship vise.

If you don't have a small sander to get into the cavity and do the dirty work of levelling the surface, I would suggest using a mix of small hand planes and rasps, as well as using a very light, even touch when it comes to the last pass with the Ball Gouge to minimize the height difference between the peaks and valleys.

Shape the outer edge

I then cut the outer edge of the dish to shape on my band saw, smoothed that outside edge with my disc sander and used a 1/2"-radius roundover bit to heavily ease both the top and bottom

outside corner, creating an edge something similar to a bullnose. At this point I used some files and a spokeshave to even out the bullnose edge before hitting it with sandpaper to produce the final surface.

Finish it up

At this point I made sure the underside was sanded, before giving a final sanding to the veneered top surface and easing all of the edges. I sanded this dish to 180-grit.

As for a finish, I wanted a non-film-forming finish that was easy to touch up. Most penetrating oil finishes would be fine, but I opted for hemp oil. I find different oils leave you with a different colour, depending on the wood, so I would strongly recommend applying a few finishes on some scrap wood before making a final decision. Most of these types of oils dry slowly, leaving a soft, smooth, even finish that's nice to the touch and is food safe, but the difference for me is in how they look on the species I'm working with. I applied about five coats, letting each coat dry for at least one full day before reapplication.

Visit the *FREE GiveAway* page on our website for your chance to win a Ball Gouge from Arbortech.



ROB BROWN

rbrown@canadianwoodworking.com

Rob is a studio furniture maker and editor, working out of Peterborough, ON. His kitchen is now stocked with interesting handmade serving dishes.



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RELATED ARTICLES: Power Carving (*June/July 2011*), Wave Cabinet (*Feb/Mar 2013*)

VIDEOS: Visit the Videos section of our website to watch a video of Brown using different techniques to hollow out the cavity in this dish.

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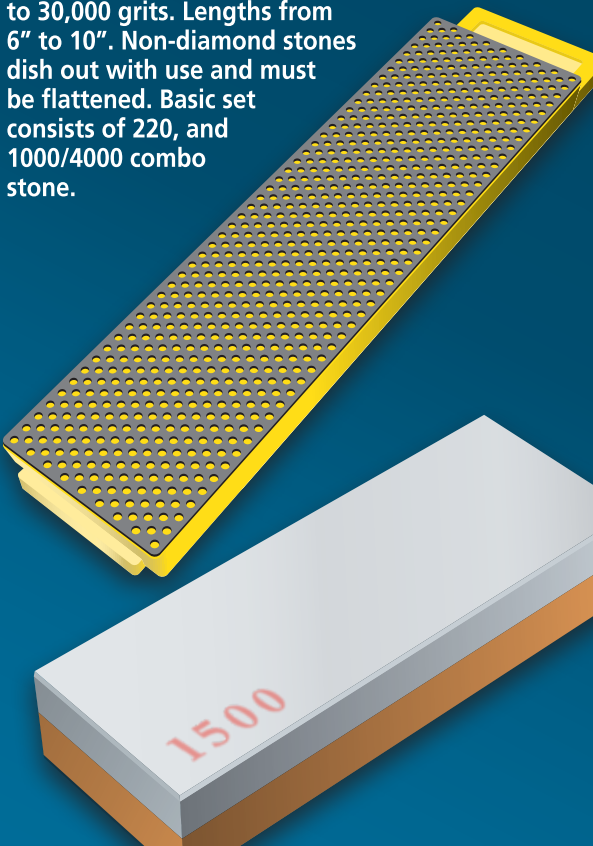
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Sharpening

HAND SHARPENING

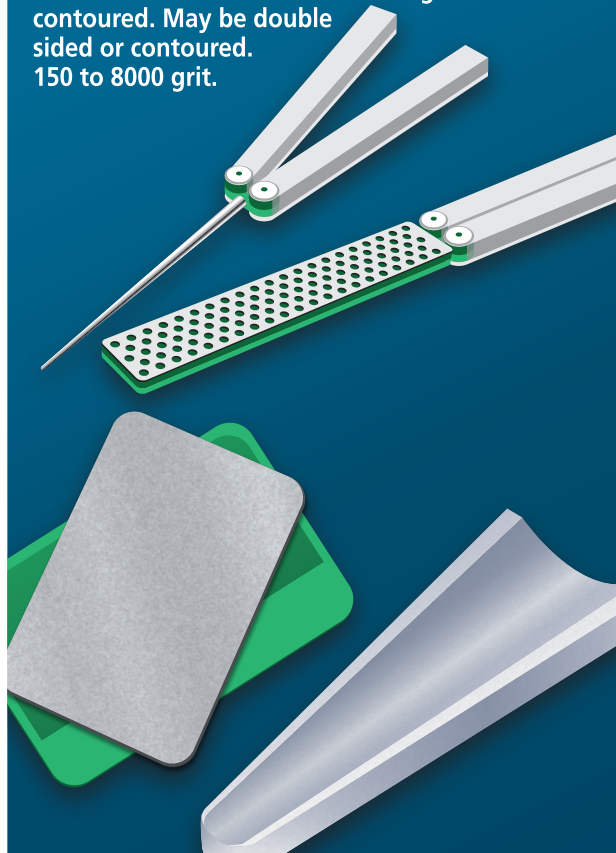
Bench Stones

Single or double-sided (combo) silicon carbide, aluminium oxide or diamond stones in 120 to 30,000 grits. Lengths from 6" to 10". Non-diamond stones dish out with use and must be flattened. Basic set consists of 220, and 1000/4000 combo stone.



Specialty Stones

Diamond or water stones in a portable, hand held format best suited for small cutting tool. Flat or contoured. May be double sided or contoured. 150 to 8000 grit.



Honing Guides

Increases accuracy when sharpening or honing on a benchstone. For bevel angles from 15 to 45-degrees on chisels and plane blades up to 3" wide.



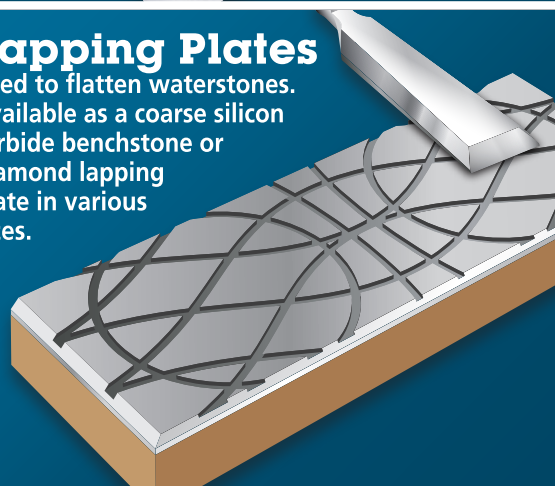
Micro Finishing Film

Silicon carbide or chrome oxide abrasive, or diamond grit on a plain or PSA backed polyester film, usually applied to glass plate. For honing a razor sharp edge. Rated in micron sizes - 15 μ to 0.1 μ .



Lapping Plates

Used to flatten waterstones. Available as a coarse silicon carbide benchstone or diamond lapping plate in various sizes.



Honing Paste/Compound

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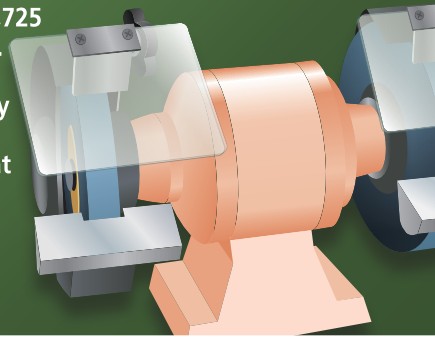
From the editors of

CANADIAN Woodworking & HOME IMPROVEMENT

POWER SHARPENING

Dry (Bench) Grinders

Usually have two 60x to 120x grit aluminum oxide grinding wheels, 1/2" to 1" wide, 6" or 8" diameter wheels spinning at 1,725 to 3,450 RPM. No lubricant used. Cut very aggressively. Excessive heat can ruin the temper of a blade.



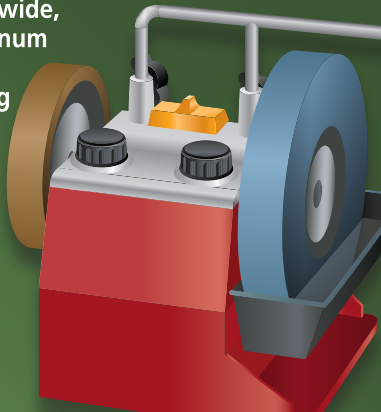
Grinding Wheels

Made of aluminum oxide or cubic boron nitride 1/2" to 1" wide, 6" or 8" diameter wheels. 36 to 1,000 grit. Require periodic dressing and truing.



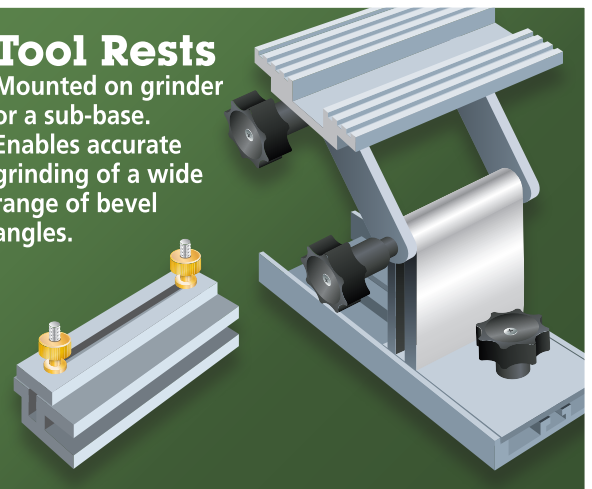
Wet Grinders

Single 1-1/2 to 2" wide, 8" diameter aluminum oxide water-lubricated grinding wheel spinning at 75 to 150 RPM. Slower cutting. No risk of ruining temper of blade.



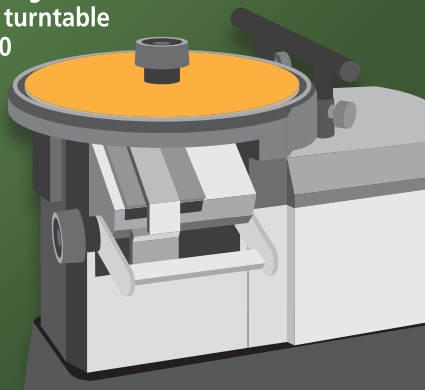
Tool Rests

Mounted on grinder or a sub-base. Enables accurate grinding of a wide range of bevel angles.



Platter Grinders

Uses 80 to 1,200 grit 6" to 8" abrasive disks mounted on a turntable spinning at 580 to 650 RPM. No lubricant used. Cuts aggressively with minimal heat build-up.



Sharpen: Remove material from a cutting edge.

Hone: Refine the cutting edge.

Grit: A measure of particle size used for benchstones.

Micron: A measure of grit particle size used for finishing film, diamond paste and honing compound.



Create Your Own Great Outdoors

Expand your useable living space into the backyard with these six approaches.

Photo by Dreamsime Illustrations by Len Churchill

BY ALLAN BRITNELL

With housing prices at record levels across the country, and many would-be cottage buyers priced out of the market, homeowners are trying to maximize the space they have, and add more where they can. Options range from digging down and renovating an unfinished basement, to adding an extra storey or extending the footprint with an addition. But all of those expansions are pricey. A more budget-friendly option is to create an outdoor living space in the backyard. Typically, that takes the form of a fairly standard deck or patio seating area. If your budget falls somewhere between the two extremes, there are a variety of options for creating your ideal outdoor oasis.

Planning and design

The first step in any renovation project is to create a list of wants and must-haves based on what kinds of activities you and your family enjoy. Do you like to host large gatherings? If so, seating areas for socializing will be a priority.

Are you an athletic family of game players? Then you'll want to think about open spaces where you can string up a badminton net or lay out a horseshoe pit.

A water-loving family may want to build their yard around a swimming pool. No room for a pool? A hot tub can be a space-saving and relatively affordable alternative.

Perhaps you are a couple of empty nesters simply looking for a tranquil place to read or relax, such as a shaded gazebo or maybe a hammock. With your wish list nailed down, you can start shopping around for quotes and material costs so you can build a budget and pare back as needed.

All decked out

For most of us, a deck is the focal point and social hub of the yard. But don't limit yourself to a simple square or rectangular design – multi-tiered or curved designs add some flare to stand out from the crowd.

A carefully designed deck and patio combination can incorporate the deck stairs as add-on stadium-style seating for guests. Building benches into the perimeter of the deck is another great way to add lots of seating, but remember that the building code requires railings along any side that's more than two feet above grade. In Ontario, a building inspector will measure from the *top of the seat* to the top of the railing to make sure it's at least 3' high. (Or 42" high if the deck is 6' or more above grade.)

Material choice also makes a big impact. Pressure-treated wood is a cheap and durable option, but if you have a little extra in the budget, cedar or composite materials will last at least as long, without the greenish hue. And instead of the standard wooden pickets for a railing, consider a glass railing so you have an unobstructed view of the yard from the deck.

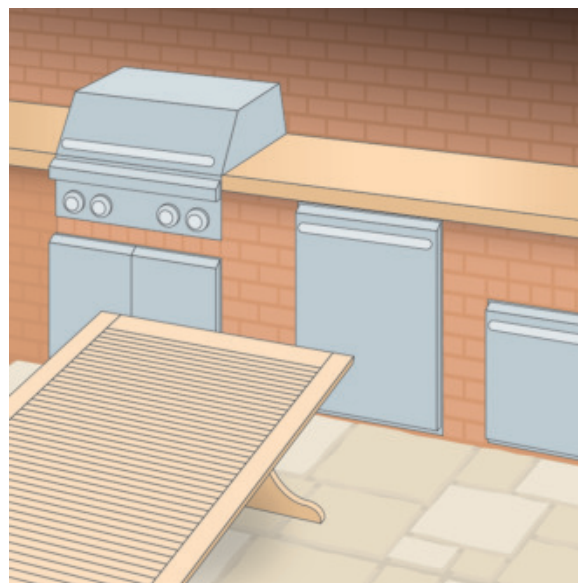
Get cooking

My day job is editing *Renovation Contractor*, a trade magazine for contractors and custom homebuilders. Every year we have a "Great Outdoors" issue, and in that we've featured some very high-end outdoor spaces. Some of the most decadent include fully functioning outdoor kitchens, complete with barbecues built into stone countertops, fridges, and even running water.

Of course, you'll want to bring in licensed professionals to run any wiring, plumbing, and/or gas lines, and keep in mind that if you do splurge on an outdoor sink, you'll have to remember to drain and blow the waterlines clear in the fall to prevent the pipes from freezing and bursting.



A Common Option – A deck is a great way to allow you and your family to spend more time outdoors during the warmer months. Curves add a lot to the aesthetic appeal of a patio, though they also add difficulty. With a bit of research, a deck is fairly easy for most DIYers to build.



Outdoor Cooking – By adding some basic appliances to your BBQ setup, a lot of cooking can take place outside. This keeps the mess inside to a minimum and allows everyone to be outside where the action is.

Friendly fires

Obviously, with our climate, an open-air outdoor living space can't be used year round, but there are ways to extend its usefulness well into the shoulder seasons.

The simplest is to install a fire pit. Most of us would agree that there's something primal about sitting around a fire, chatting and sharing stories with family and friends. There are countless design options for making your own from brick or natural stone (start by Googling "DIY fire pit"), or you can buy a metal fire ring or bowl to rest on a non-combustible surface.

Check with your local building department before you install a wood-burning fire pit though, as many municipalities ban their use in residential areas. If they are legal to use where you live, you'll want to make sure you use a screen so an errant ember doesn't start a secondary fire pit in your siding or shrubs.

If a wood-burning fire pit is not an option, gas fire pits are a viable alternative starting in the \$1,000 range. These are typically fueled via the same refillable propane tanks you use in your barbeque, so you will want to have a spare tank on hand. If you have a natural gas supply at your home, there are also models that can be plumbed directly to an outdoor gas connection.

To enjoy the space from early spring into late fall, consider investing in some patio heaters. There are a wide variety of designs of wall-mounted infrared units that can belt out enough heat to warm an entire patio.

Freestanding heaters – similar to what many bars and restaurants use on their patios – start at about \$150 and can kick out about 50,000 BTUs of heat, enough to warm a 20'-diameter area. Again, there are models that run on refillable propane tanks, or off of dedicated gas supply lines.

If money is no object, there are also indoor-outdoor fireplaces that you can build right into the exterior wall, and enjoy the view through windows on either side.

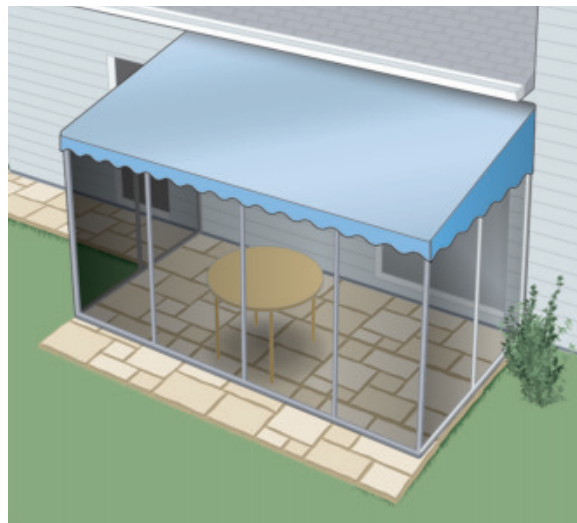
Give me shelter

Depending on the orientation of your yard, you may need a patio umbrella or canopy to shade your guests from the midday sun. In some higher-end designs, architects will actually extend a roof overhang over the main seating area. Note that this type of design would be considered a structural alteration to your home, so you'll need to apply for a building permit. A permit-free option is a wall-mounted awning that can be manually or mechanically opened and closed as needed.

Nothing will bug your enjoyment of your space more than swarms of biting insects joining the party. If you do have a roof overhanging your seating area you can install a floor-to-ceiling screened enclosure around the space. The downside is that it's a permanent obstruction. There are also powered screens that retract up into a housing that's mounted on the soffit. The higher-end alternative is articulating patio doors that you can fold out of the way when the weather's nice and bugs aren't out.



Fire Pit – A wood or gas fire pit can be added as a focal point of your backyard. The wood option is quite easy, while the gas version is a bit more involved. Either way, creating a cozy atmosphere can be accomplished with dedicated seating and some patio stones or rock slabs.



Keep the Bugs Out – A screened-in area will provide much-needed protection in areas where bugs are common. If you live in an urban area where bugs are less common, you might opt for an overhang of some sort, to protect you from unexpected rain showers.

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Two-Handed Rasps by the Unplugged Workshop

For years, Tom Fidgen has been watching woodworkers use traditional-style rasps for shaping their work. He's also noticed his students tend to hold the rasp handle with one hand, and awkwardly grip the tip of the rasp with the other. Fidgen finally decided there had to be a better way and reached out to Noel Liogier, a master rasp maker in Lyon, France. These rasps come in coarse #6, medium #9, and fine #13. They're to be used like a spoke-shave and have both a flat and a half round surface. With comfortable, locally sourced walnut handles and fine brass ferrules, they're available individually or as a set of three. www.TheUnpluggedWoodshop.com



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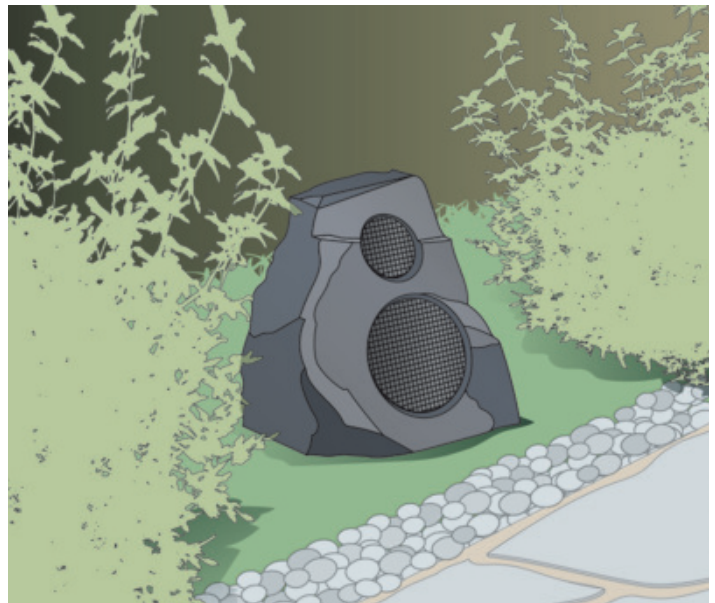
Having a family guitar singalong around your new fire pit sounds bucolic, but it probably won't be an everyday activity. For that, you'll want to look into speakers that connect to your home sound system. Options range from hardwired, wall-mounted speakers to rechargeable exterior-grade units. For a more discreet experience, there are a variety of speakers on the market that are designed to look like rocks.

Shed some light

Finally, don't forget the lighting. You do *not* want spotlights embedded in the ground shining in everyone's eyes. Instead, incorporate the same mix of ambient and task lighting you'd use on the inside. For added charm, enhance the lighting with candlelight (or citronella candles) when you have guests over.

Lining a walkway through the yard with electric or solar lights improves safety for guests unfamiliar with the path, while adding nighttime aesthetic appeal.

With a little thought and planning you can create the outdoor oasis of your dreams, with no cottage country commuting required.



Pump up the Volume – Speakers can help create the mood you want, and they don't have to break the budget. Lots of options, from in-ground to wall-mounted, are available these days.



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Shine a Light – Well-thought-out lighting not only looks great, but it helps define pathways and entranceways for visitors who aren't familiar with your yard.

This spring, Allan will be adding a new deck to his little urban slice of the great outdoors.

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Entry Doors

The front entry door is not just about a fabulous first impression.

BY CARL DUGUAY

The front entry door is what greets visitors arriving at your home, and it can make a fairly influential and lasting first impression. When it comes time to replace that door you'll want to choose one that fits the style of your home and enhances its appearance. It'll certainly pay dividends when it comes time to sell your home.

But, it's not just about good looks and first impressions. The front and back entrance doors are an important part of your home security, and even though they occupy a small amount of space relative to the whole exterior of the home, they have a measurable impact on your home's energy efficiency system.

Just like other components of your home, entry doors won't remain functional forever and at some point will require repair or replacement. It shouldn't be surprising considering how frequently entrance doors are used on a daily basis, the knocks and bumps they're subjected to, and the constant exposure to sun, rain and freezing temperatures.

A solid, secure door installed in a properly fitted and weather-stripped frame, and with an effective locking system, is going to go a long way in increasing your home's security. Doors that are easy to open and sufficiently wide, also make life that much easier for the elderly or disabled, and parents with strollers.

Insulation

Even though entry doors have a small surface area, heat loss through transmission and seepage can account for 5 to 10 percent of your home's annual heating bill – more if the door frame is compromised. Doors installed thirty or forty years ago are likely to be much less energy efficient than modern insulated doors. Just like roofing insulation, doors carry R-value ratings. In fact, manufacturers use two methods to rate the insulating efficiency of a door. The R-value is the most commonly mentioned – it's a measure of heat flow resistance, with higher numbers being better. There is also a U-value, which is a measure of heat transfer – how much heat loss occurs through a specific thickness of a material, with lower numbers being better. Make sure you consider both values when selecting a door.

Glazed doors (those with glass inserts), door assemblies with sidelights or transoms (a window above the door), and patio doors,

invite sun and heat into the home during the summer months, but can serve as a heat sink during the winter. The Solar Heat Gain Coefficient (SHGC) gives you a measure of how well the door absorbs heat from the sun. The lower the number, the better the door is at blocking the sun's heat. Generally you'll want south-facing glazed doors to have low SHGC rates and north-facing doors to have higher rates. As with windows, some glazed doors have low-emissivity (low-E) coatings that reduce energy loss by as much as 50 percent over standard glass. These coatings help keep heat on the side of the glass where it originates.

A factor that we don't often consider when replacing an entry door is noise pollution. If you live along a busy street, or you have sensitivity to noise, a door that helps reduce environmental noise may be worth considering. A door's ability to reduce noise transmission is measured by its Sound Transmission Class (STC) rating. The STC is measured in a nonlinear, logarithmic scale (similar to



Glass Can Be Cooler – Doors with windows, sidelights, transoms, etc., may not offer as much protection from the cold as entries with fewer windows. Glass technology has improved greatly over the years, so the differences are not as big as they once were. (Photo by Thurma-Tru Doors)



Keep it Consistent – Ensure the style of entry door you select is appropriate for the type of home you have. This modern door has a minimalistic look to it, but it matches the home nicely. (Photo by Simpson Door Company)



Flexible Styles – Solid wood doors can be made in many styles, especially by DIYers who want to create something truly unique. The downside to wood is that it's harmed by the elements much quicker than steel or fibreglass, so an overhang of some sorts will go a long way to keeping them looking as new as possible. (Photo by Simpson Door Company)

the way earthquakes are measured) so every number is significantly higher than the next. A common STC range for exterior doors is between 20 and 40 – with higher numbers offering the best noise suppression.

Hung or slab

You can buy the door by itself (a 'slab' door) or installed in a frame (a 'pre-hung' door). If the existing frame is in good condition, then there's no reason to replace it. The same goes for the hardware – reuse them if they're in reasonable condition. Some slab doors come pre-drilled for the latch and lock, but generally you'll need to cut the hinge mortises. Pre-hung doors are considerably heavier and take longer to install. Most likely you'll need a helper. If you've never installed a door and frame before, then consider hiring a contractor to do the job for you.

I've had very good success staining and top coating wood doors. Careful sanding and patience are the keywords for achieving a favourable outcome. However, I've been less satisfied when painting metal doors. Getting a good looking, perfectly smooth finish with a brush is quite the challenge. However, if you're competent with spray painting you'll likely get better results. Otherwise, I highly recommend you purchase a prefinished fibreglass or metal door.

Materials

The three most popular types of entry doors are wood, fibreglass, and steel. All three are generally available either unfinished or pre-finished in a myriad of colours. You can choose from a wide range

of styles – Mission to Craftsman, and Shaker to modern. Single or double doors can be had with or without glazing (glass panels), with single or double sidelights, and with transoms. Sliding patio doors, folding patio doors, and French doors (full glass hinged double doors), are most often available as fibreglass or steel and typically installed as a side or rear entrance door.

Wood

You can't beat a solid wood door for sheer beauty. They hold up well to daily wear and tear, and they're the easiest type of door to repair. However, they require ongoing attention and care, and there is the potential for warpage, cracks or twisting if not properly maintained. You'll also pay quite a bit more for wood doors. They're best suited for houses with an overhang (portico), porch, or veranda to protect them against the elements. You can get both engineered and solid wood doors. Engineered doors are often constructed with a finger-jointed core, edge banded and covered with a wood veneer that can be from 1/6" to 1/4" thick. Solid wood doors can be made of laminated or solid rails and stiles with panels ranging from 3/8" to 1-7/16" thick. Making a door is certainly within the scope of most woodworkers. It's a reasonably time-consuming project that requires a high level of precision and attention to detail, but quite rewarding. See 'Resources' below.

Fibreglass

Fibreglass doors are available with a smooth or embossed wood-grain texture. With advances in door manufacturing it's hard to tell the difference between some of the premium textured fibreglass doors and solid wood doors, unless you're at eyeball distance from them. They come in a myriad of styles and colours, and are super low maintenance. They're very durable, and resistant to dents, scratches, warping and twisting. However, a hard impact will likely dent or crack the surface, and repairs are not easy to do. These are the most energy efficient doors you can get – especially those that have a polyurethane foam core.



New Technology – With today's technology it can be difficult to tell the difference between a wood and fiberglass door, unless you're right beside it. (Photo by Thurma-Tru Doors)



Getting Fancy – Digital door handles, locks and viewers are more common every day, and offer many different advantages over traditional products. (Photo by Ring.com)



CARL DUGUAY
cduguay@canadianwoodworking.com

Steel

For top-of-mind security nothing beats a steel door, which accounts for their widespread popularity. And the fact that they're the least expensive door doesn't hurt either. Plus, they won't warp, twist or crack, and they're unaffected by mildew or moisture. You won't find them in as wide a style and colour range as fiberglass doors. And, like fiberglass, there's the concern with denting and the difficulty of repairing them. Still, they provide better energy efficiency than wood, though not as much as fiberglass.

Home security starts at the entry door

It's a good time to think about home security (and entranceway lighting) when replacing your entry door. The new crop of smart door handles, locks and viewers provide a practical and convenient way of keeping you and your family safe. Smart viewers let you see who's there before you open the door. You can even see who's there when you're not at home. Likewise, smart locks enable you to open doors remotely – for children returning home early from school, visiting relatives or friends, service calls or courier deliveries. And, if the lighting around your entry door is less than adequate, consider upgrading to higher efficiency, more cost-effective LED lighting.

Manufacturers:

Dorplex.com, Jeld-Wen.com, Masonite.ca, MDLDoorSystems.com, Pella.com, SimpsonDoor.com, ThermaTru.ca, TruTechDoors.com

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Introduction to CNC MACHINES

You may have heard the term “CNC” a lot in the last few years and found yourself wondering what CNC machines are all about. Read on to learn about how these machines are changing the way people work wood.

BY RICH KELLER

CNC(Computer Numeric Control) machines have been around for many years. A simple explanation of CNC is that a computer is used to control the movement of a tool – most often a router, with lathes being second most common. This movement can be controlled very precisely, in thousandths of an inch or decimal millimetres. You can use the CNC machine to carve, cut out and shape just about anything, and one of the big pluses is that you don’t have to use any jigs. With a CNC, if you can imagine it, you can make it.

CNCs have been used extensively in industry for decades, but they are now starting to find their way into home shops. In the last decade or so, several companies have started to make machines geared exclusively for small shop use. Machines are becoming more readily available and more affordable all the time. Many of the major retailers of

woodworking equipment here in Canada have started to stock machines and display them in their showrooms. In this article we’re going to look at CNC routers specifically; what they do, how they work, and how they can be integrated into a shop.

Software

To accomplish all this fancy computer control stuff you need two things, computer software and equipment. All CNCs are programmed in their own special “language” called G-code, which gives the machine step-by-step instructions on how to move. Each line of code tells the machine how far to move and in what direction. The machine reads the file line by line, executing one line at a time to create anything, from very simple to highly complex designs. Unless you are a super geek, you will want computer software to make this code file for you.

Some software, like ArtCAM or VCarve, allows the user to design a project and create the G-code files your machine will need in one package. Other software, like Google's Sketchup, will allow you to create designs, but you'll need additional software to convert your Sketchup file into something the machine can understand. For example, VCarve can import Sketchup files and allow you to create the G-code your machine will understand.

The machines

The most important part of the equation is the CNC machine itself. CNCs come in many shapes and sizes, and it pays to do a little research and think through what you want to do before you buy. CNC routers are machines with special guide rails in (at least) three directions, X (left-right), Y (front-back) and Z (up-down) as they are called on the machine. The router is attached to these rails, and precision motors called Stepper or Servo motors (depending on the construction of the motor) are used to move the router. Machines are purchased with specific X-Y working capacities. Smaller machines are 20" x 15" or 24" x 36". Machines have a limited Z (up-down) capacity. Smaller machines have a Z capacity of 3" to 6". It's important to keep this limit in mind because this is the maximum travel of the router. The thickness of the workpiece PLUS the height of the router bit you are using can never be greater than the Z capacity of the machine, and on some machines the workpiece can't be bigger than the X-Y capacity of the machine. It's also very important to realize that the capacity of a CNC typically can't be increased later.

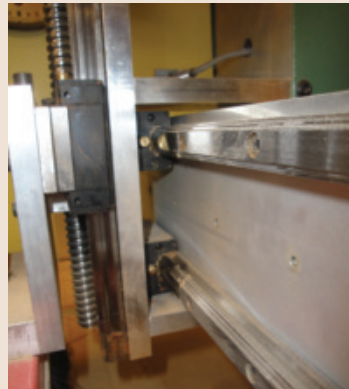


Screen Time – Some machines have a fully functional computer attached to run them. This one just has a simple keypad to operate it. You just plug in your USB drive, select the file, and run it.

What's in a Price?

There are some technical differences that can cause the price of CNCs to vary dramatically. This is an area where you will want to do some research before you buy. CNCs use two different types of motors. Router or spindle motors power the cutting tool, while Stepper or Servo motors power the movement of the router. To power the cutting tool, some CNCs use a standard router. Better machines use a spindle motor. One big difference is that most spindle motors are brushless, meaning less noise and maintenance, along with increased power output and durability. Spindle motors are usually more compact. Most of the small machines available for purchase today will have a small spindle motor, around 1/2 or 1 HP. Larger CNCs will use spindle motors of 2-3 HP or more.

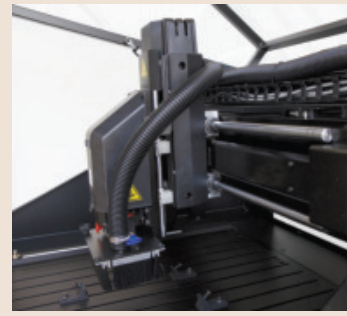
Different models of machine will also use different styles of linear bearings. Linear bearings are the rails that the machine moves around on. Less expensive machines use a round rod with a sleeve that slides over it. The sleeve usually has a low friction plastic insert of Delrin, Teflon or some other hard-wearing low-friction material. More expensive machines will use a square or rectangular steel track with grooves in the side, precision ground to size, on which a steel bearing filled with roller balls will slide. The second method is better but more expensive. For smaller machines you will typically be limited by a number of other factors (such as spindle HP) on how much you can machine in one pass, so guide rails with plastic bushings are not necessarily a prob-



Linear Bearings – This CNC uses heavy-duty linear bearings with roller balls instead of plastic sleeves.



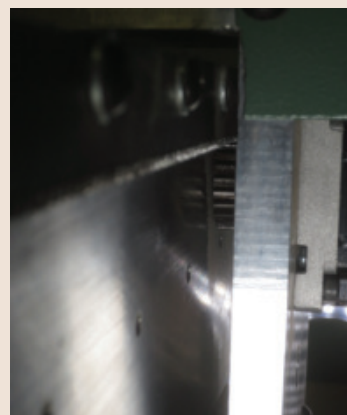
Ball Screws – The router on this CNC is moved up and down by precision ball screw. Some machines use this system on all three axes.



Spindle Motor – This CNC uses a spindle motor, which is made specifically for use in a CNC. You can also see the guide rails that the motor moves back and forth on.



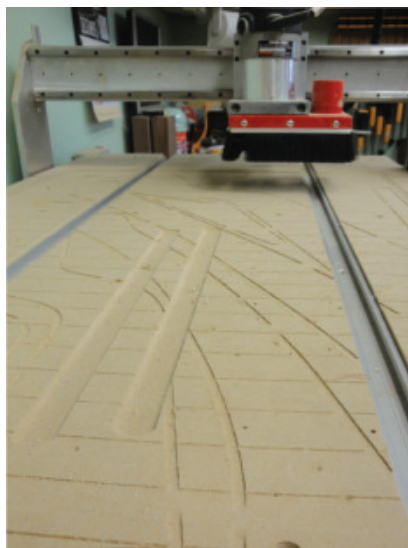
Standard Router – A standard off-the-shelf router provides power to the router bit on this CNC.



Rack and Gear – The X and Y axis on this machine are moved with a rack and gear system. This system allows for more rapid movement of the router than ball screws do, but it is considerably noisier in operation.



Router Bits – Keller has a drawer under his CNC with all sorts of router bits. These are standard off-the-shelf router bits that will work well in a CNC router.



A Clean Slate – The sacrificial table board on this CNC is well used. When it gets worn, a program can be run to resurface it with a large, flat router bit.



Simple Hold-Downs – In this case, small clamps secure the workpiece to the table during operation. You sometimes have to get creative when securing a workpiece.

Design work

Once you have decided to purchase a machine and set it up in your shop, the first order of business will be to design your part or project. This is one area where it pays to spend some time thinking things through carefully. If planning is important for a conventional woodworking project, it is many times more important with the CNC. Work-holding on the CNC can also be a big issue (depending on the project), so it pays to think about how you're going to hold the piece in the machine. During the design stage you will need to either find or create CAD drawings (2D or 3D) for the project or part you want to make. There are several websites online where you can get CNC projects for free or at minimal cost, and of course the best fun is always to create your own project from scratch. Once you have the drawing, you will need to create what are called tool paths. This is done through specialized computer software such as ArtCAM or VCarve. In simple terms, you tell the software what size router bit you have, how you want the bit to cut in relation to your drawing, and the software figures out how to make the machine move around and do that.

Holding the workpiece

Once you have your tool path made and ready to run, the biggest challenge is figuring out how to hold your work on the CNC. CNC machines have a flat table on which your workpiece sits, and some very basic clamps to hold a square board in place. This works very well for carving a sign in which the routing is contained within the board, and assuming the board is square. However, if you wanted to hold an odd shaped board, or be able to cut right thru the workpiece, that is when things get tricky. Odd shapes are usually tricky to hold in conventional woodworking, but the CNC adds to the challenge because now your hands are no longer an option. CNCs may move suddenly and in unexpected directions while in operation, so you never want your hands on the work while the machine is on. It is also because of this possible movement in a sudden an unexpected way that clamps become tricky. Whatever you use to clamp your work, it can't protrude above the workpiece because the

router bit may hit it. Remember that the router bit could still move above areas on the workpiece that are not being routed. This means you have to be creative. Sometimes double-sided tape or homemade clamps are required to keep everything in place. This also is one more element in the planning of the project.

Additionally, you may want to cut right through a workpiece, and this presents another challenge. Not only do you have to hold the piece you are cutting from, but you have to devise a way to hold the piece that's being cut out to keep it from being damaged or grabbed by the router bit once it's free from the original piece. Most machines you buy for the home shop come with aluminum tables, which you don't really want to cut into, so you'll want to put a sacrificial piece of wood on top to clamp your work to. Then, there are two simple ways to accomplish through-cuts. Software like ArtCAM that was designed specifically for CNCs can create "bridges" around your cut out part, essentially little tabs of material that are not cut all the way through. These tabs are then cut by hand after the machine work is done to free the part from the bigger workpiece. You can also glue your workpiece to a sacrificial board to be separated along the glue line later. Using a piece of newsprint in the glue joint makes this easy to do, and a chisel will separate the two parts very readily.

Misunderstandings

In my experience, there are three common misunderstandings about CNCs. It has been said that CNCs are not a "Santa Claus machine", and I would agree. Experienced operators may make it sound like you just take a drawing and spend five minutes clicking around on the computer, and it's done. Most projects take at least 30 minutes, if not several hours to complete the program, not counting the time to actually run the machine. While CNCs are getting more user friendly, especially the software part of the machine, it is not quite as simple as opening up a drawing and clicking on "print". Some computer knowledge is a must. If you're reasonably competent with Windows, then you should be fine, but if buying a CNC means you also have to buy a computer, you

might want to think about taking a computer class first. All CNC software presupposes you can use a computer. While some CNC manufacturers offer technical support for the machine, they generally are not going to explain to you how to turn your computer on.

The second major misunderstanding is that CNCs require no woodworking skill. I've often heard the CNC referred to as either "lazy way" or "cheater" woodworking, and after seven years and one hundred-plus projects on my own machine, I really find this amusing. CNC projects typically take as much time and effort as traditional methods. It takes time to come up with the concept, create the program, and run the program. It's different than conventional woodworking, but I wouldn't say it's quicker or easier. The CNC allows me to create things that would be either too time consuming or difficult by hand, but it doesn't come without effort. CNC projects typically take more thinking and less sweating than conventional projects. The greatest effort in making something on the CNC is designing the project. I can make small changes and modifications mid-stream in a conventional project, but with the CNC you can't just cut a part a little smaller or bigger mid-stream – you have to go back to the beginning and start over. The CNC is also not a magic machine that turns a tree trunk into a finished project. You still must prepare raw stock to put into the machine. If you have not yet mastered the basic skill of making a board flat and straight, you should learn that first. A CNC will not work well with uneven stock, and especially with stock that doesn't sit flat on the machine.

The third misunderstanding about CNCs is the learning curve. I, probably like most people, bought a CNC thinking that my first

project would be perfect. Well, it was perfect, after about ten tries. The CNC has a learning curve just like any other machine, except maybe steeper. The machine will always do exactly what you tell it to, so you have to be sure that your instructions are correct. A CNC also can't adjust speed on the go (at least for home machines) so there is no "feel" for feed rate, unlike a handheld router where you can change your feed rate on the fly. These little nuances make using a CNC a new experience and challenge for even a seasoned woodworker.

Despite these misconceptions, CNCs do have some major advantages. You can create intricate designs that would be either far too difficult or time consuming by hand. The CNC can also make duplicates of a design very easily. CNCs require no pattern or templates. Once you get a program working the way you want it to, it's very easy to run the program hundreds of times, and the CNC will make each run the exact same as the last. On a project where I want several or even dozens of parts the same (especially intricate ones), the CNC is a much faster way to make those.

I hope that this article will encourage you to consider how a CNC might fit into your shop. Like any other tool, CNC machines do require some learning, but there is incredible potential to add new detail and precision to your projects.



RICH KELLER
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The top four desktop CNC options for the hobby or small professional workshop.

Desktop CNC MACHINES

BY CARL DUGUAY

CNC (Computer Numerical Control) machining is no longer reserved for high-end production shops and large manufacturing companies. Small, compact, desktop CNC machines are now widely available, at prices that small woodworking shops, professional woodworkers and hobbyist woodworkers can afford.

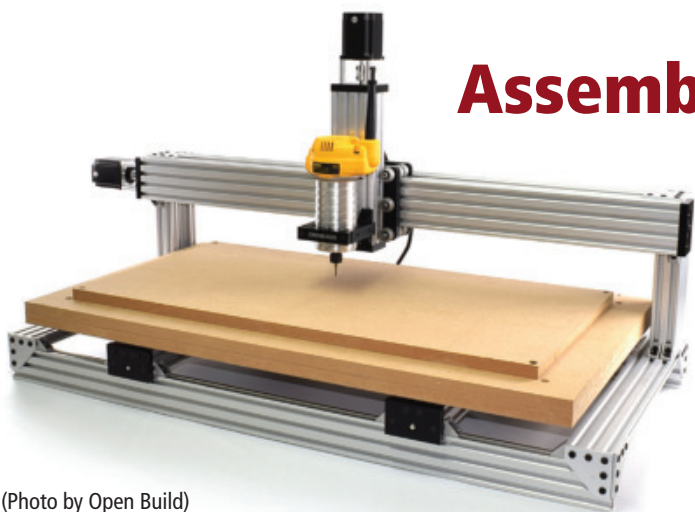
Learning about the software is likely to be more difficult than actually using the machine. Not all CNCs come with software. A good choice for most users is an 'all-in-one' program like ArtCam, Easel, or VCarve that enable you to design the item you want to mill (or import an image of the item), and then send the instructions to your CNC machine.

CNC machines require a motor to drive the cutter. Virtually all entry-level desktop CNCs use a palm router motor for this purpose. Most do not come with the router motor – you'll need to provide one. Some of the professional grade desktop CNCs come with a spindle motor – unlike router motors these are designed for

continuous use, and are either air or water cooled, which makes them significantly quieter than router motors.

Before you invest in a CNC machine, you might want to consider taking an introductory course. Check with your local community college or trade school. There are also online courses (check out Lynda.com). Other resources include: woodworking clubs; CNCZone.com, the largest CNC Forum; OpenBuilds.com, which also hosts a CNC Forum; and Makezine.com, which focus on small-scale CNCing. There are also an increasing number of Makerspaces (community workshop that provide CNC and other shared machinery) cropping up across Canada – search 'makerspace city' online to see if there is one in your area.

Software Sources: Autodesk.com (ArtCam), FreeCADWeb.org (FreeCAD), GRZSoftware.com (MeshCAM), Inventables.com (Easel), MecSoft.com (VisualImport), Onshape.com, Vectric.com (Aspire, VCarve)



(Photo by Open Build)

Assemble from a kit

If you're not sure whether CNC is for you, aren't ready to put out a lot of money for a CNC machine, or if you just might want to tinker with it, then consider assembling a CNC machine from a kit. You'll often find these machines referred to as 'tabletop milling machines'. All will require you to purchase a palm router and operating software.

The Sienci Mill One Kit V2 (\$515US) is the least expensive unit that I know of. The frame is made of MDF, but the gantry is aluminum. It has a very small (9-1/4" x 7-1/4" x 4") milling area. Travel speed is about 3/4" per second.

All the other CNC kits are fairly similar in design, with an aluminum or metal frame and gantry. The OpenBuild C-Beam Machine XLarge (\$1,410) from Maker Parts has a decent-sized milling area (13" x 29-1/2" x 2"). Travel speed is just over 1" per second. For this kit you'll also need to purchase a 12V or 24V power supply and a driver board and controller. Carbide 3D is the company that makes the hugely popular Shapeoko CNC kits. They come in several models based on the milling area size, from 16" x 16" x 3", to a huge (for a desktop model) 33" x 33" x 3". The Shapeoko 3 has an impressive travel speed of 3.3" per second. Prices start at \$1,099US.

Sources: Carbide3D.com, CNCRouterParts.com, Inventables.com, MakerParts.ca, Sienci.com

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(Photo by Shaper Tools)

The CNC as router

And now for something completely different. The Origin (\$2,399US), from Shaper Tools is a hand-held CNC machine that looks just like a large plunge router, and it uses standard 1/4" shank router and mill end bits. You upload designs via a USB stick (or through the cloud) to a built-in computer. An LED screen atop the Origin then displays the design and cut path,

which means there is no template to follow on the work piece. You simply move the Origin simultaneously as the cutting outline is displayed on the LED screen. A unique locating and auto-correcting system enables you to cut within 1/100" of the cutting path. Unlike any other CNC machine, there is no cutting area size limit.

Source: ShaperTools.com

Entry-level

There are quite a few companies making entry-level, fully assembled desktop CNC machines. For most of these you have to supply a palm router. A number of them come with CAD/CAM software. Milling area sizes are from about 12" x 16" to 24" x 24", with Z-axis depth to about 5". All will have an aluminum or steel frame and gantry.

The Piranha FX, by Next Wave Automation (\$2,499.95) has a 12" x 18" x 3" milling area and comes with CAD/CAM software and a library of 3D models that you can practice with. Next Wave Automation also has a Shark, pictured at the top of the first page of this article.

The Axiom AutoRoute 1 Basic (\$2,498.99) provides a 12" x 12" x 3" milling area and has a travel speed of 3.3" per second.

The CarveWright CX (\$2,100US) is

quite different than most other CNCs in this category. It looks just like a thickness planer, and has a cutting area 14-1/2" wide and 12' long (because it's open on both ends), with a Z-axis depth of 5-1/2". Travel speed is a whopping 9" per second.

CWI Machinery, who specialize in professional and industrial CNC machines have recently introduced their new Prodigy series for the hobbyist and educational market. The basic model features a 12" x 12" milling area and a 350 watt DC motor, along with an optional 3 watt laser and a sound enclosure. They'll also be releasing a 3 axis model with the same motor configuration and options, but with an 8" x 20" milling area.

Sources: AxiomPrecision.com, CarveWright.com, NextWaveAutomation.com

Professional-level

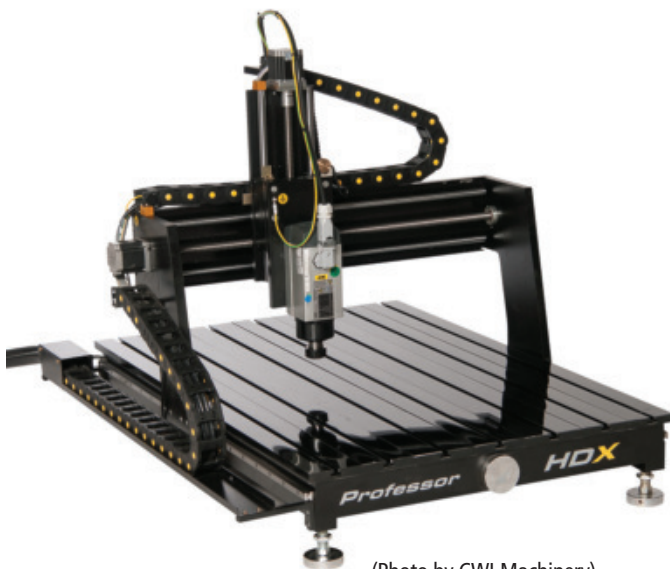
These are robust CNC machines designed to be used in a professional workshop or small production environment for extended periods of time. These machines come in benchtop and floor models.

CWI Machinery has three models in its Professor series, the 2.2, 2.3, and HDX (\$5,799.95 to \$10,599.95).

Milling areas range from 23-1/2" x 23-1/2" x 7" to 23-1/2" x 35-1/2" x 7". They feature heavy-duty cast iron base frames with adjustable feet, anodized aluminum tables, 2.2HP Bosch variable speed motors (2 HP industrial air-cooled spindle motor for the HDX), 3/4"-thick aluminum gantry and support arms, and 5/8" ball screws. Travel



(Photo by Piranha)



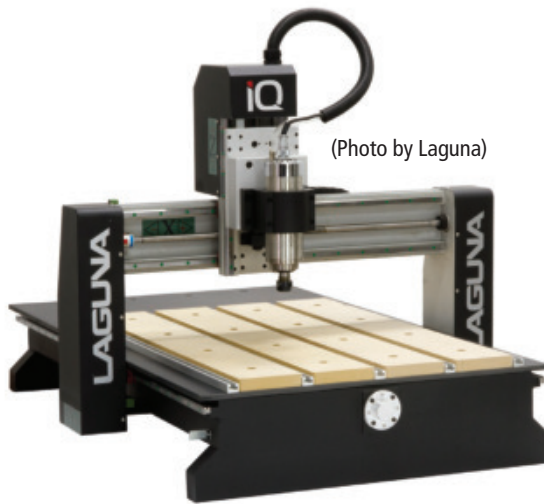
(Photo by CWI Machinery)

speed is 3.2" per second. They come with a controller and control box. CNC software is sold separately.

The Laguna IQ (\$9,249) has a 24" x 36" x 6" capacity and a travel speed of 2" per second. It features a one-piece steel frame, robust aluminum gantry, 5/8" ball screws and a 3HP induction motor with liquid-cooled spindle. It includes a controller and control box, but no software. Laguna provides free online training.

The X Series (\$4,999US) from IconicCNC is one of the smallest professional CNC machines with a 20" x 15" x 4" milling area. However it has a fast 3.9" per second travel speed with a .002" positional accuracy. The unit comes with a 600W brushless motor, and includes ArtCAM/VCarve and iPicture software along with 1/4" and 1/2" collets.

Powermatic's PM-2X2RK (\$9021.26) comes mounted on a heavy-duty base and features a welded steel frame and 24" x 24" x 6" milling capacity. The table and the gantry are made of cast aluminum. Travel speed is 3.3" per second. It comes without a spindle motor or collets.



(Photo by Laguna)



(Photo by Iconic CNC)

Sources: CWIMachinery.com, IconicCNC.com, LagunaTools.ca, PowerMatic.com



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Woodworking Classes in Toronto

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Battery-Powered STRING TRIMMERS

We take a look at the wide selection of battery-powered string trimmers between 36 and 58 volts that are on the market this spring.

BY RICH KELLER

Battery technology has changed tremendously in the last few years, and it isn't just cordless tool companies that are taking advantage of this. True, some of the units I tested are put out by power tool giants like DeWalt and Makita, but long-time companies that have exclusively made yard care tools (traditionally called Outdoor Power Equipment) like Husqvarna and Echo are also carrying battery equipment now. I looked specifically at 36–58V units, and many of these products boasted “gas-like power”. These claims would have seemed outrageous 10 years ago, but not anymore. Keeping your property clean and beautiful has been made even easier with the selection of string trimmers available today.

Photos by Manufacturers (Lead Photo by Rob Brown, Detail Photos by Rich Keller)

Makita DUR364LZ

\$399.00

w/2x 3.0Ah batteries



Reverse It – The Makita trimmer has a reverse, which will assist with getting debris out of the cutting area. This is a great feature for anyone working with long grass and brush.

The Makita trimmer has a long shaft on it, which is nice for reaching around and under shrubs and trees. It also keeps me further away from the flying debris, which I really liked. At first I found the line kept breaking on me, but after I installed some new line, the unit worked great. The soft start brushless motor has two speed settings; low was good for around delicate shrubs, while high had lots of power without being too powerful. One feature unique to the Makita trimmer is reverse. If you're wondering why reverse, that is for clearing brush and debris that gets caught around the head. If the head gets clogged up, you power it up in reverse for a second, and it flings off all the debris. This is a great feature when you're working in long grass. The Makita uses 2x18V batteries from their current 18V lithium ion platform, making it compatible with all their 18V and 36V tools. If you buy the trimmer as a kit; it comes with their dual 18V charger which is a very nice charger to have if you have the Makita 18V platform in your tool bag already. I did find the Makita a little awkward for edging because of its length, but that's very typical of a long straight shaft trimmer.

Echo CST-58V2AH

\$299.00



Choose Your Speed – The Echo trimmer has two speeds, so you can easily control how fast the string rotates.

Echo has been making outdoor power equipment for a long time, so they have lots of experience with making string trimmers. Like some of their gas-powered units, this trimmer featured a split shaft with a quick connect system. This allows you to buy other accessories like a hedge trimmer or a cultivator that can be used in place of the included string trimmer head. The 58V system is a bit higher voltage than the other systems I tested, and I did notice a power difference. In my case, I don't think this was any advantage, as it started ripping my grass out by the root instead of cutting it. The unit does have infinite variable speed available at the trigger, so it's easy to dial that power back a bit. Overall the unit was a bit heavy, although it was well balanced. It also had the largest cutting circle of any of the units I tested, at 16". I think probably for most people the Echo will be too big and powerful; however, it really depends on your needs. If you have a country lot or a farm and you're looking for a unit that will really rip through tough weeds and grass, I think this is it.



Husqvarna 115iL

\$349.99

w/2.1 Ah Battery



Quick Adjustment – With a quick flick of a switch the length of the Husqvarna trimmer can be adjusted.

I really liked the Husqvarna trimmer over all. The assembly was pretty quick and easy. One of the really nice features was the adjustable shaft length. Two cam locks allowed different sections to telescope in and out and made it very convenient to change length on the go. I found the controls and feel of the unit to be very comfortable and ergonomic. I also found the Husqvarna unit to work really well edging along my curb, and had just the right amount of power. Eco mode was powerful enough for trimming, and full power could cut through tough roots for edging. I did find that the unit was a bit nose-heavy, but it wasn't a deal breaker for me.

DeWalt DCST990H1

\$399.00



Big Cutting Path – The Dewalt trimmer has a large cutting radius, which is great if you have a lot of trimming to do, or you can't get your lawn mower into some tighter spaces.

DeWalt offers trimmers in three different voltages (20V, 40V, and 60V) and you may be wondering why so many choices. The 20V and 60V versions are compatible with their current 20V and 60V Flexvolt line-up. The 40V trimmer, which I looked at, is only battery interchangeable with DeWalt's other 40V cordless products. The 40V line from DeWalt is geared exclusively for lawn care professionals who don't need to have battery interchangeability with other tools in DeWalt's line. The benefit of not being able to use your 40V trimmer battery on your cordless circ saw is that the 40V battery has been optimized to work the best it possibly can for outdoor power equipment. DeWalt also makes a number of other tools in the 40V platform, including blowers, hedge trimmers, chainsaws, and even backpack blowers. One thing I liked right away about the DeWalt trimmer was the fact that it came out of the box fully assembled. It seems like a little thing, but it's nice to not wonder what to do – you can just get to work. The 40V 6Ah battery is pretty big, actually a little bit bigger than a Flexvolt battery, but once it's in the trimmer it balances out nicely. The brushless motor has two speed modes and lots of cutting power. With 15" of cutting capacity, this trimmer can head through some tough stuff in a hurry.

Greenworks 060-2375-2

\$239.99



Got Power? – With a press of a button a power gauge on the Greenworks trimmer shows the user how much power remains in the battery.

Yardworks 060-2370-2

\$199.00



Tidy Edges – When the head on the Yardworks trimmer (left) is rotated into edging mode, the wheel contacts the ground to assist with accuracy. (Photo by Manufacturer)

The Greenworks trimmer was a bit lighter than some of the others I tested, but it didn't lack in power at all. The split shaft system was easy to assemble, and easy to disassemble for storage. The unit has variable speed, but I found the unit seemed to go from slow speed when barely pressing the trigger, to almost half speed without depressing the trigger much more. There doesn't seem to be a great range of low speeds. One thing I did like with the Greenworks trimmer was the auto feed head. Basically, you just trim away, and the line advances itself as it needs to. The unit also has charge level indicators on the 4Ah battery. The 12" cut capacity is not the biggest of the units I tested, but still ample enough to do a city-sized lot reasonably quickly.

At first glance this unit looks very much the same as the Greenworks unit, and indeed the batteries are interchangeable. There are some feature differences that distinguish the two units from each other. One feature is the split shaft. The Yardworks trimmer uses a tool-free system that is very fast to put together and take apart. This makes assembly quick out of the box, and makes it easy to take the unit apart to store if you want to. I also found there was a good system to rotate the head of the unit around for edging. On the Greenworks unit, the head is fixed, and you have to flip the whole trimmer upside down to edge, but that isn't the case with the Yardworks unit. The Yardworks trimmer lacks the auto feed head. Every time you need more line, you have to stop and press a button on the trimmer head to manually pull more line out. The guard on the Yardworks unit has a wheel on the back of it, which makes the job of edging easy (when the head is rotated around for edging, the wheel contacts the ground). However, I did find that the guard was way too large to really see anything that you're trimming.

Ryobi RY40220

\$219.00

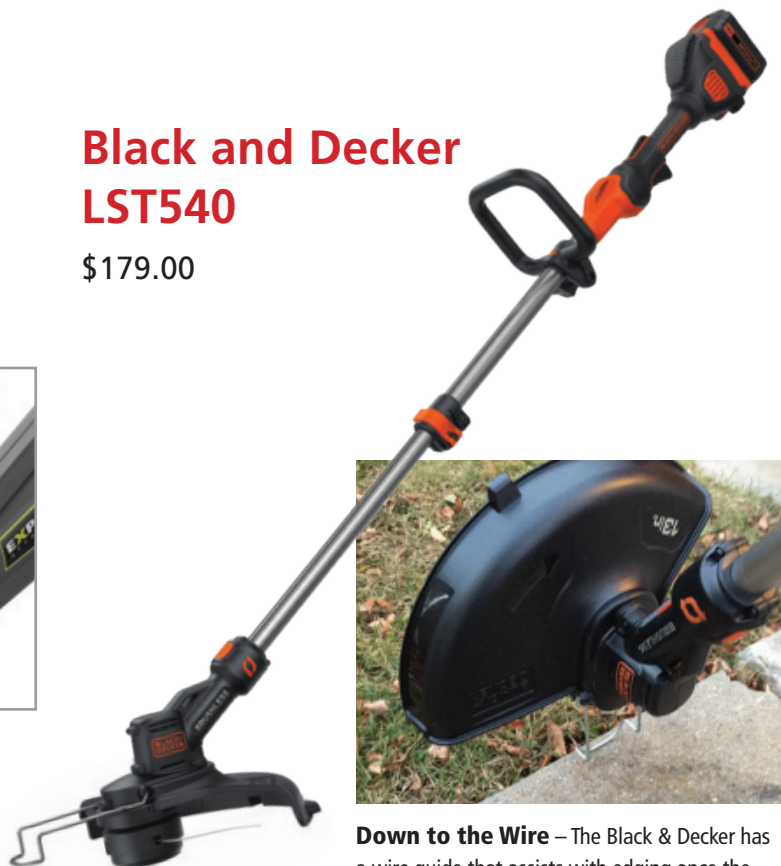


Adjustable Handle – The handle on the Ryobi trimmer is oversized and easy to adjust. This unit also allows other accessories to be used with the same motor / handle.

(Photo by Manufacturer)

Black and Decker LST540

\$179.00



Down to the Wire – The Black & Decker has a wire guide that assists with edging once the trimmer has been rotated.

The Ryobi trimmer features a split shaft, which is common to a lot of the trimmers I tested for this article. Like a couple of other units I tested, Ryobi has some optional accessories that can be used in place of the trimmer head. Not every trimmer with a split shaft has extra accessories available. For example, a blower, a cultivator, and a pole pruner/chainsaw can all be powered with the same motor. This is a great system to get into if you want to do some serious yard work, as you can economically purchase these attachments to allow you to do more with the motor you already own. The Ryobi trimmer has an adjustable cutting swath from 13–15" with variable speed control at the trigger. The Ryobi trimmer had lots of power to cut, but not to the point of being overpowered.

The Black & Decker trimmer has a couple of nice features. It has a brushless motor, which is really surprising for the price point and it's fairly lightweight, which is nice. I also really like the design of the shaft. The length can be adjusted quickly and easily with the cam lock, and the head rotates easily with one button for edging. It also comes standard with an auto feed head, which means you won't be fumbling around trying to advance the line. One concern I have with the unit is the 1.5 Ah battery, which was the smallest of all the units I looked at. I am concerned that the unit will not have great run time.

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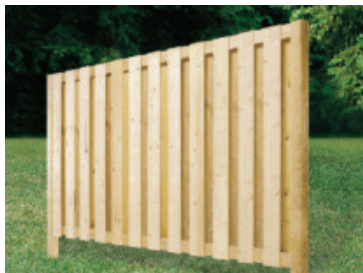
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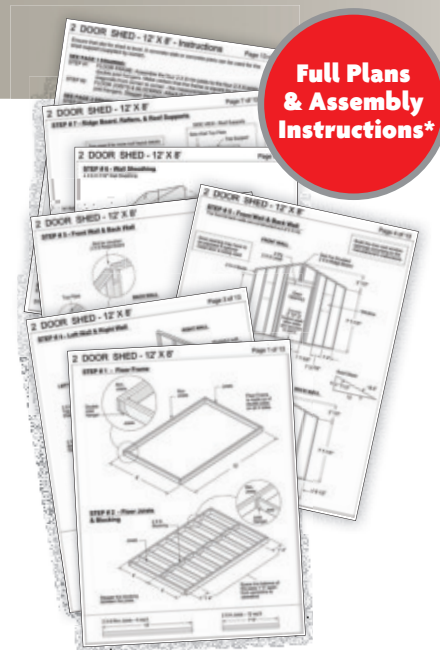


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	Voltage	Battery Size	Cutting Diameter	Line Size Feed mech	Motor	Weight w/ Battery
Makita DUR364L \$399.00	36V	3–5 Ah	13-3/4"	Dual .080" Bump feed	Brushless	8.6 lb
Echo CST-58V4AH \$299.00	58V	2.0 Ah	14-16"	Dual .080" Bump feed	Brushless	13.3 lb
Husqvarna 115iL \$349.99 w/2.1 Ah	36V	Available 2.1 Ah or 4.2 Ah	12.99"	Single .080" Bump feed	Brushed	6.83 lb w/o Battery
DeWalt DCST990H1 \$399.00	40V	6.0 Ah (9.0 Ah avail)	15"	Dual .080" Bump feed	Brushless	14.9 lb
Greenworks 060-2375-2 \$239.00	40V	4.0 Ah	12"	Dual .065" Auto feed	Brushed	9 lb
Yardworks 060-2370-2 \$199.00	40V	2.0 Ah	12"	Single .065" Auto feed	Brushed	12.5 lb
Ryobi RY40220 \$219.00	40V	2.4 Ah	13-15"	Dual .080" Bump feed	Brushed	11.4 lb
Black & Decker LST540 \$179.00	40V	1.5 Ah	13"	Single .080" Auto feed	Brushless	7.4 Lb

Top Picks

Sometimes it's hard to pick a "best choice" in a category. All of these trimmers were able to do the job on my average-sized city lot. When the grass gets really unruly, it can take almost 15 minutes to do all my trimming, maybe 20 if I edge along the curb. I admit that my lawn probably wasn't the greatest challenge these trimmers could ever face, but I think it probably is a good representation of the average reader. There are a couple of factors that might make you choose a different trimmer than I did though. Battery interchange is a big convenience. If you have already invested in batteries of a particular make, it would be no surprise that you would want to purchase a trimmer that would go along with it. Out of the ones I tested, I think you would find that any of these units will perform well for you. If you were starting from scratch, with no inkling to go any particular way, here are my thoughts.

For the "Best Professional" choice, I would pick the DeWalt. It has plenty of power, good balance, and a battery that is specifically designed and optimized for outdoor equipment. It's also modestly priced and comes assembled and ready to work. All you need to do is charge the battery before its first use. I also like the fact that the DeWalt has a brushless motor. For the professional user, that means more runtime per charge, and longer life of the tool before breakdown.

For the "Best Hobbyist" choice, I would pick the Ryobi trimmer. Given the price point, I think it gives the best bang for your buck. It has a good battery system that can work on other tools, and there are some interchangeable accessories available to use in place of the trimmer head on this unit. It also uses heavier line, which I am a fan of. I don't find that the .065" line is great for edging along concrete. The .080" line seems to stand up better.

For the "Best Overall" choice, I really liked the Husqvarna trimmer. It is lightweight, powerful and easy to use. I like that the length adjusts quickly and easily with a cam lock (B&D also had this feature). My lot is hilly, so being able to shorten the machine quickly when working above your feet is great. I also found the unit worked very nicely for edging. It is very light, powerful and easy to manoeuvre.

RICH KELLER
rich.keller@hotmail.com



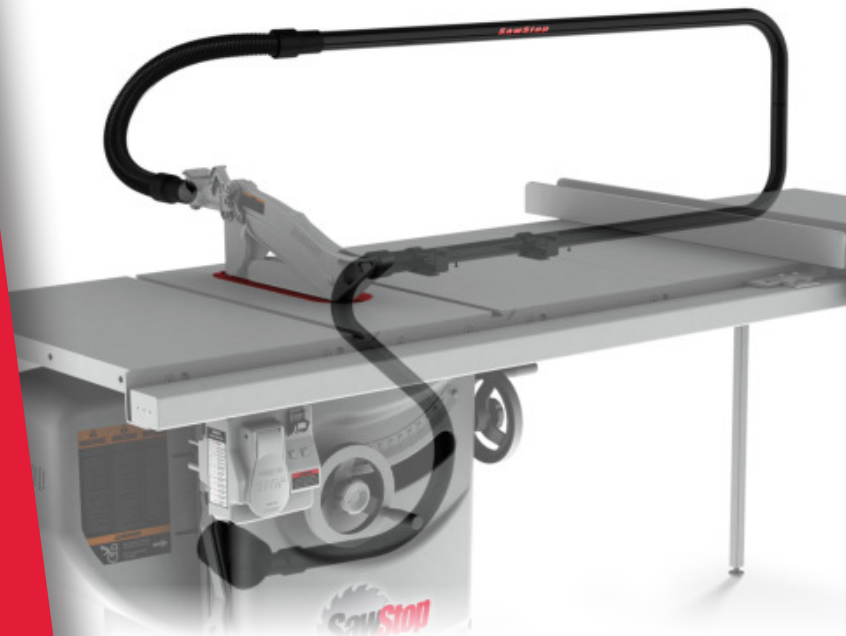
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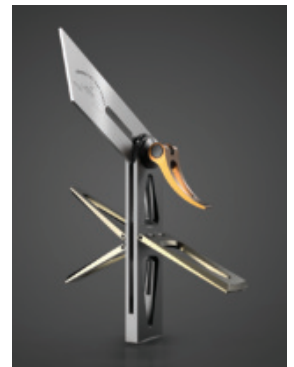
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beginner's journey

The Roots of my Addiction

When it comes to getting into woodworking, everyone has a different story.

BY JAMES JACKSON

My addiction started innocently enough last June. I was rebuilding a raised garden bed in my backyard and getting ready to take the old 2x4s to the curb, when I noticed something – one half of the wood was aged and deteriorated, but the other half was in near-perfect condition.

“This would make a really interesting shelf,” I thought to myself. Much to the chagrin of my wife, I cleaned off the boards and stacked them on the back porch.

Later that evening I went to YouTube and looked up some woodworking videos to help with the restoration, and what started with a basic introduction to various stages of sanding and what grit to use, morphed into a two-hour binge session on sanding, staining, and finishing wood.

It didn't stop there. Thanks to the electronic brain behind the scenes, YouTube quickly decided woodworking was indeed a hobby I should pick up, and it began suggesting other related videos: Build a rustic coffee table! Try this end-grain butchers block! Your friends will love these unique magnetic bottle openers!

I took the old garden boards to the family farm near Orangeville, about an hour north of Toronto, and spent a day sanding them and getting the edges squared up in my dad's woodshop. But being surrounded by my father's impressive woodworking equipment, including his thickness planer, jointer, table saw, router table, and myriad of sanders, I wanted to go beyond simple shelves.

A few weeks later I tried my first real

woodworking project – a set of cutting boards made of maple, with an oak accent strip down the middle. Still unsure around the big equipment, I bought a few pieces of wood from the local hardware store, which were square, flat, and the right dimensions for the project. I glued them up in my basement, and as I waited for the glue to dry, I went back online to watch some more videos on properly finishing cutting boards, and a video title caught my eye: “Using the Right Wood for the Right Project.”

It was then I learned oak is a bad choice for cutting boards because of its open grain. My heart sank... but quickly rebounded when I realized I could repurpose the wood. Later that week I went to the woodshop and re-sawed the maple in half on the band saw, then cut them into four-inch squares. And behold, a set of maple coasters with an oak accent strip on one side was born. But I learned an important lesson; there is more to know than how to measure, cut, glue and finish.

I've built a career as a successful investigative journalist, newspaper reporter, freelance writer and photographer, but lately my passion has begun to veer into woodworking. I used to lie awake in bed thinking about a big story I was working on, or an upcoming important interview for an article, but now I lie in bed and imagine gluing up a rustic barn board tabletop, and sanding it until the old saw marks shine through.

This has all come out of left field, really. I've never had an interest in woodworking until now. In high school I was more likely to be studying or playing on the football field than in the school's wood shop. In



Band Saw Problems – James Jackson, right, and his father Dave try to determine who broke the band saw in Dave's wood shop near Orangeville, Ontario.

fact, I didn't take one shop class in school. And while I did work for one summer with a local contractor who specializes in heritage home restorations, I mainly spent that time hanging drywall, putting up insulation and vapour barrier, or measuring and cutting lumber for wall studs.

Now, in a matter of weeks I've gone from failed cutting boards and half-rotted wood shelves, to making rustic signs, lamps, coasters, pencil holders, and coat racks. And my father has gotten involved too, making some beautiful cutting boards and serving trays, and offering constructive advice for me along the way. A few local shops have even started selling them on consignment.

We attended our first craft show together in the middle of November, but it wasn't as successful as we'd hoped. I managed to sell two rustic barn board signs, a pencil holder, and a wooden serving tray made of apple wood, and he sold one serving tray.

And most of that was to my sister.

But, the very next day I got an email from my dad with the words “Crafts show” in the title. He wanted to know if I was ready to enter another show that was just a few weeks away.

Now who's addicted?

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



Photo by James Jackson



Make It Beautiful.

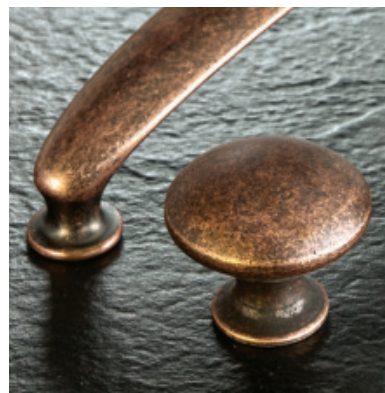
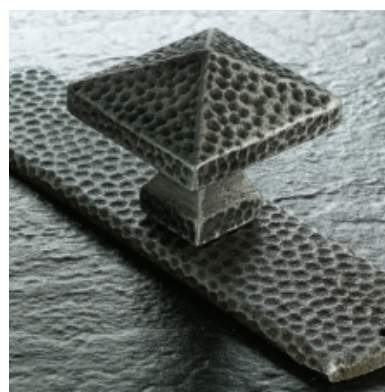
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Bill Maniotakis

Matador

Maniotakis built this table for the 2013 S.A.W.S. exhibition, and it pushed him quite a bit. “Building the tablecloth was a huge challenge on my capability at that time. The glue-up was a disaster,” he said, when asked about the piece. The build took him about 450 hours to complete.

Turn to page 12 for more quotes.
(Photo by Marni Burkhardt)