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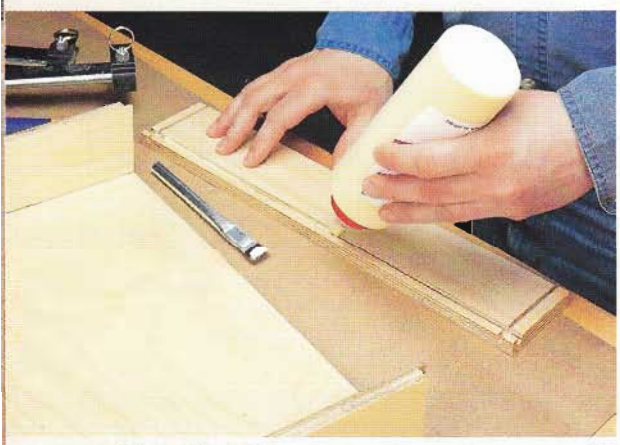
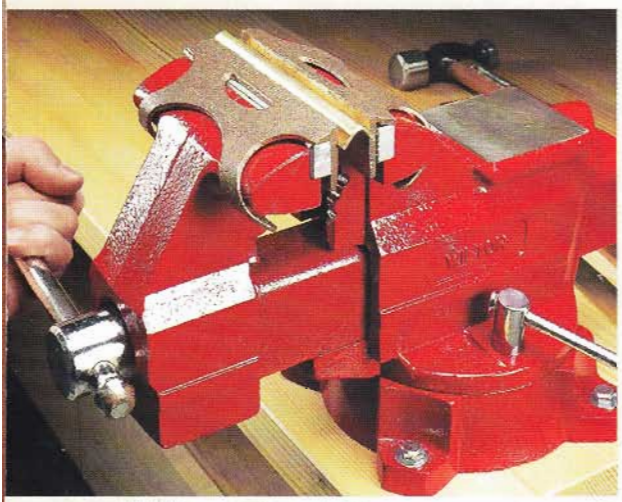
Finishing Center page 14



Slow-Set Glues page 10



All About Bench Vises page 44

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Rock-Solid Vise Stand *page 36*

Cutoffs

We've always wanted to design a spray booth that we could use in our own workshops. Spraying paints, stains, and finishes is one of the best ways to improve the look of a project. But there was always a big challenge to address — most paints and finishes were flammable, combustible products that really weren't all that healthy.

Well, dealing with all that in a home shop is pretty impractical. A great alternative is to use water-based paints, stains, and finishes. These types of products have a number of benefits. They're fast drying, easy to use, and a great "green" alternative. However, you still have to deal with overspray and odors. That's where the roll-around finishing center shown on the opposite page comes in. An exhaust system takes care of the overspray by pulling it through fiberglass filters. And a metal duct attached to the system vents the odors outside through a door or window. To learn more about the finishing center, turn to page 14.

But there are also smaller scale projects in this issue that provide big benefits in the shop. Be sure to check out the bench vise stand, handy sanding tote, and our classic sawhorses.

The stand on page 36 is a compact metalworking station. But it's built heavy and solid to stand up to the typical sawing and pounding tasks asked of a bench vise.

Finally, the sanding tote and sawhorses are basic projects every shop needs. Once you build them, you'll find yourself using them every time you step into the shop.

Tom

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from our Readers

Tips for Your Shop

Shooting Board for Any Angle

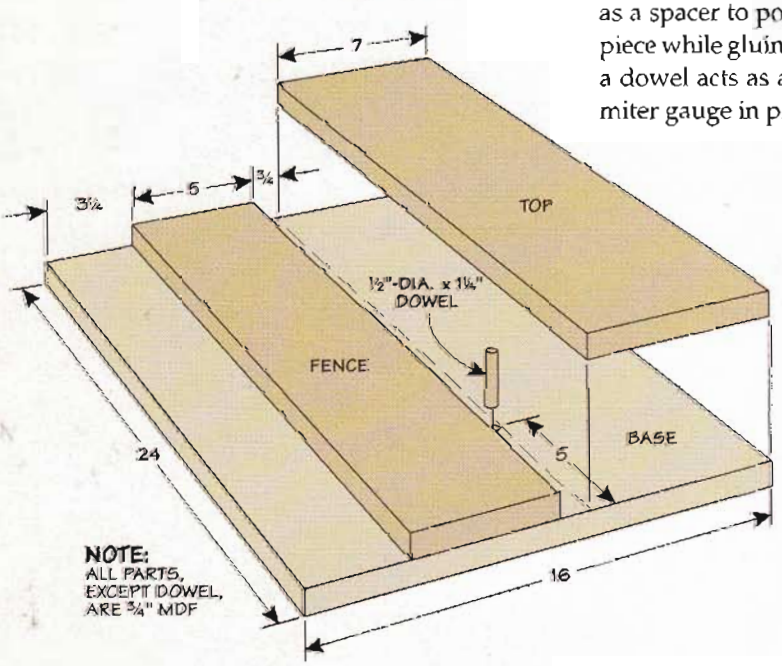
When it comes to getting gap-free joints, nothing beats using a hand plane and a shooting board. The shooting board supports the workpiece as you trim the end. I use a shooting board for miter joints but it also works great for squaring up the end of a workpiece, as you can see in the photo below.

The shooting board you see here is unique because it accommodates a workpiece cut to any angle. It uses a miter gauge as the fence instead of the fixed fence found on a traditional shooting board. The base is easy to make from MDF, as illustrated below.

I started with a large piece of MDF to create the bottom layer for the base (drawing below). Two narrower pieces are glued on top. The first serves as the fence for the plane to ride against. The other piece is spaced away from the first to form a slot for the miter gauge bar. You can use your miter gauge as a spacer to position this second piece while gluing it down. Finally, a dowel acts as a stop to keep the miter gauge in place during use.

Before trimming the end of a workpiece, I attach an auxiliary fence to the miter gauge. This backs up the cut to prevent tearout as the plane exits the back side of the workpiece. The end of the fence is beveled to match the angle of the workpiece, as you see in the photos. And to keep the workpiece securely in place, it helps to fasten pressure-sensitive adhesive (PSA) sandpaper to the fence. After applying a little paste wax to the base and fence, you're ready to put the shooting board to use.

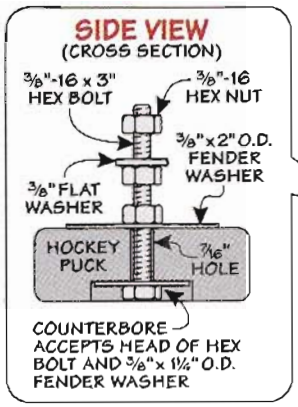
Dan Willeford
Ahwatukee, Arizona



Hockey Puck Feet

When I purchase a new tool with a stand, I immediately replace the stock feet with my hockey puck variation shown here. This serves two purposes. First, it provides a large, stable, and non-slip footing. Secondly, it allows me to adjust the tool stand so it's more suitable for my height. Forstner bits are all you need to drill the pucks.

John Doubek
South Elgin, Illinois



UHMW from Kitchen Cutting Boards

Ultra-high molecular weight plastic (UHMW) is great for building jigs and other shop accessories. It's stable and slippery which makes it perfect for runners (right photo below).

But purchasing UHMW from woodworking suppliers can be a little pricey. Instead, head on over to the housewares section of your local department store or home center. You can find cutting boards that are made from UHMW or similar plastic for just a few dollars.

You can easily cut and drill the plastic cutting board, as you can see below.

Rock Cundari
Sault Ste. Marie, Ontario

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SUBMIT A TIP

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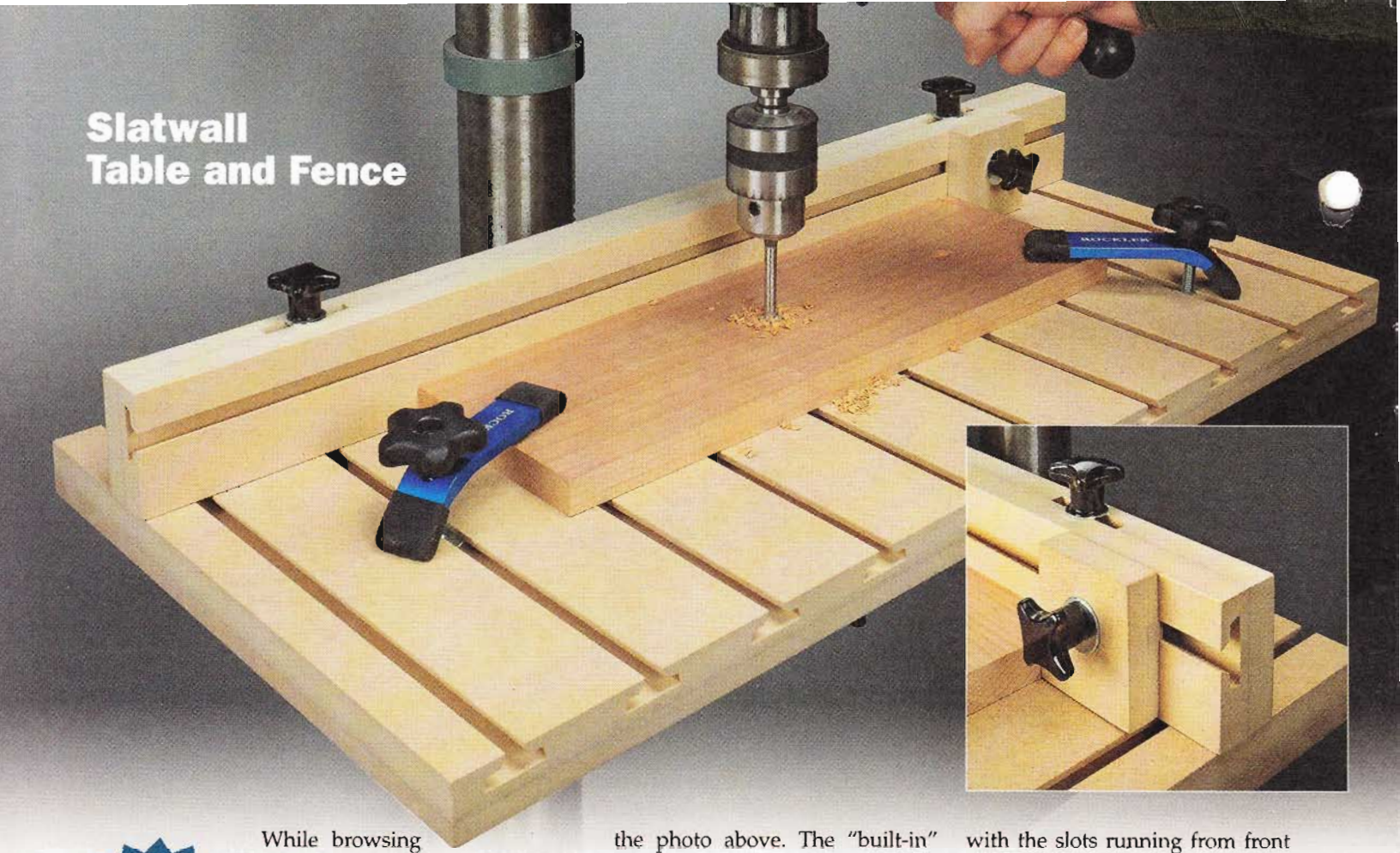
Slatwall Table and Fence



THE WINNER!

While browsing through the variety of sheet goods at my local home center, I came across slatwall MDF sheets. This inexpensive material is mostly used in retail stores for their product displays. But my mind immediately turned to how it could be used in the shop.

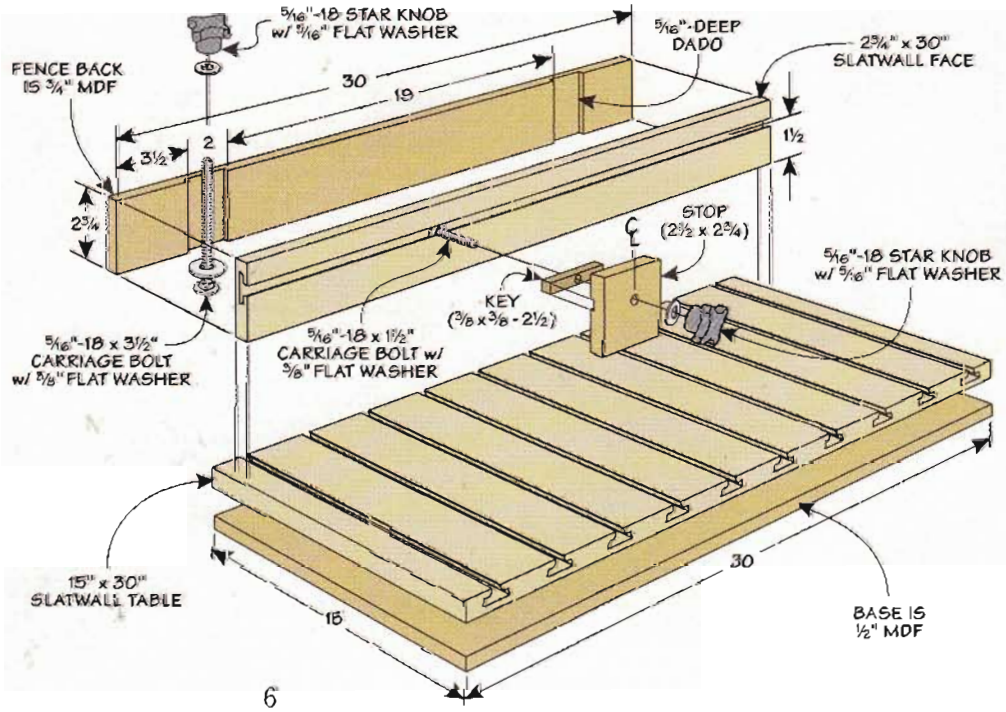
One application I came up with is the drill press table you see in the photo above. The "built-in" slots in the slatwall make it ideal for attaching a fence, hold-downs, and other accessories.

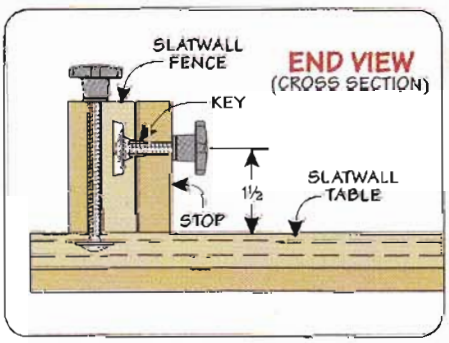
I started by building the table. The slatwall is ¾" thick but is pretty thin at the bottom of the slots. To make the slatwall stiffer, I backed it up with ½" MDF. You can find all the details in the drawings below. You'll notice that I made the table with the slots running from front to back. This provides a lot of flexibility for installing hold-downs and a fence. After mounting the table to your drill press, you can start on the fence.

I cut the fence face from the slatwall so that the slot runs horizontally. I cut a pair of wide dadoes to create slots for the bolts used to attach the fence to the table. These slots make it easy to position the fence. The only trick is to locate each slot in the fence so it's centered over a slot in the table.

Finally, carriage bolts, washers, and knobs are all you need to attach the fence and the simple stop block. The slatwall has proven so versatile, I've made an assortment of other shop jigs with it.

Mike Heidrick
Bloomington, Illinois





Anti-Racking Device & Planing Stop

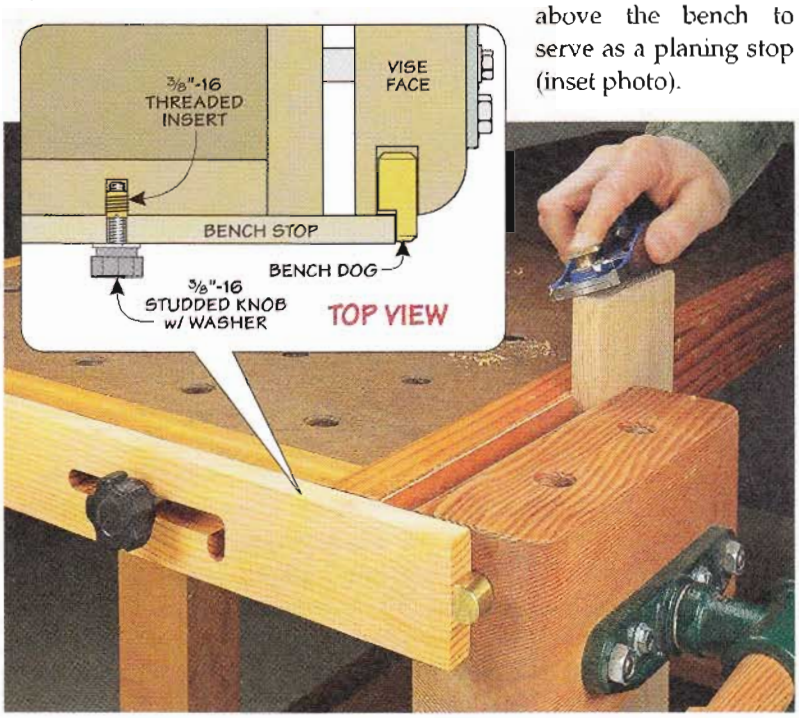
One frustration with using a face vise is its tendency to rack when clamping a workpiece near one end. When I built my workbench a few years ago, I devised a way to get around this problem. What's nice is you can use this idea on existing benches, too.

The solution starts with a sliding "stop" mounted to the end of the bench (photos and drawing). Two L-shaped slots allow the stop to move forward and back to engage the face of the vise jaw. You can make a vise face that extends past the end of the bench to contact the stop. Another option is to simply drill a hole in the end of the vise face and install a bench dog, as you see in the left photo below.

The long slots in the stop allow it to be adjusted for different workpiece thicknesses. The short, vertical slots let you raise the stop above the bench to serve as a planing stop (inset photo).

To mount the stop to the end of the bench, you'll first need to install a pair of threaded inserts, as you can see in the drawing below. Just make sure the inserts are located so the stop can make maximum use of the vise capacity. Once the inserts are in place, you can attach the stop with studded knobs and washers. Once you start using it, you may wonder how you ever got along without this useful addition to your workbench.

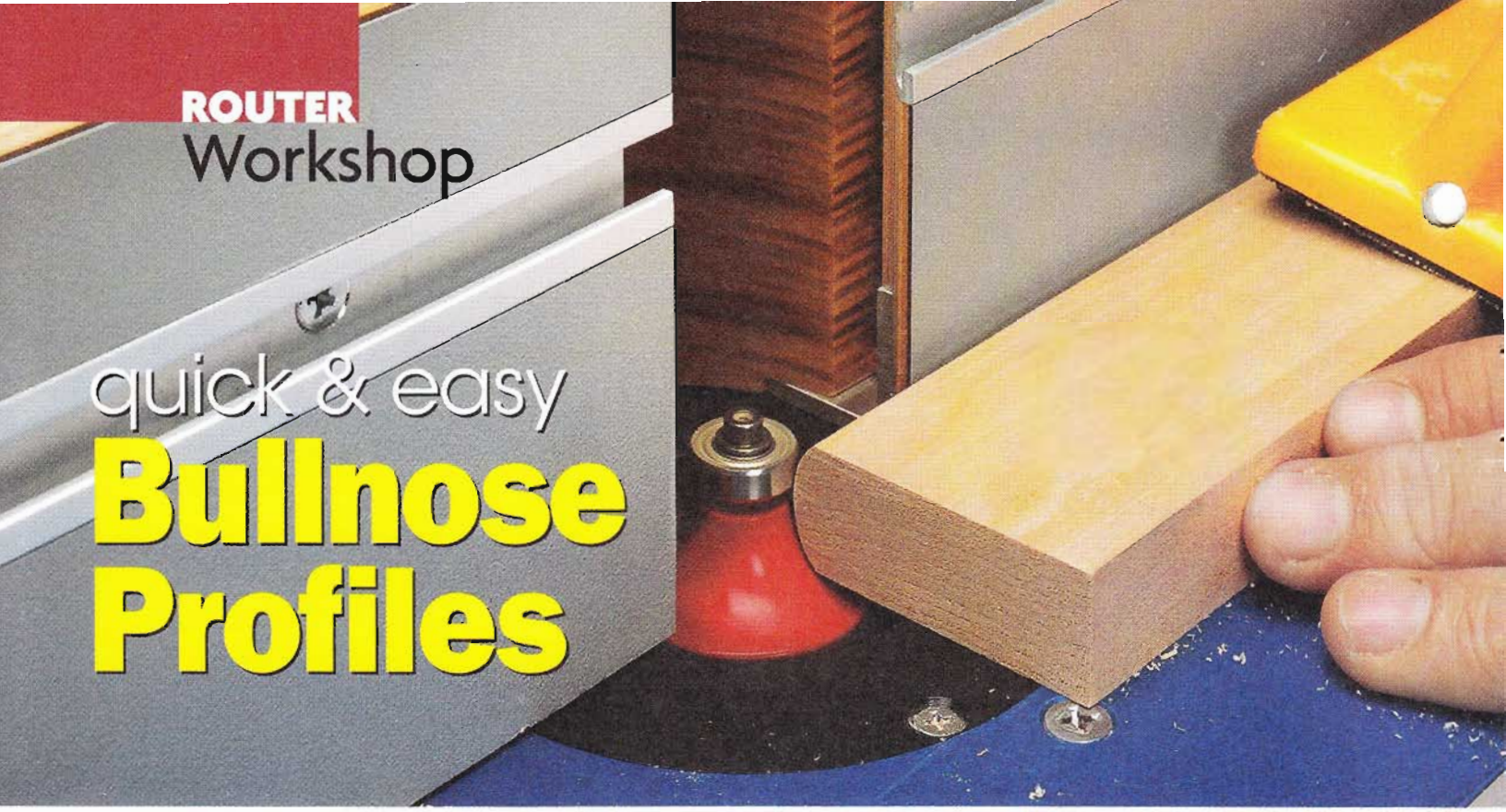
Glenn Martin
Ontario, New York



Quick Tips

▲ **Phil Huber** of Des Moines, Iowa has found a way to help wood filler blend in with the surrounding wood. He sands the filler while it's still wet. This also helps it dry faster.

▲ **Michael Cyr** of Westport, Massachusetts uses welder's magnets for shop tasks. To mount a shelf, he glues washers to the underside (above). And a pair of magnets keeps a miter gauge handy (right).

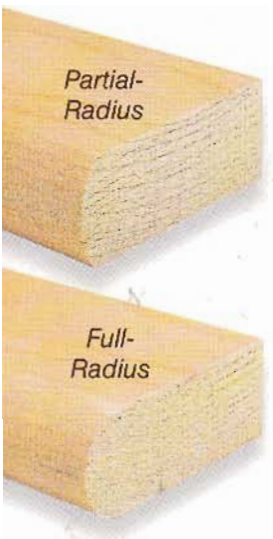


quick & easy Bullnose Profiles

With a roundover bit in your router table, you can create perfect bullnose profiles in just minutes.

Building a project often centers on making straight and square cuts. But it's the curves and profiles that make things unique. And the main way I add them is with a router.

One of the profiles I use most is a bullnose. It's great for easing the edges of tabletops, shelves, and moldings. Plus, it's attractive and easy to make — all you need is a roundover bit. But there's more to routing a bullnose than you'd think. The first things to look at are the two main types of bullnose profiles.



▼ **Two Types.** *The two most common styles of bullnose profiles are full and partial radius.*

⅜" Roundover bit

½" Roundover bit

◄ **Two Bits, Two Profiles.** *The size of router bit determines the type of bullnose profile you can rout.*

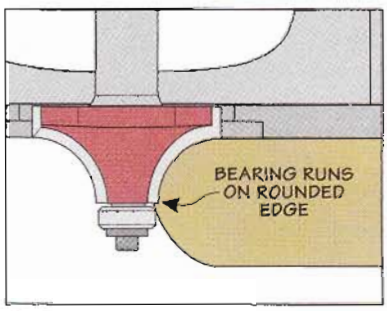
Two Types. A bullnose profile is made by rounding over the top and bottom edges of a workpiece. The two types I use most are a full-radius and partial-radius.

A full-radius bullnose follows a half-circle shape from the top to bottom edge (lower margin photo). While a partial-radius is a flatter, more gradual curve (upper photo). Regardless of the shape, each profile can be created with an ordinary roundover bit.

Choose a Bit. The key to creating the two shapes is to choose a bit with the correct radius. This depends on the thickness of the piece you're routing. Most of the time, I'm using ¾"-thick stock. There are two bit sizes that I use to create the two bullnose profiles — a ⅜"- or a ½"-radius roundover bit (near left photos). For one of the profiles, I use the entire cutting edge of the bit. With the other bit, I only use a portion of the cutter. You can see the specific setups for each profile on the next page.

Router Table. For the best results, I use a router table and fence to rout bullnose profiles. The reason a router table works better is shown in the drawing below.

When you're using a hand-held router, the bearing on a roundover bit runs along the flat edge of a workpiece. But after you make the first pass, the bearing runs along the rounded edge. That means the bit takes a bigger bite, leaving a ridge that has to be sanded away.



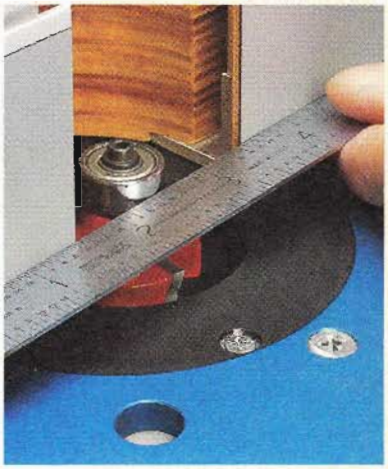
▲ **Ridge.** *On the second pass, the bearing no longer has a flat edge to ride on, creating a ridge*

Full-Radius Bullnose

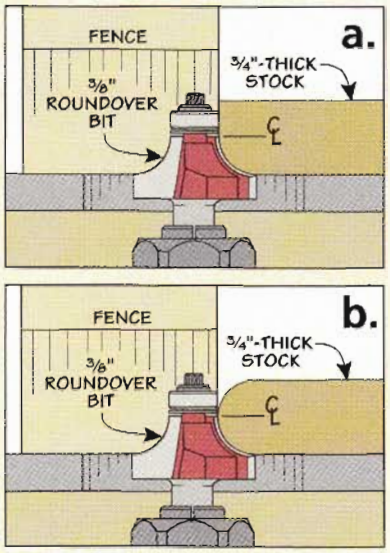
Routing a full-radius bullnose is easy with the right bit and setup. The radius of the roundover bit should be equal to half the thickness of the workpiece. (For example, on a ¾"-thick workpiece, you need a ⅜" roundover bit.) Then, it's just a matter of properly setting things up to rout a pair of simple roundovers.

Setup. When using a router table, the fence becomes the guide for the workpiece. And, it needs to align with the bearing to provide solid support (photo at right). Then, adjust the router bit so that the lower cutting edge is flush with the tabletop (detail 'a'). Now, you can get started routing the bullnose.

Two Passes. There's nothing complicated about this process. Make one pass, then flip the workpiece over to make a second pass — rounding over the whole edge, as shown in detail 'b.'



▲ ***Fence Position.*** *A metal rule comes in handy when setting the fence. Align the bearing with the front face of the fence.*

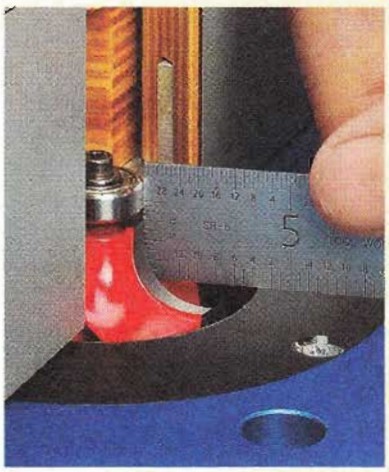


Partial-Radius Bullnose

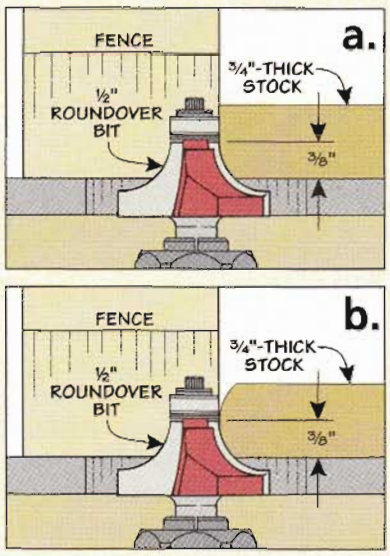
For a number of my projects, I like to use a partial-radius bullnose. It's perfect for softening the edges for a finished look. Once again, it's created in two passes with a roundover bit. But in this case, I start with a larger radius bit. For example, I use a ½" roundover bit when routing a partial bullnose on a ¾"-thick workpiece.

Adjust the Bit Height. Instead of raising the bit to expose the entire profile, just a portion is used. You can see what I mean in the photo and in details 'a' and 'b.' A rule with graduations on the end allows you to set it right up against the cutting edge at the top of the bit. This way, it's easy to set the exact height you want.

Make the Profile. Once again, you rout the bullnose in two passes. And just as before, the router table fence is aligned with the bearing. For an alternative to a two-pass bullnose, see the box below.



▲ ***Partial-Radius.*** *Use a rule to set the bit height, adjusting the router bit so only a portion of the cutter is being used.*



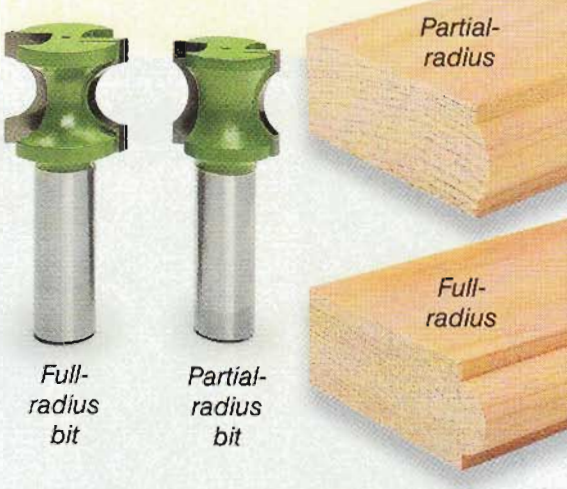
Routing a Bullnose: One-Pass Bits

Having to make two passes to rout a bullnose can be a hassle, but there is a way to do it in just one pass. And that's to use a bit like the ones shown in the center photos at right. You can find bits for routing both full-radius and partial-radius profiles in various sizes.

As you can see, there's no bearing. So, you'll need to use a router table and fence. Positioning the fence is a little bit different. Here the fence is aligned with the center of the cutting edge radius (near photo at right).

Shoulders. Depending on the thickness of your workpiece, you can create shoulders above and below by using a bit with a smaller profile (margin photos).

▲ ***Setup.*** *Use a rule to set the router table fence. Then adjust the bit height so the radius is centered on the workpiece.*



▲ ***Custom Bits.*** *These router bits are designed to rout a complete bullnose profile in a single pass.*

all about Slow-Setting Glues

You can use these glues to buy yourself a little extra time during complex assemblies.

The moment I grab a bottle of glue to assemble a project, my anxiety level goes up. One reason is that ordinary wood glue has a short "open time." At best, you have about five minutes before the glue starts to set up. After that, joints may not close tight and the joint may not reach its full strength.

One solution to ease the stress is to use a glue that has a longer open time. I have used a few of these "slow-setting" glues and find they provide some additional benefits as well. As you can see in the photo below, you have several choices. This lets you select a slow-setting glue with characteristics that match your needs. The chart at the bottom of the opposite page provides a good run-down of the features of each glue. To find out where to purchase the glue, turn to Sources on page 51.

Before talking about each glue, it's important to see how well they work. The sample panels on the opposite page show that, despite their differences, any of the slow-setting glues creates a nearly invisible joint line in wood.

◀ ***Several Options.*** *You can choose a slow-setting glue to match your needs*

TITEBOND EXTEND

The simplest way to increase your working time is to use a glue that's specifically made with a longer open time. Glue manufacturers recognized the need for more open time and created slow-setting versions of their yellow wood glues. *Titebond Extend* is one example that gives you 15 minutes of open time.

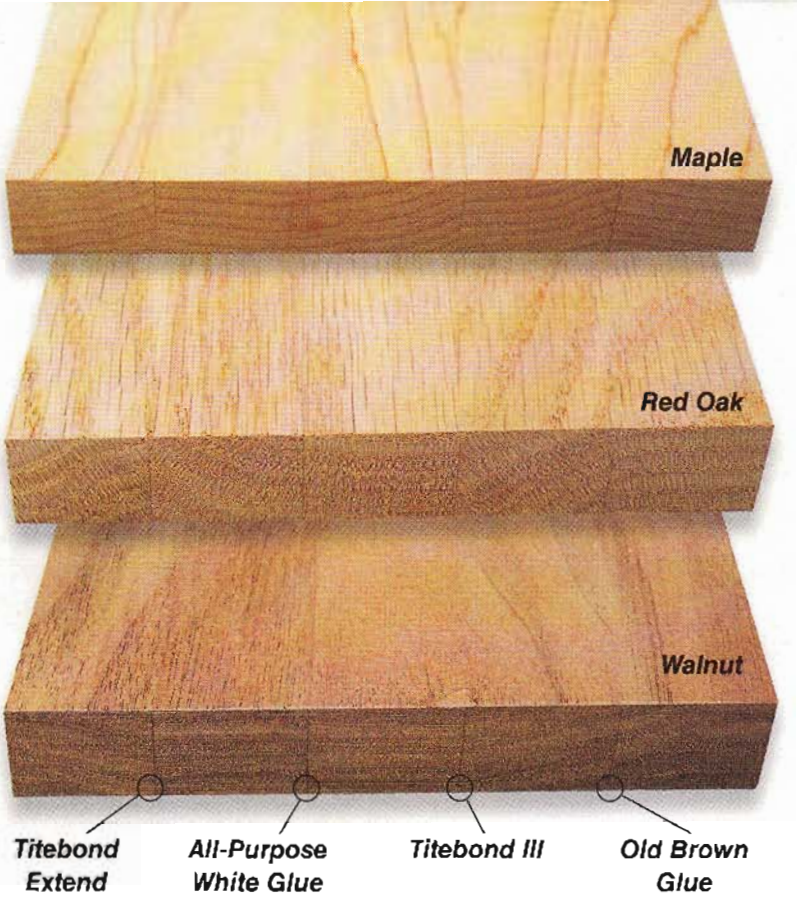
One of the main advantages with a commercial slow-setting glue is predictability. The glue looks, flows, and bonds just like the regular version. And the strength of the final joint isn't affected by the longer open time.

However, there are other types of glue you can use when you need more time. They range from the commonplace, to a recent formula, to a historic choice.

ALL-PURPOSE WHITE GLUE

One of the slow-setting options seems a little unusual at first glance. The same white glue kids use in grade school works just as well in the shop.

I was concerned that it wasn't strong enough for woodworking. The truth is, all-purpose glue is actually in the same chemical family as yellow wood glue. And it creates a bond that's stronger



◀ ***Invisible Joints.*** *In use, slow-setting glues create seamless joints in most wood types.*

than wood. In fact, there are a lot of woodworkers who use this glue exclusively for assembly.

Now, even though the label claims it's "fast-drying," white glue nearly doubles the open time of wood glue (about 10 minutes). Like yellow wood glue, white glue joints reach their full strength in about 24 hours.

White glue has some other things going for it. It's really inexpensive and you can find it just about anywhere.

In use, white glue has a runny consistency that allows it to flow easily into tight joints and spaces. And it dries transparent. I've also found that any squeezeout is easier to clean up than yellow glue. One limitation of white glue is that it's only for interior use. High humidity and exposure to the elements will weaken the glue line in a short amount of time.

TITEBOND III

I don't usually trust the label hype on a product. So when *Titebond III* claims it's the "ultimate wood glue," I'm a little skeptical. What I found was that the glue does outperform standard yellow glue in some key areas. Most importantly, *Titebond III* gives you at least 10 minutes of open time. Another key feature is that it's completely waterproof once it's cured.

There are a couple of quirks I'd like to point out. The biggest surprise is how runny the glue is. It has the same consistency as white glue. So you want to take it easy applying it and have a damp rag close by to clean up drips.

The other thing is the color. The gray-brown tone doesn't seem like a good match for light colored wood. But as you can see in the examples above, it blends in quite well with a range of wood colors.

OLD BROWN GLUE

One of the oldest types of woodworking glue is hide glue. Traditionally, it comes in beads that are mixed in water and "cooked" in a special glue pot and applied while hot. However, you can now find liquid versions that are ready to use at room temperature.

Depending on the formula, liquid hide glue gives you at least 20 minutes of working time. *Old Brown Glue* however, has an amazing open time of 1 hour. But you need to keep the clamps in place at least four hours.

Liquid hide glue has a few other attractive qualities besides a long open time. The transparent glue line blends perfectly with many woods. And any glue smudges are nearly invisible even after you apply stain or finish. So it's a good choice for projects with a lot of nooks and crannies.

Liquid hide glue has a few downsides. First of all, like white glue, it's meant for indoor projects only. There's one other thing about hide glue to keep in mind. It has a relatively short shelf life — about six months to a year. Most bottles have the expiration date on them. Finally, liquid hide glue costs about twice as much as the other slow-setting glues.

Make the Switch. Any of the glues shown here are sure to bring your assembly stress level down. That alone you may lead you to consider using these types of glues as the primary woodworking glue in your workshop.

BRAND	OPEN TIME	COLOR WET/DRY	CLAMPING TIME	USES
Titebond Extend	15 minutes	yellow/yellow	1 hour	indoor only
All-Purpose	10 minutes	white/transparent	1 hour	indoor only
Titebond III	10 minutes	gray brown/light brown	1 hour	indoor & outdoor
Old Brown Glue	60 minutes	amber/transparent	4 hours	indoor only

right-angle Drilling Tools

These handy accessories are the answer to drilling in tight quarters.

One of the biggest frustrations in woodworking is discovering that you forgot to drill a hole in some part of a project. Or similarly, you find out during assembly that there isn't enough clearance to drive a screw. The solution to these problems is a right-angle drilling attachment, like the one shown above.

A right-angle drilling attachment slips into the chuck of a hand-held drill and has a shaft that "turns a corner." This creates a lower profile, making it easier to work in confined areas where a full-size drill won't fit.

Minimizing the Size. For me, the main reason for using any right-angle drilling attachment is to get into as tight an area as possible to drill a hole or drive a fastener. With that in mind, I took a look at the four right-angle drilling attachments you see on these pages. They're about as low profile as you can get. You can find a listing of sources for these attachments on page 51. And to get even more out of them, check out the box on the next page.

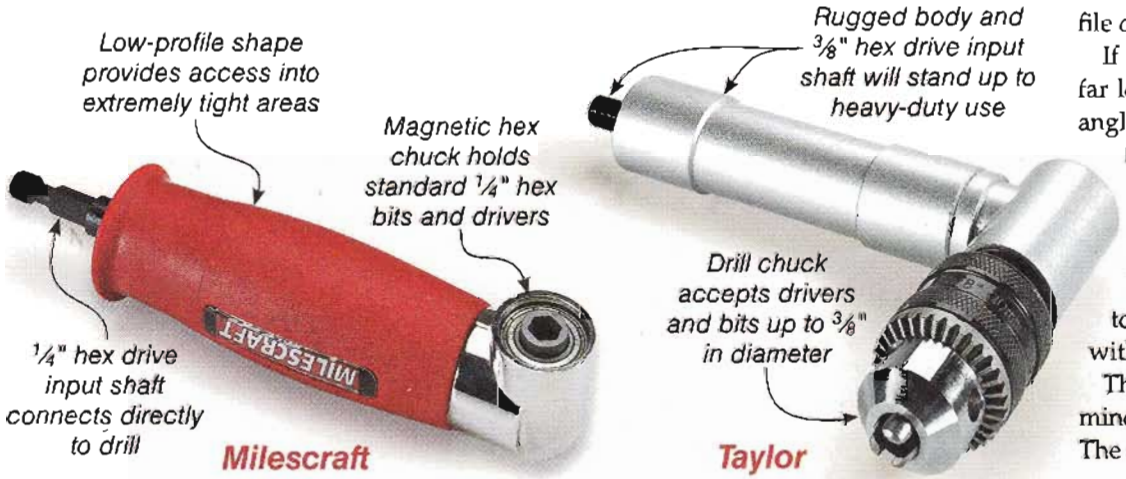
Start with the Basics. One of the most common right-angle drilling attachments you'll run across is the *Taylor Pneumatic Tool Company* model shown directly below. You'll find it available from retailers in black or red, but it's identical in all respects.

The *Taylor* is as basic as it comes. It features a built-in ⅜" chuck at one end and a hex drive input shaft at the other that chucks into your drill. One of the downsides of the *Taylor* is that the built-in chuck does create a larger profile (3¾" from the chuck to the back of the body). And that's before installing any drill bit or driver. So it may limit your access into some areas. But the chuck will accept any style of drill or driver bit.

Lowering the Profile. As I said earlier, the goal with any right-angle drilling attachment is to get access into confined areas. So doing away with a typical drill chuck can greatly reduce the profile of the attachment.

If you look at the photo at the far left, you can see a basic right-angle attachment from *Milescraft* that does just that. The body is contoured for a comfortable grip and it has a very low profile of about 1¼". Plus, the chuck is designed to accept any driver or drill bit with a ¼" hex shank.

The *Milescraft* does have one minor annoying characteristic. The driver or drill bit is held in the



▲ **Secure Installation.** *The bits and drivers of the Tight Fit Drill thread securely into the attachment, eliminating any chance of slipping.*

head magnetically, so it is possible for it to slip out during use. Not something you want happening in a confined space.

An Upgrade in Quality. To avoid that problem, take a look at the right-angle attachment from *Milwaukee* (photo below). It's solidly built and offers some features the first two attachments don't.

For starters, the chuck is spring-loaded, so a ¼" hex driver or drill bit securely locks into place. For installation or removal, simply pull the collar out, slip the bit into place, and release the collar.

Another feature I really like is the adjustable, built-in handle. The handle locks at four different angles and can also be rotated to one of twelve positions around the head. That's a useful feature to have for some tasks. Even with the handle, the *Milwaukee* still has a low, 2½" profile.

Aircraft Style. The last right-angle drilling attachment is pretty unique, as you can see above. Common in the aircraft industry, the *Tight Fit Drill* doesn't have a drill or hex-style chuck. Instead, it accepts drill and driver bits with threaded shanks, like you see in the upper left photo. You simply thread the driver or drill bit in place and you're good to go.

The drill bits and drivers are available in two lengths, both of which are very short. Combined with the 1" profile of the attachment, you can get into some pretty tight areas. Plus, to suit your needs, the drill is available with a wide range of accessories in different kit forms.

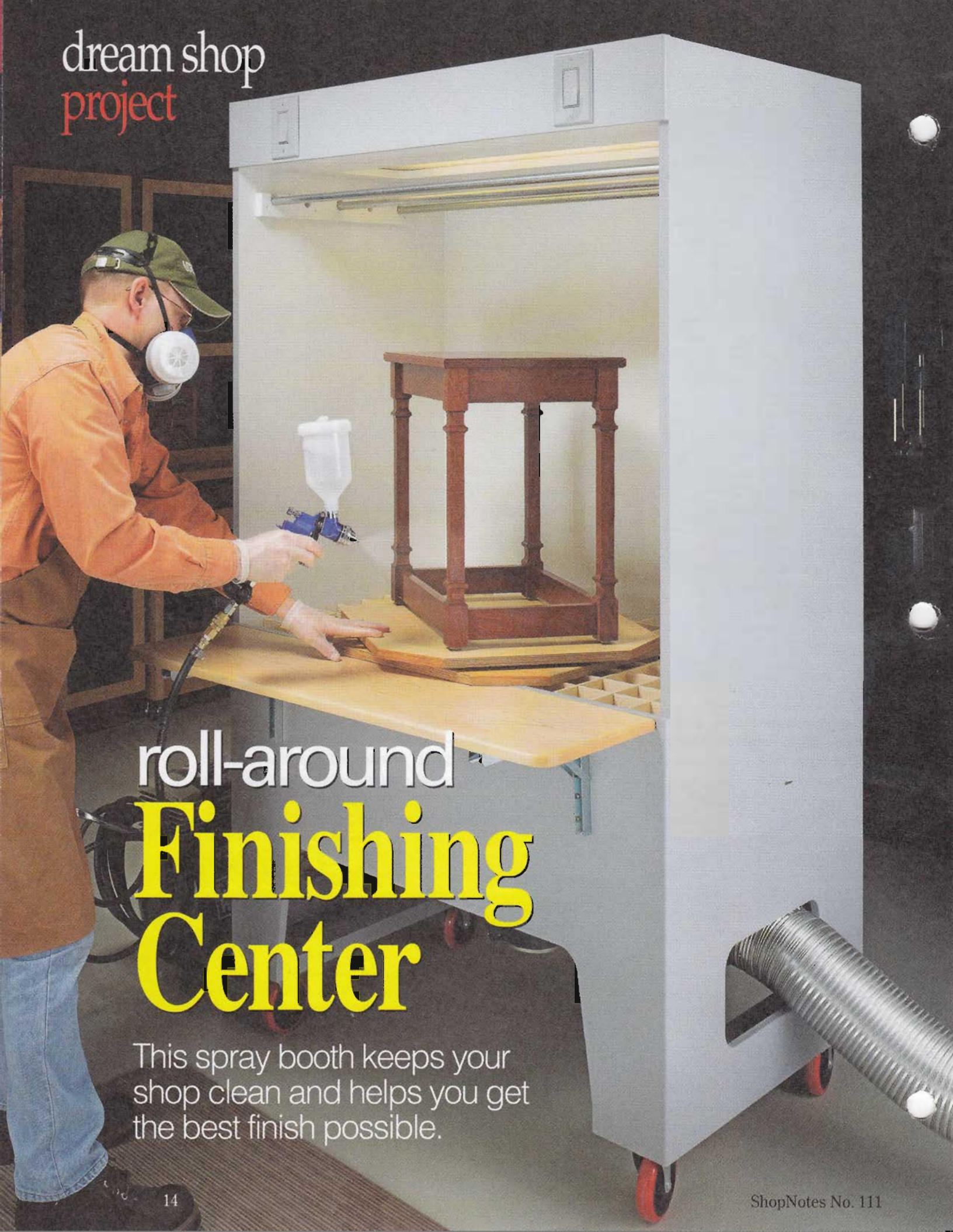
Now, you may not need to use a right-angle drilling attachment very often. But when the need does come up, there's really no other option. So it's the only solution to drilling a hole or driving a fastener in a confined space.

getting more with Add-Ons

► **"Stubby" Bits.** *These short, high-speed steel bits allow you to drill holes in extremely tight spaces.*

◄ **Chuck Attachment.** *This handy chuck attachment allows you to use any driver or drill bit up to ¼" in diameter.*

dream shop
project



roll-around Finishing Center

This spray booth keeps your shop clean and helps you get the best finish possible.

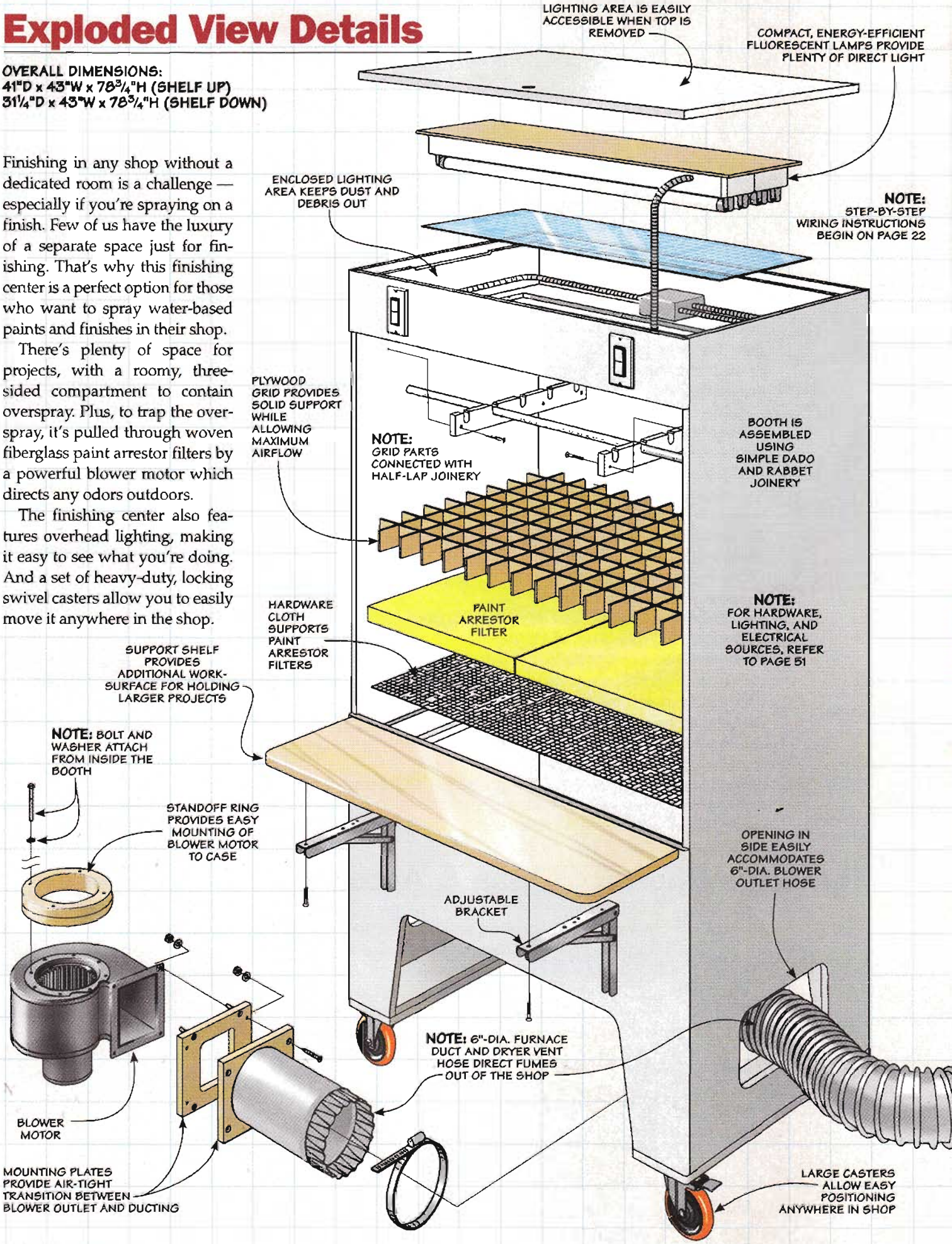
Exploded View Details

OVERALL DIMENSIONS:
41"D x 43"W x 78¾"H (SHELF UP)
31¼"D x 43"W x 78¾"H (SHELF DOWN)

Finishing in any shop without a dedicated room is a challenge — especially if you're spraying on a finish. Few of us have the luxury of a separate space just for finishing. That's why this finishing center is a perfect option for those who want to spray water-based paints and finishes in their shop.

There's plenty of space for projects, with a roomy, three-sided compartment to contain overspray. Plus, to trap the overspray, it's pulled through woven fiberglass paint arrestor filters by a powerful blower motor which directs any odors outdoors.

The finishing center also features overhead lighting, making it easy to see what you're doing. And a set of heavy-duty, locking swivel casters allow you to easily move it anywhere in the shop.



build the Case

The finishing center is just a big box divided into three compartments — a large, open spray area, an upper enclosed space for lights and electrical connections, and a lower area for mounting a blower to ventilate overspray out of the case.

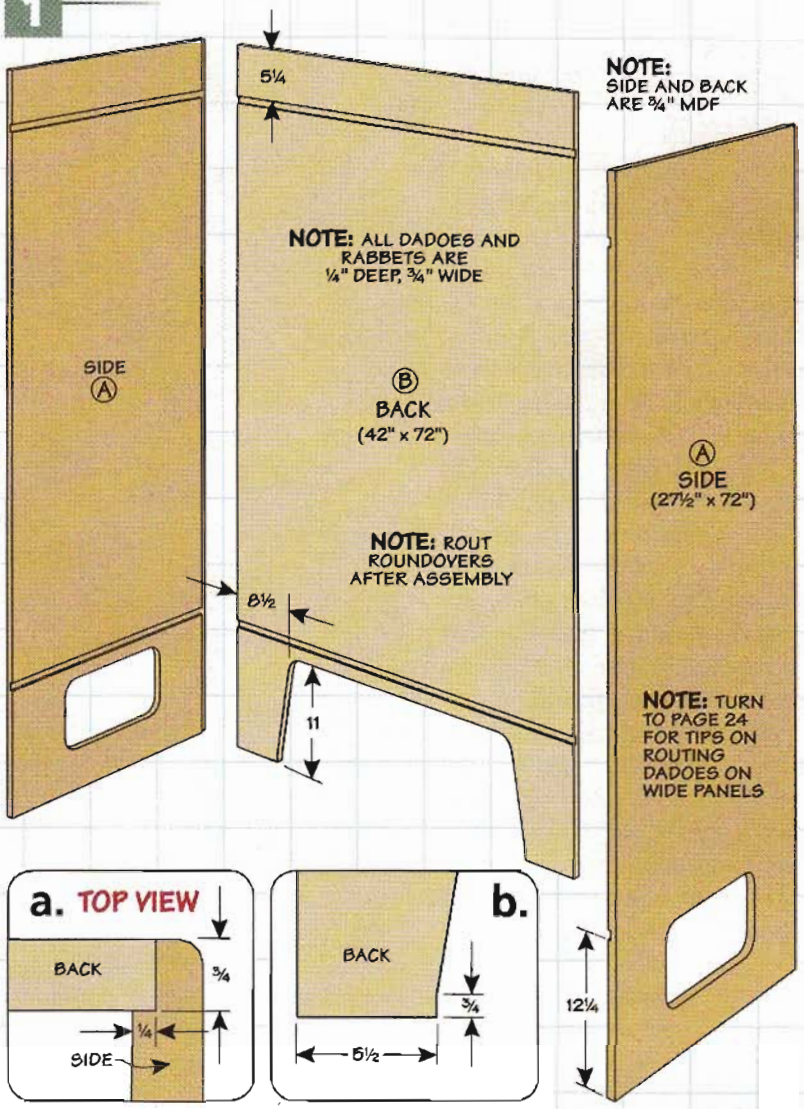
The sides and back are full height and form the enclosed part of the case. The front piece and switch panel frame the opening at the front of the case.

A closer look at Figures 1 and 2 shows that the front, back, and sides have more in common than their joinery. First of all, the case has small openings that allow you to route the ducting left or right (or out the back), depending on how the blower is positioned.

The front and back also have a cutout which creates a pair of legs where the caster assemblies are located. You'll start by cutting these case pieces to overall size.

Case Joinery. Once you have the sides, front, and back cut, you can start on the joinery. Since these are large pieces, a router and spiral downcut bit work well for routing the dadoes. I used a shop-made dado jig to guide the router and cut the upper dadoes on all three pieces first. Then I repositioned the jig to rout the lower dadoes, including the one on the case front.

FIGURE 1



To learn more about making and using the dado jig, refer to Shop Short Cuts on page 24.

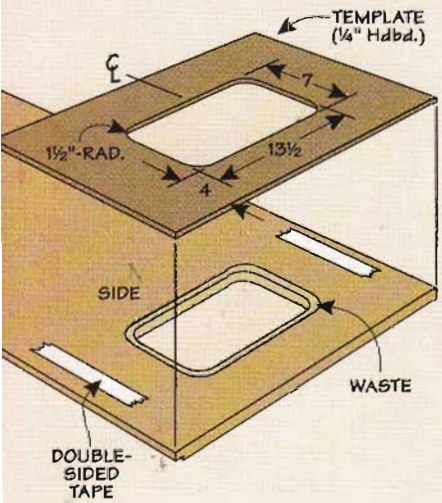
After the dadoes are completed, go ahead and rout the rabbets on the back edges of the sides and on each end of the front (Figure 1a).

Openings & Cutouts. Creating the identical openings in the case sides is straightforward. Simply rough them out, then clean them up using a template and a pattern bit in a hand-held router. The box at left shows how I did this.

The tapered cutouts at the bottom of the front and back open to the bottom. To make them, form the radius at the corners with a hole saw. Then use a jig saw to cut the tapers, and sand them smooth.

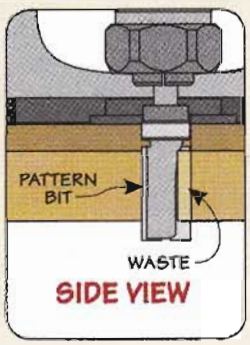
I want to point out one more thing here. You should note that

Template Routing: Clean & Accurate



When creating identical openings like the ones in the sides of the spray booth, a template comes in real handy for making consistent cutouts.

All it takes is a piece of ¼" hardboard to make the template. Use a 3"-dia. hole saw to make the four rounded corners, then cut out the opening and sand up to the layout lines.



Now, making clean openings in the project pieces is just a matter of roughing out an opening, and then using the template and a router, equipped with a pattern bit, to clean up the edges, as shown in the detail drawing.

the cutout tapers start ¾" above the bottom edge on both the front and back (Figure 1b). This provides a smooth transition to the caster supports added later.

Light & Blower Panels. The light and blower panels come next. They also have openings. But, since there's only one of each, there's no need to make a template.

Instead, I drilled a hole at each corner to form the radius, then used a jig saw to make the opening in the light panel. For the round opening in the blower panel, drill a single pilot hole and cut out the circle with a jig saw (Figure 2). A little light sanding cleans things up.

Switch Panel. There's one more piece to make before you're ready to start assembling the case and that's the switch panel at the top. The ends and bottom of this panel are rabbeted to fit over the sides and the light panel (Figures 2 and 2a). And, I added openings for two switch boxes, to control the blower motor and the overhead lights.

You might ask, "Why two switches?" It's simple. This way, you can turn off the lights, but still let the blower run for a while after you've finished spraying.

Assembly. I decided to assemble the booth on the workbench, one piece at a time. Laying these big parts down makes it easier to keep everything aligned. This is one of those assembly jobs when you'll definitely need a helper.

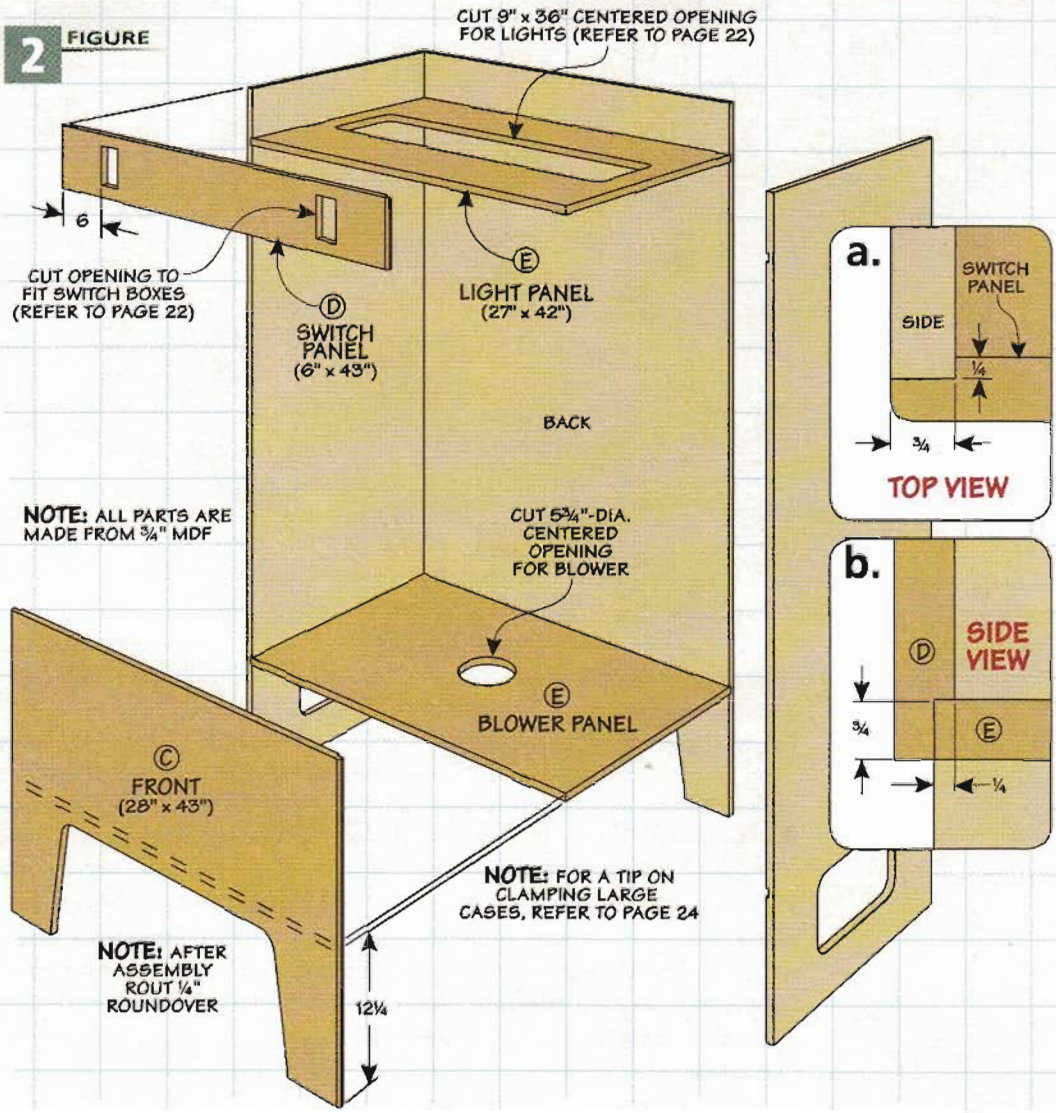
Start by laying the back on the bench with the dadoes facing up. (I propped it up on blocks to make it easier to attach the clamps.) After installing the light and blower panels with glue only, you can add the sides. It takes several long clamps to hold everything together.

Don't own a lot of long clamps? Refer to page 25 for an idea on how extend the length of the pipe clamps you have.

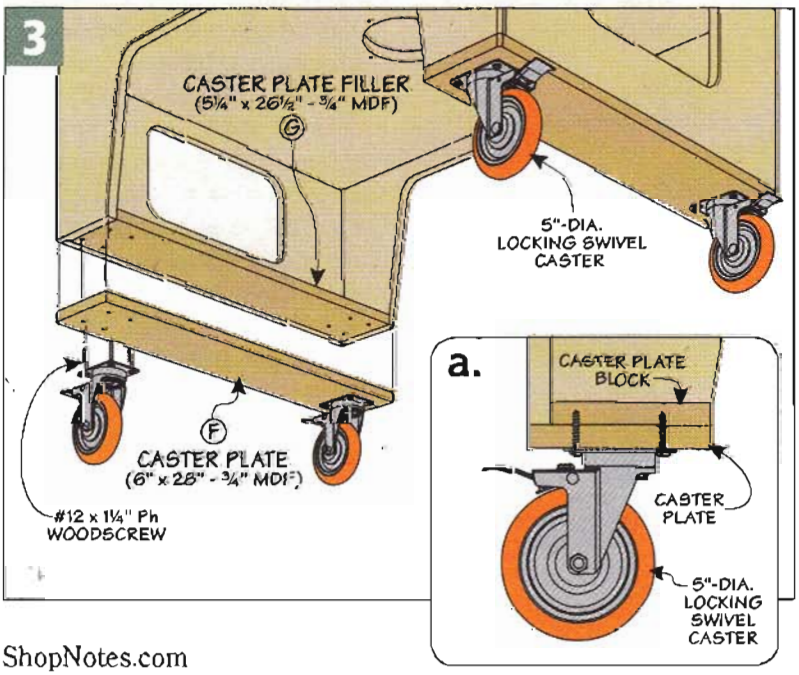
Now you want to reinforce the front of the cabinet by gluing the front and switch panels in place. Once the glue dries, you can ease the front edges by routing small roundovers (Figure 2).

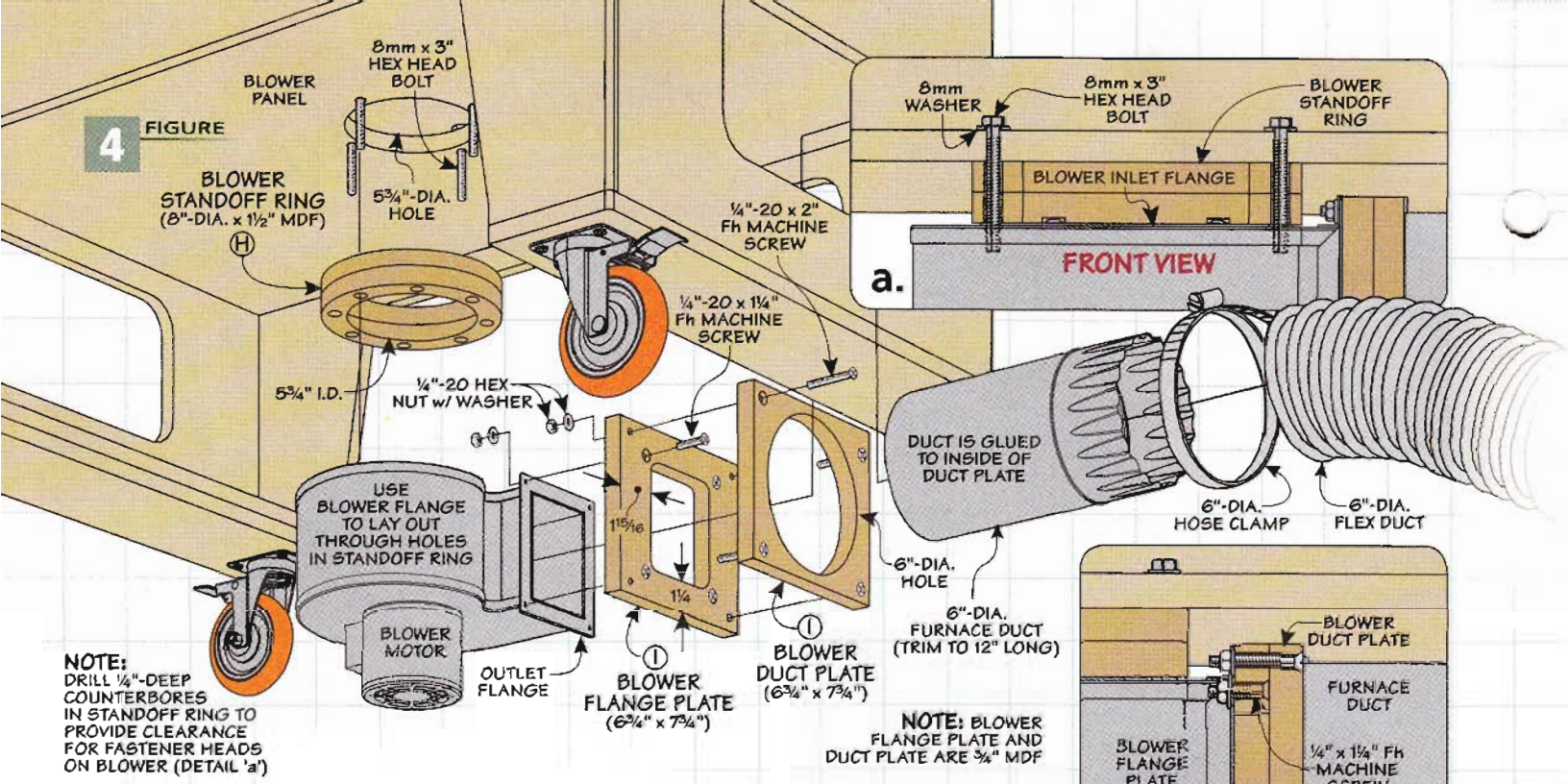
Caster Plates. All that's left now is to make the case mobile. To do this, I added a wide caster plate to the bottom edge of the sides, and the front and back legs. Then, to provide more solid support for the casters, I made fillers that allow me to attach the casters with long screws (Figures 3 and 3a).

FIGURE 2



3





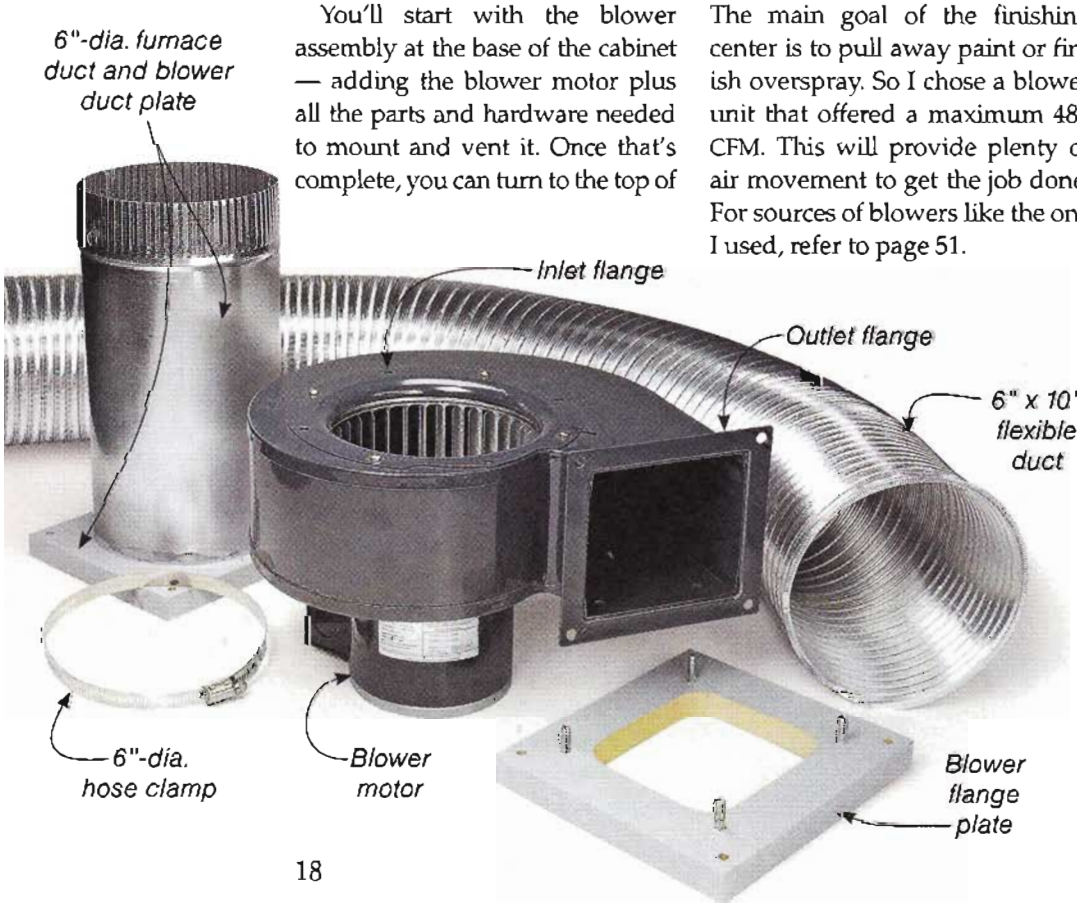
blower & lighting Assemblies

With the case complete, you're ready to start on the heart of the finishing center — the blower and light assemblies. These are the parts that make the booth more than just a backdrop for spraying.

You'll start with the blower assembly at the base of the cabinet — adding the blower motor plus all the parts and hardware needed to mount and vent it. Once that's complete, you can turn to the top of the cabinet and add the light assembly. I found that leaving the case propped up on the bench made this assembly go a lot easier, too.

BLOWER ASSEMBLY

The main goal of the finishing center is to pull away paint or finish overspray. So I chose a blower unit that offered a maximum 485 CFM. This will provide plenty of air movement to get the job done. For sources of blowers like the one I used, refer to page 51.



Standoff Ring. The blower assembly is made up of a 1-hp blower, a short length of 6"-dia. duct, and some flexible dryer vent hose, as you can see in the margin photo. To lower the blower unit just enough so the duct can be directed out through one of the side openings, I made a simple standoff ring out of two layers of ¾" MDF (Figures 4 and 4a).

Mounting Plates. Before you mount the blower, you'll want to add the duct. There's just one problem — the duct is round, but the outlet on the blower is rectangular. That means you'll need to make a pair of plates to connect the two together.

The blower flange plate is mounted first to the blower outlet. It has an opening that matches the one on the blower. It's attached to the blower outlet with countersunk machine screws, nuts, and washers (Figures 4 and 4b).

The blower duct plate has a round opening that's the same

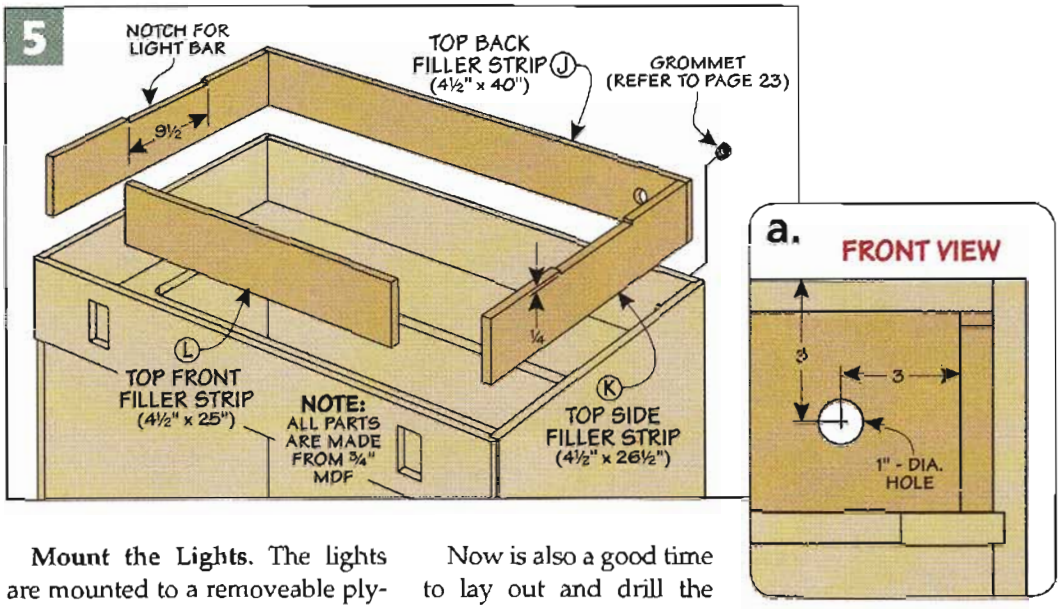
inside diameter as the duct. If you take a look at Figures 4 and 4b again, you'll be able to see what I mean. Once you have the plates cut to size and the outlet holes made, go ahead and attach the duct to the plate with construction adhesive.

Then all that's left to do is attach the flange plate to the duct plate. Once again, I used machine screws, nuts, and washers to attach the two pieces (Figure 4b).

Mount the Blower. For now, all you need to do is mount the blower assembly to the underside of the blower panel. My blower required metric bolts and washers that are passed from inside the case, through the standoff ring, and into threaded holes in the blower flange (Figure 4a). Now that the blower is installed, you can move on to the lights. Wiring the blower comes later.

LIGHT ASSEMBLY

A well-lit spray area is essential to getting a great-looking finish. To ensure the finishing center has plenty of light, I used two 3'-long, 2-bulb fluorescent lamps. The lighting assembly sits inside the small compartment at the top of the booth. Sources for the light fixtures can be found on page 51.



Mount the Lights. The lights are mounted to a removeable plywood light bar, as shown in Figure 6. The light bar makes it easy to replace the bulbs when necessary.

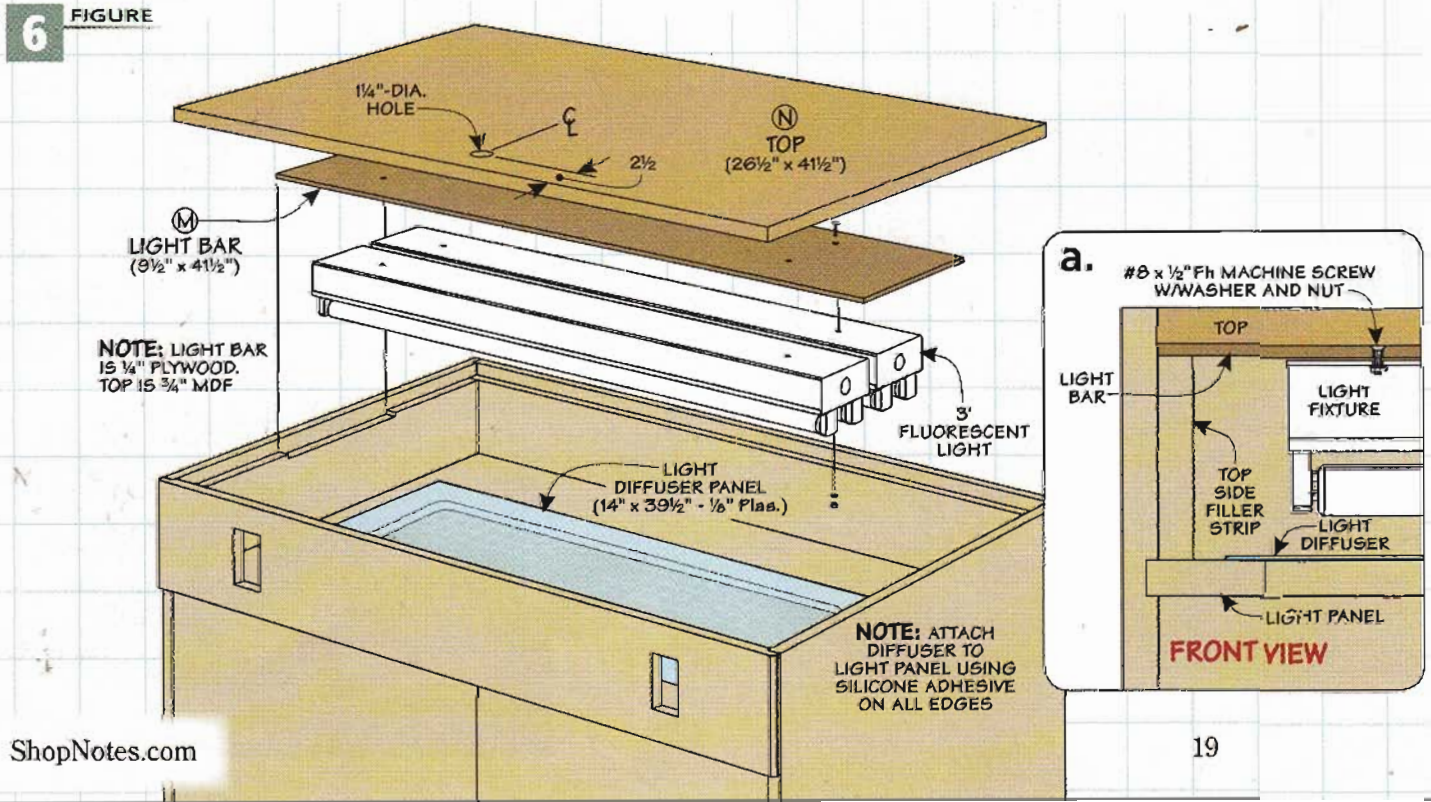
To support the light bar (and a top that's made later), I made a set of fillers to form a ledge inside the opening. The side fillers go in first, then the back filler. Figure 5 shows how the front filler fits in between the two openings you made earlier in the switch panel.

Side Fillers. Before you install the side fillers though, you'll want to first cut a notch in each one for the light bar to drop down into (Figure 5). A table saw and dado blade are perfect for this job.

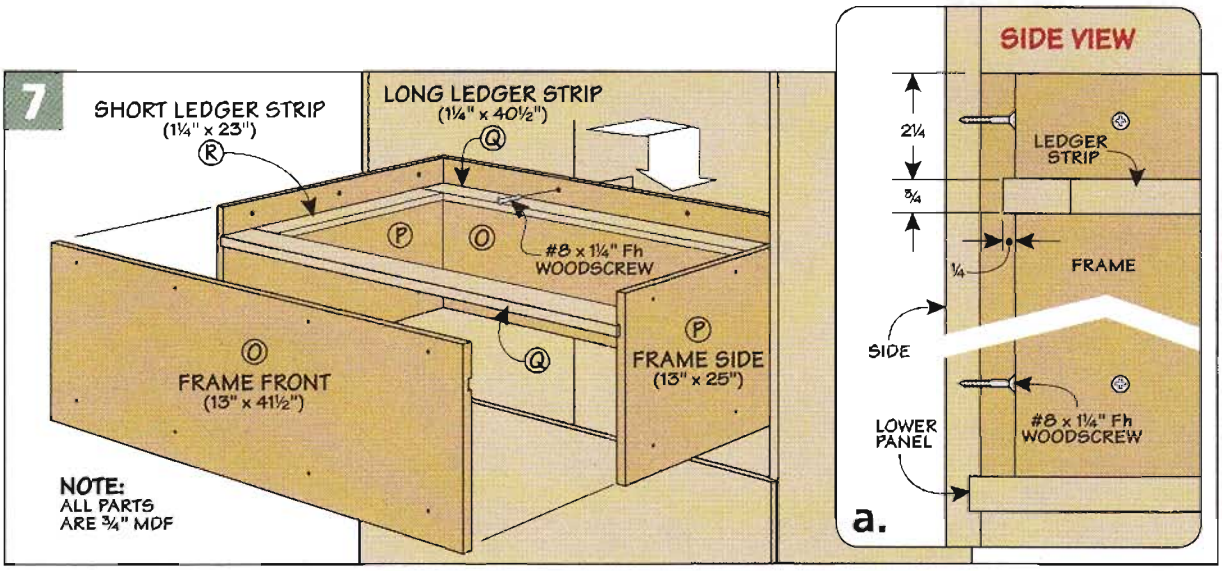
Now is also a good time to lay out and drill the access holes at the top and bottom of the case for all the wires and conduit (Figure 5a). A spade bit works well for making clean holes in MDF. Just be sure to back up the hole with a piece of scrap to prevent blow out.

Diffuser Panel. To isolate the upper compartment, I installed a plastic diffuser over the opening in the light panel. Then I sealed the edges with silicone caulk.

Top. A simple top closes off the opening at the top, as illustrated in Figure 6. And a finger hole makes it easy to remove it when you need to change out a bulb.



▲ **Grid.** *A three-layer sandwich of a plywood grid, filters, and hardware cloth support the project and trap overspray.*



removing fumes & Overspray

In order for the finishing center to be effective at exhausting odors and fumes to the outside, you need to create a system that provides solid support for a project, while letting air circulate down and out through the blower outlet.

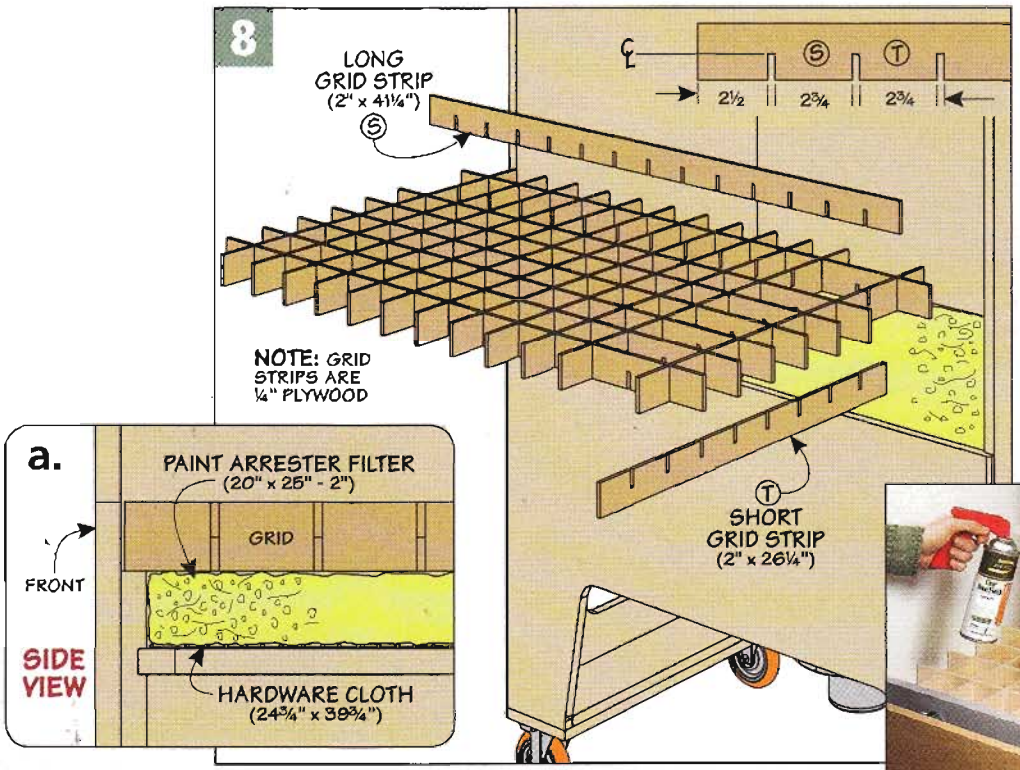
To do this, I made a three-layer "sandwich" out of hardware cloth, paint filters, and a plywood grid, as you can see in the margin photo. The grid and filters are supported by a simple "platform" made up of ledger strips and a support frame inside the booth (Figure 7). The platform frames also serve another purpose. They create an open area at the bottom of the case, allowing excess fumes to be removed more efficiently by the blower.

Once the support platform and grid are completed, you can build a few accessories, like hanger strips and a folding shelf, to make the finishing center easier to use.

Platforms. If you take a look at Figure 7, you'll see what I mean when I talk about a platform. The frame pieces create the first ledge without taking up a lot of space. Then a second ledge is formed by the ledger strips. Start by making the frame front, back, and sides.

Install the Platform. After the frame pieces are cut to size, you'll need to cut a shallow groove in each piece before you can glue and screw them inside the case (Figures 7 and 7a). I used a dado blade in the table saw to cut the grooves. These grooves are sized to hold the front, back, and side ledger strips. To complete the platforms, go ahead and install the ledger strips in the grooves (Figure 7a).

Trap the Overspray. The disposable paint filters I used are 2"-thick fiberglass with enough density to trap a majority of the overspray. (You can find sources for the paint filters on page 51.) These filters aren't rigid though, so you'll need to add hardware cloth for the filters to rest on. I stapled the hardware cloth (really just a stiff wire mesh), to the ledger strips.



▼ ***Build a Turntable.*** *A turntable made with lazy Susan hardware allows you to spray all sides of a project without touching it.*

Grid. The top layer of the sandwich is made up of interlocking strips made from ¼" plywood. Each strip has a series of half-lap notches cut in one edge (Figure 8).

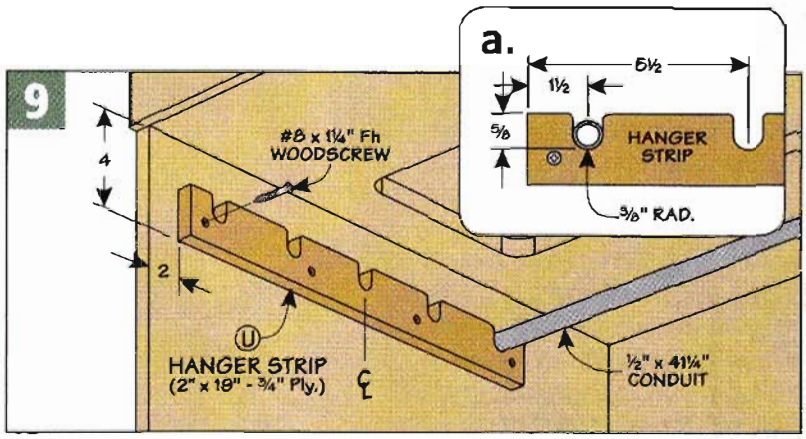
One thing you want to keep in mind when you cut the notches is that the grid pieces slide together with a friction fit — there's no glue or fasteners holding them together. So make sure they have a snug fit.

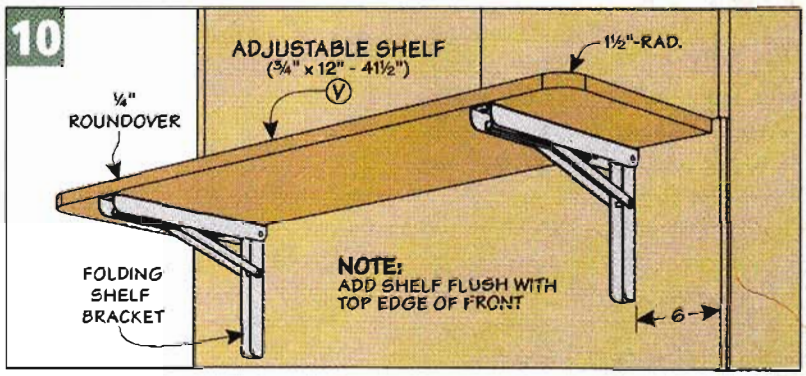
To cut the notches, mount a dado blade in your table saw and use an auxiliary miter gauge fence to back up the strips. Stand several strips on edge to speed up the process, then set the rip fence to locate and cut the first notch. Rotate the strips 180° and cut another notch at the opposite end. Then reset the rip fence for the next pair of notches.

Once the notches are cut, the strips go together like a large puzzle to make the grid (Figure 8).

The grid works great to support most projects. But as you can see in the photo at the bottom of the previous page, the addition of a finishing turntable helps you get the most out of the space inside the booth. You can find plans for how to build it at *ShopNotes.com*.

Hangers. Some projects are hard to finish while resting on a grid. One of the most effective ways to provide access to all sides of a workpiece is to hang it, as you can see in the right margin photo.





You'll see how I installed hanger strips at the top of the booth, if you take a look at Figure 9. Each strip has five notches to hold a short length of conduit. You can make the strips and install them now.

Support Shelf. The last thing to add is a folding hardwood shelf to the cabinet front. The shelf extends the capacity of the interior compartment and also provides a place to set supplies. To support it, I added a pair of adjustable, folding shelf brackets (Figure 10).

Locate the brackets so the shelf sits level with the grid in the open position. After you've finished cutting the tray to size, go ahead and round the corners and add a small roundover to the top edge on three sides (Figure 10). On the next page, you'll tackle the wiring.

▲ ***Hang it Up.*** *A pair of brackets attached to the walls of the spray compartment allow you to hang workpieces from a length of conduit.*

ShopNotes GO ONLINE EXTRAS

For plans on how to build a finishing turntable, go to: **ShopNotes.com**

Materials & Hardware

A	Sides (2)	27½ x 72 - ¾ MDF
B	Back (1)	42 x 72 - ¾ MDF
C	Front (1)	28 x 43 - ¾ MDF
D	Switch Panel (1)	6 x 42 - ¾ MDF
E	Blower/Light Panel (2)	27 x 42 - ¾ MDF
F	Caster Plates (2)	5¾ x 28 - ¾ MDF
G	Caster Plate Blocks (2)	5¼ x 26½ - ¾ MDF
H	Blower Standoff Ring (1)	8-dia. - 1½ MDF
I	Blwr. Flnge./Dct. Plts. (2)	6¾ x 7¾ - ¾ MDF
J	Top Back Filler Strip (1)	4 x 40 - ¾ MDF
K	Top Side Filler Strips (2)	4 x 26½ - ¾ MDF
L	Top Front Filler Strip (1)	4 x 25 - ¾ MDF
M	Light Bar (1)	9½ x 41½ - ¼ Ply.
N	Top (1)	26½ x 41½ - ¾ MDF
O	Front/Back Frames (2)	13 x 41½ - ¾ MDF
P	Side Frames (2)	13 x 25 - ¾ MDF
Q	Long Ledger Strips (2)	1¼ x 40½ - ¾ MDF
R	Short Ledger Strips (2)	1¼ x 23 - ¾ MDF
S	Long Grid Strips (8)	2 x 41¼ - ¼ Ply.
T	Short Grid Strips (13)	2 x 26¼ - ¼ Ply.
U	Hanger Strips (2)	2 x 19 - ¾ MDF
V	Adjustable Shelf (1)	¾ x 12 - 41½

- (36) #8 x 1¼" Fh Woodscrews
- (4) 8mm x 3" Hex Head Bolt w/ Washers
- (4) ¼" x 1¼" Fh Mch. Screws w/Nuts & Washers
- (4) ¼" x 2" Fh Mch. Screws w/Nuts & Washers
- (2 pr.) 6"-dia. Locking Swivel Casters
- (16) #12 x 1¼" Ph Sheet Metal Screws
- (1) 24¾ x 39¾" Hardware Cloth
- (2) 20" x 25" - 2" Paint Arrester Filters
- (1) Blower Motor
- (1) Light Diffuser Panel
- (2) 3' Fluorescent Lamps w/Bulbs
- (4) #8 x ½" Fh Mch. Screws w/Nuts & Washers
- (2) Metal Square Junction Boxes w/Covers
- (2) Metal Switch Boxes
- (2) 15-Amp Switches
- (2) Switch Cover Plates
- (1 box ea.) Red & Yellow Wire Nuts
- (8 ft.) 12ga. SJ Cable
- (1) 115v Grounded Plug
- (1) 6" x 24" Round Furnace Duct
- (1) 6" x 10' Flexible Duct
- (2) 6"-dia. Hose Clamp
- (1) 1" Cable Grommet
- (14) #10 x ⅝" Sheet Metal Screws
- (4) ½" Cable Clamps w/Screws
- (20 ft.) ½" Flexible Conduit
- (1) Strain Relief for Power Cord
- (12) ½" Flexible Conduit Connectors
- (40 ft.) 12 ga. Stranded Wire - White
- (30 ft.) 12 ga. Stranded Wire - Black
- (30 ft.) 12 ga. Stranded Wire - Green
- (1 pkg.) Spade Terminals for 12 ga. Wire
- (3) ½"-dia. x 41¼" EMT Conduit
- (1 pr.) Folding Shelf Brackets w/Screws

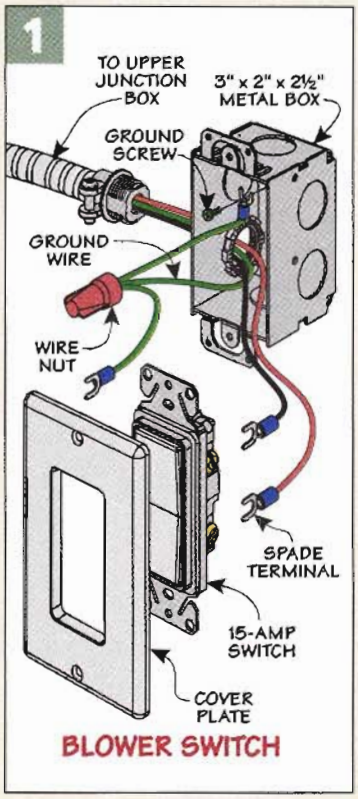
Electrical Hook-Ups

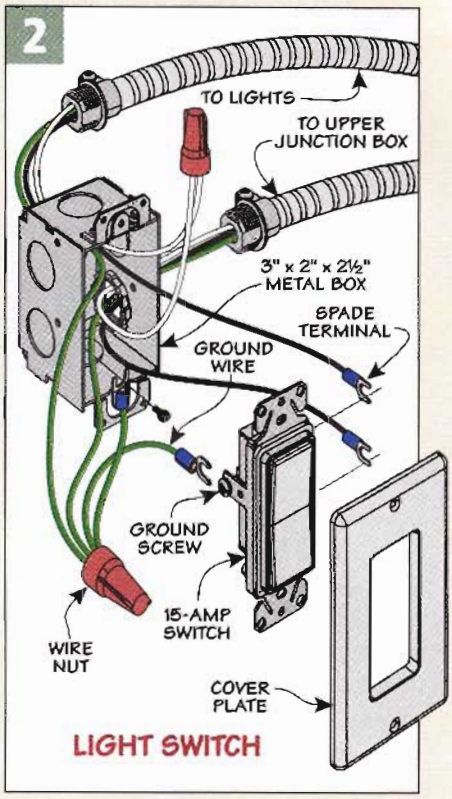
▲ ***Typical Wiring.*** *You'll use this ½" flexible conduit, connector, and bushing at all connections to a metal box (color and number of wires may vary).*

The wiring for the finishing center is pretty basic and doesn't involve any complicated procedures. But, if you're not comfortable wiring a project yourself, be sure to consult with a licensed electrician. The photo at the bottom of the opposite page shows all the types of hardware you'll be working with.

Metal Boxes. The first thing to do is install all of the boxes you'll need to connect the wiring. I started at the top of the cabinet with the boxes for the light and blower switches (Figures 1 and 2). Next, you can mount the two junction boxes — one on the top and another on the back side of the cabinet (Figures 5 and 6). The drawings indicate which knockouts you need to remove so you can connect the conduit.

Flexible Conduit. If you look at the left margin photo, you'll see the type of conduit, wire, and connector I used at each entry point into the metal boxes. I purchased flexible conduit and cut it to length with a hack saw. After making the connections to the boxes, it was an easy task to fish the wires through the conduit. I usually like to bundle them together and fish them through all at once.





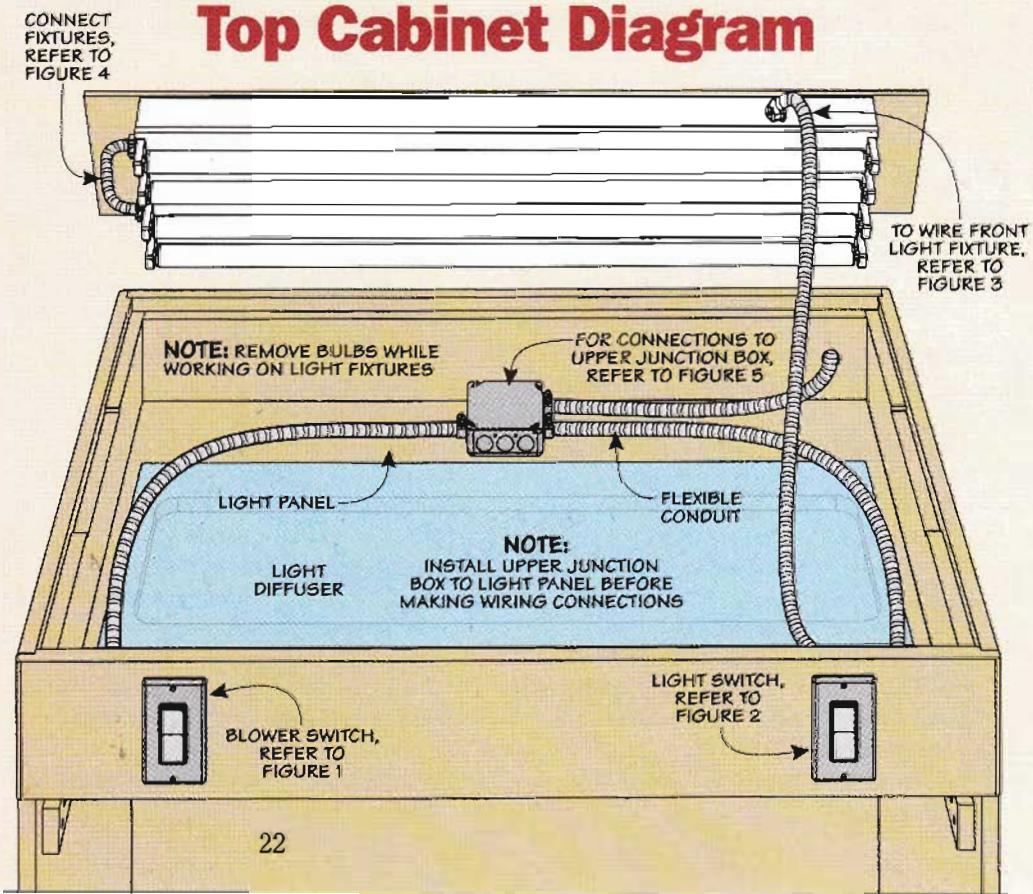
Stranded Wire. I chose to use individual spools of 12-gauge stranded wire, but you can use solid if you wish. Because I used stranded wire, I terminated all my connections at the switches with spade terminals. Just crimp them securely onto the end of the wire.

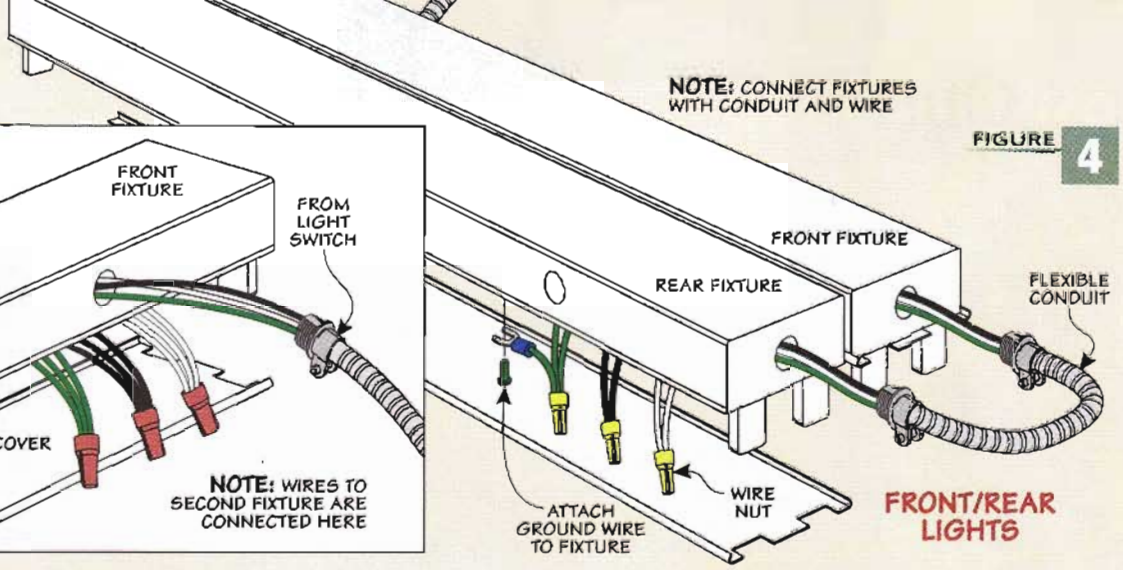
Colors. I used the three standard colors for the wiring: black (hot), white (neutral), and green (ground). The drawings in Figures 1, 5, and 6 show a red (hot) wire, but you can use black, as long as you mark it to avoid confusion.

Grounding. There's one other thing that's important to remember. You need to attach a ground wire (green) to every metal box and light fixture. And all the green wires should be tied together at every box with a "pigtail" connection, like you see in Figures 1 and 2. There should be a threaded hole and a green-colored screw within each box to make this connection.

Follow the Diagrams. With all the boxes and wiring in place, you're ready to make all the connections. Figures 3 and 4 show you how I connected the two light fixtures together. The power from the light switch comes into one fixture. Then three wires are run to

Top Cabinet Diagram

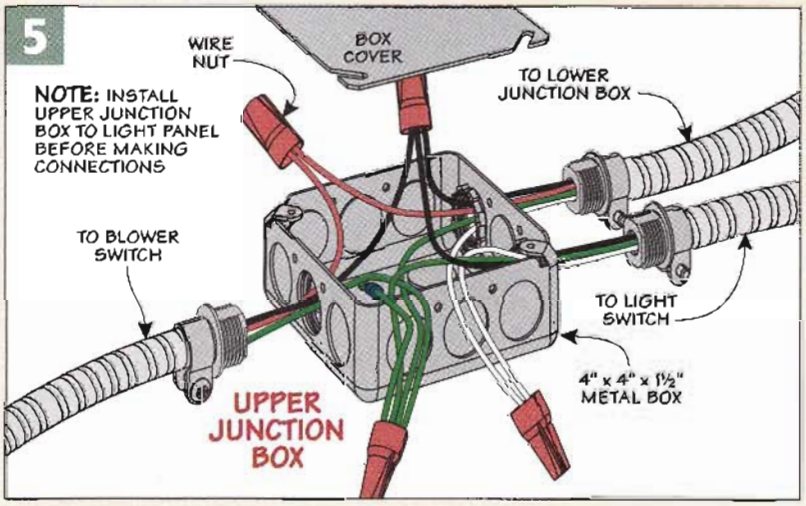




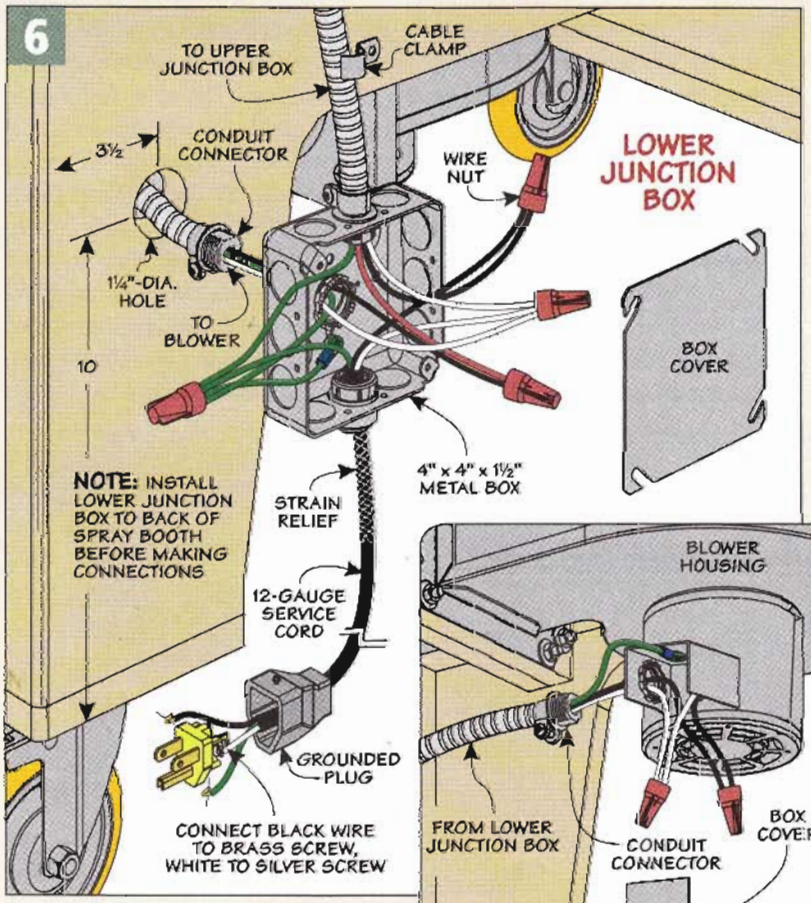
the other fixture through a short length of conduit.

Power Cord. There's one other thing I need to point out. Where the power cord enters the lower junction box, I added a strain relief. This helps prevent the cord from being pulled out of the box accidentally. And it keeps the cord from kinking at the box.

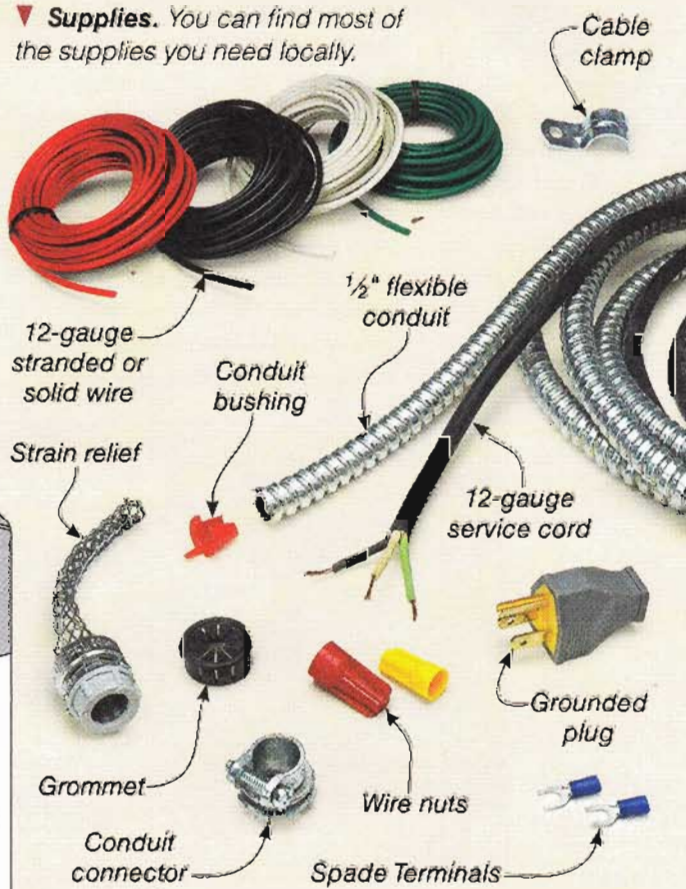
Power Up. Make sure all the connections are tight before putting the covers on the box. Now that all the connections are made, the finishing center is ready to use.



SAFETY NOTE
If you're not comfortable performing electrical work, consult with a licensed electrician.



▼ **Supplies.** *You can find most of the supplies you need locally.*



Shop Short Cuts

▲ **Guides.** *Using a piece of scrap the same thickness as your workpiece makes it easy to position the guides.*

Simple Dado Jig

▲ **Spiral Downcut Bit.** *To get smooth cuts in plywood without "lifting" the veneer, try using a spiral downcut bit.*

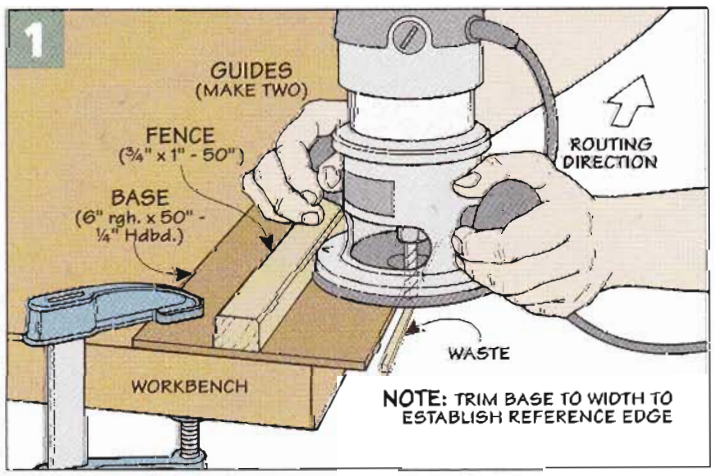
I usually rely on a table saw to cut dadoes. But sometimes a workpiece is just too big, like the sides and back of the finishing center on page 14, to cut joinery on a table saw. Instead, I turned to my router and a pair of shop-made guides to rout them, like you see above. Best of all, it's easy to rout dadoes that fit a workpiece perfectly.

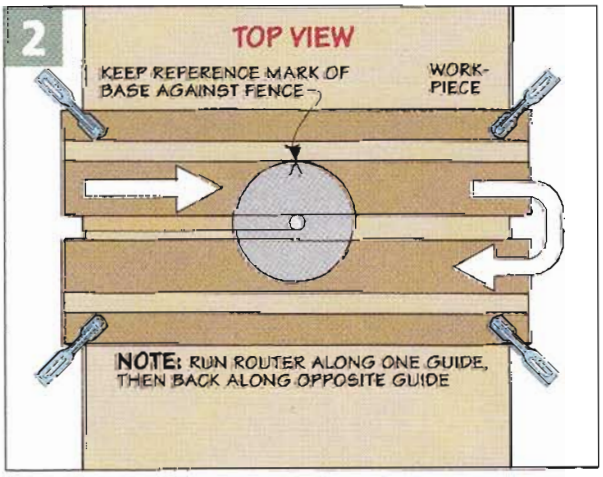
Guides. Each guide consists of two parts: a hardboard base that the router rides on, and a wood fence to guide the router (Figure 1). It's best to make your guides long enough to rout across a full sheet of plywood or MDF.

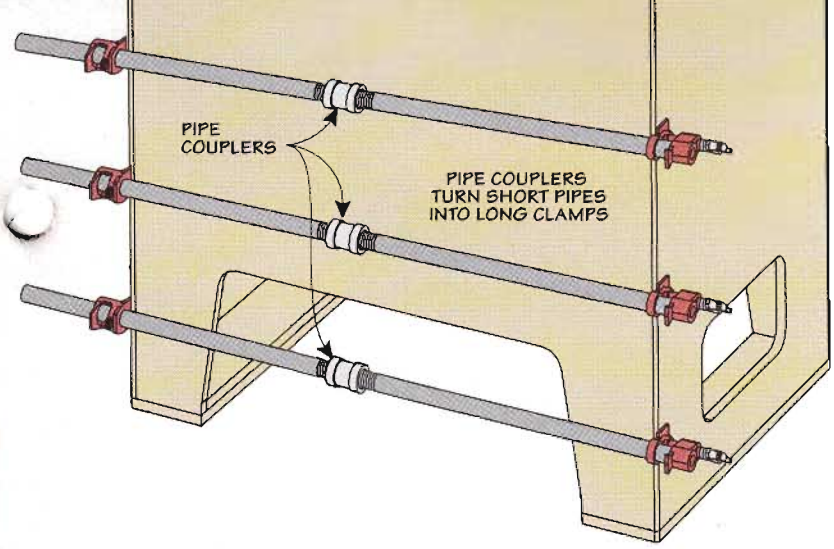
Also, you'll want to start with an extra-wide base. This way, after the fence is glued in place, you can trim the base with your router to create a reference edge for aligning the guide during use. Just be sure to always use the same router and router bit to rout the dadoes. I like to use a ½" spiral downcut bit, like the one in the left margin. You'll also want to make a reference mark on your router base so that you always run the same edge against the fence of the jig.

Setup. With the guides complete, positioning them only takes a second. Start by laying out the location of one side of the dado. Then, align one of the guides along that mark and clamp it in place (Figure 2). To position the second guide, you'll need a spacer the same thickness as your workpiece. After sandwiching the spacer between the guides, clamp the second guide in place (inset photo above).

Rout Dado. To rout the dado, run the router along the fence of the first guide, making a ⅛"-deep pass (Figure 2). Then, with your router against the opposite fence, make another pass in the opposite direction. Simply repeat the process, increasing the depth of cut after each pair of passes until you reach the desired depth.





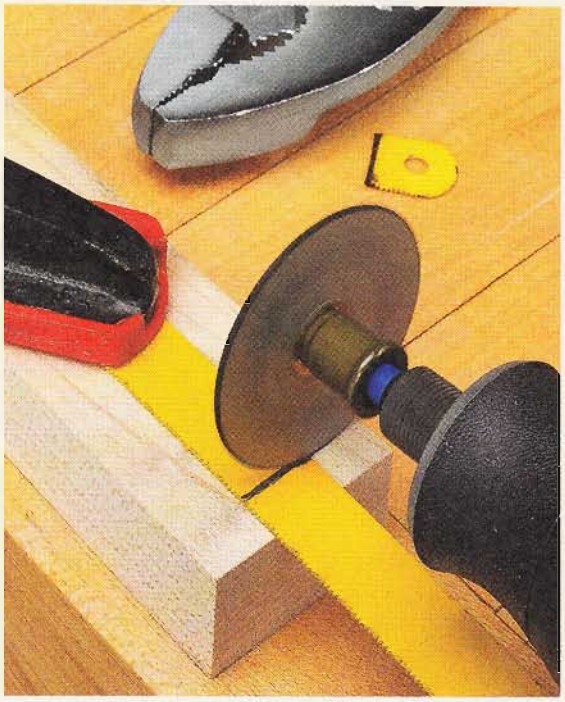


Clamp Extension

It takes some extra-long clamps to assemble the spray booth on page 14. Unfortunately, I didn't have enough long clamps on hand to complete the assembly.

Instead of buying longer pipes that I probably wouldn't use all that often, I turned to the solution you see in the photo at left — pipe couplers. Using the pipes you already have on hand, you can connect them with couplers to create any lengths you need.

Cutting the Blade



▲ ***Cutting Metal.*** *A section of hack saw blade is used to trim sandpaper to length in the sanding tote (page 42). Use an abrasive wheel in a rotary tool to score the blade first. Then, snap it free using pliers.*

Dowel Chamfer Jig

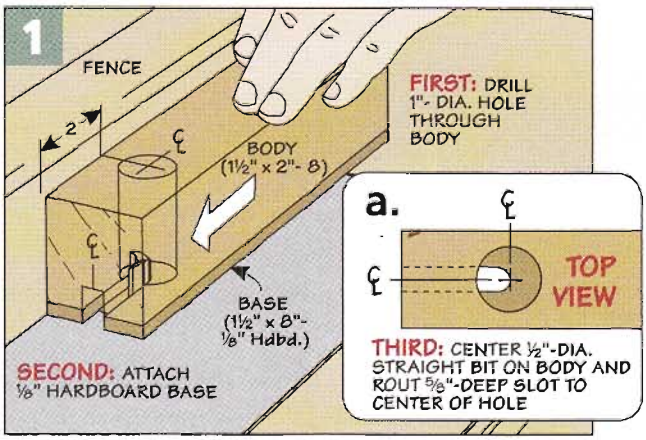
To ease the sharp ends of the handle on the sanding tote (page 42), I added chamfers. The challenge is routing a smooth, consistent chamfer on the end of a dowel. To do this accurately and safely, I turned to the simple chamfer jig shown here.

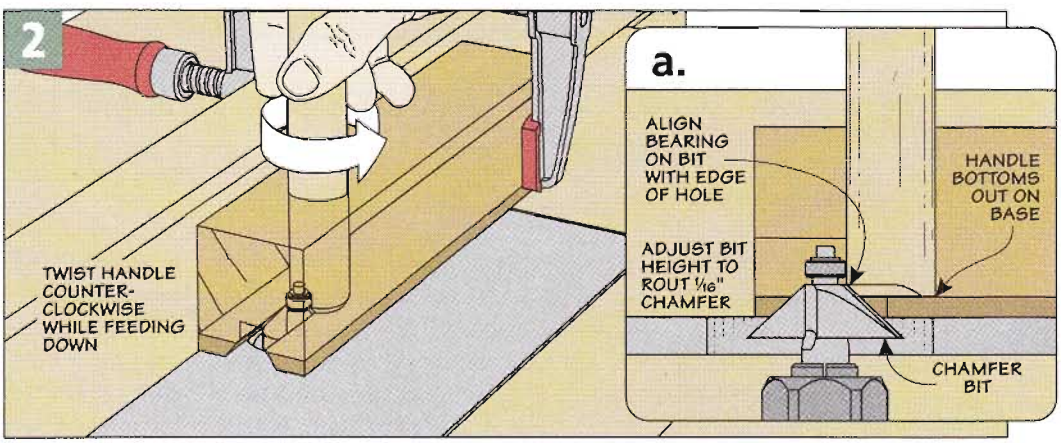
A Simple Jig. The jig is nothing more than a length of "two-by" cut to the size detailed in Figure 1. To accept the handle, I drilled a centered hole near one end, as in the Top View in Figure 1. Once that was complete, I added a ⅛" hardboard base. This serves as a baseplate to support the handle as you rout the chamfer.

Providing clearance for the chamfer bit is the next step. As you can see in Figure 1, I used a ½"-dia. straight bit to rout a ⅝"-deep clearance slot just past the edge of the hole.

Using the Jig. Creating a chamfer couldn't be simpler. After installing a chamfer bit, adjust the height to cut the desired profile. Then, position the jig so the bearing is in line with the edge of the hole and clamp the jig to the router table fence (Figure 2a).

To rout the chamfer, turn the router on and slip the dowel into the hole until it bottoms out on the baseplate. Finally, turn the dowel counterclockwise until the chamfer is completed.





classic Sawhorses

In just an easy weekend, you can build these must-have shop helpers that will last a lifetime.

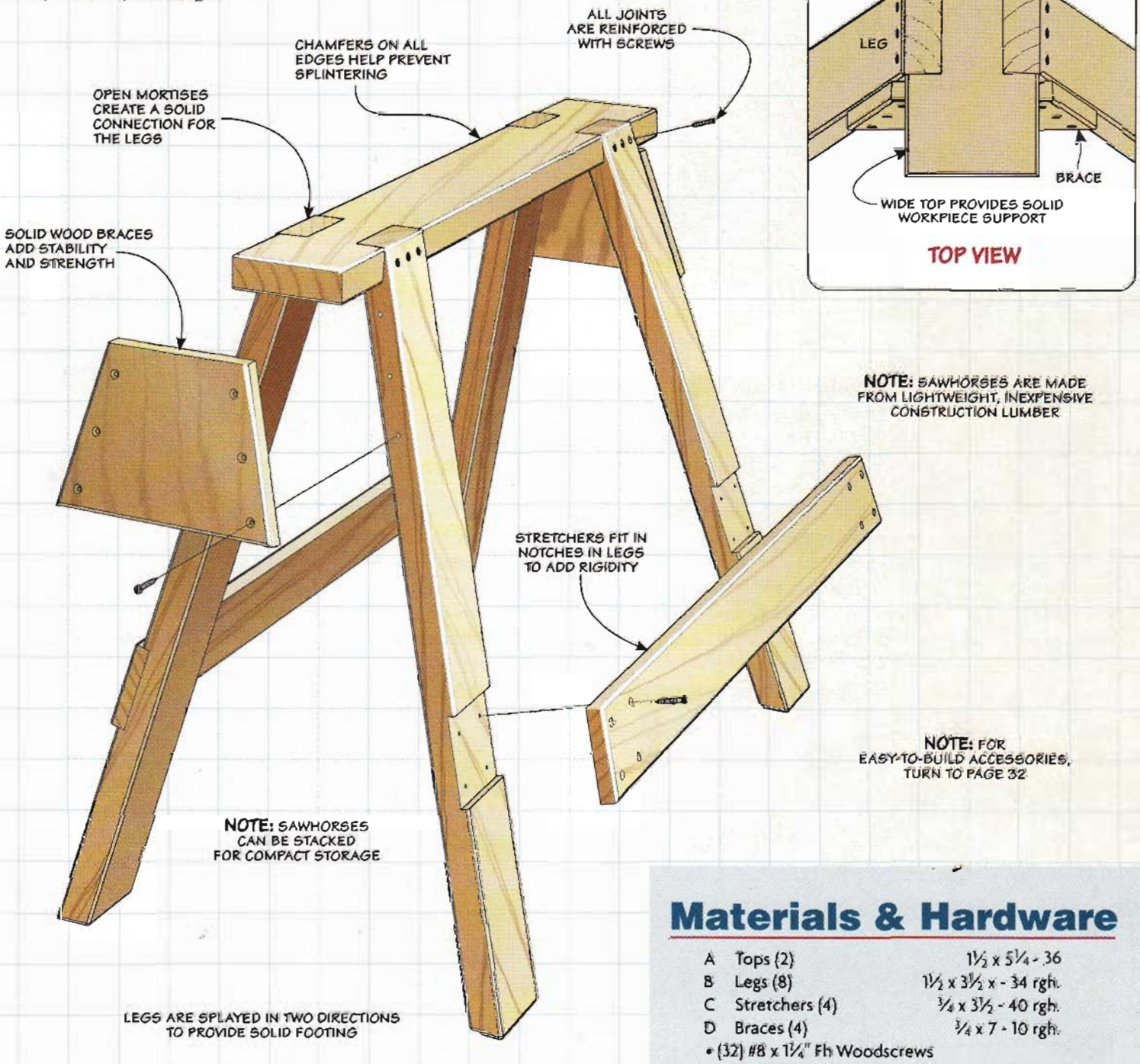
Sawhorses are handy when it comes to remodeling and construction projects. But I also put them to use almost every day in my workshop.

The sawhorses you see above are built to stand up to years of heavy use. They're great for setting up a temporary assembly table. And for trimming boards to rough length or cutting sheet goods down to a manageable size, they're the perfect solution.

Best of all, you can build these sawhorses in a short amount of time. And that's just the beginning. I'll also show you a few accessories you can add that will make these sawhorses a mainstay in your shop.

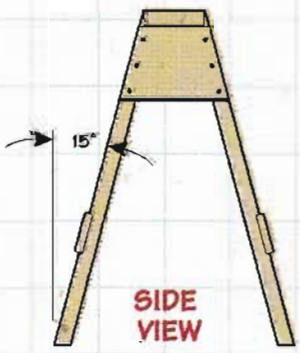
Exploded View Details

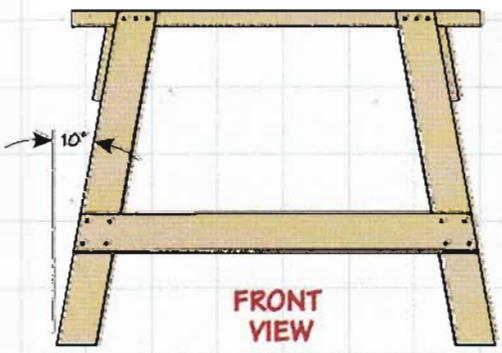
OVERALL DIMENSIONS:
21¼ "D x 38¼"W x 29½"H



NOTE: SAWHORSES ARE MADE FROM LIGHTWEIGHT, INEXPENSIVE CONSTRUCTION LUMBER

NOTE: FOR EASY-TO-BUILD ACCESSORIES, TURN TO PAGE 32





Materials & Hardware

A	Tops (2)	1½ x 5¼ - 36
B	Legs (8)	1½ x 3½ x - 34 rgh.
C	Stretchers (4)	¾ x 3½ - 40 rgh.
D	Braces (4)	¾ x 7 - 10 rgh.

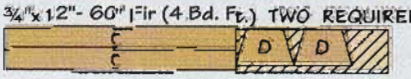
- (32) #8 x 1¼" Fh Woodscrews
- (24) #8 x 1¾" Fh Woodscrews
- (24) #8 x 2½" Fh Woodscrews

NOTE: Materials and hardware shown for two sawhorses

Cutting Diagram

1½"x 12"- 72" Fir (12 Bd. Ft.) TWO REQUIRED

¾"x 12"- 60" Fir (4 Bd. Ft.) TWO REQUIRED



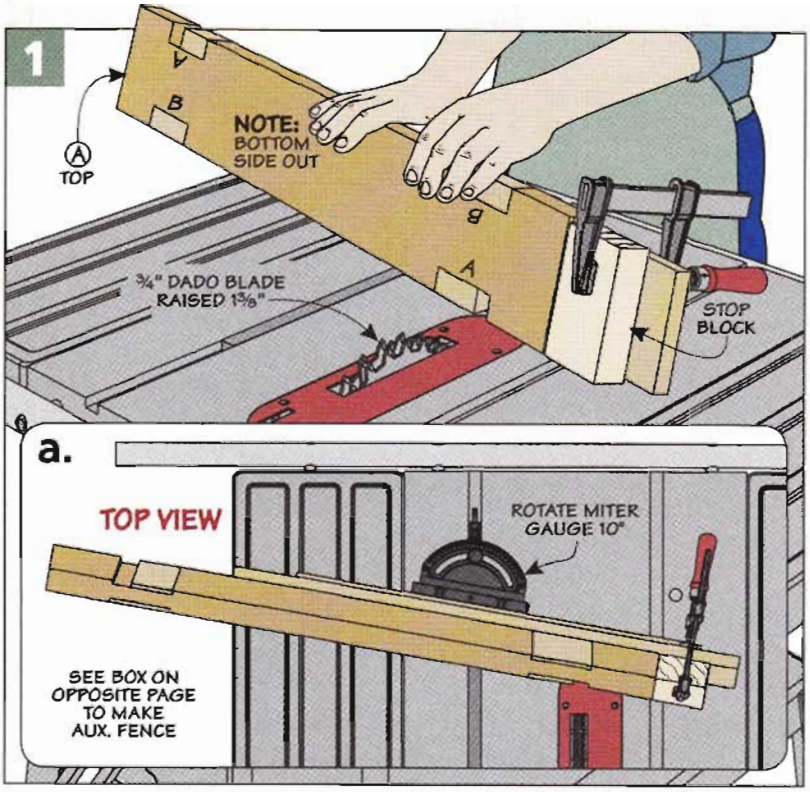
making the Top

Stability is the name of the game when it comes to building a sawhorse. Wherever it's put to work, the sawhorse needs to stand up to heavy use without wobbling.

The problem with many sawhorse designs is that they tend to loosen up after a short time. To end up with a sawhorse that will stay strong and rigid for years, it takes a combination of the right design and materials.

The Right Materials. Building long-lasting sawhorses doesn't mean you need to use premium materials. Ordinary, construction-grade Douglas fir does the job nicely. It provides a good balance between strength and light weight to make the sawhorses easy to move around the shop.

It pays to take a little time to sort through the stack at the home center to find boards that are straight and free of knots. I know this sounds like a tall order. And I've found that by cutting the pieces from wider stock (2x10s or 2x12s), I can easily cut around defects and large knots. This enables you to get parts with clear, straight grain.



The Right Design. What makes these sawhorses stand out is the way each of the pieces interlocks with the others. That starts with how the legs are joined to the top. Notches in the top form open mortises for the legs. These notches do double duty. First they "lock" the legs in place so they won't wiggle. And second, they splay the legs in two directions for added stability.

The Top. I started work on the sawhorse by cutting the top to finished size. Next, I marked the location of the four notches on the bottom face (drawing at left). The notches are angled so the legs spread 15° out to the side and 10° outward from the ends. Take a look at the drawing on the bottom of page 27 to see what I mean.

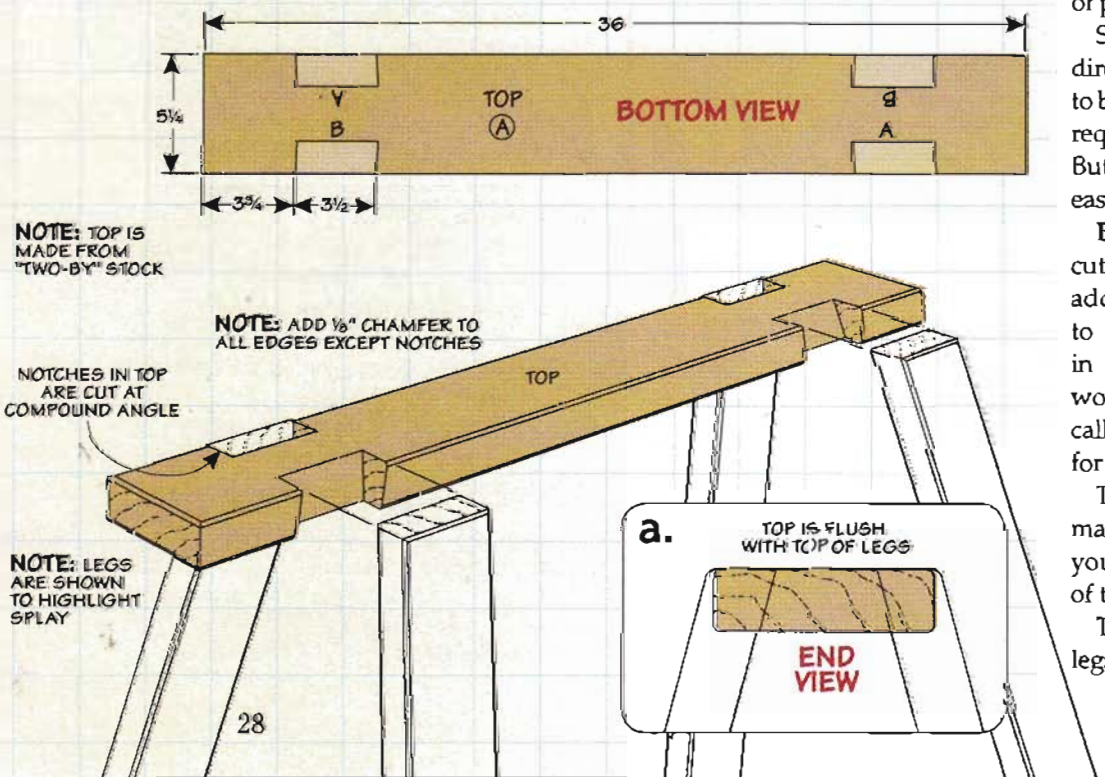
Since the legs are angled in two directions, these notches also have to be angled in two directions. This requires cutting compound angles. But there's no need to worry. It's easier than it looks.

Beveled Fence. To help simplify cutting the compound angles, I added a beveled auxiliary fence to the miter gauge, as illustrated in Figure 1. The fence holds the workpiece at 15°. This automatically gives you the correct angle for the spread of the legs.

The beveled fence is easy to make. You'll find all the details you need in the box at the bottom of the opposite page.

The second notch angle tilts the legs toward the ends. Cutting this

Open Mortise Layout

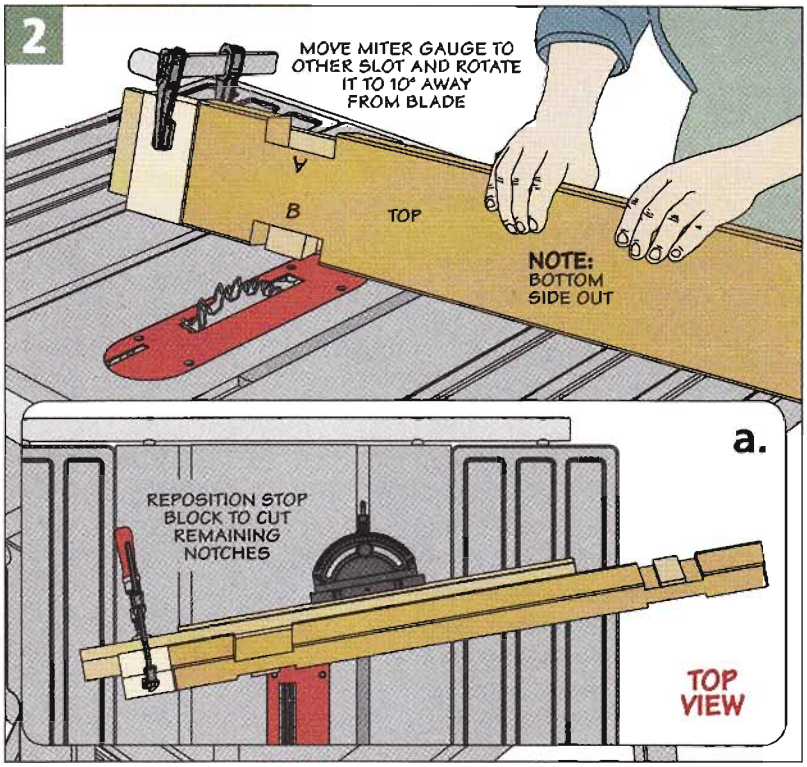


10° angle is simply a matter of adjusting your miter gauge.

A quick way to cut these notches is to complete them in pairs. This way, you only have to change your setup once. Two of the notches are cut using the right miter gauge slot and the other two are cut using the left slot. To help me keep things straight, I labeled the notches "A" and "B," as shown in the drawing at the bottom of the previous page. And to accurately locate the notches along the edge of the workpiece, I used a stop block clamped to the auxiliary fence, as you can see in Figures 1 and 2.

Cutting the Notches. I started cutting the notches by working on the "A" pair. First, I installed a dado blade and then raised it 1⅜". Second, I positioned the miter gauge in the right miter gauge slot and set the miter gauge to 10° (Figure 1). A stop block clamped to the fence establishes one edge of the notches. Then I repositioned the stop block and cut the other edge. Then I removed the waste by making several passes over the blade.

When cutting the "B" pair of notches, move the miter gauge from the right miter slot to the left miter slot. Then change the miter gauge to the opposite 10° angle setting before cutting the notches.



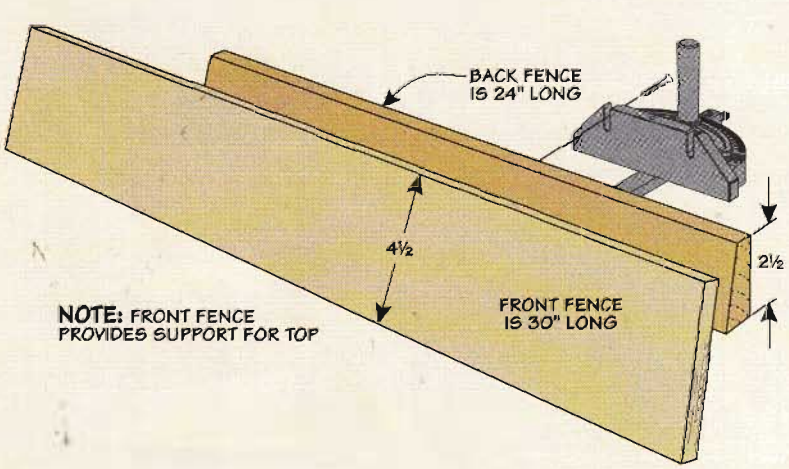
Chamfered Edges. After the notches were cut, I wanted to keep the edges on the top piece from splintering. So I routed a ⅛" chamfer on all of the top and bottom edges. Doing this operation at the router table keeps you from accidentally chamfering the inside edges of the notches.

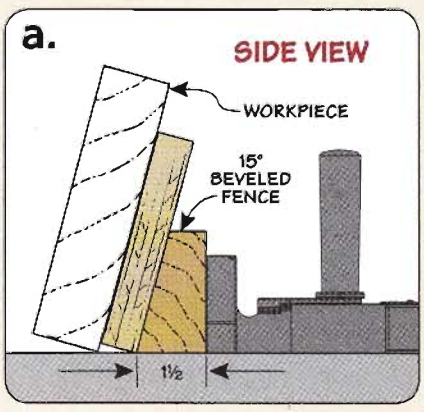
With the top pieces done, you can set them aside and turn the page to get started on the legs.

Beveled Fence

A beveled fence attached to the miter gauge makes it easy to cut the compound angle in the sawhorse tops. The drawings below show how it's made.

The fence starts with a piece of stock bevel ripped at a 15° angle. It's fastened to the miter gauge with screws. Attached to the beveled fence is an auxiliary fence. It backs up the top to prevent chipping when cutting the notches. Plus, it provides a good place to clamp your workpiece to keep it from shifting during the cuts.





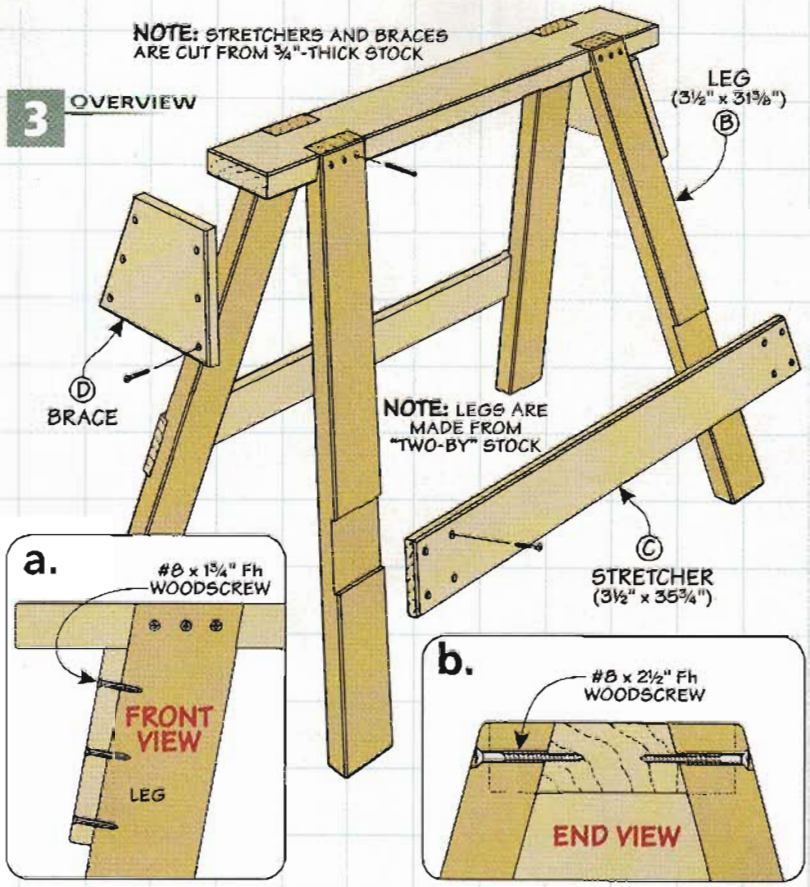
four sturdy Legs

Once I had the top finished, I started work on the legs. They're also cut from the same "two-by" stock. I ripped them to width to fit in the notches (in my case 3½" wide) and cut them extra long.

Cut to Length. After cutting the legs to width, the next step is to trim them to length. The top end of the leg needs to fit flush with the upper face of the top. While at the same time, the bottom end must sit flat on the floor, as in Figure 3.

The first step is to make a compound miter cut on one end of all of the legs. To do that, I tilted the saw blade to 15° and set the miter gauge to 10° (Figures 4 and 4a).

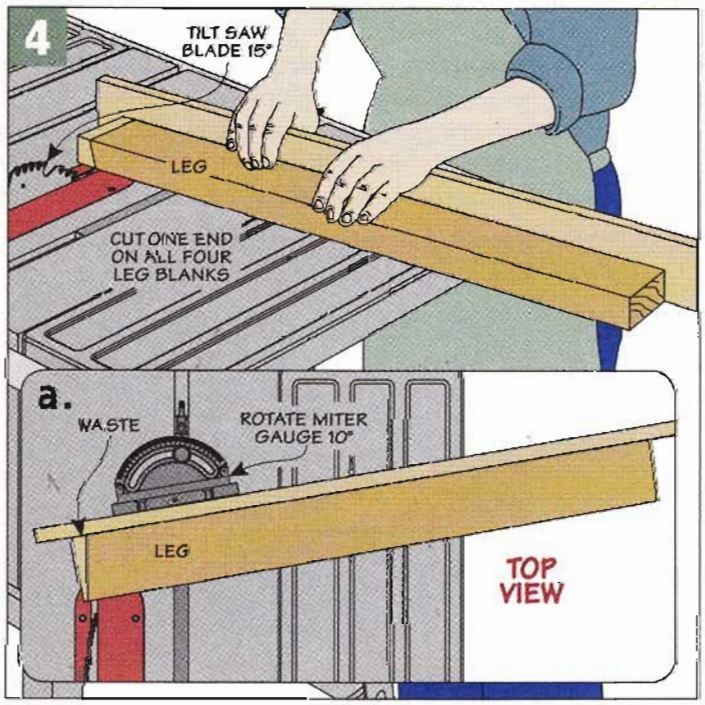
Once you complete the cuts on one end, the next step is to cut the legs to final length. To do that, you'll need to reset the miter gauge to 10° in the opposite direction (Figures 5 and 5a). Then you can cut the other end of the leg to length. To make sure the legs would all end up the same length, I used the first leg to help me position a stop block on the auxiliary fence. This makes cutting the rest of the legs a breeze.

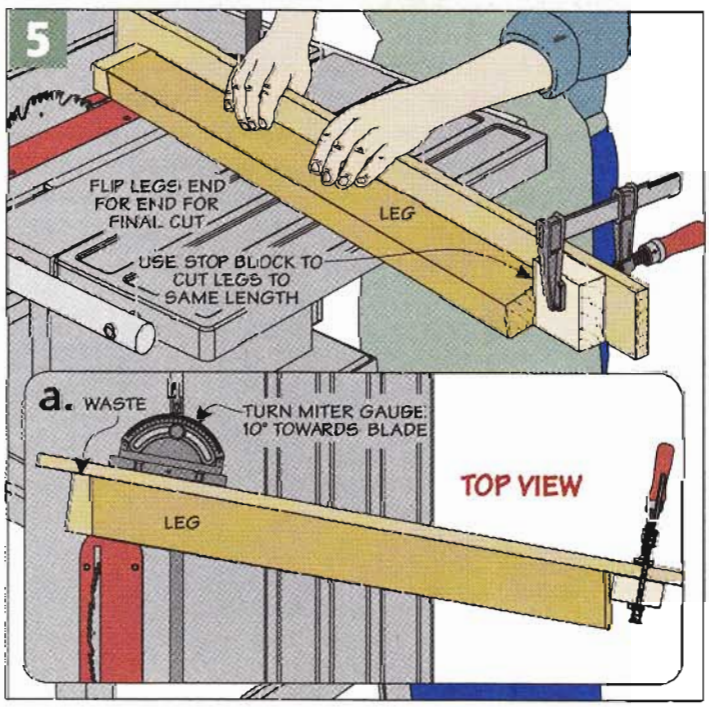


Lay Out the Notches. After the legs have been cut to finished length, you're ready to lay out notches for stretchers. The stretchers fit in the notches and join the legs together on each side of the sawhorse to keep it from racking.

To help me visualize how the stretchers would fit on the legs, I first dry assembled the legs in the notches in the top and then labeled them to match the letters of the notches. Then I removed the legs from the top and marked the notch location, as illustrated in Figure 6. Just be sure these notches are laid out parallel to the ends of the legs.

Cutting the Notches. Cutting the ⅜"-deep notches for the





stretchers is pretty straightforward. First, I installed a dado blade in the table saw. Then I used the same 10° setting on the miter gauge to follow my layout lines and cut out the notches, as in Figures 7 and 7a. Just as you did for the cutting the ends of the legs, you'll need to reset the miter gauge to the opposite 10° setting for cutting the opposite pair of legs.

Chamfer the Ends. Sawhorses are always being dragged around the shop. To help keep the ends of the legs from chipping out, I routed an ⅛" chamfer around the bottom of all the legs. Then glue and screw the legs to the top.

Stretchers. After the legs have been fastened to the top, the next step is to cut the stretchers to fit in the legs. Just like cutting the legs, first rip the stretchers to finished width so they fit snugly in the notches in the legs. But leave them a little long. This way, you can use the legs to mark the stretcher length for an exact fit.

To do that, cut a 10° angle on one end of the stretcher so it fits flush with the edge of the leg, as shown in Figure 8. Then, use the other leg as a guide to mark the length of the stretcher and cut it to size.

After the first stretcher is cut to finished length, use it to mark the other one. This will ensure you have an exact copy and the assembled horse will be square.

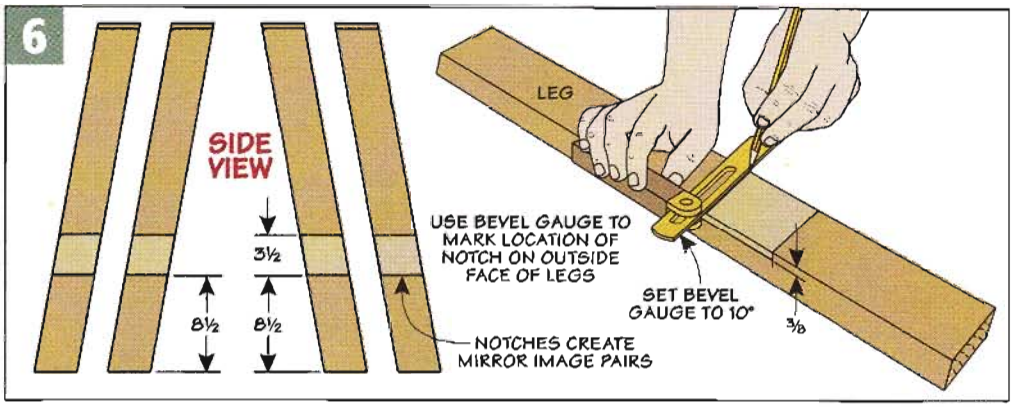
Chamfer the Edges. Once again, to keep the edges of the stretchers from splintering, I routed an ⅛" chamfer along the outer edges of the stretchers. Then glue and screw the stretchers to the legs.

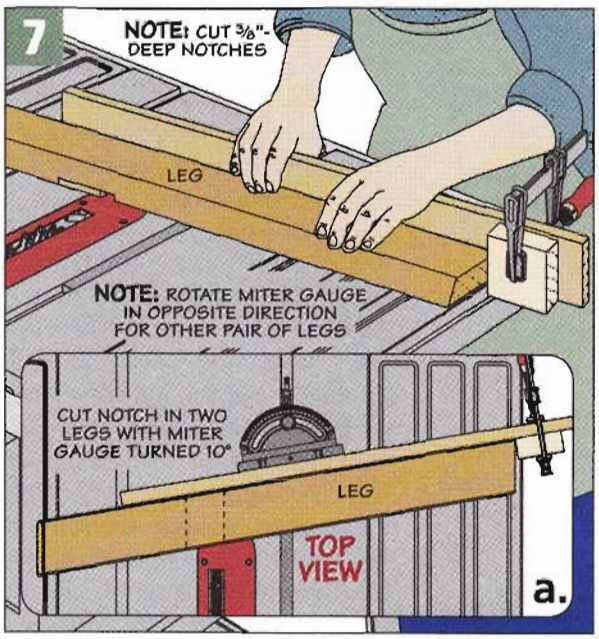
Braces. The last pieces added to the sawhorse are the braces. They're installed on the ends of the sawhorse to keep the legs from "doing the splits" when anything heavy is set on the top (Figure 9).

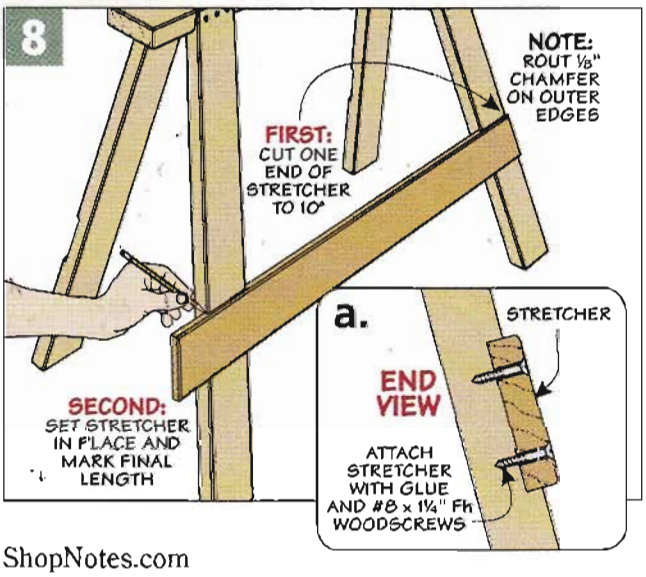
Cut to Fit. I started making the braces by cutting them to rough size. Then I cut a 10° bevel on one edge. This bevel lets the brace fit tight against the bottom face of the top, as you can see in Figure 9a. Then rip the opposite edge of the brace to final width.

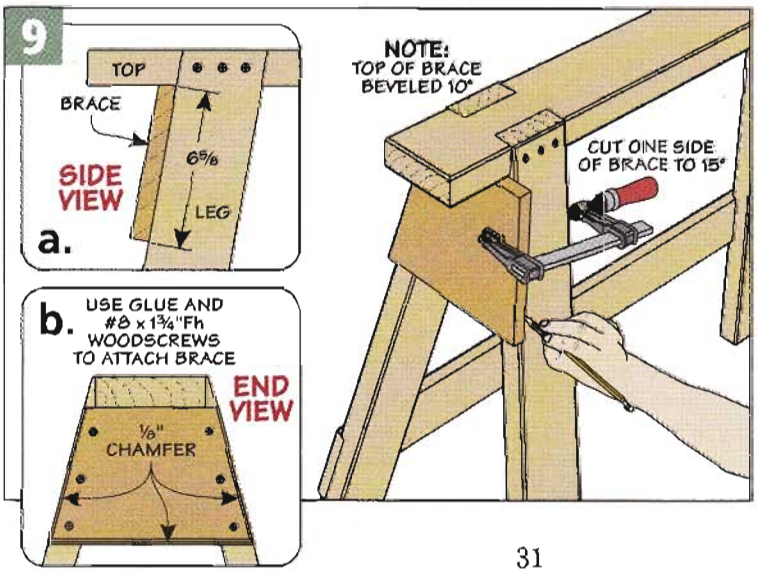
Next, I "custom fit" the brace to the legs for a perfect fit. I started by cutting one side on the table saw, using the miter gauge to get the proper angle. Then, I clamped the brace in position, marked the opposite side, and simply cut to that mark, as shown in Figure 9. I used the finished brace as a template to make the second one.

Here again, I finished work on the braces by routing a chamfer around the outer face. But don't chamfer the top edge. Finally, glue and screw both braces in place (Figure 9b). You can put the sawhorses to use right away, or build the accessories on the next page.









a few helpful

Accessories

There's no doubt that having a pair of sawhorses will prove to be a big help in your workshop. But to make them even more useful, I've also come up with some simple accessories designed to make a few tough tasks more manageable.

FINISHING EASEL

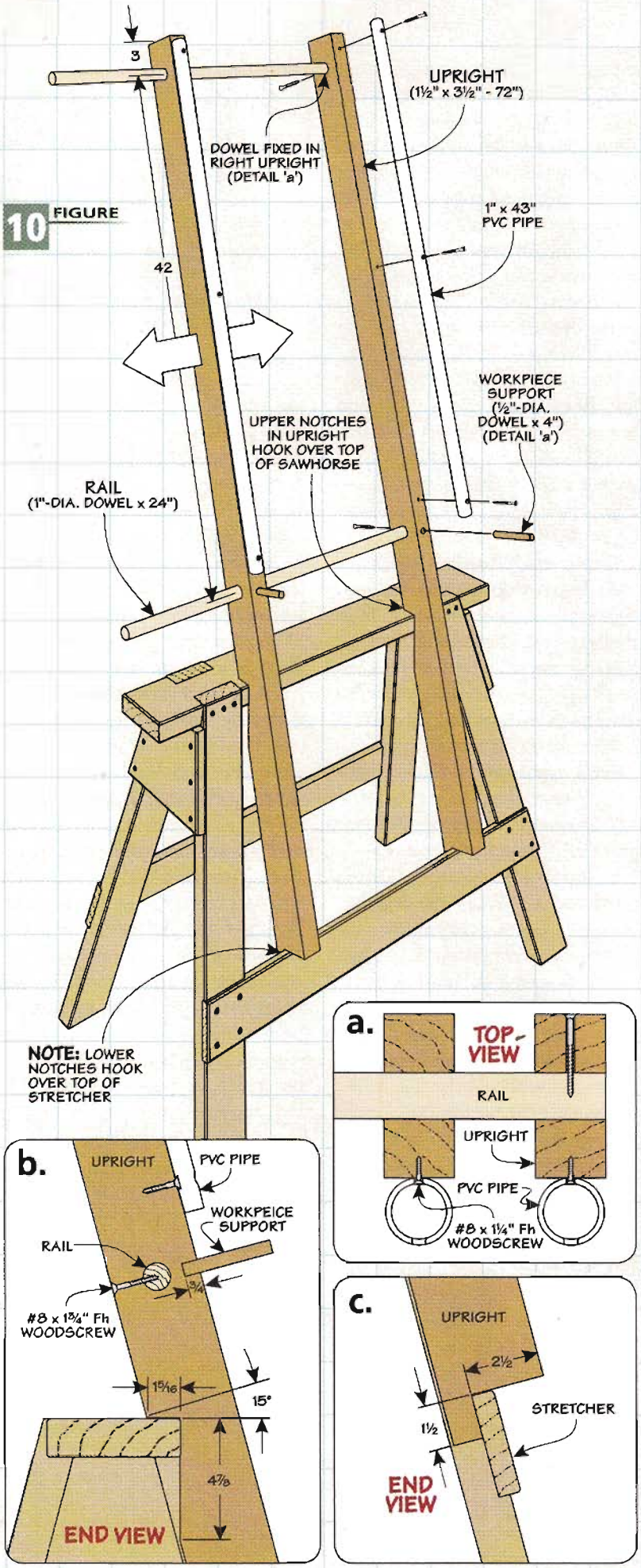
Finishing doors and other flat project parts is always a challenge. First, you need to find a place to set the part (usually your workbench), then you end up hunching over it while you apply the finish. At the end of the day, you can count on having an aching back.

A better solution is to build the easel attachment shown in the drawing at right. It not only holds the project at a comfortable height, but you can keep your workbench clear for other tasks.

Uprights. The main parts of the easel are a pair of uprights made from "two-by" stock. A square notch at the bottom of each upright hooks behind the stretcher of the sawhorse, as shown in Figure 10c. An angled notch in the upright nestles against the top, as you can see in Figure 10b.

A Pair of Dowels. To keep the uprights aligned, I drilled a pair of holes in each and inserted long dowels. I glued and screwed the ends of the dowels to one of the uprights, as illustrated in Figure 10a. This way, you can adjust the other upright to accommodate different sized projects.

Final Details. To keep the freshly finished project from sticking to the uprights, I attached two lengths of PVC pipe. I fastened the pipes in place with screws. Finally, a pair of short dowels in the uprights supports the bottom edge of the piece you're finishing. Just drill holes and insert the dowel pieces in the locations shown in Figure 10.



OUTFEED SUPPORT

Whether you're cutting a large workpiece on the table saw or running long boards through a planer, supporting the outfeed end is a challenge. But instead of trying to rig up a separate solution for every tool, I pull out my trusty sawhorse and the simple, adjustable support shown in Figure 11.

The outfeed support is just a ¾" plywood panel with a short piece of PVC pipe screwed to the top. The smooth, curved surface of the pipe allows a workpiece to slide easily across the top without catching. And the sawhorse provides a wide stable base so the support won't tip over.

A pair of slots in the plywood lets you attach the support to the sawhorse with studded knobs and washers. I installed a pair of threaded inserts in the top of the sawhorse to hold the knobs.

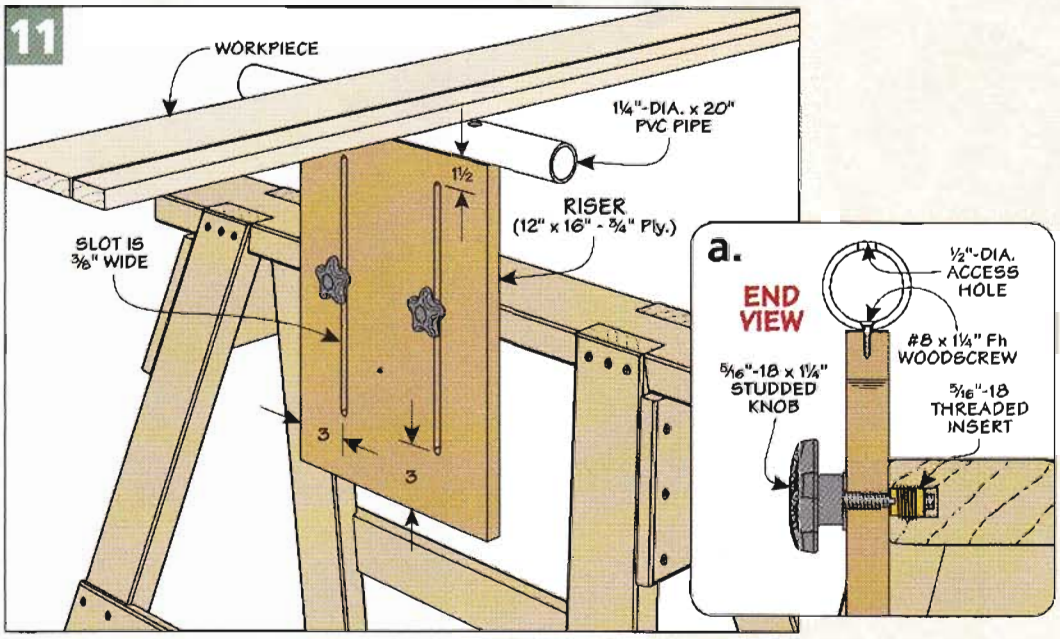
CUTTING GRID

Working with sheet goods requires a large surface to provide support while you cut it down into manageable pieces. The cutting grid shown below placed on top of your sawhorses makes this task easier and more comfortable.

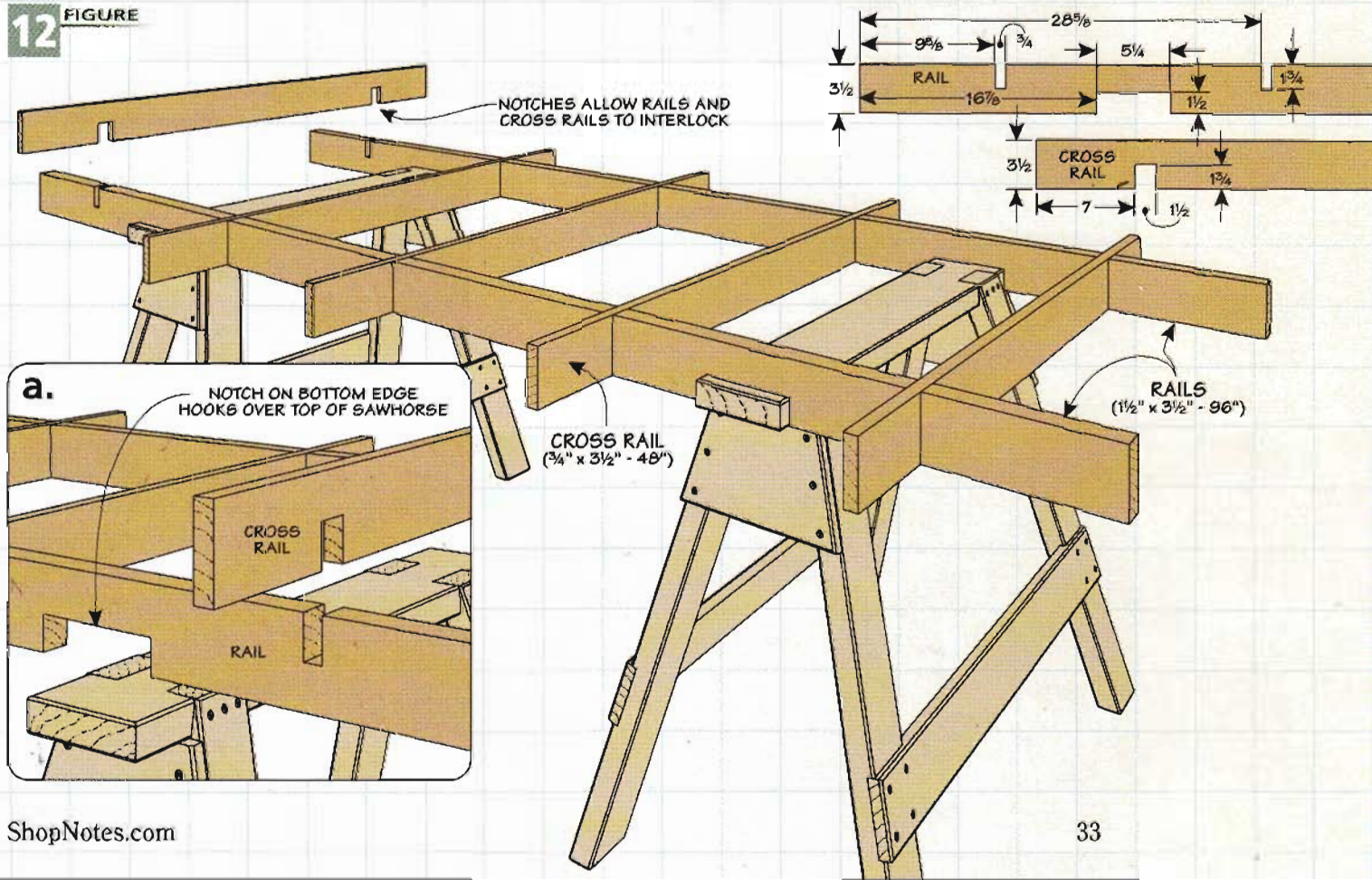
The grid is made up of interlocking rails and cross rails. The notch locations are shown in Figure 12. You'll also need to cut a pair of notches in the bottom edge of each of the long rails, as you can see in Figure 12a. This keeps it from shifting around as you work.

To use the cutting grid, simply assemble the pieces on top of the sawhorses (no glue or screws are needed). Then lift your workpiece onto the grid and you're ready to go to work. Once you're done, you can disassemble the grid and store the pieces out of the way.

11



12 FIGURE



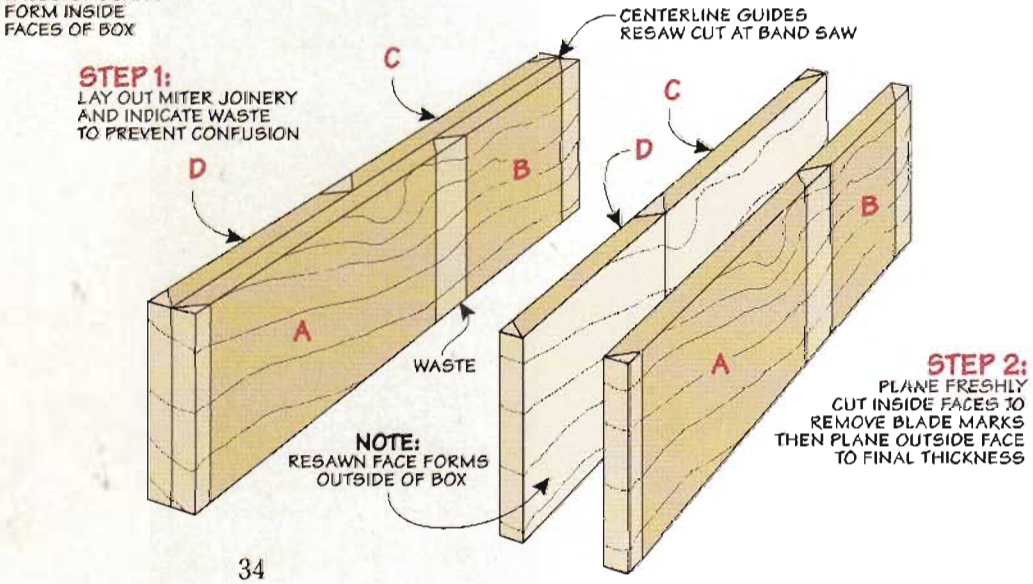
resawing for Better Boxes

A simple technique results in a near-perfect grain match on all four corners of any box.

Building small boxes is a great way to show off the beauty of just about any hardwood. For years, I carefully cut box sides in sequence from a single board in an effort to match each mitered corner with a continuous flow of the grain. But unless you get really lucky, the last corner is usually a mismatch.

It's no mystery why this happens. The grain pattern on the fourth side comes from the opposite end of the board as the first.

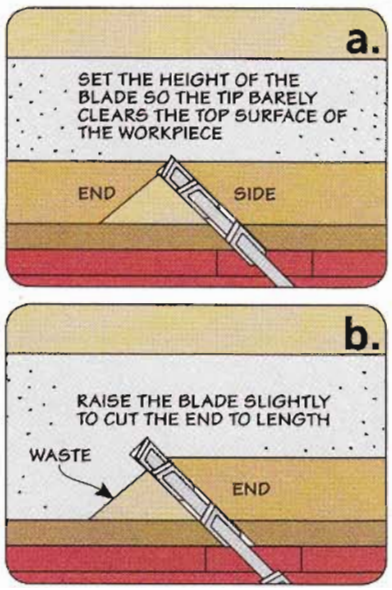
Fortunately, I've found a simple technique to avoid this problem and guarantee a good match on all four corners. The key is resawing the parts from thick stock so you start out with a pair of book-matched blanks. These pieces can then be mitered to form four perfectly matching corners. The drawings at left and on the top of the next page provide an overview of how the process works to ensure the proper grain match.

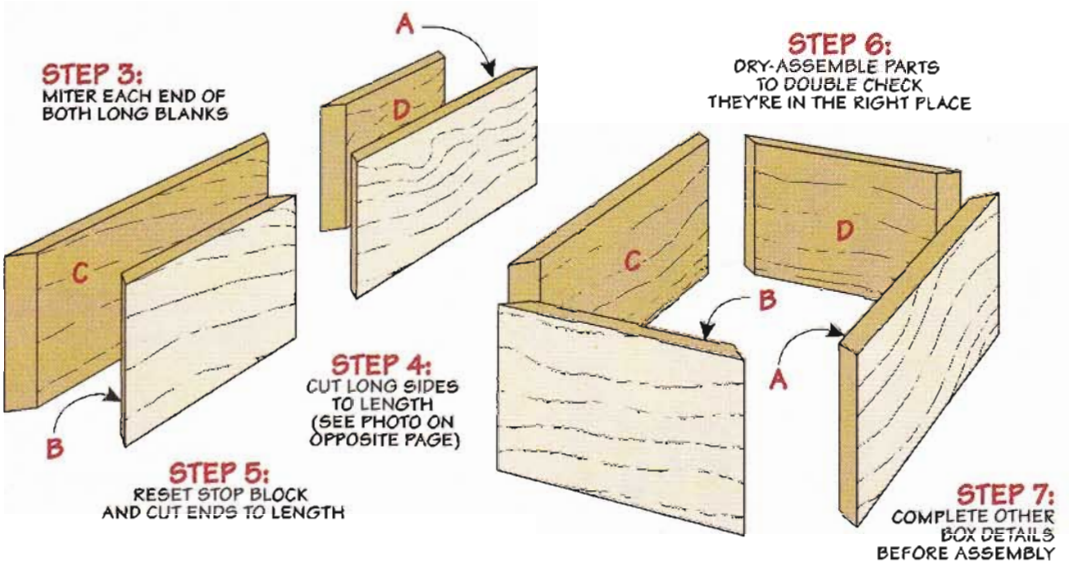


Selecting the Stock. The first step is to find the right blank. I usually look for straight grain, but you can also get a dramatic effect from just about any pattern.

You'll want the piece to be slightly longer than the combined length of one side and one end of the box. This allows for the kerf when mitering the parts to length. I find that 4/4 stock works well. It's usually about $1\frac{3}{16}$" thick so it easily yields $\frac{5}{16}$"-thick stock I need for the box parts after resawing, planing, and sanding.

Lay Out. With the blank sized, I like to do a little layout before





heading to the band saw to resaw the parts. As you can see in the first drawing on the facing page, I draw a centerline down the length of the blank. This serves as my guide for resawing. Then I mark the length of each piece along the top edge and faces of the blank.

You can also see that I lay out the miter joints as well. This helps me keep the parts organized during the following steps.

Resawing. Cutting the blank in half at the band saw is the next step. The thin kerf of the band saw wastes less wood and ensures a closer grain match of the parts.

I prefer to use a ½"-wide blade with 3-4 teeth per inch for resawing. I also install an auxiliary fence at least as tall as the workpiece.

Smooth the Faces. The band saw makes quick work of resawing the blank. But once that's done, you'll need to clean up the cut face and bring the blanks to final thickness. You can turn to your planer to take care of this.

I try to take very light cuts at this point. Since the cut faces will form the outside faces of the box, remove just enough to clean up the saw marks. This will result in the best grain match possible. Then flip the blank over to take passes on the other face to complete the planing process.

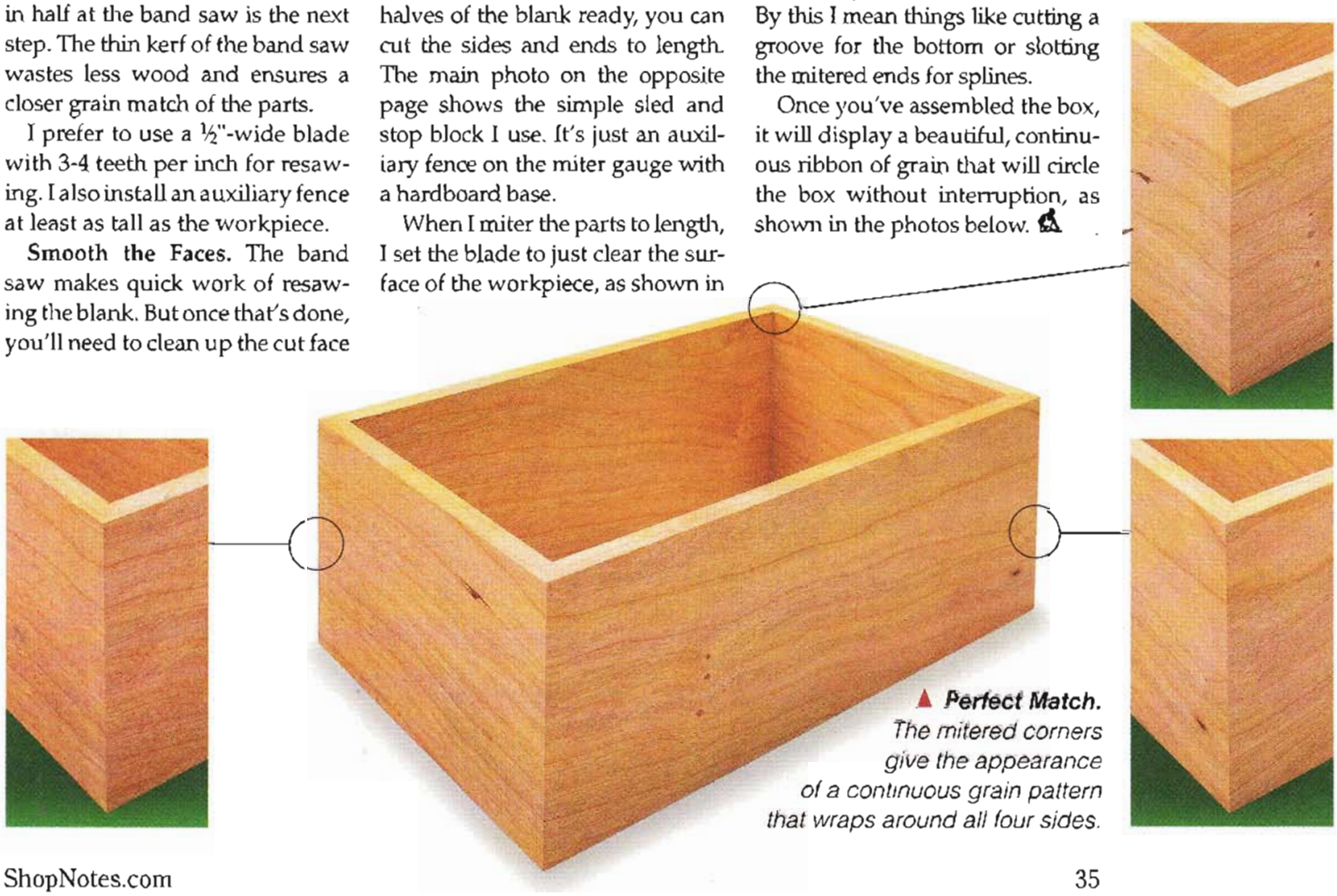
Sizing the Parts. With both halves of the blank ready, you can cut the sides and ends to length. The main photo on the opposite page shows the simple sled and stop block I use. It's just an auxiliary fence on the miter gauge with a hardboard base.

When I miter the parts to length, I set the blade to just clear the surface of the workpiece, as shown in details 'a' and 'b.' Once again, this helps preserve the continuity of the grain patterns.

The thing to keep in mind as you cut the miters is to pay attention to the marks you made earlier. You'll start by mitering each end of both blanks. Then set the stop block to cut the sides. Next, you'll need to reset the stop block to carefully miter the ends to length.

Other Details. Now you can take care of any other work on the box. By this I mean things like cutting a groove for the bottom or slotting the mitered ends for splines.

Once you've assembled the box, it will display a beautiful, continuous ribbon of grain that will circle the box without interruption, as shown in the photos below.



▲ ***Perfect Match.*** *The mitered corners give the appearance of a continuous grain pattern that wraps around all four sides.*

bench Vise Stand

weekend project

Designed to tackle the toughest tasks, this strong, stable, and easy-to-build stand is a great home for your bench vise.

My bench vise used to sit on a rickety old bench in a dark corner of my shop. But that old bench wasn't meant to stand up to sawing, pounding, and torquing on a vise handle. The solution was to build the vise stand you see at right.

For starters, the stand is made by gluing up multiple layers of MDF to create a lot of mass. It's designed to rest solidly on the floor *and* anchor to the wall. These features make the stand able to absorb vibration and redirect all the force of pounding and sawing to the floor and wall.

As you can see in the photos, the extra storage the stand provides is a welcome bonus. The open shelves hold a lot of tools and supplies. And the custom racks on the sides keep your tools close at hand. After a weekend's worth of work, you'll finally have a permanent home for that shop workhorse.

starting with a Cabinet

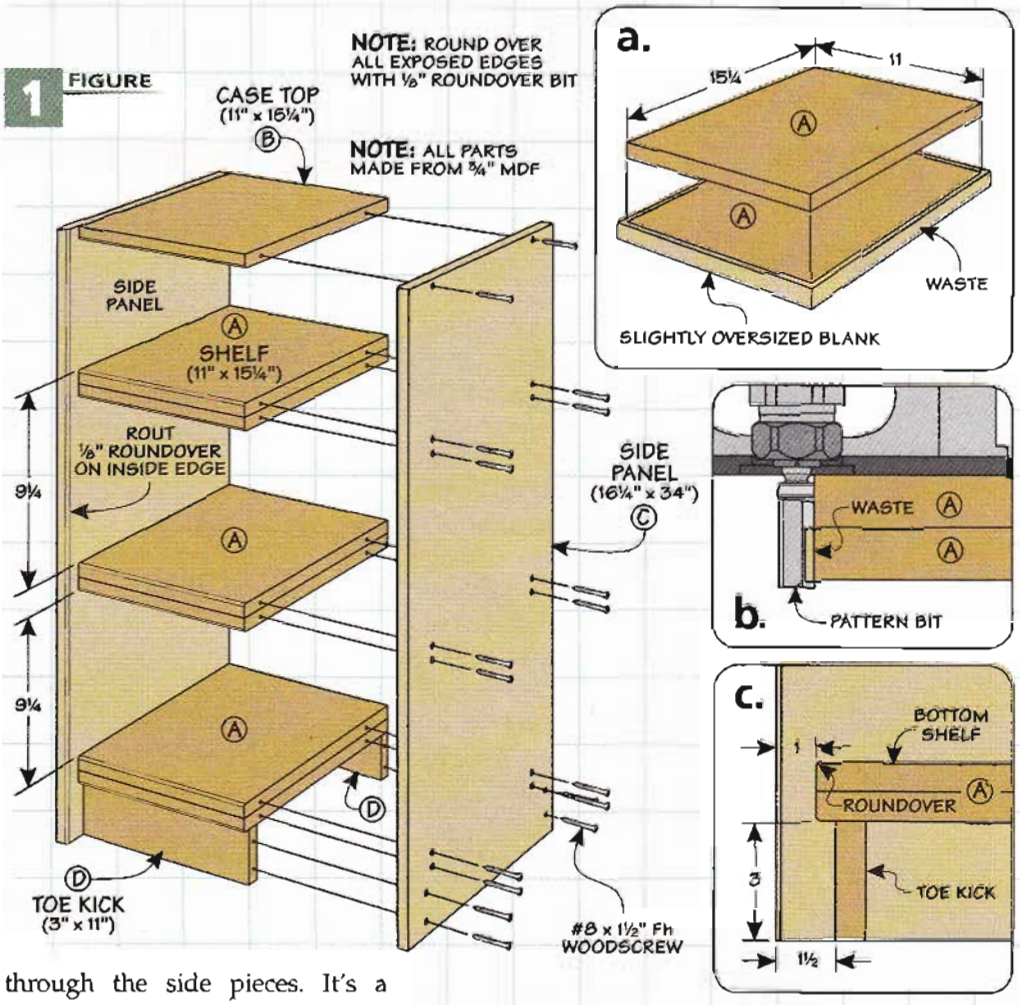
Most of the components that make up the vise stand are built up from multiple layers of MDF, as shown in the drawings. When laminating sheet goods like MDF, I like to use a spray adhesive or contact cement. This way, the bond is instant with the added benefit of being strong.

Creating Two Layers. Rather than trying to line up two layers cut to final size, I went another route. I chose to cut one layer to final size and then glue a slightly oversized blank onto that (Figure 1a). This way, it's an easy task to trim the oversized layer with a flush-trim bit, as in Figure 1b.

Main Cabinet. The construction starts with the three shelves, a case top, and the sides. The narrow width of the cabinet allows for the back panel to extend past the cabinet sides (main photo). But I'll talk more about that later.

All of the shelves, toe kicks, and top are fastened with screws through the side pieces. It's a good idea to clamp the assembly together first and then predrill the screw holes. This way, the screws won't split the edges of the MDF as you drive them home.

1 FIGURE



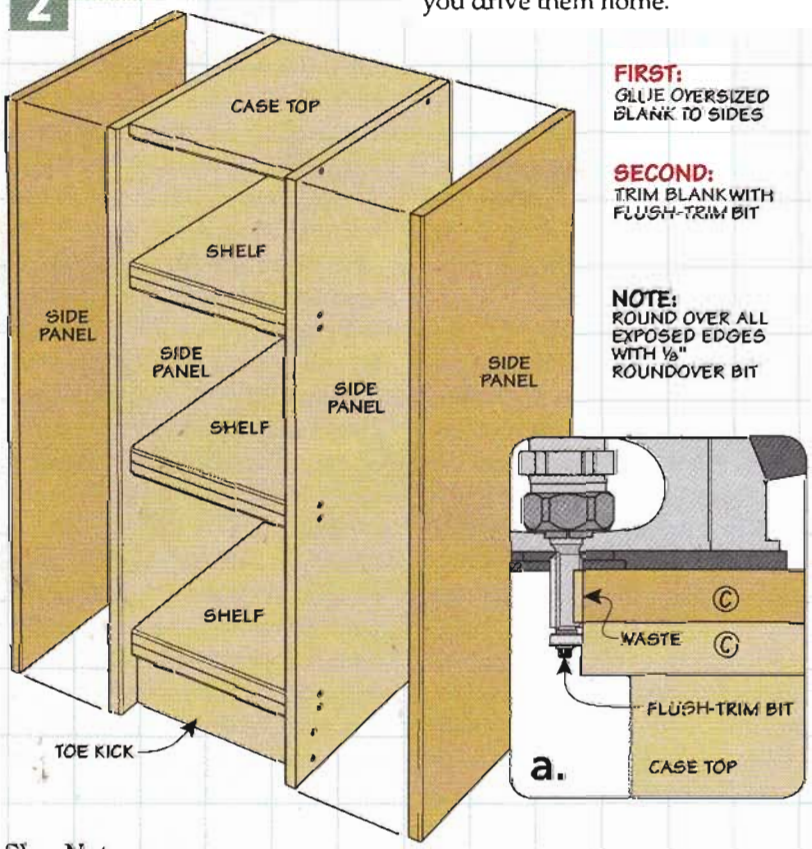
To locate the bottom shelf, I cut two pieces for the toe kick (front and back), as shown in Figure 1. After the bottom shelf is fastened to the sides, I used a pair of spacers to position the other two shelves.

Finally, to hide all of the screws and add more mass, glue an oversized blank to each side. As before, use a flush-trim bit to cut away the waste around the edges. That leaves you with the double-layer sides, as you can see in Figure 2.

ShopNotes GO ONLINE EXTRAS

To download a 3-D model of the vise stand, go to: ShopNotes.com

2 FIGURE



Materials & Hardware

A	Shelves (3)	11 x 15¼ - 1½ MDF
B	Case Top (1)	11 x 15¼ - ¾ MDF
C	Sides Panels (4)	16¼ x 34 - ¾ MDF
D	Toe Kicks (2)	3 x 11 - ¾ MDF
E	Top (1)	17¼ x 18 - 2¼ MDF
F	Rim (1)	17¼ x 18 - ¾ MDF
G	Back (1)	18 x 40 - ¾ MDF

NOTE: All parts can be cut from 1½ sheets of MDF

HARDWARE

- (60) #8 x 1½" Fh Woodscrews
- (4) ⅜" x 2½" Lag Screws w/Washers

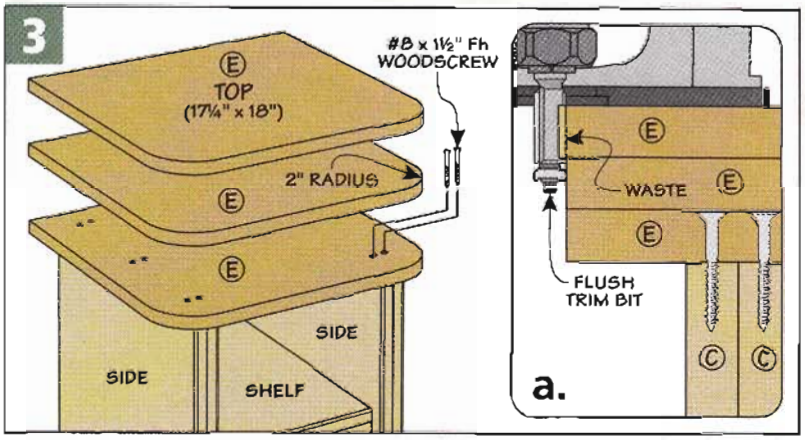
adding a Top & Back

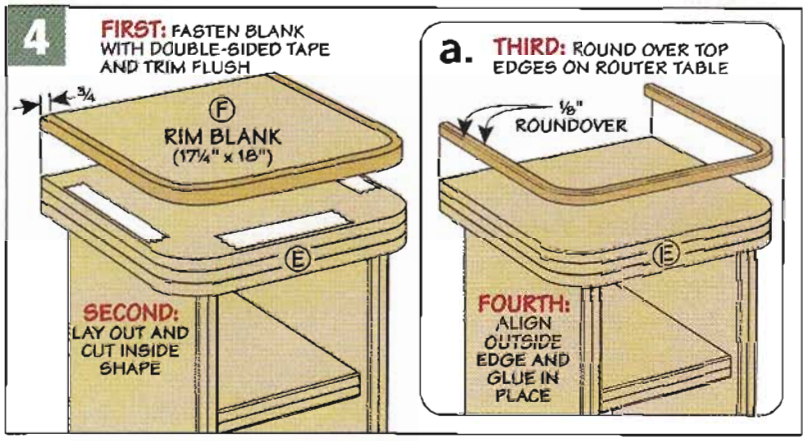
Even though the case of the vise stand is pretty heavy, I added even more mass with a built-up top. The top is made from three layers of MDF. It provides a solid platform for mounting your bench vise. Finally, to keep your tools from rolling off onto the floor, the top has a rim around the edge.

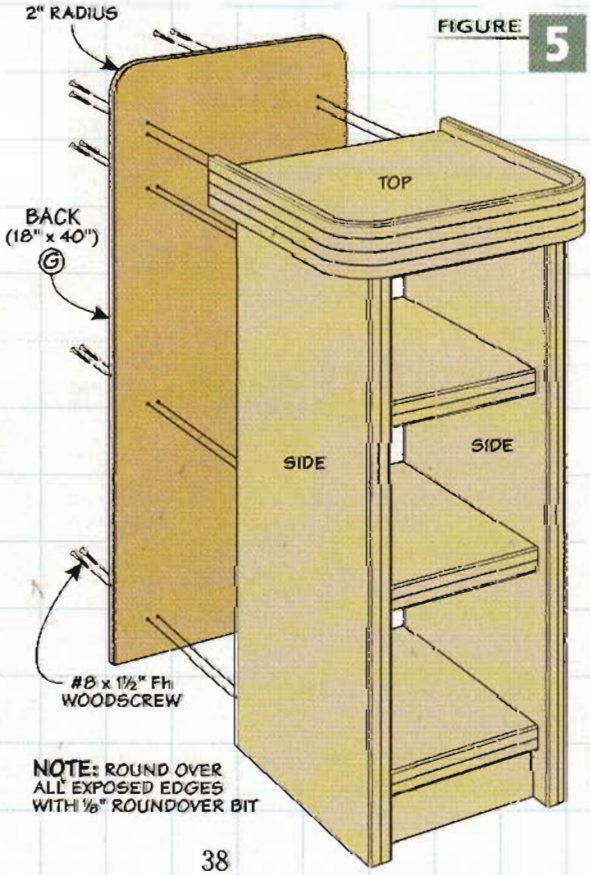
Three-Layer Glueup. Gluing up the top is a pretty simple process. The first layer is anchored to the cabinet and serves as a template for the other two layers and the narrow rim you'll add later.

To start, I cut the first layer to size and shape, carefully sanding the edges smooth. Then you can fasten it to the cabinet with screws, as shown in Figure 3.

Flush Trimming. Using the first layer as a template, trace the shape onto three oversized blanks that will create the other two layers for the top and later, the rim. Cut close to the line then carefully glue the second layer to the first.







Using a hand-held router fitted with a flush-trim bit, clean up the edges. Just repeat this process for the final layer of the top.

Adding a Rim. In Figure 4, you see the rim I added. The construction again starts out with an oversized blank. You've already traced the outside shape using the top as a template. But this time, instead of gluing the blank to the top, temporarily attach it using double-sided tape. Then trim is flush as you did before.

Shaping the Inside. At this point, you're ready to lay out the inside shape of the rim. To do this, mark a line ¾" in from the outside edges. After removing the blank and tape from the top, head to the band saw to remove the waste on the inside. You'll need to be careful as you do this. The resulting thin strip will be fragile.

After some careful sanding, it's time to round over the top edges and attach the rim to the top with yellow glue. The goal here is to clamp the rim in place so it's lined up and flush along the outside edge of the top (Figure 4a).

Solid Back Panel. While the glue is drying, start on the back. It's simply a panel cut to shape then fastened with screws into the top and cabinet, as illustrated in Figure 5. The panel is flush with the bottom of the cabinet and centered side-to-side. It overlaps the sides to create flanges you'll use later to fasten the stand to the wall.

Prime & Paint. Painting the vise stand not only makes it look better, but makes it easier to wipe off dirt and grime. I sealed the porous edges with drywall compound and sanded them smooth before brushing on a coat of primer. After a couple coats of paint, you're ready to find a home for the stand.

Solid & Secure. The best place to locate the stand is a permanent spot in your shop where you can securely fasten it to the wall. Then, after mounting your vise with a few lag screws, be sure to take a look at the accessories on the next page to make the stand more useful.

Custom Tool Holders

You'll gain quite a bit of storage space with the three shelves of the vise stand. But for keeping your often-used tools readily accessible, you can make the custom tool holders you see on the right. They make use of the real estate on the sides of the vise stand.

All of the racks are made from ¾" plywood. Their simple construction means you can make a variety of racks to fit your tool selection. A couple of screws are all you need to fasten them to the sides of the vise stand.

Hammer Storage. The tools I find myself using often at the bench vise are my ball pein hammer and a small mallet. To keep them readily accessible, I made the hammer racks you see at the upper right. They're L-shaped holders with a slot in the top piece. The slot is sized to fit the handle width of your hammer or mallet just under their heads.

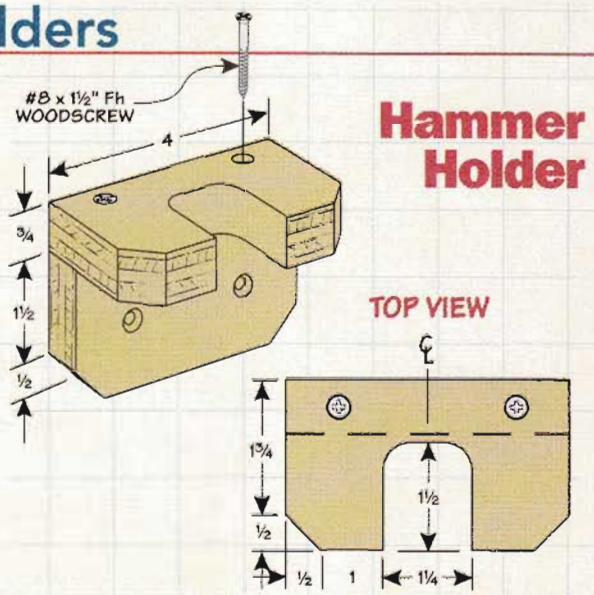
Hack Saw Holder. Another tool I reach for a lot is the hack saw. The holder you see at right consists of two layers of plywood. These layers form a notch for the frame of the saw (the front piece is taller). The ends of the two pieces are angled to match the angle on the saw's frame. This way, the saw will hang straight.

File Rack. My collection of metal files and rasps was beginning to get out of hand, so this rack is a welcome addition (bottom right photo). The rack keeps the files organized and prevents them from banging against one another, which can dull them.

The dimensions shown in the drawing are just a guide. Be sure to size the slots for your files. And the rack can be made longer or shorter to match your set of files. Note: If your files don't have handles, you'll find them at most hardware stores or home centers.

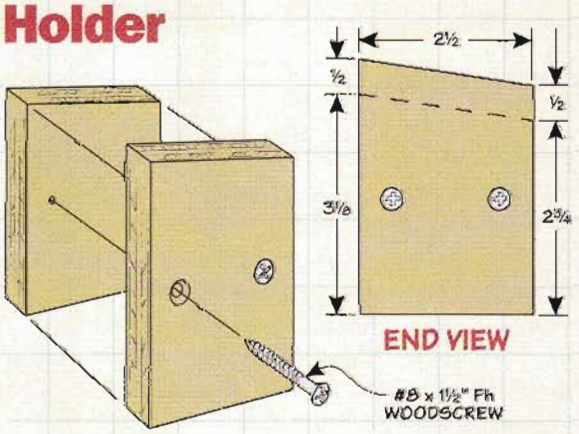
As you can see, with just a little extra time, it's easy to keep those essential tools within easy reach.

Hammer Holder



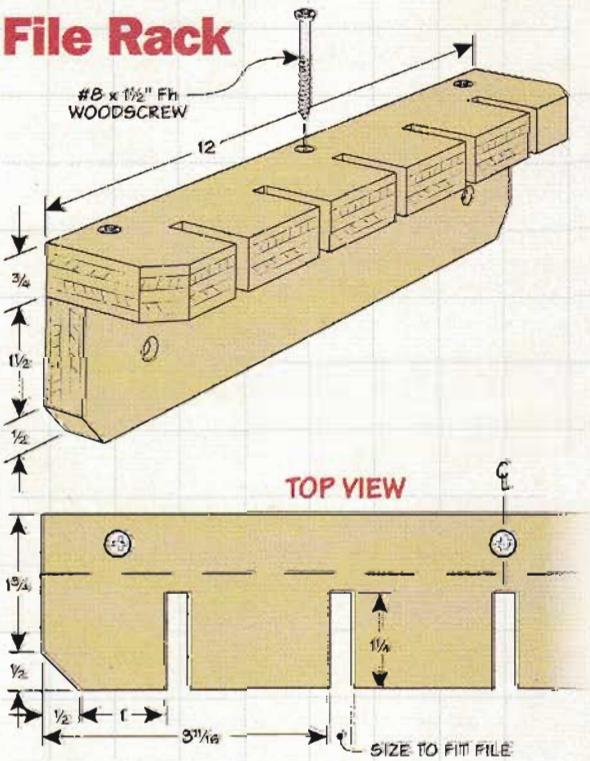
▲ ***Hammers & Mallets.*** *These simple L-shaped racks keep your hammers within reach.*

Hack Saw Holder



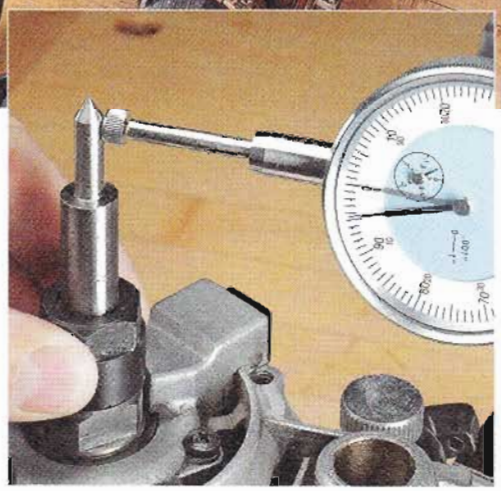
▲ ***Hack Saw Storage.*** *Keep this often-used tool close at hand with this lipped support.*

File Rack



▲ ***Storage & Protection.*** *Protect the cutting edges of your files by storing them in this rack.*

replacing Router Bearings



Give your router new life and get better results using some inexpensive parts and a little time in your shop.

Your router is really a pretty simple machine. Its motor includes an armature and windings on a shaft that spins in a bearing at each end. But over time, these bearings can wear out, resulting in a noisier router and rough cuts.

To replace the bearings, you can take the router to a service center and pay for an hour's labor plus the cost of new bearings. But if you're mechanically inclined and have a little time, you can do the job yourself. All you need is a set of new bearings and a few simple tools (refer to Sources on page 51).

Symptoms. As I mentioned, the signs of worn-out bearings include more noise than usual and a chatter that results in a rough cut. If you have access to a dial indicator, you can check the runout (inset photo at right). This measures the amount of "slop" or wobble in the shaft (0.0045", in my case). Just be sure to clean the collet first to get an accurate reading. Your router's manufacturer or service center will have guidelines for the maximum allowable runout.

Bearings. When it's time to buy new bearings, I order them from an authorized service center or online repair facility. This way, you're sure they meet the same quality specifications as the originals.

If you're having trouble finding bearings, you can often pick up replacements at an auto parts store. Take your old bearings with you so they can match the diameters and speed rating. They can also cross-reference the numbers on the bearings to find the right ones (photos at left).

Router Disassembly. Besides the bearings, the most important tool for taking your router apart is the parts diagram. You can find this in the owner's manual or online. This helps you remember how everything goes back together. And it lists the part numbers you need to order bearings.

Two Bearing Locations. When taking your router apart (with it unplugged), you'll find one of two configurations. The bearings will either be pressed onto the shaft of the motor or into the housing.

Use Care. The most important thing to remember is to be kind to the bearings and shaft. If you try to pry off the bearings or beat on the shaft with a metal hammer, you're likely to cause some damage. It's best to take your time and use the right tools for the job.

Bearings in the Housing. On many routers, the bearings are located in the top and bottom

▲ **New Bearings.** *Make sure the new bearings meet the size and speed specifications for your router.*

halves of the housing (main photo). To remove them, use a short length of dowel slightly smaller in diameter than the opening in the housing. Gently tap the old bearings out of the housing from the back side (near photo at right).

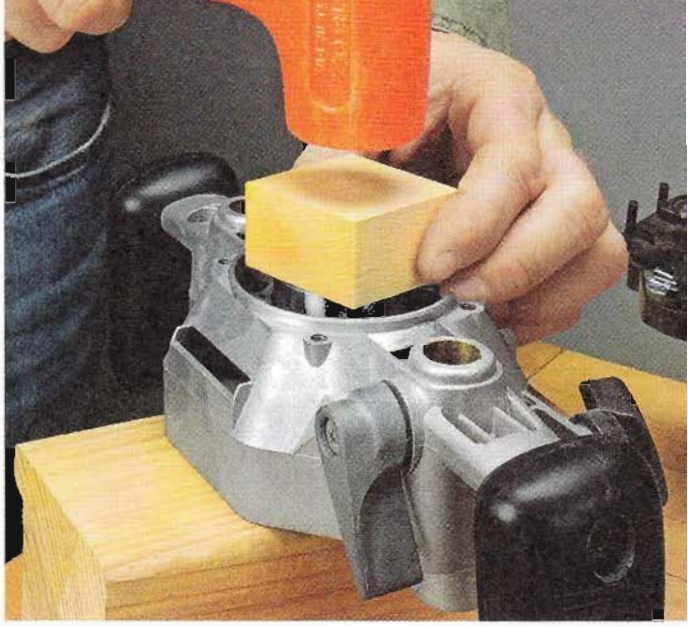
Then, after cleaning the housing to remove dust and dirt, you can gently tap the new bearing into place using a block of wood sized to fit over the outer race of the bearing (right photo). The important thing is to be gentle and make sure the bearing goes in straight.

Shaft Bearings. Removing the bearings on some routers requires a couple of different techniques and an inexpensive gear puller (box below). But before you begin, you may need to remove the collet from the shaft. An impact wrench is the best tool for the job.

With the router disassembled, you'll find that the top bearing is pressed onto the shaft. To remove it, use a two-jaw gear puller. The hooked jaws engage the underside of the bearing. Simply twist the handle to pull it off the shaft.

Lower Bearing. The lower bearing (arbor end) resides in the housing and is held in place with a snap ring. To get access to the ring to remove it, simply tap the end of the shaft with a rubber mallet to remove the armature assembly. After removing the snap ring, tap the bearing free using the dowel technique I mentioned before.

▲ ***Tapped Out.*** *A dowel sized to fit the housing opening is perfect for tapping out the bearing.*



▲ ***Tapped In.*** *Cut a wood block to fit over the outer race of the new bearing. When tapping it home, make sure the bearing is going in straight.*

New Bearings. Replacing the bearings goes a little easier. To press the top bearing onto the shaft, start by placing the bearing at the end of the shaft. Then, to seat it, make a small wood block with a hole drilled to fit over the shaft, as you can see in the margin inset below. The block is sized to fit over the entire bearing. With the block in place, *gently* tap the bearing until it seats against the shoulder on the shaft. Again, just exercise care to make sure it's straight.

Reassemble and Rout. Now it's time to carefully reassemble the router, using the parts diagram for reference. Once everything is secure, spin the shaft to make sure it rotates freely. Then you can plug in the router and get to work.

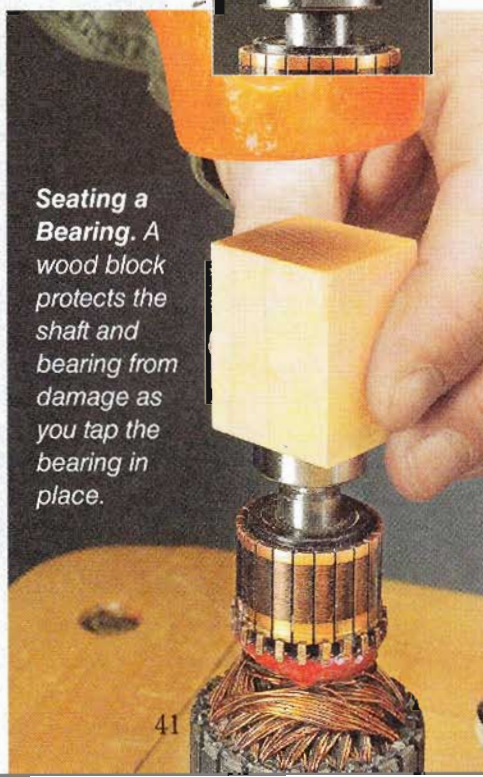
specialized Tools

The key to removing router bearings is having the right tools and a little patience. For shaft-mounted bearings, a gear puller does the job with little effort (left photo).

Some bearings are held in place with a snap ring. To remove it, you'll need a pair of snap ring pliers. The ones with interchangeable tips work for both internal and external rings. You can see some in use in the left inset photo.

Finally, you'll need a custom-made wood block, like the one shown in the far right photo and inset. It will help seat the bearings without causing damage.

▲ ***Removing Bearings.*** *Some inexpensive, but specialized tools, like a gear puller and snap ring pliers, make quick work out of removing bearings.*



Seating a Bearing. *A wood block protects the shaft and bearing from damage as you tap the bearing in place.*

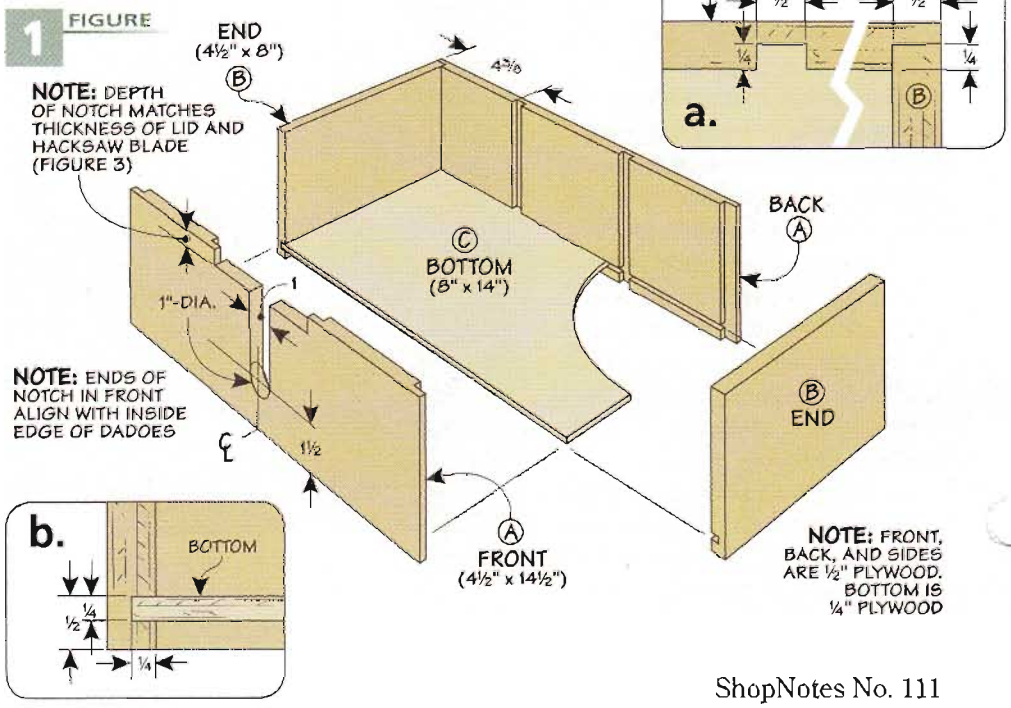
weekend project

top-notch Sanding Tote

Keep all your sanding supplies within easy reach with this handy tote.

Sanding is an important step in any project. It's not only your last opportunity to smooth joints and surfaces, but also it prepares the project for a finish. While it's not my favorite task, it's a little more enjoyable when I have all my supplies organized and close at hand. That's why I built this handy tote. Besides holding rolls of sandpaper and accessories, there's a lidded compartment with a built-in cutter.

Sizing the Tote. The tote is sized for rolls of pressure-sensitive adhesive sandpaper (up to 3¾" diameter). To allow for the sandpaper rolls and the joinery, I cut the front, back, ends, and dividers to the sizes shown in Figures 1 and 2.



Some basic joinery is the next order of business. A pair of rabbets and dadoes in the front and back are what you'll need here to accept the ends and dividers. They're sized to match the thickness of the plywood I used for the tote, as detailed in Figures 1 and 1a.

There's a little more work left to complete the front. First, to provide easy access to the center compartment, I cut a long, centered slot across the width of the front (Figure 1). And to allow the lid to rest flush with the top edge, there's a shallow notch. The ends of the notch align with the inside edge of each dado. And the depth matches the thickness of the lid and a short section of hacksaw blade.

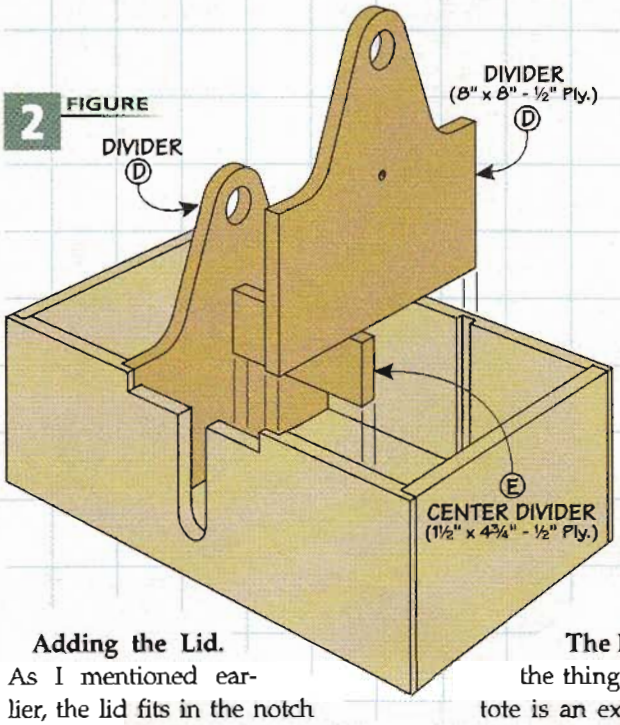
You're just about ready to assemble the basic case. But first, you'll need to cut a groove near the bottom edge of all of the pieces for the ¼" plywood bottom (Figure 1b). After sizing the bottom, go ahead and assemble the tote.

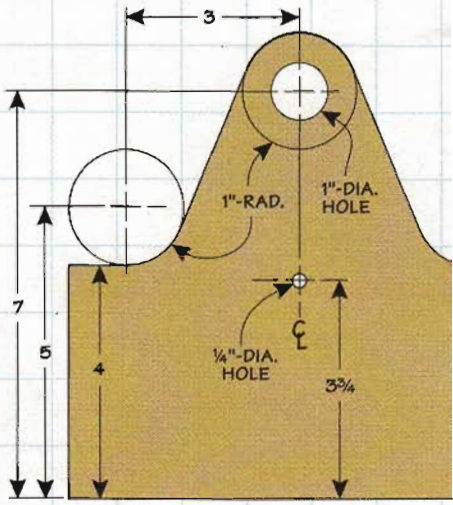
Making Compartments. Creating separate compartments in the tote is taken care of by the pair of dividers you cut to size earlier (Figure 2). They fit between the front and back of the tote. But they're taller than the rest of the tote to provide clearance for the handle you'll add later.

Before shaping the dividers, you'll want to drill two pairs of holes. One pair of holes is for the handle. The other pair accepts two short dowels that act as pivot pins for the lid. To ensure the mating holes lined up, I stacked the dividers together and drilled the holes at my drill press.

Shaping the dividers comes next. To do this, you'll need to lay out the curved shape along the top. A band saw (or jig saw) makes quick work of cutting the dividers to shape. After sanding the edges smooth, they're ready to install.

To corral the sandpaper in the cutting bin, I cut a short divider to size and glued it between the dividers, centered from front to back, as detailed in Figures 2 and 3b.





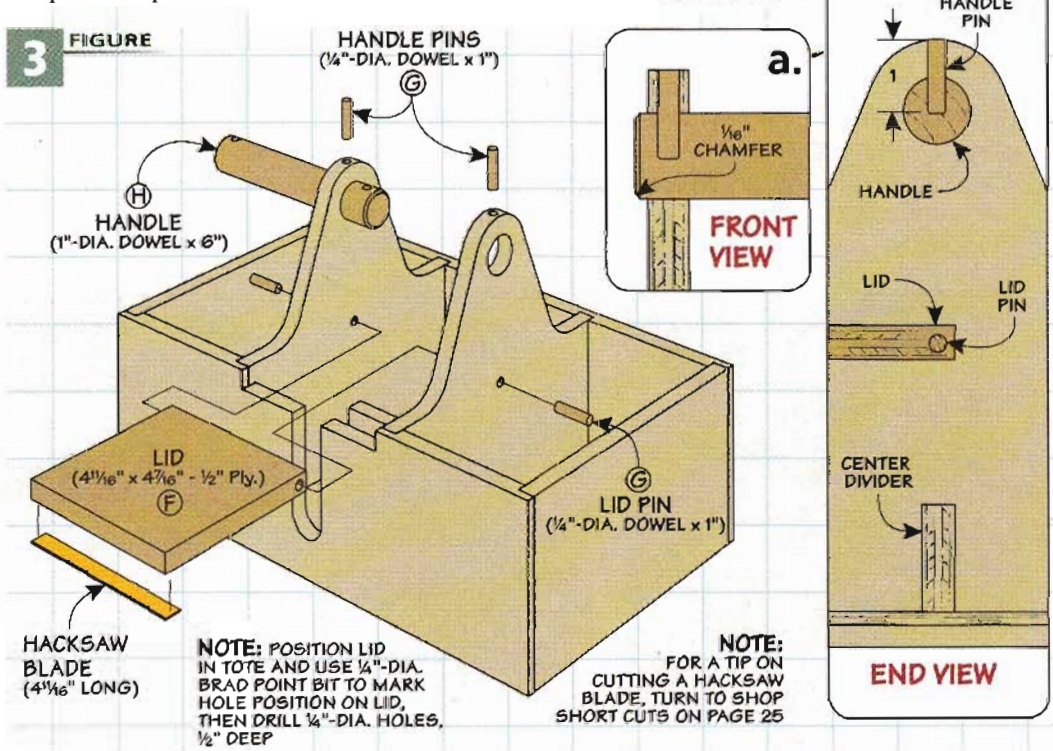
DIVIDER LAYOUT

Adding the Lid. As I mentioned earlier, the lid fits in the notch cut in the front. For clearance, the width of the lid is 1/16" less than the width of the notch. And it's sized in length so it's flush with the front of the tote once it's pinned in place. Then to trim the sandpaper to size during use, I attached a section of hacksaw blade to the bottom front edge with epoxy, as in Figure 3.

Installing the lid requires drilling holes near the back edge for a couple of short dowels (Figure 3). To ensure that the lid pivots smoothly, add a dab of glue to the holes in the lid only and then tap the pins into place.

The Handle. One of the things that defines a tote is an exposed, integral handle. The one for this tote is sized to extend past the outside faces of the dividers. To prevent it from turning or sliding out of the holes, it's pinned in place (Figure 3). I eased the ends by routing a small chamfer, like you see in Figure 3a. For more on this, turn to Shop Short Cuts on page 24.

After applying a finish and letting it dry, you can gather up your sanding supplies and store them in their new home. With a convenient way to transport everything right where you need it, sanding is certain to be less of a chore.



anatomy of a Bench Vise

This accessory is a must-have in any shop. Here's what you need to know about this shop workhorse.

If there's one fixture every shop should have, it's a good bench vise (sometimes called a machinist's vise). While it's not a "woodworking" tool, when it comes to clamping and holding, a bench vise is the tool of choice. As you can see in the photos, its versatility makes it the go-to tool for lending a hand with many shop tasks.

If you're shopping for a vise, you'll quickly discover a wide array of choices. To help you find the right vise for your shop, I'll point out a few of the features that have proven useful in my shop.

Heavy to Light. One of the first things to consider when looking for a vise is its classification. By this I mean whether it's a heavy, medium, or light-duty vise.

Heavy-duty vises are designed for production shops where they get used and often abused all day long. You'll pay a premium price for one (up to several hundred dollars) because of their size and additional weight.

Light-duty vises are designed for hobby and craft work. For the uses in my shop, a medium-duty vise has the right blend of performance and cost.

Size. Within each classification, you'll find a range of sizes. The size of

▼ ***Anvil.*** *A flat, machined surface behind the rear jaw is perfect for peening rivets.*

▲ ***Pipe Jaws.*** *A secondary set of jaws on this vise can be used to hold pipes or rods.*

a vise usually refers to the width of the jaws. But the overall size of the vise also dictates the total capacity and throat depth. You can see what I mean in the drawing at right. I've found that a vise with a 4" to 6" jaw width is about right for most shop tasks.

Total Capacity. As I mentioned, you'll also want to know the maximum opening. This determines how large a workpiece you can hold between the jaws.

Throat Depth. The final size consideration is the depth of the throat. This is measured from the top of the jaw to the top of the front jaw beam that covers the screw (detail drawing at right).

Swivel Base. The next feature worth noting is the type of base. Is it fixed or does it swivel? For me, the convenience of a swivel base is worth the few extra dollars. With a swivel base, you can pivot the jaws of the vise to provide the most convenient access to the workpiece.

Anvil. If you take a look at the photos and drawing, you'll see a machined platform located behind the rear jaw. This anvil area provides a solid, flat surface for peening rivets or straightening a kink in sheet metal (bottom left photo on the opposite page).

Pipe Jaws. There's one other feature you'll want to consider. If you look at the bottom right photos on the opposite page, you'll notice a pair of curved pipe jaws. Most vises incorporate this style of jaws since they make working with round stock much easier. The "teeth" of the jaws securely grip pipe or conduit.

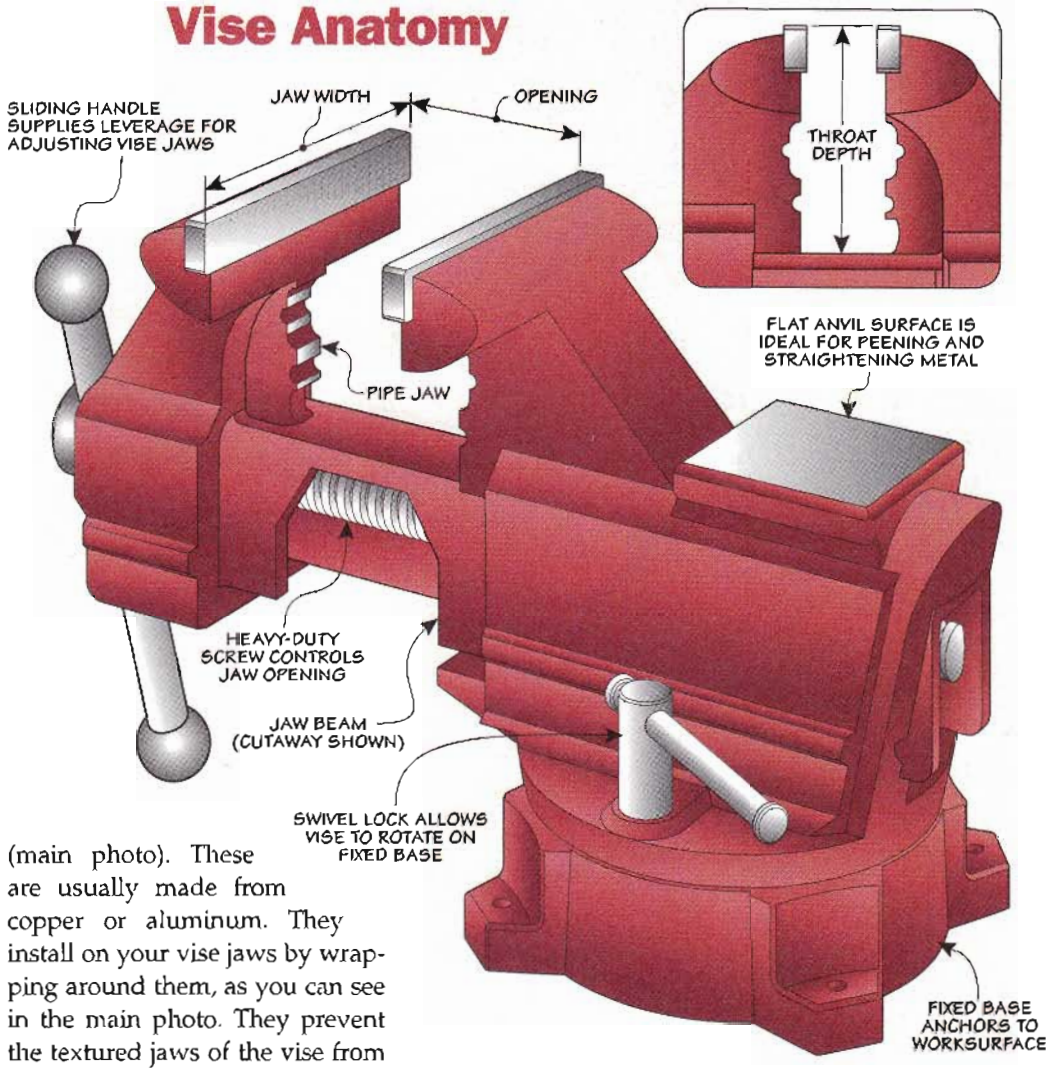
Auxiliary Jaws. While I'm on the subject of vise jaws, I want to mention a couple of other things. Better quality vises have interchangeable jaws. By removing a couple of screws, you can replace the textured jaws with smooth-faced or grooved jaws for holding various materials.

Jaw Liners. A less-expensive option and accessory worth having is a pair of commercial jaw liners (main photo). These are usually made from copper or aluminum. They install on your vise jaws by wrapping around them, as you can see in the main photo. They prevent the textured jaws of the vise from marring your workpiece. Some other options are shown below.

Shop-Made Liners. For an even more cost-effective option, you can make your own jaw liners out of plywood or hardwood. To find out more, check out the Online Extras at ShopNotes.com.

Solid Footing. No matter which vise you use, it needs to be installed on a solid worksurface. I like to make sure the bench or stand is securely anchored to the wall or floor so it can't move. With all the pounding, sawing, and heavy use you're sure to give it, you'll want a vise and worksurface that will stand up to the task. You can find a great solution in the vise stand, starting on page 36.

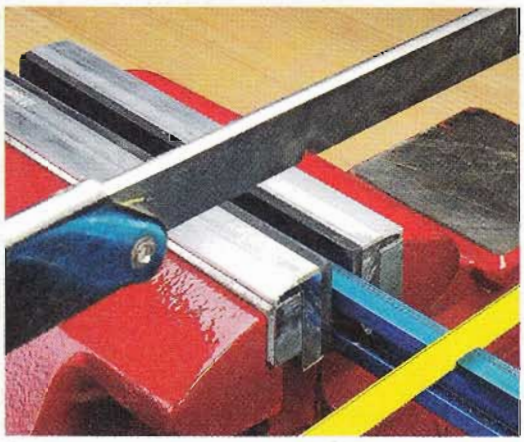
Vise Anatomy



ShopNotes GO ONLINE EXTRAS

To see design options for jaw liners, go to: ShopNotes.com

▲ ***Grooved Jaws.*** *Sets of vertical grooves and horizontal grooves make it easier to hold round objects.*



▲ ***Soft Lining.*** *Rubber-faced jaws securely hold your workpiece without marring or scratching soft surfaces.*

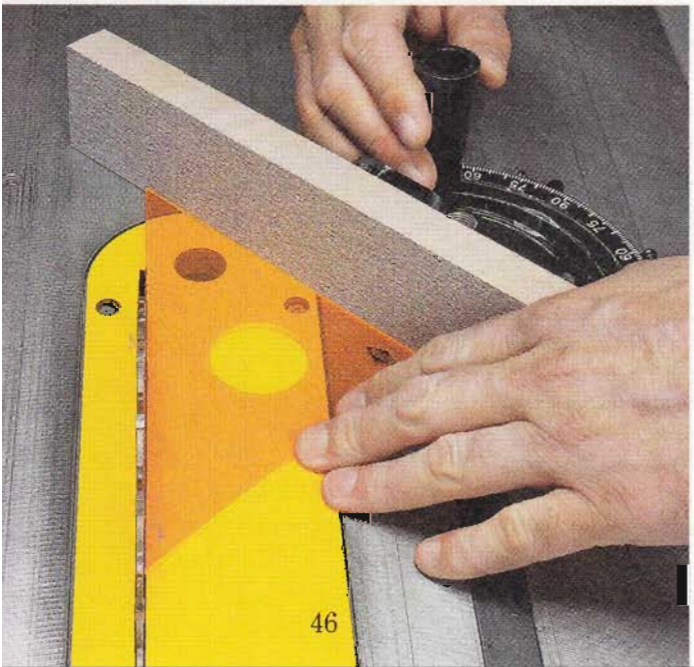
MASTERING THE
Table Saw

must-have accessories for Perfect Cuts

These handy tools help you make accurate cuts quickly and safely.

▲ ***Accurate Crosscuts.*** *The fine graduations on a steel ruler let you set a stop block precisely.*

Of all the tools in my shop, I probably spend the most time at the table saw. And in the process of cutting workpieces for a project, I rely on a handful of tools and accessories to make accurate and safe cuts. Since I use these items all the time, I always keep them close at hand near my table saw.



◀ ***Miters Made Easy.*** *Inexpensive drafting squares save time in setting the miter gauge.*

6" & 12" Rules. The first tools I'd like to talk about are a pair of metal rules. I like to use the kind with etched markings instead of stamped. The etched markings are a lot finer and more accurate.

You can buy metal rules in lengths up to 24", but I find a 6" and 12" rule to be the most useful. They come in handy for a variety of tasks. I use them to do quick layout work right at the saw.

The photos above show another common use for the rules. For instance, you can accurately set a stop block for crosscutting parts.

The rules also make great straightedges. Besides checking the flatness of a board, I use a rule to adjust the throat insert so it's flush with the saw table.

Drafting Squares. Most of the cuts I make at the table saw are square cuts. But when I do need to make angled cuts, I don't trust the markings and accuracy of my stock miter gauge or blade angle indicator on the saw.

Instead, I check and set the miter gauge and blade angle using plastic drafting triangles, as you can see in the lower left photo. You can get these at almost any office supply or art store. They're available in pairs that include a 45° triangle or a 30°-60°-90° triangle.

There's one thing I need to point out. When you're setting the angle of your miter gauge, be sure to reference the edge of the triangle against the plate of the saw blade. This way, the setting won't be thrown off by the teeth.

Digital Angle Gauge. I like to keep things simple when it comes to tools. So I don't usually fall for gadgets. However, I did add one "high-tech" tool to my table saw kit. It's a small, magnetic digital angle gauge, as shown in

▲ **Dead-On Angles.** *A digital angle gauge makes it easy to accurately set the blade angle. It's more precise than the angle indicator on your saw.*

▲ **Dust Free.** *A few blasts from a can of compressed air keeps dust from spoiling a cut. Use it to clear dust away from the rip fence and miter gauge.*

the photo above. I can attach it directly to the saw blade and just watch the readout until I get the blade tilted just right.

Pencil. On the other hand, one low-tech tool you'll always find on my table saw is a pencil. Besides basic layout, a pencil serves another important function at my table saw. I use it to mark the waste portion of a cut. This makes cutting joinery like dadoes, grooves, and miters a little more foolproof.

For increased accuracy, I turn to a mechanical pencil. The lead is always sharp and it draws a fine line for laying out precise cuts.

Sticky Notes. Along with a pencil, you'll always find a small pad of sticky notes on the top of my rip fence (left photo below). I'll use it to keep track of parts or do some quick calculations. And since my shop time is often interrupted, I can leave myself a note about a setup or the next step in a process.

Compressed Air. Take a quick look around my shop and you can easily see I'm not a neat freak — except when comes to my table saw. Dust and chips affect the accuracy of a cut. For example, dust along the edge of the rip fence can keep a board from making contact and leading to an inaccurate cut. So I keep a can of compressed air close at hand to blow away debris (right photo above).

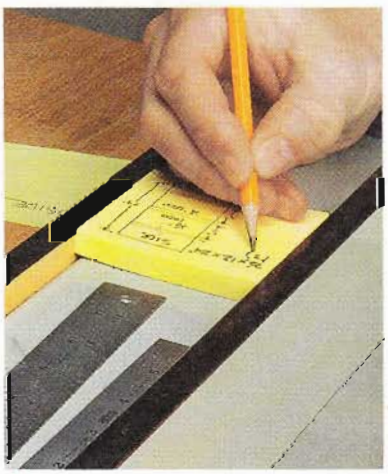
Masking Tape. One unlikely accessory I have at my table saw is a roll of blue masking tape. It comes in handy as a shim to tweak a cut (center photo below).

Since it doesn't leave a residue (like ordinary masking tape), you can also use it to wrap up like parts or label parts to avoid confusion.

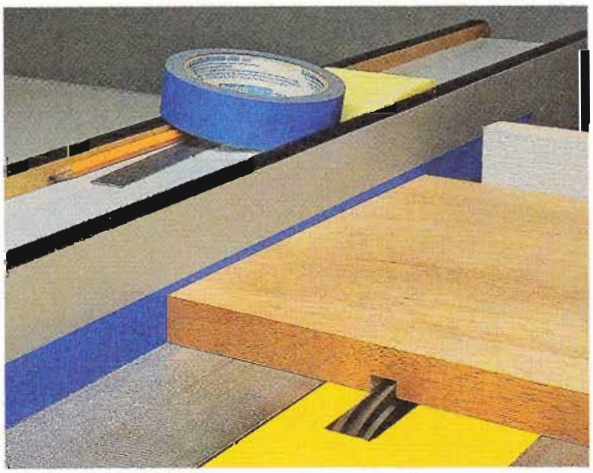
Set-Up Blocks. One final table saw tool is a set of set-up blocks, like you see in the right photo below. I use them to set the rip fence for precisely locating dadoes and grooves close to the edge of a workpiece. And for me, they're more accurate than using a ruler to set the blade height.

As you can see, these tools save time and help you make clean, accurate, and safe cuts. And that will lead to better projects.

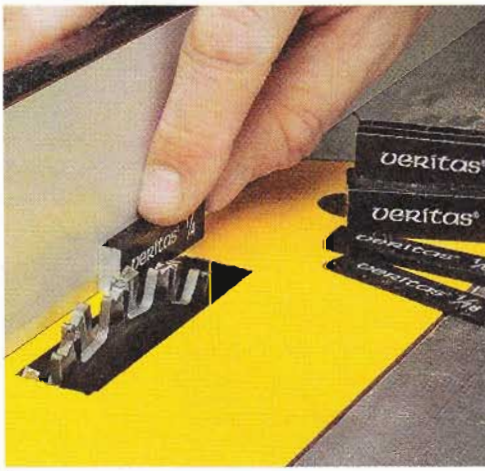
▲ **Layout Tool.** *You can never have too many pencils in your workshop.*



▲ **Taking Note.** *To keep track of parts and setups, a small notepad comes in handy.*



▲ **Fine-Tune A Joint.** *Adding a layer or two of masking tape to your rip fence allows you to zero in on the size of a joint to create a snug fit*



▲ **Precise Position.** *Set-up blocks let you accurately set the rip fence for cutting grooves and dadoes.*

These simple straightedge guides provide accuracy and ease of use for a wide range of shop tasks.

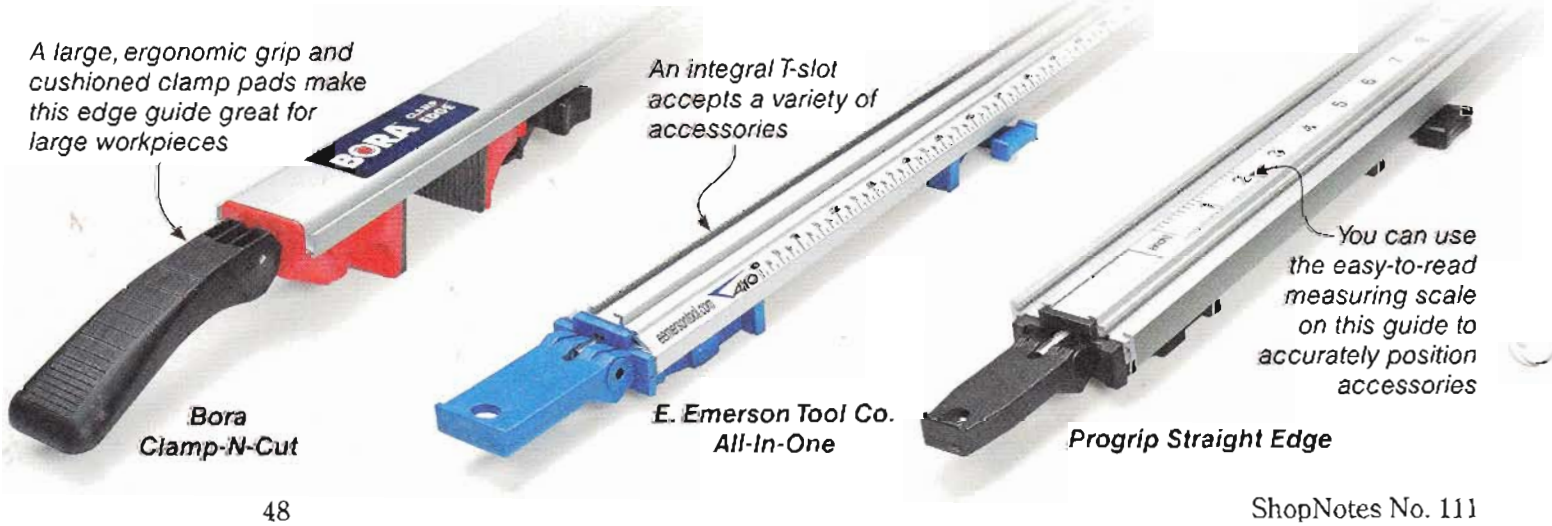
clamp-on Straightedge Guides

When it comes to making straight, accurate cuts, circular saws and jig saws certainly have their limitations. And routing dadoes and grooves without something to guide the router is impossible.

Straightedge Guides. A great option for guiding many tools is a straightedge clamping guide, like the ones shown below. This group includes *Bora's Clamp-N-Cut*, *E. Emerson Tool Co.'s All-In-One*, and *Progrip's Straight Edge*. Sources for straightedge guides are on page 51.

How They Work. With slight variations, all three share a similar design. Each guide has an extruded aluminum rail with two clamping jaws, one fixed and one adjustable. Just a flip of the cam-action lever clamps the guide tight to a workpiece, providing a smooth, straight bearing surface for a tool to ride against. A variety of handy accessories make them even more useful (more on this later).

Choose the Right Length. Buying the longest guide available might seem like the best choice, since you can clamp it to a wide range of workpieces. But it can be a challenge trying to work around a long guide on smaller pieces. So, I've found that a 24" or 36" guide provides plenty of capacity.



CLAMP-N-CUT

One clamping guide with some unique features is the *Clamp-N-Cut* edge guide. The first things you notice about it are the large, easy-to-grip locking lever and the extra-large clamping jaws (main photo and far left on the previous page).

The extra-long handle makes it easy to apply clamping pressure. And the jaws (which are 1½" deep) clamp to a wide range of workpiece thicknesses. But when clamping across thin stock, the jaws can get in the way. To get around this, you'll have to prop your workpiece up off the bench so the rails will sit flush on top of the workpiece.

Swivel Head. Another thing that makes this clamp unique is the swiveling jaw. With it, you can clamp it securely up to a 22° angle. This makes it easier to cut tapers or bevels across a workpiece.

ALL-IN-ONE

Some clamp-on guides can do more than just act as a straight edge for power tools. For example, the *All-In-One* clamp guide. It has a centered T-slot that accepts a variety of accessories like circular saw and router carriages and adjustable stop blocks (photo at right).

Low-Profile Pads. The other thing I like about the *All-In-One* guide is the low-profile integral clamp pads. The pads have extra-wide jaws that allow you to clamp firmly onto a workpiece and help square up the guide rail. This is a nice feature that helps save a lot of fumbling around during setup.

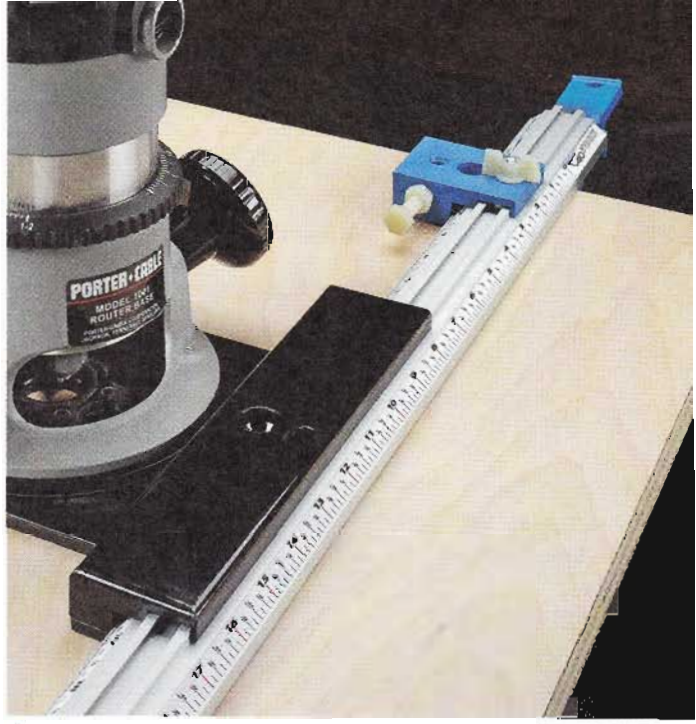
STRAIGHT EDGE

The other straightedge guide I want to talk about is the *Straight Edge* clamp. Although it looks a lot like the other guides, it takes the concept of accessories to a new level. You can see a few of them in the photos at left and below. A set of drilling guides lets you drill precise holes with a hand drill. And a featherboard turns the edge guide into a handy router table accessory. Like the *All-in-One* guide the *Straight Edge* has a scale to accurately position the accessories.

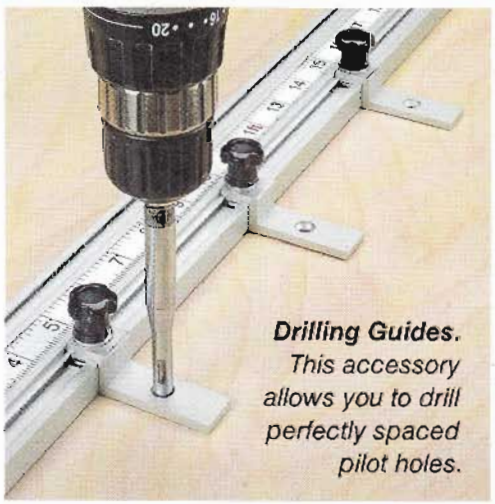
There's one other thing you can do with the twin T-slots in the *Straight Edge*. The slots also accept a set of four "connectors" that can turn two guides into a single back-to-back edge clamp. If you take a look at the lower right photo, you'll see what I'm talking about.

Back-to-back clamps turn any worksurface in your shop into a large, surface vise. This is especially nice for gluing up large panels, sanding, routing, or even assembling a project.

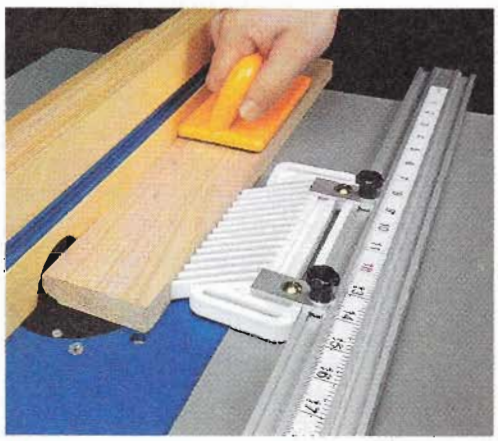
Clamping guides are low-cost, versatile, and easy-to-use shop accessories. Best of all, they greatly improve the accuracy of your hand-held power tools.



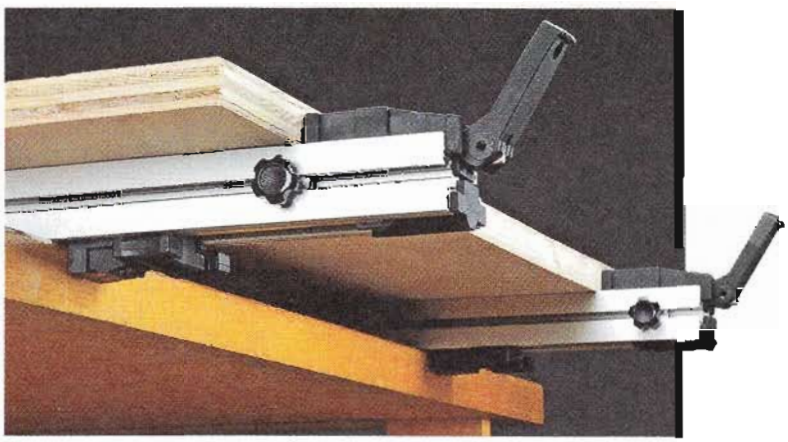
▲ ***Added Versatility.*** *An integrated T-slot on the top of the All-In-One guide makes it easy to use optional accessories like a router base and a stop.*



Drilling Guides. *This accessory allows you to drill perfectly spaced pilot holes.*



▲ ***Safety Feature.*** *Lock down the edge guide and add a featherboard to hold a workpiece securely against the fence while routing.*



▲ ***Back to Back.*** *With simple connectors, you can attach one edge clamp to almost any worksurface in your shop. Then secure a workpiece in the upper edge clamp.*

Q&A

questions from
Our Readers

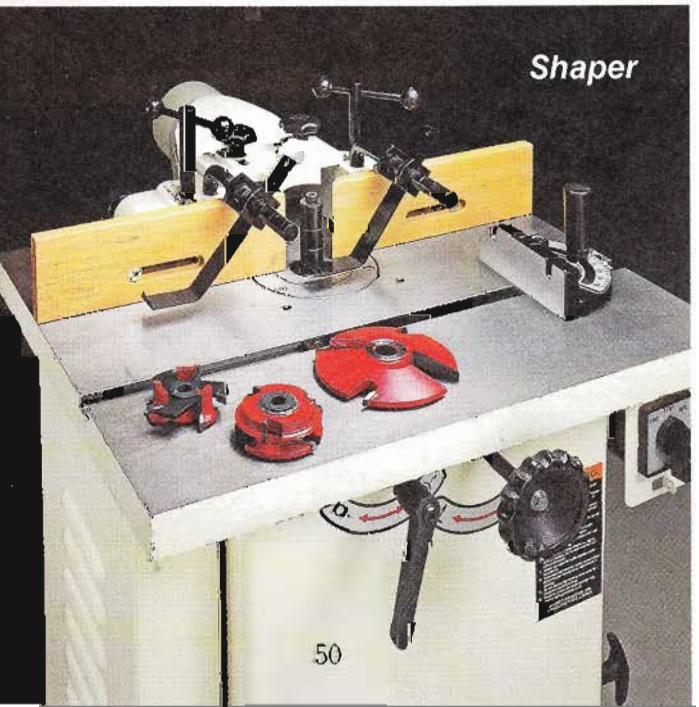
the options for Shaping Wood

By the time you add up the costs of a router, router lift, and router table, it seems as though a shaper would be a better buy. Yet, I never see any mention of this as an option. What am I missing?

Brent E. Snyder
via email

At first glance, the cost of a fully equipped router table, like the one you see above, can certainly approach that of an introductory level shaper, similar to the one below. But there are other things to consider before making a choice.

Versatility. Both tools have the capability to create simple or complex profiles on the edge of a workpiece. And when it comes to precision joinery, like making rail and stile joints for a set of doors, you can accomplish the task with either tool. Since they're both versatile tools, how do you go about choosing one over the other?



Quantity. Much of the decision rests on the quantity of work you do. Are you making a custom project or a hundreds of feet of molding? Do you have an entire set of frame and panel doors for a kitchen or a single, small box to build? The answers to these kinds of questions will point you in one direction or the other.

For the most part, a shaper is a tool designed for production use. It's induction motor and heavy-duty design are meant to work from sunup to sundown. It'll handle hundreds of feet of stock without a problem.

A router installed in a table can be used to accomplish the same tasks, but you'll be making it (and yourself) work harder. And the universal motor is certainly louder and less efficient in comparison.

Profile Choices. When it comes to choosing profiles, you'll find a wide variety for either a router or shaper. But one consideration is cost. As a general rule, a shaper cutter will cost more for the same profile. So putting together a basic set of cutters is going to require a significantly higher outlay than a set of similar router bits.

Operating RPM. Speaking of bits and cutters, shaper cutters typically have three cutting edges compared to two on a router bit. And due to the larger diameter cutterhead, you should theoretically end up with a higher-quality cut.

But you also need to remember that a shaper is usually running at a lower speed than a router. So taking into account the profile, RPM, and the feed rate, it's hard to say that one tool or the other will result in the best quality of cut.

The design of a shaper spindle generally excludes making any type of face cut in a workpiece. Now you can use router bits and an adapter in a shaper to get around this. Unfortunately, the slower speed of a shaper may result in a lower-quality cut. On the plus side, shaper cutters are reversible, so you can run the shaper in reverse to minimize tearout on problem workpieces.

Okay, so what's the answer? The truth is, most of us will never have a need for a shaper. But every woodworker needs a router (or two). And while the cost might seem comparable at first, you can easily build a quality router table and fence at low-cost. Add in a router with a built-in height adjustment and you would still have money left over for a good set of quality bits — before even making a dent in the cost of a shaper.

Sources

Most of the materials and supplies you'll need for projects are available at hardware stores or home centers. For specific products or hard-to-find items, take a look at the sources shown below. You'll find each part number listed by the company name. See the right margin for contact information.

The *Woodsmith Store* in Des Moines, Iowa is an authorized *Rockler* dealer. They carry many of the hardware items used in our projects. And they ship nationwide. Their customer service representatives are available for your calls from 8am – 5pm Central Time, Monday through Friday.

BULLNOSE BITS (p.8)

- **Rockler**
  3/8" Roundover Bit 37431
  1/2" Roundover Bit 32104
- **Lee Valley**
  1/2"-dia Full-Radius 16J48.58
  1/2"-dia Half-Radius 16J49.08

SLOW-SETTING GLUES (p.10)

- **Woodsmith Store**
  Titebond Extend (16 oz.) . . . 551050
  Titebond III (8 oz.) 551160
- **Highland Woodworking**
  Old Brown Glue (5 oz.) 166031

RIGHT-ANGLE DRIVES (p.12)

- **McFeely's**
  Taylor R/A Drive RA-5301
- **Amazon**
  Milwaukee R/A Drive . . . 49-22-8510
  Milwaukee 1/4" Chuck . . . 49-22-1560
  Milescraft R/A Drive 1302
  Milescraft Stubby Drill Bits . . . 2320
- **Tight Fit Tools**
  Pro Tool Set: Aircraft Style . . . 00102

FINISHING BOOTH (p.14)

You can find hardware and most of the electrical wiring components at your local hardware store or home center. Other hard-to-find items are listed below.

- **McMaster-Carr**
  Cord Grip 70175K2
  20" x 25" Filters (25) 78435T39
- **drillspot.com**
  Blower 433895
  3' T8 Fluorescent Lamp . . . 2UWU2
- **Rockler**
  5" Locking Swivel Casters . . . 37138
  Folding Shelf Bracket 65798

VISE STAND (p.36)

- **Benjamin Moore Paint**
  Regal Egg. Brilliant Blue . . 2065-30

ROUTER BEARINGS (p.40)

For replacement bearings, check out your local repair center. Online sources are *eReplacementParts.com* or *AceToolRepair.com*. You may find tools from the sources listed below useful for removing bearings.

- **McMaster-Carr**
  2-Jaw Puller 6340K71
- **Harbor Freight**
  Pulley Puller 66868-0VGA

BENCH VISES (p.44)

You can order a variety of accessory vise jaws and jaw liners to fit your vise from *McMaster-Carr*.

TABLE SAW TOOLS (p.46)

- **Lee Valley**
  Veritas Set-Up Blocks . . . 05N58.01
- **Rockler**
  Wixey Digital Angle Gauge . . . 27487

STRAIGHTEDGE GUIDES (p.48)

- **Peachtree Woodworking**
  24" Straight Edge 589
  24" Back-to-Back 581
  Connectors (8 pk.) 594
- **Rockler**
  24" Clamp-N-Cut 29374
  24" All-In-One 30291

MAIL ORDER SOURCES

Woodsmith Store
800-444-7527

Rockler
800-279-4441
rockler.com

Ace Tool Repair
888-901-0446
acetoolrepair.com

Amazon.com

Benjamin Moore
benjaminmoore.com

drillspot.com
720-204-3660

eReplacementParts.com

Harbor Freight
800-423-2567
harborfreight.com

Highland Woodworking
800-241-6748
highlandwoodworking.com

McFeely's
800-443-7937
mcfeelys.com

Lee Valley
800-871-8158
leevalley.com

McMaster-Carr
630-600-3600
mcmaster.com

Peachtree Woodworking
888-512-9069
ptrecusa.com

Tight Fit Tools
800-669-6213
tightfittools.com

ShopNotes

easy-to-build Lazy Susan

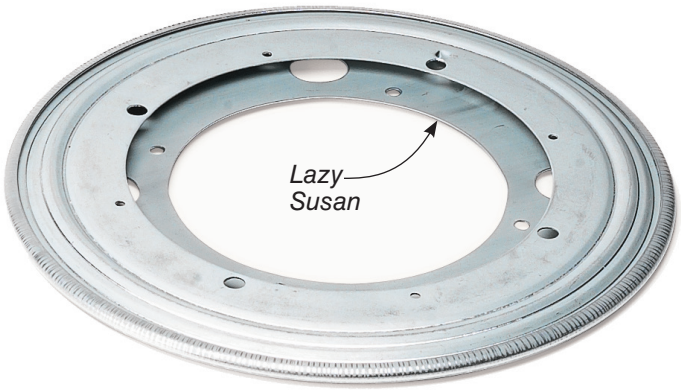
Expand the capabilites of the finishing center with this handy turntable.

The problem with any finishing project is getting to all sides easily without having to handle the project. The solution is a simple lazy Susan turntable, like the one used in the finishing center (photo above).

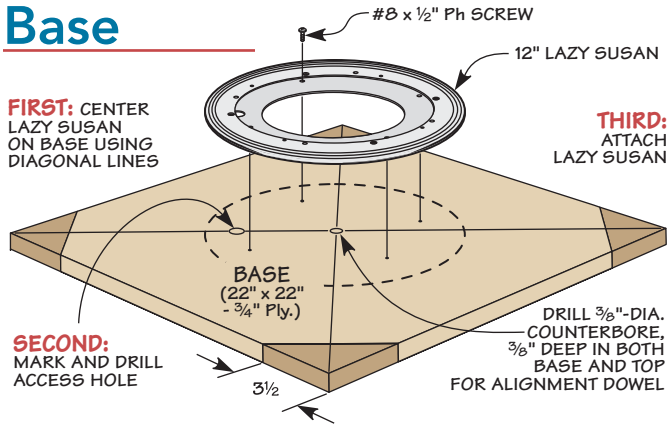
The trick to installing a lazy Susan (photo below) is a little advance work. And that's just a matter of drilling a small access hole, as shown in the drawings at right.

To do this, center the lazy Susan on the turntable base, mark where the hole needs to be, and drill the hole (top drawing). Then screw the lazy Susan in place.

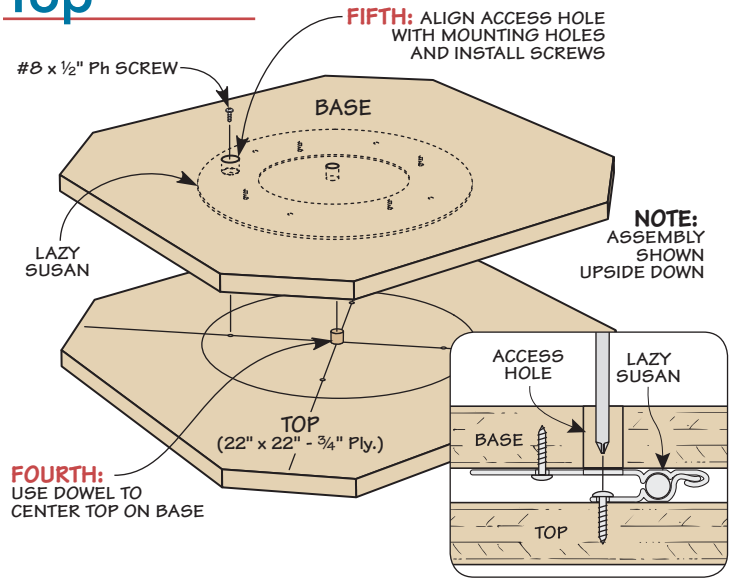
Now, flip this assembly over and set it in place on the top so it's centered. Finally, attach the lazy Susan to the top with screws using the access hole.



Base



Top



ShopNotes

shop-made Vise Jaw Liners

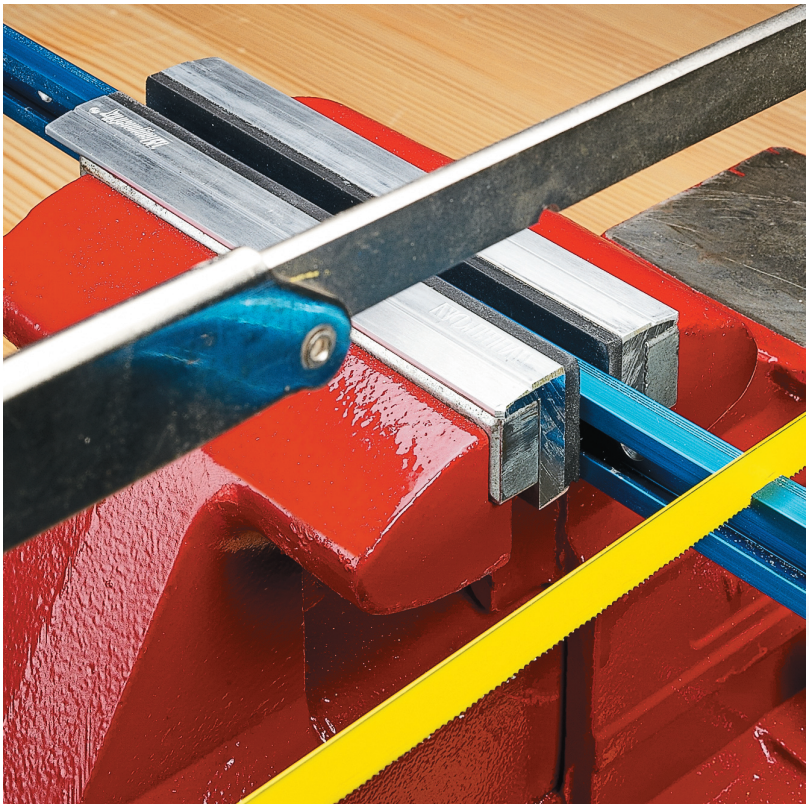
The textured jaws of your bench vise can leave marks on soft materials like aluminum or brass. And you can forget about trying to hold round objects securely. To solve these problems, you can purchase commercial jaw liners, like you see in the photo below.

But a less expensive option is to make your own. The shop-made jaw liners you see on the right are easy to make.

I used ¾"-thick maple and formed a shallow rabbet on the back side. This leaves a narrow lip that keeps the jaw liner from slipping down between the vise jaws.

To hold the jaw liner onto the jaw of your bench vise, the next thing to do is drill a small counterbore on the back face. This holds a rare-earth magnet that's glued in place with epoxy or cyanoacrylate glue.

As you can see at right, you can make several pairs, each with a different face treatment. Keeping them handy near your vise makes it easy to switch them out.



▲ ***Smooth.*** *To keep the textured jaws of the vise from marring the workpiece, use these smooth jaw liners.*

▲ ***Magnetic.*** *Clamping metal workpieces like bar stock or sheet metal is easier with these magnetic jaw liners.*

▲ ***Grooves.*** *Jaw liners with grooves make it easy to clamp any type of tubing and threaded rod.*

▲ ***Extra Cushioning.*** *Line the jaw liners with leather or rubber to clamp delicate workpieces.*

Scenes from the Shop

This handy tote keeps all your sanding supplies organized and within easy reach. Get all the details on how to build it on page 42.

Replacing the bearings will extend the life of your router. Learn what you need to know in the article that begins on page 40.

Every shop needs a pair of sturdy sawhorses and these fill the bill. You'll find detailed plans to build them, along with some useful accessories, starting on page 26.