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WORKING THE LAND

DIY PROJECTS TO MAKE THE MOST OF YOUR SPACE



When I would arrive at the farm, my cousins would say “the city kid is here,” even though I was as suburban as a kid could be. As preteens, my pals and I played football on manicured lawns and slurped Orange Julius at the mall. But to my cousins on the family dairy farm in northern Wisconsin, I was all skyscrapers and polished shoes.

I loved those day trips. Within minutes of stepping out of my dad’s Ford Country Squire station wagon, I’d be riding a pony, hunting squirrels in the woods with a .22 or playing hide-and-seek in the cornfield. By the time I was 14,

summer trips to the farm became work outings, and they lasted for days. Baling hay and stacking it in the barn, milking the cows, checking the fences—the meaning of farm life and acreage changed when I grew old enough

to work. And mowing my small suburban lawn back home became no big deal.

The do-it-yourself projects we feature in this issue take me back to the farm. And we’ve modernized it all. You don’t need a 100-head dairy farm to benefit from a tractor. You don’t need 80 acres to get the most out of a greenhouse. You can harness the sun’s renewable energy in the small space you have.

I hope you enjoy our acreage-themed features, even if your property measures in fractions of an acre.

GLENN HANSEN

DEPUTY EDITOR



DEPARTMENTS

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An easy-to-manage garden hose, a no-frills sander, and much more.

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Tractor, UTV or ZTR mower? Here's how to choose the right one for your land.



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WE LOVE YOUR PROJECTS!

Inspiration is a two-way street. We learn a lot from your projects and want to share a few recent submissions we love.



INCREDIBLE CUTTING BOARDS

Danny Lockett makes these mesmerizing cutting boards for family and friends. According to his wife, Joyce, he is self-taught and makes intricate designs with many types of wood. Thanks to the Locketts for sharing.

WALKING STICKS TO AID AND INSPIRE

"My hobby for the past 35 years has been fashioning hiking/walking sticks and canes/shillelaghs from downed trees or branches, mostly oak or beech," says Dennis Daulton. "My father was a strong man who depended on the use of a cane, which may be a stigma to some. When I was looking for a hobby, I wanted one that would make others feel better about themselves." And that's how Daulton began his craft. He has even built sticks for Boston Celtics legend Bob Cousy, who took one to the White House when he received the Presidential Medal of Freedom.

Daulton gives his walking sticks to those who have mobility issues. And we think you should stick to it, Mr. Daulton—you do beautiful work.



SOLAR-LIGHTED MAILBOX

"My mailbox post had seen better days," says E. Troy Washington. "A project by Joe Cruz inspired my new design. I purchased the mailbox and designed my post to accommodate it. I used 3/4-in. wood for most of it. I added LED solar lights to provide a back-light behind the numbers. Joe, thanks for the plans that inspired me."



TOP PHOTOS COURTESY OF JOYCE LOCKETT; BOTTOM LEFT: DENNIS DAULTON; BOTTOM RIGHT: E. TROY WASHINGTON

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HANDS ON



TOOLS, GADGETS + GEAR WE RECOMMEND

NEATER PAINT EDGES

Before you bust out the roller to quickly paint large swaths of wall, you need to carefully and accurately “cut in” around trim.

Paintbrushes often feel cumbersome for this job if the brush is too wide or the handle too long. The Purdy XL Cub is a compact edging and cut-in brush. It has angled 2- or 2-1/2-in.-wide nylon and polyester bristles, which work well for all paints and stains.

The compact size is the real draw—at just over 8 in. long, it feels like an extension of your hand. I put the XL Cub to work on a couple of rooms in my house to see how it performed. The brush worked as

advertised on drywall. The bristles were easy to control and held plenty of paint for the finicky cut-in process. The short handle made painting in tight spaces, like behind the door or around light fixtures, a breeze. The plaster walls in my bathroom were more of a challenge because it’s hard to make a clean line when there’s even a little texture, but that’s true for any brush. The Purdy XL Cub is available at home centers and online for about \$15. 

ETHAN O'DONNELL *PRODUCTS EDITOR*





STEAM TO POWER THROUGH DIRT

Why a steam mop? Steam easily breaks down dirt from hard floors and kills bacteria without chemicals. The Bissell PowerFresh Deluxe 1806 is easy to set up and user-friendly. It comes with both a microfiber soft pad and an abrasive pad, both machine washable, as well as two fragrance discs.

To use the mop, just add water to the tank, plug it in and turn it on. The fragrance discs slip into the compartment above the mop head. You can use a whole disc, a half or none. I used this mop on tile and hardwood floors, sweeping first. The Bissell did everything I hoped it would do, even grabbing all the pet hair the broom didn't get. A detachable spot-cleaning brush with tough bristles worked really well on the most stubborn dirt. You can buy the Bissell PowerFresh Deluxe 1806 online for about \$100. 

MIKE BERNER EDITOR

ESSENTIAL POCKET SCREWDRIVER

I like having a screwdriver handy, but I don't want to carry a standard screwdriver, let alone four of them. This 4-in-1 from Stanley gives me just what I need in most cases. It has No. 2 and No. 1 Phillips bits, and two sizes of slotted bits. And all of it is packed into a tool the size of a ballpoint pen. It's easy for pocket carrying or to leave in the car. A four-pack—so you can leave one wherever you need it—will set you back about \$24 online or in home centers. 

GLENN HANSEN DEPUTY EDITOR



GROWING GARDEN HOSE

Most garden hoses are heavy and a hassle to store. This expandable hose from TheFitLife collapses when drained, so it is compact, lightweight and easy to store. It has a triple-layer latex inner hose, wrapped in a woven elastic fabric made to expand to three times its drained size when in use.

With a built-in shutoff valve at the end, heavy-duty brass fittings connect the hose to the water supply and an included eight-setting spray nozzle. The 25-ft. version measures 28 ft. when full and is just under 9 ft. when drained, so it easily coils up into a small garden pot.

Because expandable hoses require water pressure to expand, they don't expand without an attachment and might not work well with a high-flow sprinkler or high-flow nozzle. Also, when you turn the water off, your sprinkler will crawl across the yard as the hose deflates. You can find different lengths of TheFitLife hoses online, and the 25-ft. version is about \$30, including the nozzle. 

BRAD HOLDEN SENIOR EDITOR





NO-FRILLS SANDER

If you need a random orbital sander only occasionally and don't want to spend a fortune, the Ryobi RS290G should be a good fit for you. It is comfortable, nicely made and performs well.

I tested this sander on hardwoods and plywood with hardwood veneer. I worked through different grits to see if the sander

would effectively remove scratches from the previous grit. I also looked for ease of handling—but what does that mean? Some random orbital sanders pull your hand around. I want a “floating” feel so I can direct the sander instead of forcing it, which leaves deeper scratches. As is true with any random orbital sander, I had to

work a bit to find the sweet spot where it floats. Once I did, its operation was smooth and effective.

The RS290G has only two minor limitations. First, it's not cordless. Cordless is nice, but it costs more, and most users will have an outlet available. Second, it lacks variable speed. I've used random orbital sanders

for years, and I can count on one hand the times I've needed to adjust the speed. In those cases I was glad to have the option, but it's not a deal breaker for me.

Bottom line? At about \$60, the RS290G gets a strong recommendation from me. Find it at The Home Depot, in store or online. 

BRAD HOLDEN SENIOR EDITOR



MADE BY WOMEN FOR WOMEN

Handyma'am Goods is a company owned and operated by women, and it has the “versatile clothing” thing down to a science. From coats to coveralls to aprons that double as dresses (“draprions”), everything the business makes is functional and fashionable.

Handyma'am has full-length overalls that are durable and comfortable, and they look good. Each shoulder has an adjustable self-tie closure instead of the usual sliding buckle, so it's easy to get the right fit. If they're a little long, you can just roll up the cuffs. Other useful features are the extra-deep front pockets (finally—pocket space!), a key loop, a side leg utility pocket and a pen slot. “Shortalls” are also available for working in warm weather.

These overalls are made with 100% cotton and come in black, olive green and natural. They're available in sizes XS through XXL, and Handyma'am Goods includes a detailed fit guide on its website. At \$225, these overalls cost more than I would usually spend, but for a serious DIYer or tradesperson, this reliable workwear is worth the splurge. Find these overalls and more at handymaamgoods.com. 

MARIAH CATES JR. ART DIRECTOR



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EXPLORE NOW



WASH & WAX IN ONE

With the convenience of drive-through car washes, it's been more than 20 years since I washed and waxed a car by hand. Recently, I grabbed a jug of Armor All Ultra Shine Wash & Wax at the auto parts store to give it a try.

Ultra Shine is a concentrated combo of car wash soap and wax in one. It combines a proprietary blend of cleaners, surface lubricants and real carnauba wax to deliver a streak-free shine. Ultra Shine can be applied with a car-washing foam gun or a rag and bucket. It's available in either a 16-oz. or 1-gallon bottle.

Armor All recommends just under 1-1/2 oz. of soap concentrate per gallon of water. I was concerned

about the meager suds, but I hosed off my truck and then scrubbed my way down each side, doing the tires and wheels last. Then I spot-cleaned any drips or runs with a microfiber cloth and buffed out any film buildup.

While I didn't reach showroom quality, my results were far better than a drive-through wash. The all-in-one formula, easy application and trusted brand name make the Armor All Ultra Shine Wash & Wax ideal for anyone looking to beat a gas station car wash. This product is available online or at auto parts stores and other retailers. A 1-gallon bottle is under \$10.  **APPROVED**

ETHAN O'DONNELL *PRODUCTS EDITOR*



CHARGING BASE

FUN-SIZE FLASHLIGHT

As a kid out trick-or-treating, I thought "fun-size" seemed like a rip-off. When it comes to a go-anywhere flashlight, tiny and portable are sought-after features. I can drop the NEBO Torchy flashlight in my pocket and barely know it's there. This light delivers 1,000 lumens of LED light and has five modes: high, medium, low, strobe and turbo.

*A magnet in the base lets me stick the flashlight to any ferrous metal for hands-free use. Or I can clip the light to my cap. Another big plus: I never have to buy batteries. The lithium-ion battery is rechargeable via the USB power cord and has a magnetic base. My NEBO flashlight is also impact and water resistant. You can find one at home centers, hardware stores and online for about \$40.  **APPROVED***

VERN JOHNSON *CREATIVE DIRECTOR*

HIGH-PERFORMANCE HEAT GUN

Heat guns handle a wide range of jobs—removing flooring and paint, thawing frozen pipes, etc. The Wagner Furno 700 Heat Gun features an LCD display, push-button controls and six fan settings, including a cooldown mode. Its 1,500-watt heating element puts out 5,100 BTUs with temperature settings from 125 to 1,300 degrees. It also includes a glass protector and flare attachment. I love that the gun stands up on its own, making it handy for heat-shrink tubing, bending PVC or running the cooldown mode.

With the gun set to 950 degrees, it'll quickly lift layers of old paint, making the paint easy to scrape off. I also used it to bend composite decking. For this I used a much lower temperature, bending the decking carefully while heating the entire bend area. Setting the fan on high works great for shrink-wrapping large objects, while lower settings are adequate for heat-shrinking electrical connections. The Wagner Furno 700 Heat Gun is available online and at home centers for about \$70.  **APPROVED**

JAY CORK *ASSOCIATE EDITOR*





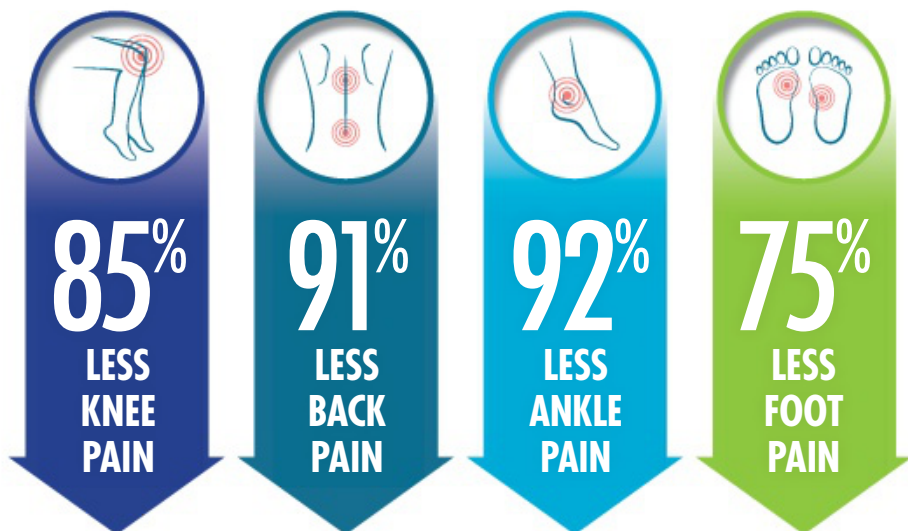
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PORTABLE & AFFORDABLE GRILL/PELLET SMOKER

As the only one in my family who loves grilled and smoked meats, I've been keeping my eye on the portable pellet grill category. The Z Grills Cruiser 200A is a portable wood pellet grill capable of smoking, baking, roasting, searing, braising, barbecuing or char-grilling whatever fare you desire.

The tabletop-size grill features a foolproof digital temperature controller, automatic auger system and an 8-lb. pellet hopper. The Cruiser's three handles, lockable chamber and durable powder-coated finish make it perfect for bringing to campgrounds, sporting events or backyard get-togethers. The Cruiser has 200 sq. in. of cooking area, which sounds like a lot, but a six-pack of brats and three kabobs fill up the cooking space. Another important note: The Z Grills Cruiser needs a 110V outlet to operate. A portable power station works well in remote situations. Also, while the grill is portable, it weighs about 50 lbs.

After following the Cruiser's christening instructions, I filled the hopper with cherry wood pellets and set the temperature to 375 degrees for grilling brats. Minutes later, the grill was heated up and I had meat spitting away on the grate.

On my next attempt, I tried smoking a pork tenderloin. I set the grill to 225 degrees and plopped the meat on, checking the internal temperature every hour or so. After four hours, the pork came out juicy and delicious.

So whether you're single, have a small family, live in an apartment with limited outdoor space or simply want to bring your grill anywhere, the Z Grills Cruiser is a great option. Its ease of use, sturdy construction, high-end features and best-in-class price make this portable pellet grill the right choice. The Cruiser runs about \$300 and is available at zgrills.com.



ETHAN O'DONNELL *PRODUCTS EDITOR*



ALL-PURPOSE ADHESIVE FOR SOLID REPAIRS

Barge All-Purpose Cement is a professional-strength adhesive that can be used on a wide range of materials, from leather to rubber to plastic to wood. Barge Cement is used mainly by shoe repair shops. I discovered it many years ago while working in a theater as a prop artisan. We used Barge Cement on anything we wanted to permanently stick together.

I've since used Barge Cement to glue the rubber soles back onto my favorite pair of shoes. I've repaired many leather work gloves I wasn't quite ready to part with. I've also used it to glue rubber pads on the bottoms of furniture feet. There's one drawback to Barge Cement: It's highly toxic. When you work with it, you need adequate ventilation, eye protection, rubber gloves and a respirator.

If you're a DIYer like me and you'd rather fix something than throw it away, whether it's a favorite pair of shoes or that designer leather handbag, you'll want Barge Cement in your arsenal. Look for Barge Cement at your local craft store or hobby shop. You can also find it online at Amazon. A 32-oz. can costs about \$35.



JOE CRUZ *ASSOCIATE EDITOR*





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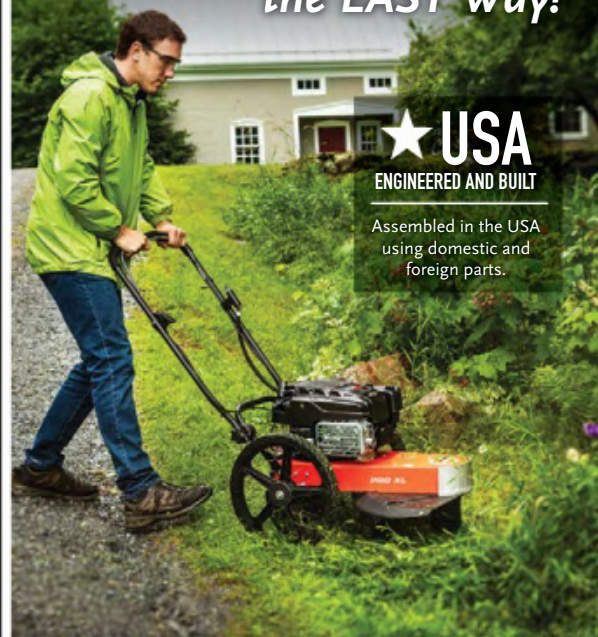
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HANDY HINTS



CLEVER SOLUTIONS FROM OUR READERS

EDITORS' NOTE

We were skeptical about this hint, but when we tried it, it worked so well that we bought more rollers!

PORTABLE ROLLER STAND

Ripping a long board on a small portable table saw can be downright dangerous without extra support. If you don't have a helper to control the board, clamp a paint roller with a short-nap sleeve to a sawhorse as a temporary roller stand. Tighten the clamp firmly to prevent slipping.

It can be used with other tools, too. As you move this setup to different tools, simply adjust the roller height as needed.

WILLIAM A. GOLDBACH

RAISE OR LOWER
THE ROLLER
TO SUPPORT
THE BOARD

PLASTIC BAG DISPENSER

Storing and reusing plastic bags is easy if you make a dispenser from a 2-liter soda bottle. Cut off the top and bottom with a razor knife, trimming any jagged edges so you don't tear the bags when you pull them out. Then screw the dispenser to a cabinet door or closet wall (or attach it with hook-and-loop tape).

CAROL SCHRUM



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NYLON SCRUBBER

Put your car-washing sponge inside a pair of old pantyhose for a nonabrasive, paint-friendly scrubber. The threads act like thousands of little scrapers to rub off insects and gunk with every swipe.

MANUEL RODRIGUEZ



PRESERVE YOUR LAWN PRODUCTS

If you leave a bag of fertilizer or weed killer open for long, it will absorb moisture from the air and won't be able to go through a spreader. Even grass seed could use an extra layer of protection from a moisture-wicking concrete floor. Place opened bags of lawn products in large resealable plastic bags. The products will be free of clumps or pests and ready to go when you need them.

RICK WILSON



THICK-SKINNED SANDPAPER

Put duct tape on the back of a piece of sandpaper and cut it into custom-sized strips for sanding in tight spots. The tape's tough hide lets you sand without tearing the paper.

These strips work great for cleaning dried glue from project parts or sanding lathe turnings, and for any other job that requires firm, detailed sanding. Cut the strips with a sharp utility knife and a straightedge.

MAGGI THOMAS



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TRAILER WIRE HOLDER

I finally got sick and tired of the trailer wiring harness hanging down behind my pickup truck. It looked ugly and was always exposed to the elements. The solution: a magnetic key storage box.

Cut a slot on one end of the box just large enough for the wires to pass through. Place the connector in the box, and place the box on the hitch bar or any other steel surface under the vehicle.

KEN MARETKA

EASY-TO-MOVE DECK UMBRELLAS

Does your deck umbrella always seem to be in the wrong spot to shade you from the sun? Mount several sets of galvanized plumbing pipe straps on your deck posts or railing in key places. Use straps with a slightly larger diameter than the umbrella pole. Then pick a spot and slip the umbrella pole through the straps until the bottom of the pole rests on the deck. You'll get shade right where you need it.

LIBBY KNOCH



HAND-SPINNING LAUNDRY

For hand-washed clothing that shouldn't go in the dryer, you can remove excess water with a salad spinner. Then either lay the clothing flat or hang it on a rack to dry.

JANET PAHL



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HOMELAB



A TESTING ZONE FOR INNOVATIONS

BRING YOUR ROOF TO LIFE



BY KARUNA EBERL

Green roofs have been around since at least the time of the Vikings, who laid birch bark and sod on top of boards to keep drafts out of their homes. The modern incarnation of these roofs began in 1960s Europe. Now they are sprouting up everywhere, thanks to their aesthetics, sustainability and long-term cost savings. Is a green roof, also called a living roof, right for you?

"Germany started looking at green roofs as a way to cut down on the spread of wildfires," says Jim Mumford, president and resident horticulturist at Good Earth Plant Company in San Diego. "And then it came across the Atlantic."

Today, Europe is still the leader in green roofs. But several U.S. cities are embracing the benefits and giving incentives to homeowners to install them. New York, Portland, Denver and Nashville require them in new

construction of a certain size. Today, even the McDonald's world headquarters in Chicago sports a fuzzy, green top.

"One of the things I really like about it is the addition of biodiversity," says Mumford. "I've got milkweed all over mine, so I see butterflies all the time, and birds and bees. It's a nice little wild spot."

WHAT IS A GREEN ROOF?

Green roofs feature plants growing on top of a manufactured structure. They include a hefty waterproofing layer, soil or other growing medium, and usually a

root barrier, plus drainage and irrigation systems.

"What we build most is what I call an eco-roof," says Mumford. "It's got 4 to 6 in. of soil and native plants, so the roof uses as little water as possible."

Green roofs can be pricey, especially if you're retrofitting your house to accommodate one. But if you have the means, they pay off economically, environmentally and aesthetically.

"I think the number one reason homeowners get them is the cool factor," says Mumford. "Would I rather look at an ugly garage roof from my second-story bedroom window, or a green roof that's obviously sustainable?"

Developers and contractors can also benefit by installing green roofs. If a development requires green space, a green roof may qualify, allowing more surface room for parking and other needs. Green roofs can also ease compliance with stormwater retention codes.

BENEFITS OF A GREEN ROOF

- Possible heating and cooling savings of 20 to 25%, because the plants insulate the building and cool the air.
- Durability. Green roofs last 45 years or more, two to three times longer than a regular roof. That's because they protect the roof's waterproofing layer from windblown debris, UV radiation, and expansion and contraction.
- Wildlife habitat creation. A green roof helps pollinators and birds, and adds biodiversity to the neighborhood.
- Food self-sufficiency. It's possible to grow your own food on a green roof.

In addition to the benefits above, a green roof can reduce:

- Stormwater runoff, erosion and pollution. A green roof can hold 60 to 80% of rainfall, then release it slowly while filtering and cleaning it.
- Sound reflection and transmission.
- Landfill waste, because green roofs last longer.
- The spread of wildfires.

WHAT YOU NEED TO KNOW

How Much Maintenance Is Required?

Green roofs do require regular maintenance, such as removing weeds and checking drains to ensure no water is pooling. Mumford's company performs maintenance four times a year. "I think a homeowner actually has better roof maintenance as a result of us being up there on a semi-frequent basis," he says. "Otherwise, nobody goes on the roof."

Where Can I Have a Green Roof?

"Pretty much anywhere but Antarctica," says Mumford. However, depending on your location, it may be more complex. In drier places, green roofs need irrigation. And in Florida, they must be designed to withstand hurricanes. They're especially popular in the Pacific Northwest and Canada.

Does a Green Roof Have to Be Flat?

No. They need a slight slope so water doesn't pool. On pitched roofs they feature retention systems, although they typically aren't installed on roofs with more than a 40% slope. "At some point, once the angle rises enough, it becomes a living wall instead," says Mumford, laughing.

Can I Convert My Traditional Roof to a Green Roof?

Yes. But it's probably going to be expensive because it requires adjusting your home's structural load capacity. A green roof with 4 in. of soil adds about 30 lbs. per square foot when it's fully saturated. Don't forget to factor in the costs of installing green-roof-specific waterproofing and hiring an engineer, as well as the green roof itself.

What Does a Green Roof Cost?

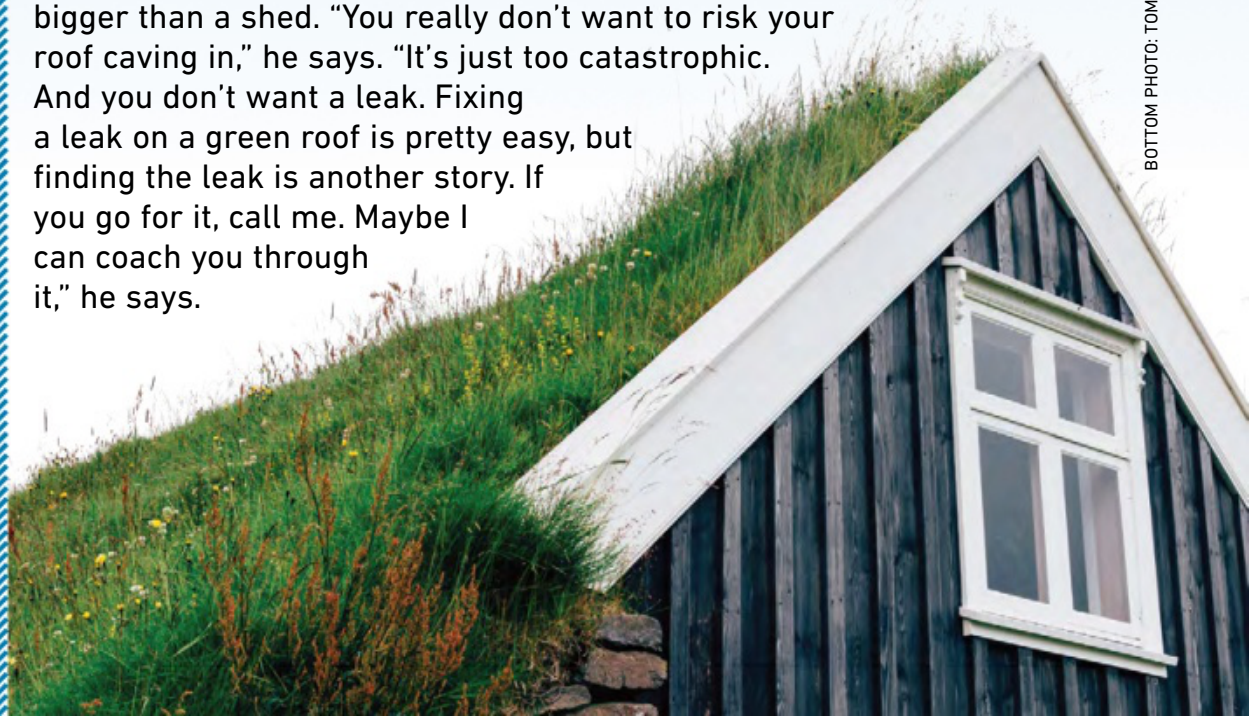
If your house is already engineered to accommodate a green roof, it'll probably cost \$30 to \$50 per square foot to have one professionally installed. The range can be as wide as \$20 to \$200 per square foot, with the high end more likely for an apartment rooftop park with trees, walkways and seating.

Typically, homeowners will put a green roof on only a portion of their house or garage. Mumford estimates a green roof for a two-car garage might run about \$25,000. If you decided to cover your 2,500-sq.-ft. house, it might cost \$75,000 to \$100,000.

Can I Install a Green Roof Myself?

Yes, especially on smaller structures such as a shed. That's if you have the patience for research and planning, plus a good set of construction and gardening skills. Mumford says to plan on about \$30 per square foot, which puts the total for an 8 x 10-ft. shed at about \$2,500.

Mumford cautions against installing a green roof yourself on anything bigger than a shed. "You really don't want to risk your roof caving in," he says. "It's just too catastrophic. And you don't want a leak. Fixing a leak on a green roof is pretty easy, but finding the leak is another story. If you go for it, call me. Maybe I can coach you through it," he says.



BOTTOM PHOTO: TOM LAU/GETTY IMAGES



The Kohler H2Wise provides whole-home protection by monitoring household water usage. It sends real-time alerts to your smart device if the system detects changes in water pressure.

Easy for DIYers to install, the H2Wise connects to under-sink water lines. It's compatible with 3/8-in. water lines and threaded angle stops.

SMART WATER ASSISTANT

With one smart plumbing device under your kitchen sink, you can monitor all your home's plumbing fixtures and water usage. When you connect the new Kohler H2Wise device to your hot and cold water pipes, it monitors water pressure, learns your water-use habits and looks for unusual changes through the day.

The Kohler device uses technology developed by Phyn, a subsidiary of consumer electronics giant Belkin

International. Phyn developed a leak-detection technology that uses ultrasonic sensors to sample a plumbing system's pressure 240 times every second. The goal is to empower homeowners with information that can help them reduce water use and prevent major damage if a leak occurs.

As the Kohler H2Wise runs its diagnostic tests, it can alert you of water leaks—even small ones. It can also inform you of blockages

and send you freeze warnings so you can protect your pipes. The H2Wise system (\$300) is simple to install under a kitchen sink as long as a dedicated electrical outlet is nearby. Kohler's H2Wise+ system (\$500) is a device that a plumber installs on your home's main water line. It also monitors water use and can shut off the water to your home in an emergency. Both products are available online and at home centers.

GLENN HANSEN DEPUTY EDITOR

HIDDEN-SLOT SCREWS

Andrew Klein, inventor and woodworker, wanted a better-looking screw, so he created one himself. He now sells his hidden-slot screws under the PIKA Screw name. As a craftsman, Klein has a passion for building unique products and inspiring others to do the same. He built a striking workbench for TV host Adam Savage, and the bench includes his two-speed, gear-driven Twin Turbo vise, among other features.

Klein's PIKA Screws are designed for use on woodworking projects, to provide a sleek, minimalist look. Offered in two sizes, PIKA Screws are made of 400-series magnetic stainless steel. Each screw's slot is invisible until you depress the spring-loaded insert, revealing the unique three-sided screw slot. A special screwdriver allows you to insert and remove these screws.

The full-size screws are 1-1/4-8, and the PIKA Screw Minis are 5/16-18 and cost \$35 and \$16, respectively. The same screwdriver works on both sizes. You can also buy nuts, screw extensions, drill bits and thread-tap tools at in-kleind.com, the inventor's website.



GLENN HANSEN DEPUTY EDITOR



INDOOR GARDEN

The best part of gardening is being around growing things. Whether plants, flowers, fruits or vegetables, I love watching them all grow, and of course eating food I've grown myself. As a life-long vegetarian, I try to get the freshest vegetables possible during the winter months. I love waking up each morning and finding something fresh and fragrant growing right there in my kitchen.

Many manufacturers make gardens of all sizes, designs and functionality. Its design drew me to Rise. I love vertical gardens, but I didn't want that in my small kitchen. I liked the sleek, modern look Rise offers in all its gardens, including the

Personal Garden I tried.



I was happy with the compact size of the Rise Personal Garden (18 in. long, weighing a mere 10 lbs.) and how easy it was to set up. The kit includes a base, grow lights, a water pump, a garden nursery, a variety of seeds, eight net cups, hydroponic nutrients and a bottle each of Sprout, Thrive and pH balance.

You can't choose the veggies and herbs that come in the initial package, but what they provided worked for me. You can always order individual seedpods directly from the site if you want something different. There's a wide variety to choose from, everything from micro-greens to beets.

The Rise Personal Garden is a hydroponic garden, meaning it doesn't use soil. Agriculturists also find it to be one of the most eco-friendly gardening methods because it requires little water or space.

Since indoor hydroponic gardens are in a controlled environment, they can also produce higher yields than more traditional gardening methods. The keys to hydroponic gardens are

their use of a water pump and the manual addition of specific nutrients (included with the Rise Garden). These help supplement nutrients that plants would normally be getting through the soil.

This was my first hydroponic garden, so I was a little intimidated at first. How does it work? What if the pump breaks? What if the plants aren't growing?

Once I started setting it up, I realized that this was going to be easy. Once you wrap your head around testing the pH level in your tap water (using the kit provided by Rise) and manually adding nutrients (Thrive, Sprout and pH balance—all provided in your kit), it's a breeze.

At \$279, the kit provides great value. I haven't done the math to see if I save money on fresh veggies or herbs by growing them at home instead of buying them at a grocery store. But that's tricky to calculate given each user's consumption habits and access to fresh produce.

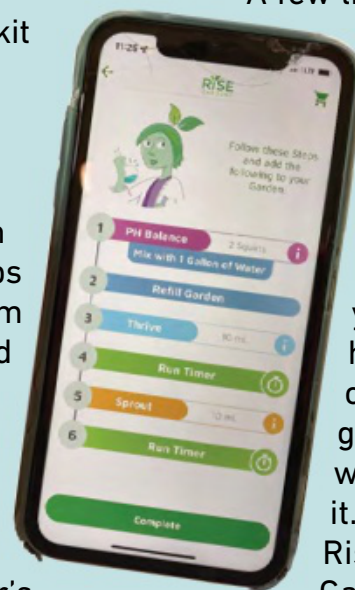
The kit also includes an app, which is its biggest difference from outdoor gardening. You can download the Rise Gardens app, create an account and connect your garden to your home's Wi-Fi. I had trouble with this at first because the garden app wouldn't work on our 5G network, so I had to choose a different network, and it took me a few minutes to figure out the issue.

You don't need to connect to the internet to use the garden, but I could immediately see the benefits of doing so. I could get notifications on my phone when it was time to add nutrients or water. You can also control the lights and the water pump using the app.

A few lights on the

front of the garden also alert you when it requires care. The garden tells you when to harvest your veggies or herbs, based on what you're growing and when you planted it. You can buy the Rise Personal Garden online from Rise Gardens.

AMY NOVAK CONTENT DIRECTOR





SMART, POWERED WINDOW SHADES

Smart technology is applied to a whole lot of things in your home that really don't need smarts. An internet-connected trash can or juicer? A smart salt shaker? I don't understand.

Smart window shades, however, are one of the smartest ideas out there. You can power a bedroom's shades for bedtime or as a wake-up call. Add privacy to any room when desired, even if you're not in it. And make large or hard-to-reach window coverings respond to your needs. Smart and powered window shades let you take control of your home. That's smart.

The shade part of powered window shades is easy; the power part takes some thinking. Windows don't have electrical outlets, and nobody wants an extension cord running from the top of the window to the nearest outlet. Two electrical engineers from Missouri started a company in 2017 called PowerShades to make that hard part easy.

PowerShades window shades are available in dozens of colors, textures and fabrics, and include styles for both residential and commercial buildings. What makes these shades unique is the power source capability. These shades can run on AC or DC power, batteries, solar power or PoE power. That last one is Power over Ethernet and means that a standard Cat 5 or Cat 6 ethernet cable can power these shades. The company calls this TruePoE, and the shades require only 5 watts of power. Of course, you still need to get most of these power sources to your windows, but having all the options available can ease the installation, and it's simple for any new construction.

I tested the rechargeable-battery-powered PowerShade on a large window in my home that's tall enough to make a traditional manual-operation window shade difficult. After months of use and daily operation to open and close the shade, I have not needed to charge the battery. Doing so will require that I reach the shade's drive motor to plug in a charger, and the manufacturer claims the charge should last six months or more. That's easier than running full-time power to the shade.

As for smart capabilities, PowerShades can be programmed to run on any schedule you choose. They will also work with smart-home networks and voice-control devices such as Google Home and Amazon Alexa. You can manipulate multiple shades in one program, giving users such as office managers control from a distance. PowerShades makes indoor and outdoor shades and sells through many retailers nationwide. Visit PowerShades.com.

GLENN HANSEN DEPUTY EDITOR

SPONSORED



BUILD STRONGER

Gorilla Heavy Duty Construction Adhesive is a tough, versatile, all-weather adhesive. The gap-filling, durable, 100% waterproof adhesive formula is perfect for indoor and outdoor projects, holds in 30 seconds, and bonds virtually anything, including subfloor, mirrors, trim, drywall, landscaping, bath surrounds, foam board, marble and more!



Fast Grab

All-Weather

Gap Filling

BUILD A GREENHOUSE

////////////////////
EXTEND YOUR GROWING SEASON BY MONTHS!

Here in the Upper Midwest, the gardening season is short, typically May through September. By building a greenhouse, we can harness the sun's rays to let plants thrive as early as March and extend harvest into late fall. A greenhouse is also a great place to store less hardy plants during harsh winters. Even if you live in a more temperate region, a greenhouse will create a perfect climate for plants, protecting them from temperature swings, storms and pests.

We built our greenhouse from cedar, which weathers beautifully, and polycarbonate sheets, which diffuse the sunlight and give even exposure to all the plants.

BY MIKE BERNER



**SCAN THIS CODE
TO WATCH US
BUILD THIS
AMAZING
GREENHOUSE.**



KEITH AND RENEE JOHNSON live on a picturesque plot of land amid rolling hills in rural Wisconsin. They have run a small hobby farm for about 30 years and have always wanted a greenhouse. *Family Handyman* teamed up with them to build this greenhouse so they could start seedlings for their garden just a few steps away.

WHAT IT TAKES

TIME About a week	COST \$8,000 to \$10,000	SKILL LEVEL Intermediate
TOOLS Circular saw, miter saw, table saw, reciprocating saw, impact driver, drill/driver, hammer drill, framing nailer, compressor, level, sawhorses, basic hand tools		

MEET THE BUILDER



MIKE BERNER ENJOYS WRAPPING HIS HEAD AROUND PROJECTS OF ALL SIZES AND HELPING PEOPLE BUILD COOL STUFF.



1 BUILD THE FOUNDATION

We removed 8 in. of topsoil to make room for our base layer of rock. We leveled and compacted the dirt, rolled out heavy-duty landscape fabric, then added at least a 2-in. layer of 3/4-in. limestone. Next we created a mini retaining wall using landscaping timbers. We placed, leveled and squared three sides of the retaining wall, leaving the fourth side off until most of the rock was dumped.

We secured the timbers at the corners with 8-in. timber screws and fastened a pressure-treated board to keep the timbers together at the seams. When most of the rock was dumped and evenly spread, we built the fourth side. Then we leveled off and compacted the rock with a tamper.



2 BUILD THE SIDE AND BACK WALLS

To build the walls, we used pressure-treated 2x4s for bottom plates and cedar 2x4s for top plates. We cut them to the length of each wall and marked the stud layout on them. Because the studs will be visible inside and outside, we wanted the walls to be symmetrical, so we found the center of the wall and marked the studs every 16 in. on-center from there. We nailed the cedar 2x4 studs through the plates and then fastened a second bottom plate. After tipping up each wall, we kept it plumb with braces at each corner and nailed the corners together, making sure the top plates were flush on top.

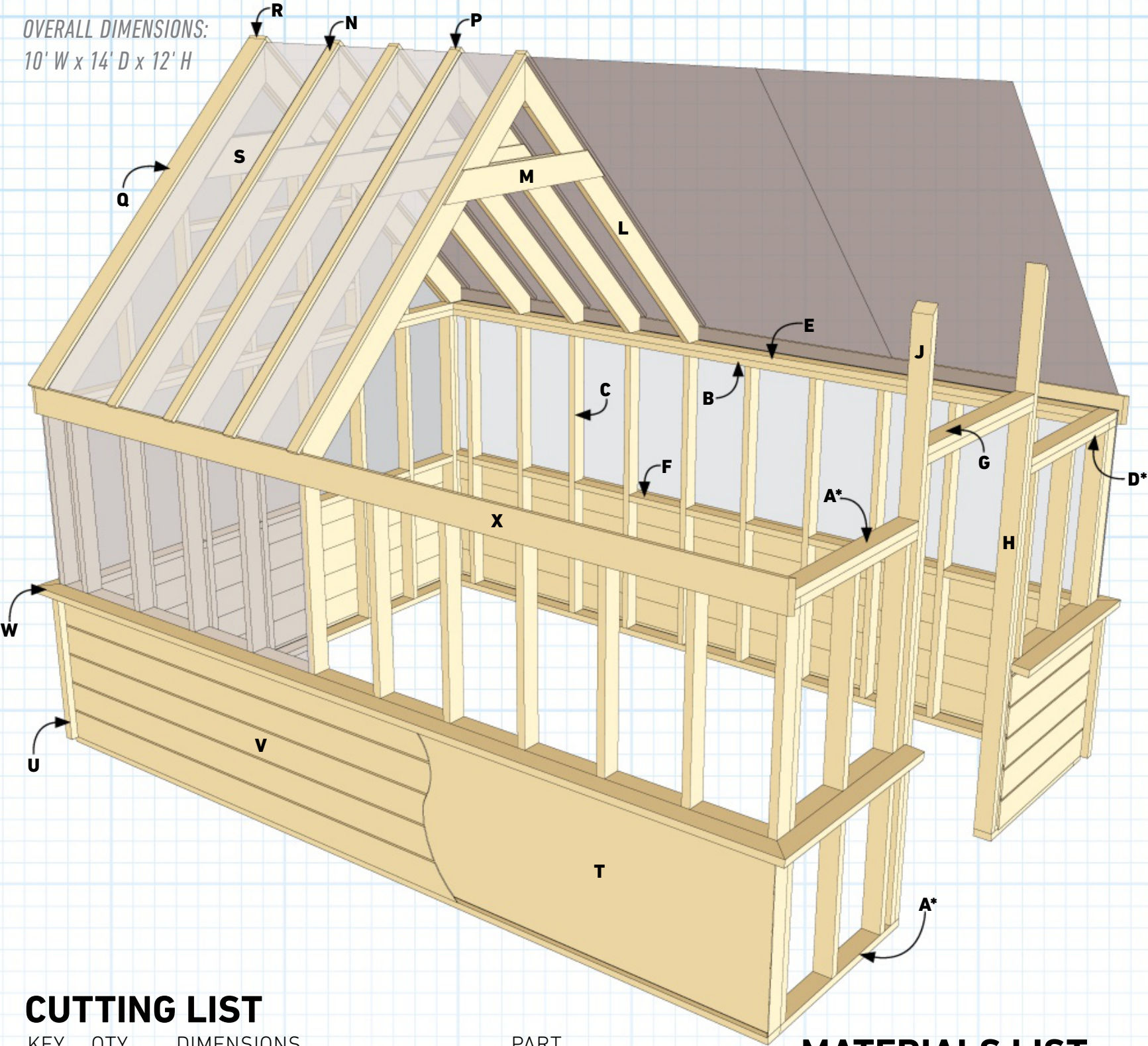


3 FRAME THE FRONT WALL

Since the walls are only 6 ft. tall and the door is taller than that, we didn't frame its rough opening during this step. We wanted all the walls tied together while the rest of the structure gets built, so we built the wall all the way across, leaving out the center studs where the door will eventually be framed. We tipped this wall up, braced it plumb and nailed it to the side walls.

FIGURE A GREENHOUSE

OVERALL DIMENSIONS:
10' W x 14' D x 12' H



CUTTING LIST

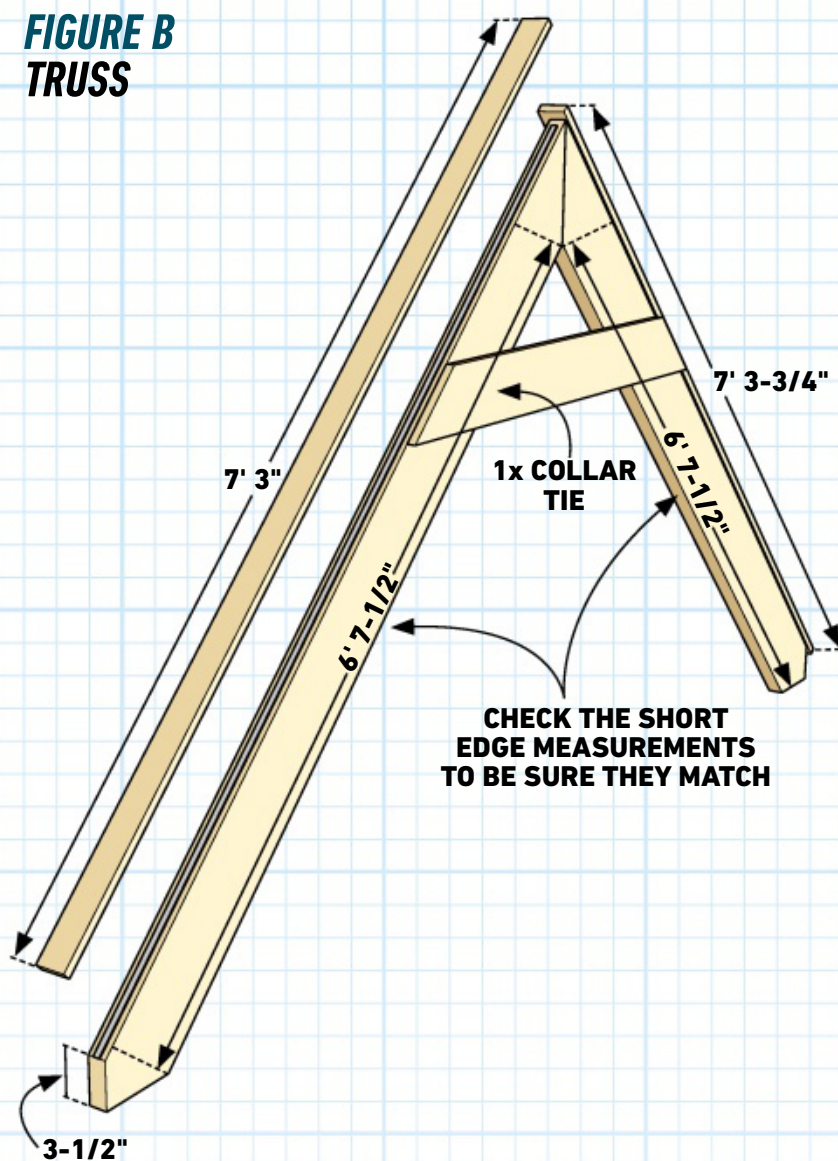
KEY	QTY.	DIMENSIONS	PART
A	4	1-1/2" x 3-1/2" x 9' 5"	Front/back wall top/bottom plates
B	4	1-1/2" x 3-1/2" x 14'	Side wall top/bottom plates
C	40	1-1/2" x 3-1/2" x 5' 9"	Wall studs
D	2	1-1/2" x 3-1/2" x 10'*	Front/back wall, second top plate
E	2	1-1/2" x 3-1/2" x 13' 5"	Side wall, second top plate
F	35	1-1/2" x 3-1/2" x cut to fit	Wall/sill blocking
G	2	1-1/2" x 3-1/2" x 3' 3-1/4"	Door header for 36" door
H	2	1-1/2" x 3-1/2" x 6' 8-3/4"	Door trimmer stud
J	2	1-1/2" x 3-1/2" x cut to fit	Door king stud
K	12	1-1/2" x 3-1/2" x cut to fit	Gable cripples (Figure C)
L	28	1-1/2" x 5-1/2" x 6' 7-1/2" (short edge)	Rafter
M	10	3/4" x 5-1/2" x 3' 11-1/2" (point to point)	Collar tie
N	10	3/4" x 3-1/2" x 7' 3"	Batten, short side
P	10	3/4" x 3-1/2" x 7' 3-3/4"	Batten, overlap
Q	2	3/4" x 5-1/2" x 7' 3"	Gable batten, short side
R	2	3/4" x 5-1/2" x 7' 3-3/4"	Gable batten, overlap
S	4	1-1/2" x 5-1/2" x 2' 7" (point to point)	Gable collar tie
T	7	7/16" x 32" x cut to fit studs	Sheathing
U	8	1-1/2" x 1-1/2" x 32"	2x4 corner trim
V	30	9/16" x 7-1/4" x cut to fit	Cedar lap siding
W	4	1-1/2" x 3-1/2" x cut to fit	2x4 cedar sill
X	2	3/4" x 5-1/2" x cut to fit	Cedar fascia
Y	4	3/4" x 5-1/2" x cut to fit	Cedar frieze board (Figure C)
Z	8	3/4" x 3-1/2" x cut to fit	Cedar corner trim (Photo 18)

*(The front wall plates will be cut to frame the door opening)

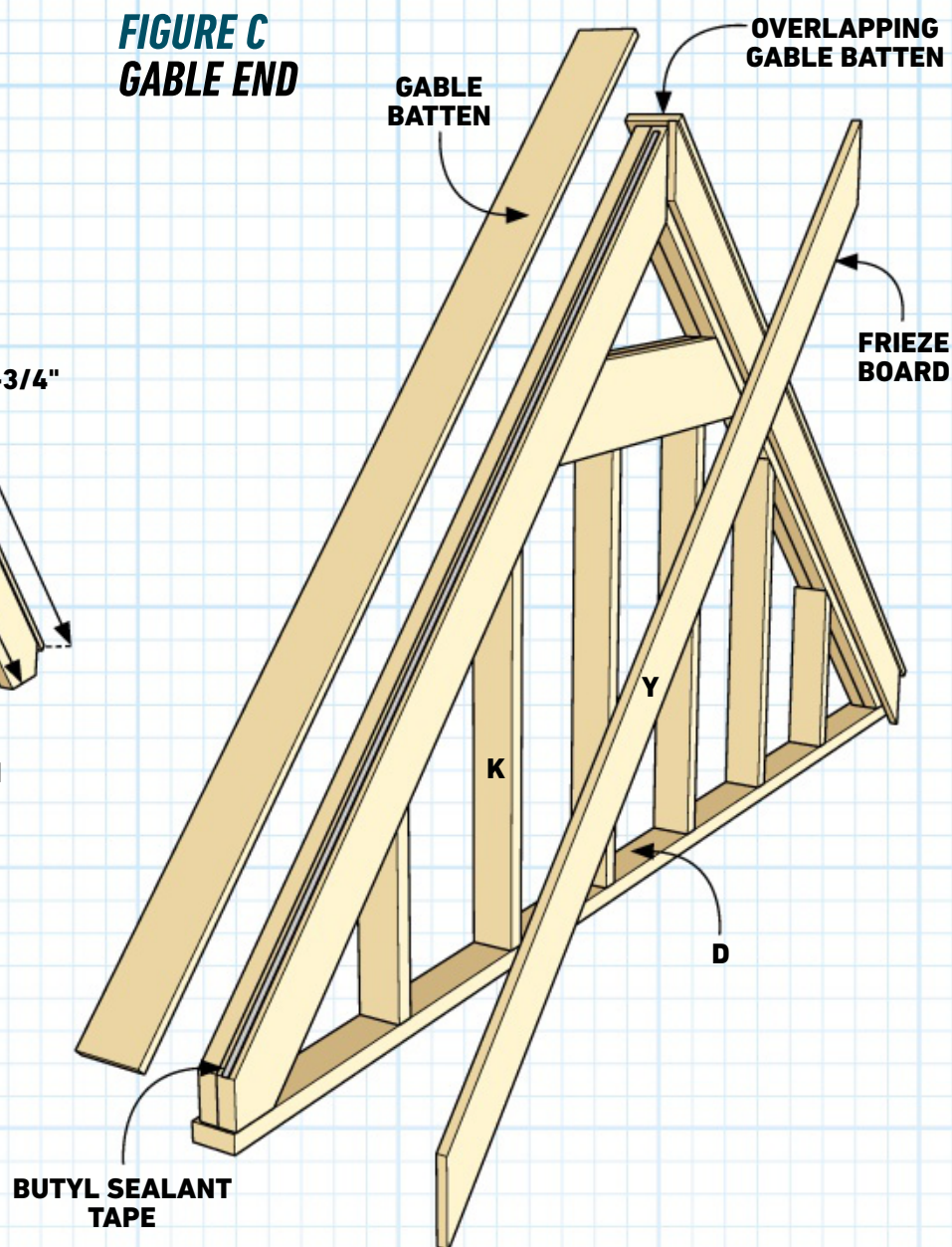
MATERIALS LIST

ITEM	QTY.
5"x5" x 8' ground-contact timbers	8
Cedar 2x4 x 14'	6
Cedar 2x4 x 10'	6
Cedar 2x4 x 8'	55
Pressure-treated 2x4 x 14'	2
Pressure-treated 2x4 x 110'	2
2x4 x 12' framing lumber (bracing)	8
Cedar 2x6 x 8'	26
Cedar 1x4 x 8'	20
Cedar 1x6 x 8'	8
Cedar 1x6 x 16'	2
11/16" x 8' x 14' cedar bevel siding	12
11/16" x 8' x 12' cedar bevel siding	12
7/16" x 4' x 8' weather barrier sheathing	7
8mm x 4' x 8' polycarbonate sheets	14
10' polycarbonate ridge cap	2
No. 9 3" construction screws	
2" stainless steel rubber gasket roofing screws	
3" framing nails	
No. 9 2-1/2" construction screws	
2" stainless steel ring-shank siding nails	
Butyl sealant tape	
Wooden screen door	

**FIGURE B
TRUSS**



**FIGURE C
GABLE END**



MAKE A TEMPLATE FOR TRUSSES



REPEAT PARTS WITH A TEMPLATE

Make a template to accurately cut the rafters and assemble the trusses to ensure they're all identical. We built a simple 2x4 frame on a pair of sawhorses and fastened a piece of sheathing to the top. Be sure to build the frame to the exact span of the walls, then draw a line up from the center point to locate the ridge miter. We fastened a block 3-1/2 in. up from the corner on each side of the template at a 45-degree angle. With this setup, we could accurately mark and make all the necessary cuts before assembly.



PRO TIP

We used sheathing to make this template. After disassembling the table, we reused the sheathing for the greenhouse.

BUILD THE TRUSSES

After making the cuts, place the parts of the truss back on the template, line them up and fasten the peak together with a screw. Then cut and fasten 1x6 cedar collar ties. After determining the location of the collar tie, fasten another block to the template so you can repeat the location on the rest of the trusses.



4 ANCHOR THE WALLS

To anchor the structure to the ground, we used bullet anchors by American Earth Anchor. After drilling holes in the bottom plates to fit the anchors through, we drove the anchors into the ground with a hammer drill outfitted with a driving rod. Then we pulled the cable through the Quickvise washer to set the anchor in the ground and hold the structure firmly in place.

5 ASSEMBLE GABLE WALLS

The gable walls on the front and the back of the greenhouse follow the same process as the trusses, with a few exceptions. First, the gable ends are doubled up. Second, the collar ties are cut from 2-by material and fit between the two rafters. Third, we added cripples to match the layout of the wall they will be sitting on. We used the same template to position the parts, then fastened the second top plate to the bottom of the trusses, and cut the collar tie and cripples to fit.

6 POSITION AND BRACE THE GABLE END

We lifted the gable end onto the walls. Before tipping it upright, we fastened a few scrap 2x4s to the back of the wall to prevent the gable from slipping off. We fastened a long board to the center cripple toward the top of the gable to use as a brace, pushed the gable upright and then braced it plumb. With it in place, we added a second top plate to the side walls where we'll rest the trusses.



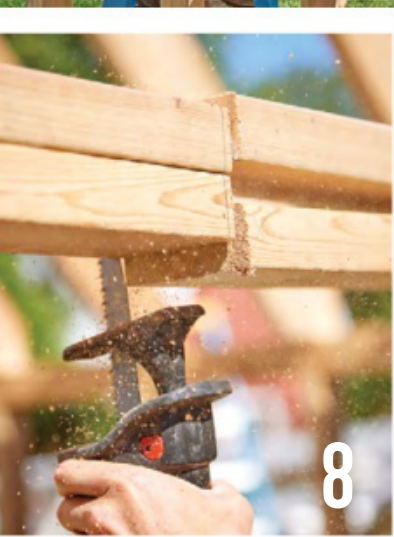


USE BLOCKS
FOR EVEN
SPACING

7

7 POSITION THE TRUSSES

When the gable end is plumb, braced and fastened to the wall below, it is time to set the rest of the trusses. First, precut cedar 2x4 blocks to match the spacing of each stud bay. Fasten the blocks to the gable 36 in. from the peak, tip up the next truss, fasten it to the blocks and then add the next blocks. Repeat this for each truss until all are attached. As we tipped up trusses, we checked that their tails lined up with the studs in the walls and toe-screwed them to the top plates.



8



KING
STUD

TRIMMER
STUD

DOOR
HEADER

9

8 CUT OUT THE DOOR OPENING

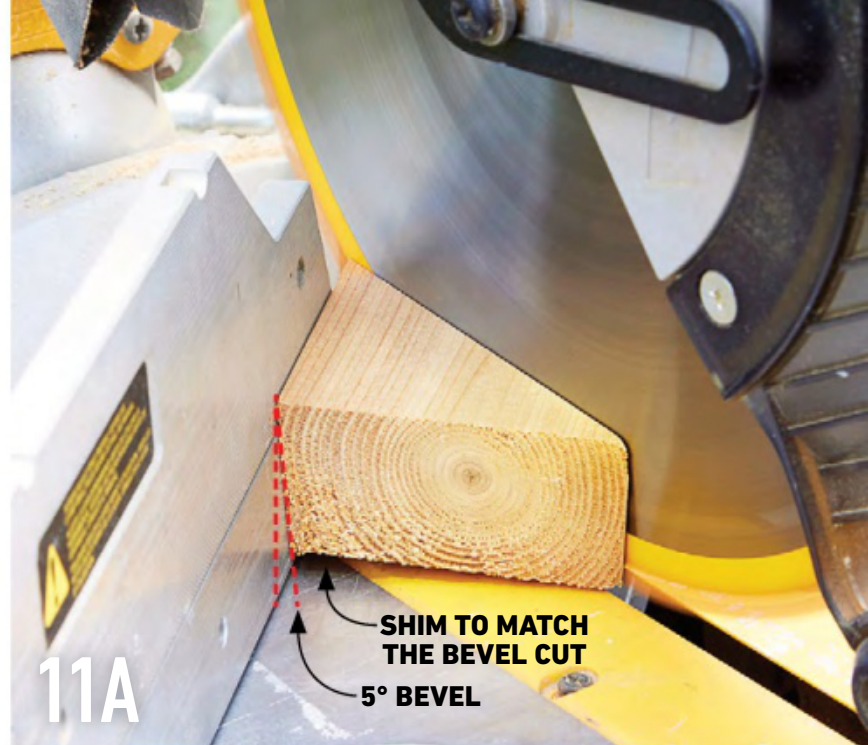
When the trusses are fixed to the walls, cut away the top plates and a bottom plate to frame the door. We marked out a 42-1/2-in. opening in the center of the front wall and cut it out to fit the 36-in. door and its framing. This left room for the framing and space for the door to swing open.

9 FRAME THE DOOR

Cut king studs to fit from the bottom plate to the gable truss, plumb and fasten them in place. To finish the framing, add trimmer studs cut to fit the height of the door and a header across the top. Because there is no doorjamb, these components must be perfectly plumb and level. Keep about 3/16-in. space at the sides and top, and about 3/8 in. at the bottom when the door is in place. Install the door temporarily to make sure it fits.



10



11A

SHIM TO MATCH
THE BEVEL CUT
5° BEVEL

10 SHEATH THE BOTTOM

To install siding on the bottom half of the greenhouse, we added sheathing to the studs. The sheathing also adds rigidity to the entire structure. We ripped the sheets and nailed them to the studs with ring-shank framing nails, making sure all the seams landed on a stud. We kept the factory edge of the sheets up for easier leveling.

11 ADD THE SIDING SILL

Before adding the siding, we needed to cut and install a siding sill to keep water from getting behind it. We started by cutting a 5-degree angle on the edge of a 2x4 with the table saw, then we cut a miter at both ends to turn the sill around the corner. To get these miters to snug up at the corner, we matched the bevel cut with the miter saw. We marked the miters and set the back of the board on a shim to keep the beveled edge flat against the fence (11A). This trick makes it easy to make more precise compound cuts.

Once the miters were cut, we cut a 1/4-in.-deep kerf in the bottom of the sill about 1/2 in. from the outer face of the sill (11B). This kerf will keep water from wicking backward and getting behind the siding.

We fastened 2x4 blocks between the studs to attach the sill (11C). We set the sill on top of the plywood sheathing, flushing up the top of the blocks with the top of the sill. Then we fastened the blocks through the studs and the sill through the blocks.



11B

DRIP KERF



11C

BLOCKS
TO FASTEN
THE SILL

WHAT IS AVAXHOME?

AVAXHOME-

the biggest Internet portal,
providing you various content:
brand new books, trending movies,
fresh magazines, hot games,
recent software, latest music releases.

Unlimited satisfaction one low price

Cheap constant access to piping hot media

Protect your downloadings from Big brother

Safer, than torrent-trackers

18 years of seamless operation and our users' satisfaction

All languages

Brand new content

One site

AVXLIVE • ICU

AvaxHome - Your End Place

We have everything for all of your needs. Just open <https://avxlive.icu>



CORNER TRIM

12



13

12 INSTALL CORNER TRIM

There are several ways to handle the corner detail of the siding. We chose an inverted corner trim that the siding butts into. We used leftover 2x4s ripped in half and nailed them to the corners. This makes cutting the siding right up to the trim a breeze and adds a unique look. We also didn't have to order thicker trim boards, spend time cutting angles into each piece of siding or install individual corner hardware for each course.

13 INSTALL SIDING

The corner trim makes the siding installation fast and easy. We recommend buying lap siding that's long enough to span an entire side, if available. Cut the siding to length and nail it to the studs using ring-shank nails compatible with cedar (some galvanized siding nails will leave a blue streak on the cedar when water passes over it). Each course of siding overlaps the next, leaving 6 in. of each course exposed.

14 FINISH SHEATHING THE WALLS

With the sill and siding finished, we started sheathing the rest of the greenhouse walls with polycarbonate sheets. We cut the sheets to length, made sure each seam landed on a stud and then used 2-in. stainless steel roofing screws to fasten the sheets.



14

PRO TIP

We used 8mm twin-wall polycarbonate sheets that are UV protected and allow 80% light transmission through the panels. When light passes through a panel that is less translucent, it's spread more evenly to the inside. Using clear panels tends to create hot and cool spots, which could harm the plants inside.



15

15 FASTEN THE FASCIA

Cut a piece of 1x6 cedar to fit beneath the edge of the roof. Fasten the fascia so that a straight-edge placed on the rafter contacts the top outer edge of the fascia. Drive nails into each truss and top plate.

16 MAKE A POLYCARBONATE SANDWICH

Apply a strip of butyl tape down the center of each truss (Photo 16A). This tape is very sticky, especially in hot weather! Cut the pieces of polycarbonate to overhang the fascia by about 1-1/2 in. Double-check the truss layout to verify that the edge of each sheet will land on a truss, then set the sheets in place. The butyl tape sticks to the polycarbonate instantly, so be precise when laying each sheet down.

As you position the sheets, fasten a piece of cedar 1x4 over each truss with a 3-in. exterior construction screw (Photo 16B). Drive the screw through the butyl tape to seal the penetrations and secure the polycarbonate sheets. To be on the safe side, we added a second strip of butyl tape where two sheets met on one truss to make sure all the screw holes would be sealed.

17 TRIM THE ROOF

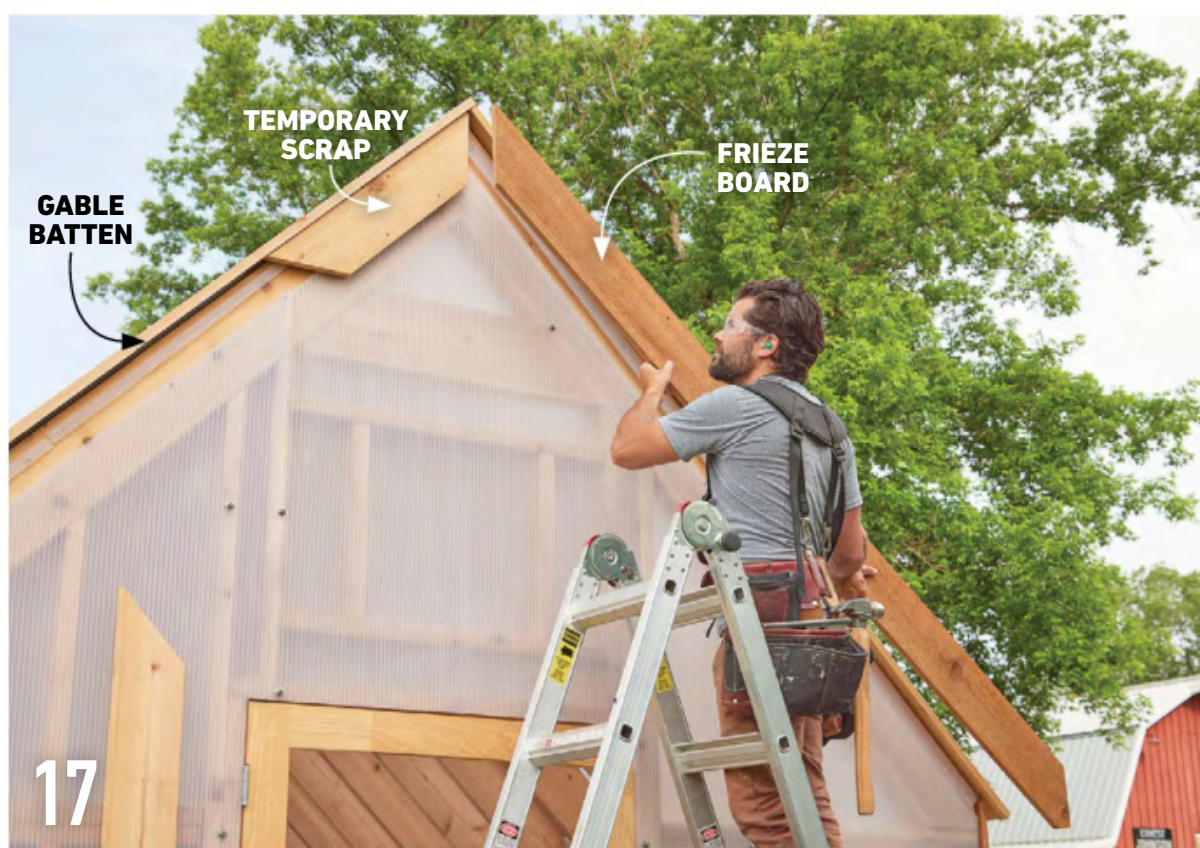
We trimmed the gable edges of the roof with 1x6 cedar. This batten needed to overhang the frieze board, so we positioned it 1 in. proud of the sheathing on the gable end. Then we installed cedar frieze boards to trim the peak. We cut two scraps of 1x6 at a 45-degree angle to check the fit at the peak and fastened one of them temporarily. We positioned the frieze board on one side, then removed the scrap to install the other side.



16A



16B



17



1x4 CORNER TRIM (Z)

18



POLYCARBONATE RIDGE CAP

19



20

18 ADD CORNER TRIM

Cut 1x4 cedar boards to fit between the sill and the fascia, and fasten them to fit around the corners using siding nails.

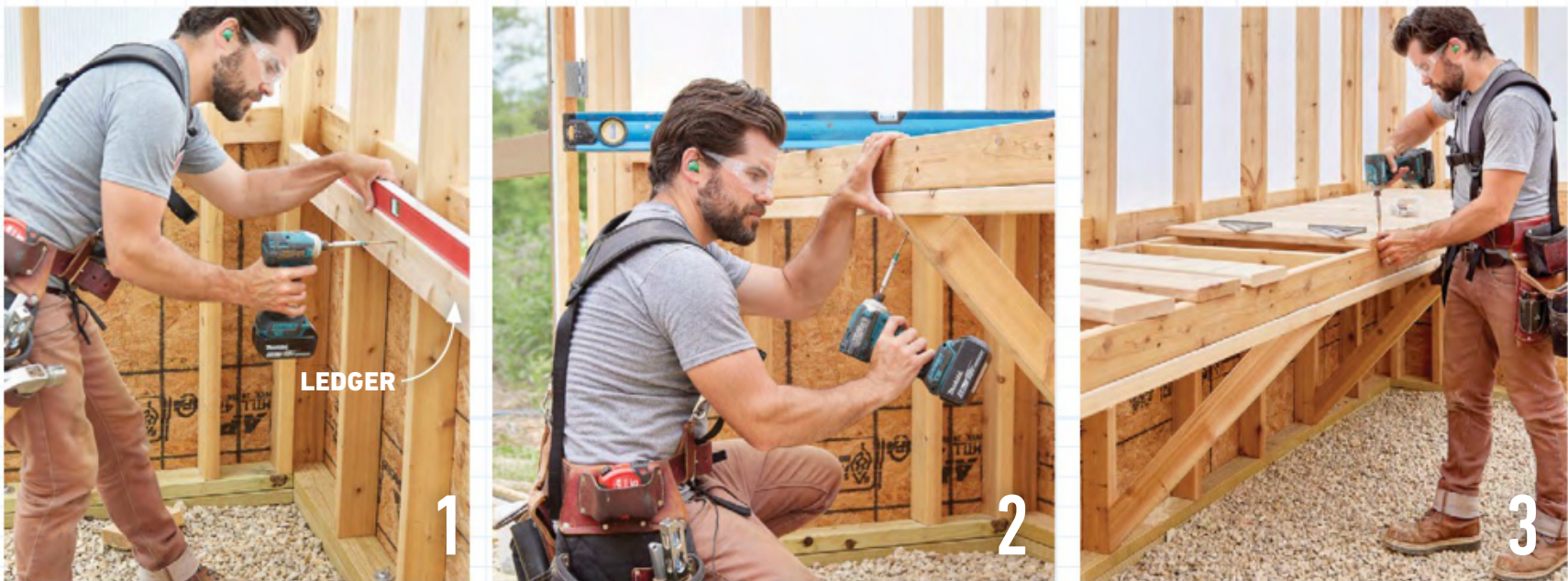
19 FASTEN THE RIDGE CAP

To finish the outside of the greenhouse, we covered the peak with a polycarbonate ridge cap. We lined up the ridge of the cap with the peak of the roof all the way down and fastened it through each batten into the trusses with 2-in. stainless steel roofing screws.

20 INSTALL THE SCREEN DOOR

We purchased a screen door from a home center to fit our door opening. We removed the screen and replaced it with a clear version of the polycarbonate we used on the rest of the greenhouse. Then we hung the door using 3-in. galvanized utility hinges. Finally, we installed a screen door closer and fence gate latch to keep it from blowing open in the wind.

BUILT-IN POTTING BENCH



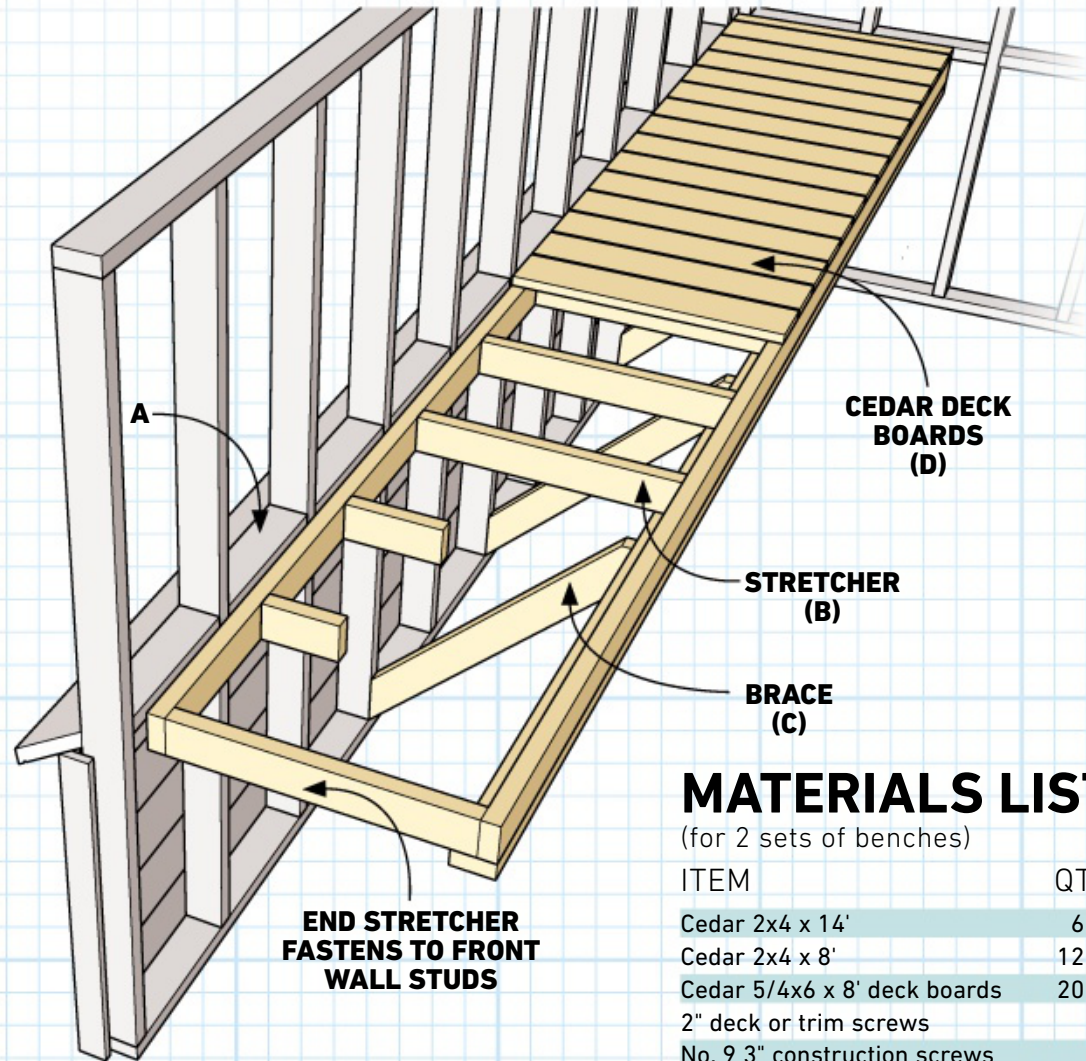
1 START WITH A LEDGER
Fasten cedar 2x4s to the studs inside the greenhouse so the top of one 2x4 is 34 in. from the ground. Level it across and then fasten two more 2x4s to create the ends of the bench. Fasten the 2x4 front of the bench to the end pieces. Next fasten 2x4 stretchers between the front and the back 2x4s to complete the frame of the bench.

2 ADD BRACES
Add a 2x4 on the bottom of the bench where braces will be fastened. Cut a 45-degree angle at each end of a 2x4 to make a brace about 40 in. long from point to point (trim the brace to fit). Then fasten the brace from the underside of the bench to one of the studs. We spaced three braces evenly along the bench.

3 TOP WITH CEDAR DECKING
Top the bench with cedar decking, fastening it to the frame with trim screws. The incense version we used is mostly used for saunas and closet lining, but it's much cheaper than typical cedar decking. It was perfect for the greenhouse and made it smell amazing inside.

FIGURE A BUILT-IN POTTING BENCHES

OVERALL DIMENSIONS: 10'5" W x 27-1/2" D x 35" H



MATERIALS LIST

(for 2 sets of benches)

ITEM	QTY.
Cedar 2x4 x 14'	6
Cedar 2x4 x 8'	12
Cedar 5/4x6 x 8' deck boards	20
2" deck or trim screws	
No. 9 3" construction screws	

CUTTING LIST (for 2 sets of benches)

KEY	QTY.	DIMENSIONS	PART
A	6	1-1/2" x 3-1/2" x cut to fit	Ledger board/front/bottom
B	20	1-1/2" x 3-1/2" x 24-1/2"	Stretcher
C	6	1-1/2" x 3-1/2" x cut to fit	Brace
D	28	1" x 5-1/2" x 27-1/2"	Cedar top deck boards

GREENHOUSE UPGRADES

To make this a perfect place for plants to thrive, we outfitted the inside of the greenhouse with some useful features, both high tech and practical.

CIRCULATING FANS

We installed two wall-mounted fans on the back wall. These fans circulate air and simulate wind inside the greenhouse. It's important for young plants to be exposed to wind so their stems will mature strong enough to support their growth.



GROW LIGHTS

We attached several eye hooks to the rafters above the benches so we could install cafe lights with full-spectrum grow lightbulbs. These bulbs will give the plants the light they need early on in the growing season.

VENTILATION FAN

We added an automatic ventilation fan in the gable end of the roof to help control temperature and humidity. This is a complete kit that allows you to program when the fan will turn on based on the temperature and humidity found by built-in sensors.

It comes with a controller that's easy to program from inside the greenhouse, but the kit also includes access to an app that monitors the temperature throughout the day and gives you the ability to change the settings remotely.

BUILT-IN POTTING BENCH

This simple floating bench is sized perfectly to pot plants and to store trays of starter plants. We built it right inside the greenhouse.

SIMPLE GARDENING BENCH

////////////////////
YOU CAN BUILD IT
IN HALF A DAY

BY JOE CRUZ

When you get into serious gardening, you need a sturdy bench where you can perform all your potting chores. I designed this one using cedar 2x4s and deck boards. All you need to do is cut the parts to length and assemble. Your bench can be ready for use in just a few hours. If you want to save a little money, use pressure-treated lumber instead of cedar.





WHAT IT TAKES

TIME	COST	SKILL LEVEL
Half day	\$200	Beginner

TOOLS

Miter saw, drill/driver, handsaw, quick clamp



SPACER BLOCK

1 BUILD THE FRAMES

After cutting your parts to length, assemble the top and shelf frames by attaching the short frame members (A) to the front and back frame members (B) using 3-in. screws. Use a block for even spacing.



2 MAKE THE LEGS

Each L-shaped leg has two parts: a front and a side (C). Fasten the fronts to the sides as shown in Photo 2 using 3-in. screws. Keep the outer edges of the fronts flush with the faces of the sides.

If you're adding the upper shelf, cut two leg/shelf supports (D) at 60 in., and be sure to assemble them as a right and left leg.

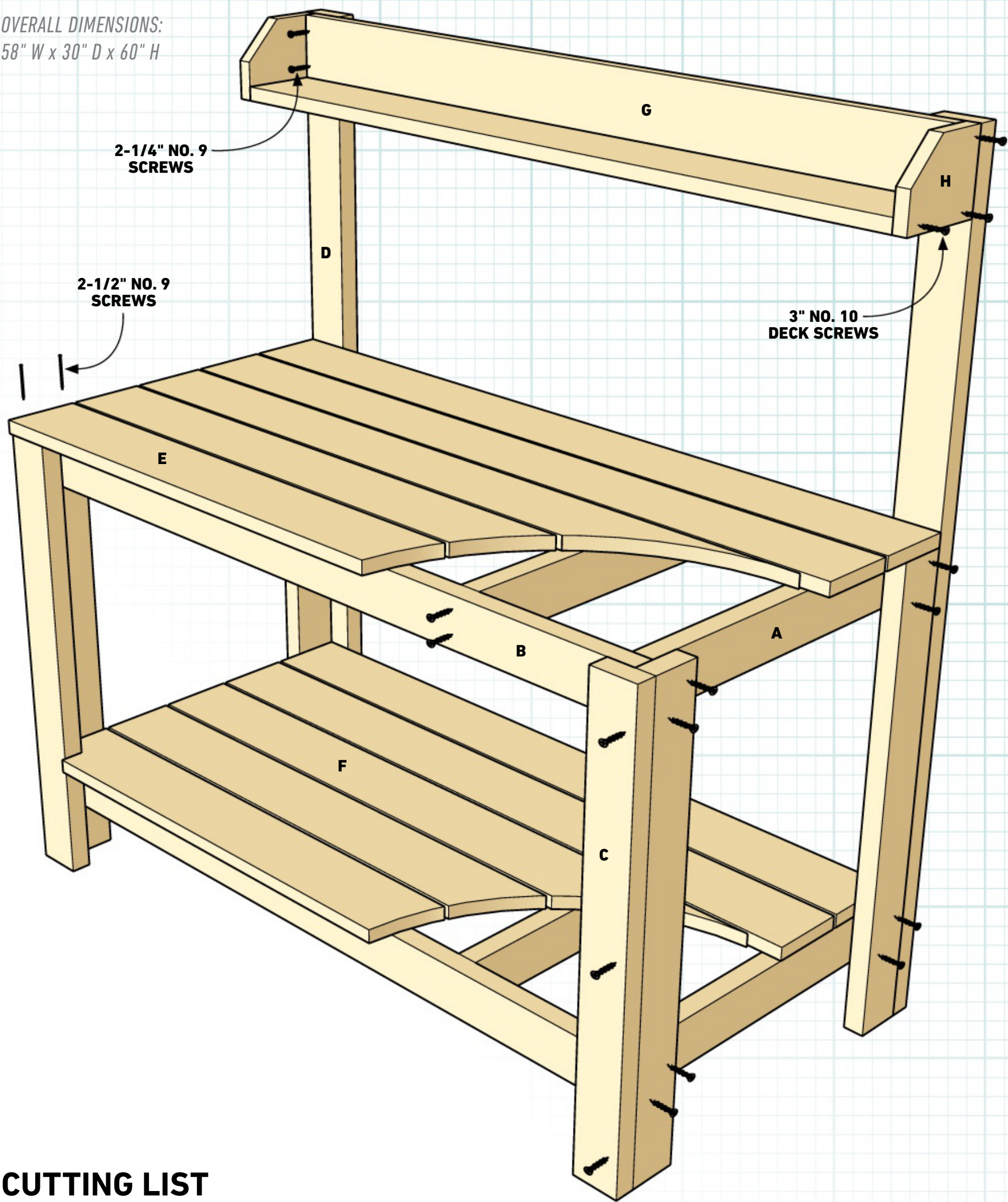
3 ASSEMBLE THE BENCH

Lay the left and right back leg assemblies on a flat work surface. Place the frame assemblies between the two legs, the top frame flush with the top of the legs and the lower shelf frame 5 in. from the bottom of the legs. Secure the legs to the frames with 3-in. screws (Photo 3A). Then fasten the front leg assemblies to the frames using 3-in. screws (Photo 3B). Stand the bench on the floor and finish screwing the back legs to the frames.



FIGURE A GARDENING BENCH

OVERALL DIMENSIONS:
58" W x 30" D x 60" H

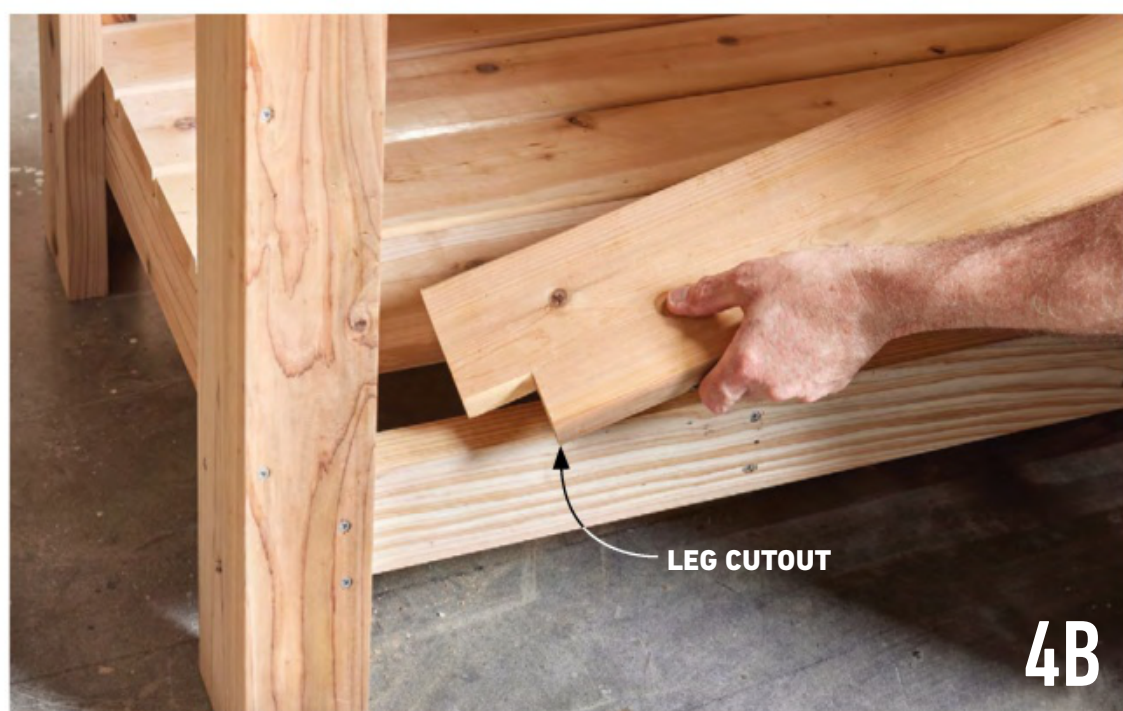


CUTTING LIST

KEY	QTY.	DIMENSIONS	PART
A	10	1-1/2" x 3-1/2" x 23-3/4"	Short frame members
B	4	1-1/2" x 3-1/2" x 55"	Front and back frame members
C	6	1-1/2" x 3-1/2" x 34"	Leg fronts and sides
D	2	1-1/2" x 3-1/2" x 60"	Back leg/shelf supports
E	5	1" x 5-1/2" x 58"	Top deck
F	5	1" x 5-1/2" x 55"	Lower shelf deck
G	2	1" x 5-1/2" x 56"	Upper shelf
H	2	1" x 5-1/2" x 6-1/2"	Upper shelf ends

MATERIALS LIST

ITEM	QTY.
2x4 x 8' cedar	9
5/4 x 6 x 8' cedar	12
3" No. 10 deck screws	2-lb. box
2-1/2" No. 9 screws	1-lb. box
2-1/4" No. 9 screws	4



4 INSTALL THE DECKING

Attach the decking (E) to the top frame with 2-1/2-in. screws or nails (Photo 4A). Use a 1/4-in. spacer to establish the gap between the deck boards.

Cut the deck boards for the lower shelf (F) to fit between the legs. For the front deck board of the lower shelf, cut a 1-1/2 x 2-in. rectangle out of each end of the board using a handsaw or jigsaw (Photo 4B), then attach it.

5 ADD THE UPPER SHELF

Next, cut your upper shelf parts (G), and assemble them as shown in Figure A. Attach the shelf ends (H) using screws or nails. Then use a quick clamp to hold the upper shelf assembly while you fasten it to the back legs/shelf support with 2-1/4-in. screws. 

MEET THE BUILDER



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MILL AND DRY LUMBER YOURSELF

////////////////////////////////////
TWO AFFORDABLE CHAIN SAW
ATTACHMENTS MAKE IT POSSIBLE

If there's one thing more satisfying than building something with wood, it's building something with lumber you milled and dried yourself. You don't need a giant band saw mill to do that. All you need is a milling attachment for your chain saw. Attachments come in several styles and sizes to suit various saws and sizes of stock.

MEET THE EXPERT



CHAD BEATY IS A MASTER TECHNICIAN
AND AN IN-HOUSE CHAIN SAW EXPERT
AT NORTHERN TOOL + EQUIPMENT.

BY BRAD HOLDEN



BACKGROUND PHOTO: KNAUPE/GETTY IMAGES

WHAT IT TAKES

TIME	COST	SKILL LEVEL
1 log per day	Varies	Intermediate

MATERIALS AND SUPPLIES

Logs, 4x4s, log supports, wedges, stickers, corrugated roofing, chaps, headgear, face shield, gloves, Anchorseal, rake to keep work area clean

TOOLS

Chain saw with a 25- to 30-in. bar	\$1,400
Mini edging milling attachment	\$30
Frame-style milling attachment	\$250
EZ Rail straightedge	\$250

MINI EDGING MILLING ATTACHMENT



1 SECURE THE LOG

This edging attachment operates with your saw in a vertical position. Roll the log up onto smaller logs so the chain doesn't dig into the ground. Use a log peavey to roll the big logs onto the smaller ones. Wedge the log into position so it doesn't shift as you work.

2 INSTALL THE MILLING ATTACHMENT

Carefully read the instructions for your specific attachment, and then fasten the attachment to your saw's bar. Three setscrews secure this one to the saw's bar.

3 ATTACH THE STRAIGHTEDGE

For this attachment, you need to fasten only one 2x4 to the top of the log. "Use the straightest 2x4 you can find for this. The 2x4 acts as a guide, so the straighter the 2x4, the straighter your cut will be," says Chad Beaty of Northern Tool.

4 MAKE THE FIRST CUT

Start up your saw and begin the first cut. Go slowly and let the saw do the work. Since you're working vertically, it's not necessary to slip shims into the kerf unless the piece you're cutting off wants to bind. Just make sure that first cut piece will fall safely away from you.

5 MAKE SUBSEQUENT CUTS

After the first cut is done, you can now either move the 2x4 over and slice off another board, or roll the log and cut another flat side perpendicular to the first one. "Proceeding like this, you can use this attachment to make either boards or beams," Beaty says.





**SCAN THIS CODE
TO SEE BOTH
MILLING
ATTACHMENTS
IN ACTION.**



FRAME-STYLE MILLING ATTACHMENT



1 SECURE THE LOG

Start by blocking your log to keep it stationary while you're milling. A few well-placed wedges will do the trick. It is also helpful to roll the log onto sturdy blocking to make a more comfortable working height.

2 INSTALL THE MILLING ATTACHMENT

Carefully read the installation instructions for your specific attachment, then bolt it onto your chain saw. You attach this type by tightening steel pads at both ends of the bar. The attachment features a push handle and tip guard.

3 ATTACH THE STRAIGHTEDGE

A flat, straight carriage is essential to getting a flat first cut. Here we're using the EZ Rail system that has leveling screws and pawls to hold it in place. Now is the time to get some wedges ready to keep the kerf open while cutting.

4 MAKE THE FIRST CUT

Fire up your saw and start the cut. Go slowly and don't force it. Let the chain's teeth do the work. As the saw progresses through the cut, slip wedges into the kerf on both sides. This keeps the slab you're cutting from pinching your chain and bar.

5 MAKE SUBSEQUENT CUTS

Remove the slab you just cut, as well as the EZ Rail. Now you've got a flat surface for the milling attachment to ride on. Continue cutting slabs, using the same techniques you used for the first pass. "The slabs will be rough, and not dried, so be sure to leave extra thickness for drying and final milling," Beaty says.





DRYING LUMBER

Once you've cut your logs, it's time to exercise patience. The rule of thumb for air-drying lumber is one year of drying for each inch of board thickness. Buy a moisture meter so you can check your lumber's moisture content. Kiln-dried lumber is dried to about 7% moisture content. For air-dried lumber, look to get down to 12% or less. At that point, you can let it acclimate in your house or shop for a couple of weeks before further dimensioning.

1 CREATE A BASE

Make a base using 4x4s. Beatty says, "The stack doesn't need to be perfectly level, but use mason's line to ensure that the 4x4s are in the same plane."

2 START THE STACK

Place the first layer of boards. Set "stickers" on top, spacing them no farther than 12 to 16 in. apart, to help prevent your boards from bowing as they dry. Stickers can be made from any dry lumber. The gap created allows airflow between the boards.

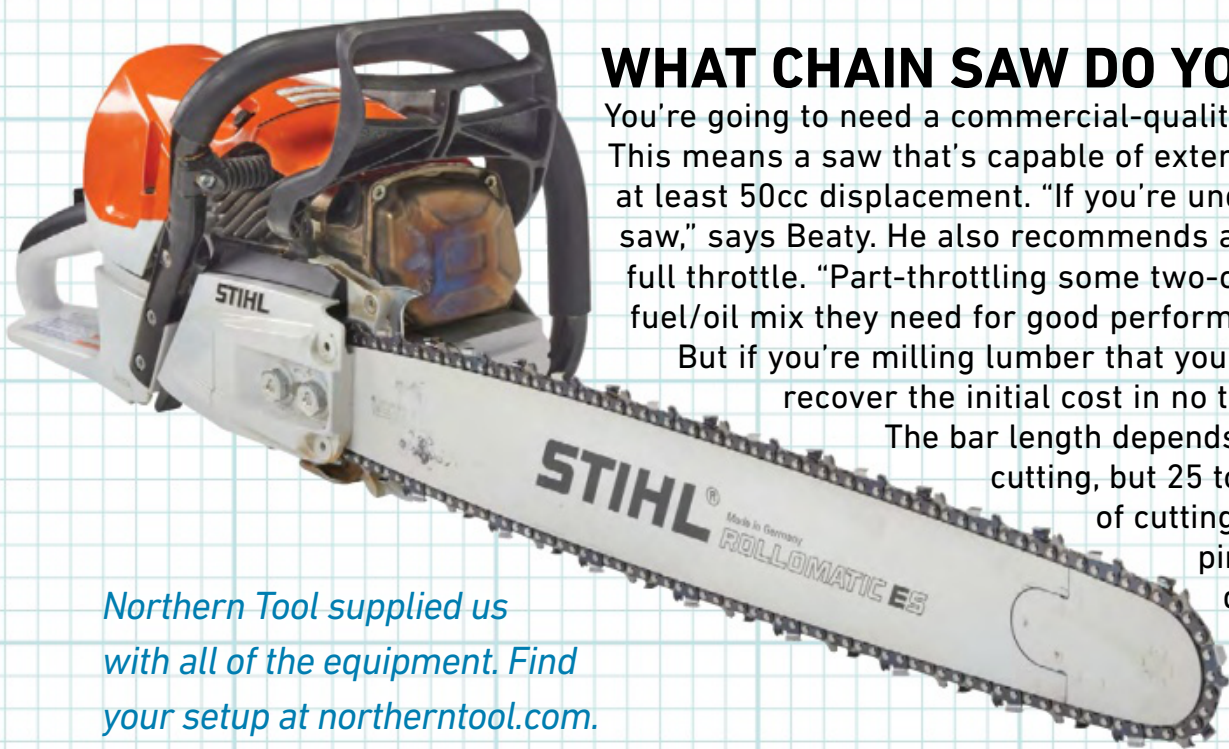
3 CONTINUE STACKING

Stack subsequent layers the same way: a layer of boards followed by a layer of stickers. The ends of the boards dry out the fastest. To help keep them from cracking, paint them with Anchorseal to slow the drying.

4 COVER THE STACK

Now you need to put a roof on the stack. A piece of corrugated roofing or other sheet metal works well for this. You want it to curl down a bit so it sheds water but doesn't inhibit airflow. Weight the roof with lumber scraps so it doesn't blow off.





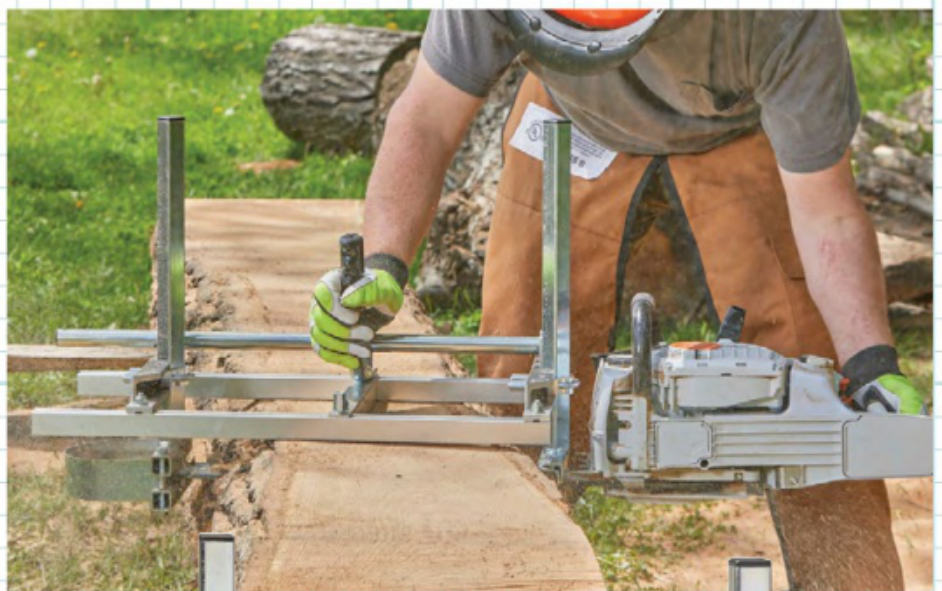
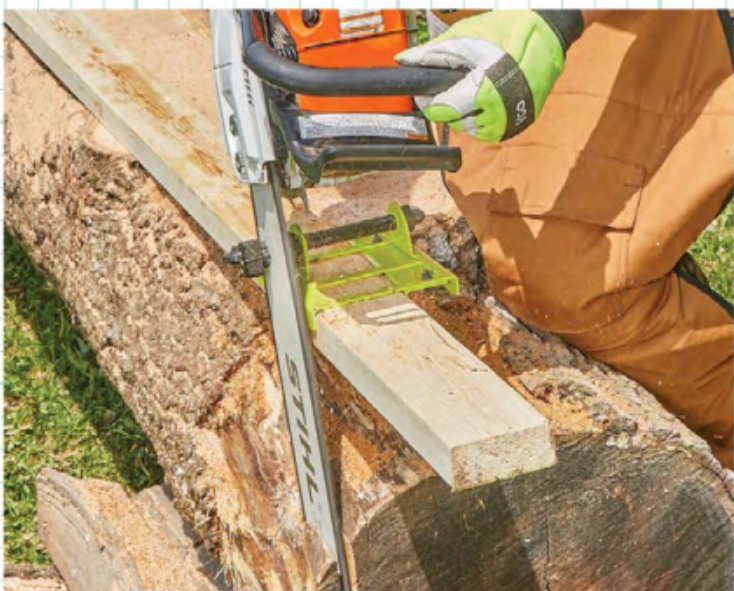
WHAT CHAIN SAW DO YOU NEED?

You're going to need a commercial-quality saw, not a typical residential saw. This means a saw that's capable of extended running time and an engine with at least 50cc displacement. "If you're underpowered, you'll just destroy the saw," says Beaty. He also recommends always running two-cycle engines at full throttle. "Part-throttling some two-cycle engines can starve them of the fuel/oil mix they need for good performance." The saws don't come cheap.

But if you're milling lumber that you can turn around and sell, you'll recover the initial cost in no time.

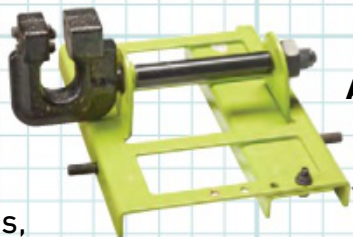
The bar length depends on the diameter of the logs you're cutting, but 25 to 30 in. is usually sufficient. This type of cutting—cutting with the grain—is called ripping. Most chains are made with teeth designed for crosscutting—typical chain saw work. To mill lumber, you'll need a special chain with teeth designed for ripping.

Northern Tool supplied us with all of the equipment. Find your setup at northerntool.com.

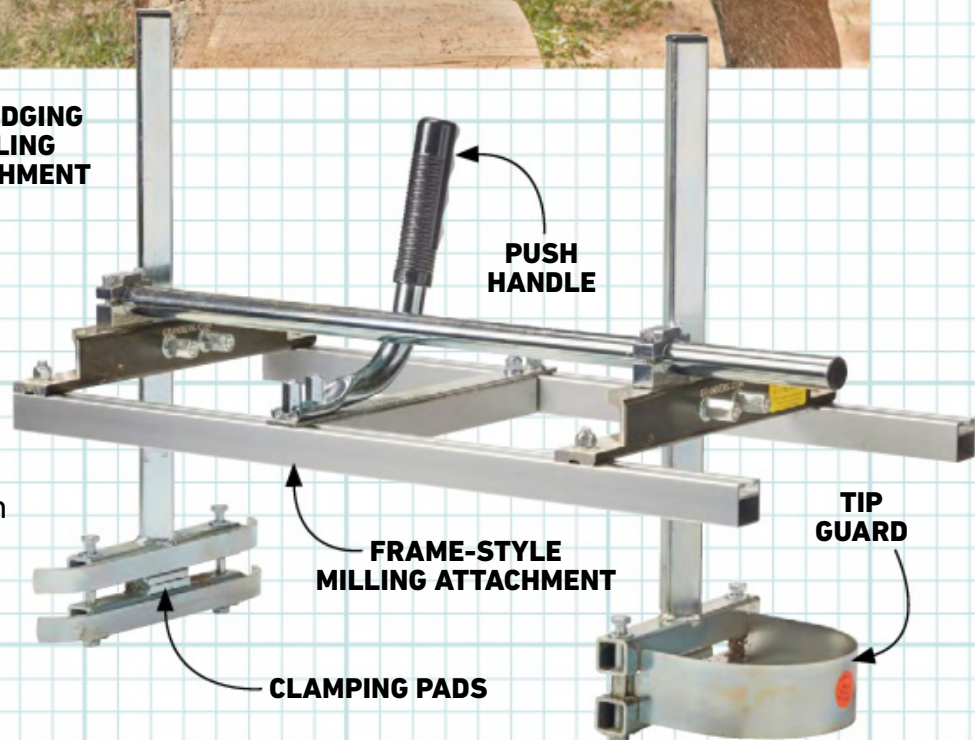


WHICH STYLE ATTACHMENT DO YOU NEED?

Whether you're making boards or posts and beams, either of the milling attachment styles shown will do the job. The frame style, however, is more accurate because the frame helps prevent bar deflection, giving you flatter, straighter cuts. For occasional use, to cut just a few posts for example, you can get by with the inexpensive mini edging attachment. For more frequent use, go with the frame style.



MINI EDGING MILLING ATTACHMENT



CHAIN MAINTENANCE

If you're throwing dust, not chips, your saw's chain is dull. You'll need a file with a guide to sharpen a chain. Count the strokes it takes to get a clean, sharp edge on the first tooth. Follow up by giving each tooth the same number of file strokes; otherwise you'll get an unbalanced chain and a curved cut.

BAR MAINTENANCE

Use brand-specific bar oil to cool and lubricate the chain and bar. "Some folks think used motor oil is OK to use, but unlike motor oil, bar oil has tack additives that help keep the oil on the bar instead of splattering all over," says Beaty. Clean the bar when you sharpen the chain, and clean the bar's groove using a special bar groove cleaning tool. "Also, remember to grease the two little holes in the sprocket nose at the end of the bar every time you sharpen the chain. This is also a good time to make sure to clean the saw's air filter." 

DO-IT-YOURSELF SOLAR

BUILD A COMPACT SYSTEM TO
RUN POWER WHERE YOU NEED IT

BY JAY CORK

The sun has been sharing its energy with us for a long time, and we should be utilizing it!

You can start small—you don't have to cover your entire roof. A compact off-grid solar array is a fantastic solution for RVs and campers, and it can be an easy way to run power to an outbuilding. A small solar array can provide convenient power to a remote location, such as our greenhouse, and it will reduce your carbon footprint. You can even expand the array as your needs grow.

WHAT IT TAKES

TIME	COST	SKILL LEVEL
2 days	\$2,000 to \$3,000	Beginner

TOOLS

Cordless drill, socket set, heavy-duty lug crimpers, multimeter, basic electrical tools, specific tools for solar installation.

The 200W PV panels shown above are \$220 each from Rich Solar.

MEET THE EXPERT



ERIC CARTER IS A TECHNICAL SALES SPECIALIST WITH DRAGONFLY ENERGY AND BATTLE BORN BATTERIES. HE EXPLORES THE COUNTRY AND CAMPS OFF-GRID IN HIS SPRINTER VAN POWERED BY BATTLE BORN BATTERIES.

SOLAR ARRAY DESIGN

Solar power is easy to understand; photons emitted by the sun are absorbed by semiconductor materials in the photovoltaic (PV) cells. This generates a flow of electrons, which is converted and stored as potential energy in a bank of batteries. The power stored in the batteries is then made usable by an inverter. Simple, right?

CHOOSING BATTERIES

More sources than ever exist for batteries, but most originate overseas. I wanted strong customer support with a simple phone call, and Dragonfly Energy/Battle Born Batteries provides that and more. Based in Nevada, it offers domestically assembled lithium iron phosphate (LiFePO₄) batteries. Its heated battery was a perfect choice for the greenhouse's northern location.



**12V, 100Ah
HEATED CELL
\$949**

■ LITHIUM IRON PHOSPHATE.

Battle Born lithium batteries have an integrated management system that protects the cells; they can't be overcharged or overdrawn. The batteries cost more, but with their high charge cycle specs (1,000 to 3,000 cycles), they still have the highest cost-to-benefit ratio.

■ **LEAD ACID.** Many types of lead acid batteries, including flooded, gel and absorbent glass mat (AGM), are available. They cost less than LiFePO₄ batteries, but the drawbacks of lead acid outweigh that advantage—literally. They're very heavy, making them a poor choice for mobile installations. With their shorter life span (300 to 1,000 cycles), you'll pay more for lead acid batteries over time.



**SCAN THIS CODE
TO SEE THE
SOLAR ARRAY
INSTALLED
ON THE
GREENHOUSE.**

RIGHT-SIZE YOUR BATTERY BANK

USE THIS SIMPLE EQUATION TO DETERMINE BATTERY BANK SIZE.

List all AC loads in watts (W) in the table below and calculate the total watt-hours (Wh) per day. Multiply that number by the days of autonomy (DoA)—that is, the average number of days you expect to have complete cloud cover. Then divide that number by the voltage (V) of the system. This is the amp-hours (Ah) your battery bank should have.

OUR GREENHOUSE

AC Load	W	x	Hrs./Day	=	Wh/Day	x	DoA	=	Total Wh
14' wall fan (2)	132	x	2	=	264				
Ventilation fan	50	x	2	=	100				
LED lights (24)	15	x	2	=	30				
					394	x	3	=	1,182

FIND THE TOTAL Wh

$394 \text{ Wh/Day} \times 3 \text{ DoA} = 1,182 \text{ Total Wh}$

FIND THE NECESSARY Ah

$1,182 \text{ Total Wh} / 12\text{V} = 98.5\text{Ah}$

Based on these equations, our battery bank needs 99Ah to accommodate this simple system. I chose to double this number to allow for growth.

OFF-GRID VS. GRID-TIED SYSTEMS

True off-grid systems aren't connected to the power grid, so they need a bank of batteries. RVs, campers and out-buildings are perfect candidates for an off-grid system. A grid-tied system allows the energy generated from the solar array to power your home, but when the sun goes down, the power grid takes over.

The benefit of a grid-tied system is if you generate more power than you use, it gets shunted back to the power grid and the utility company pays you for it. The downside: If the power goes out in your neighborhood, you lose power; these systems automatically shut off in the event of a power failure to protect the line workers.

MAKE THE POWER DISTRIBUTION CENTER

I configured the panel in my workshop first, attaching all the elements on a small plywood panel that I sealed with oil-based paint. I used 3/4-in. washer-head screws to mount the solar charge control module, power inverter, shunt, bus bars and fuse block.

POWER INVERTER

Choose a power inverter that will give you plenty of room to grow. Pure sine wave inverters provide a power signature that is even cleaner than the power grid. Modified sine wave inverters may cause issues with delicate electronics such as computers; it's best to avoid this type.

BATTERY SHUNT

A battery shunt allows you to monitor the health of the battery charge. It needs to be connected to the negative lead between the battery and the inverter.

FUSE BLOCK

In-line fuses protect the system from overloads and power spikes. I used a standard fuse block with a 200-amp fuse mounted directly in line with the positive side of the system.

CHARGE CONTROLLER

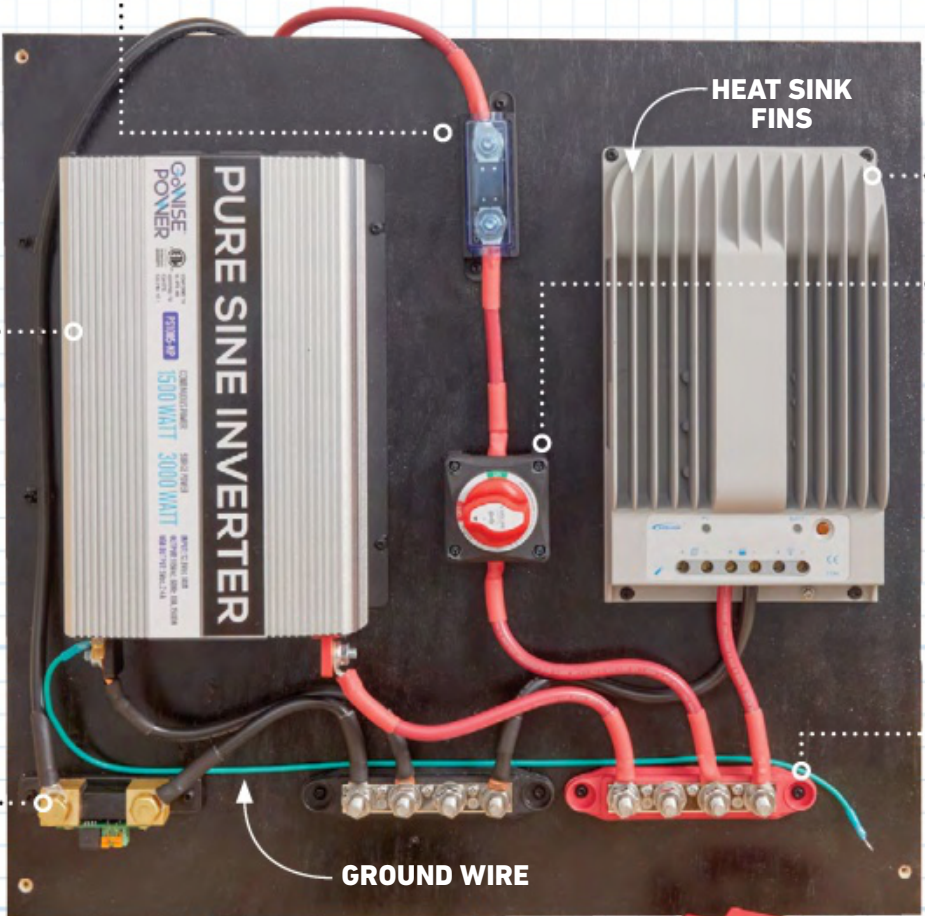
I chose to use the EPEVER 40-amp solar charge controller. It has an integrated heat sink design (which keeps things cool) and heavy-duty wire terminals. It's completely programmable for use with any type of battery.

BATTERY SHUTOFF

A kill switch for the batteries and on/off switch for the power inverter together provide a quick way for you to safely work on the system.

BUS BARS

Terminal blocks organize the cables and allow for expansion.



SERIES VS. PARALLEL

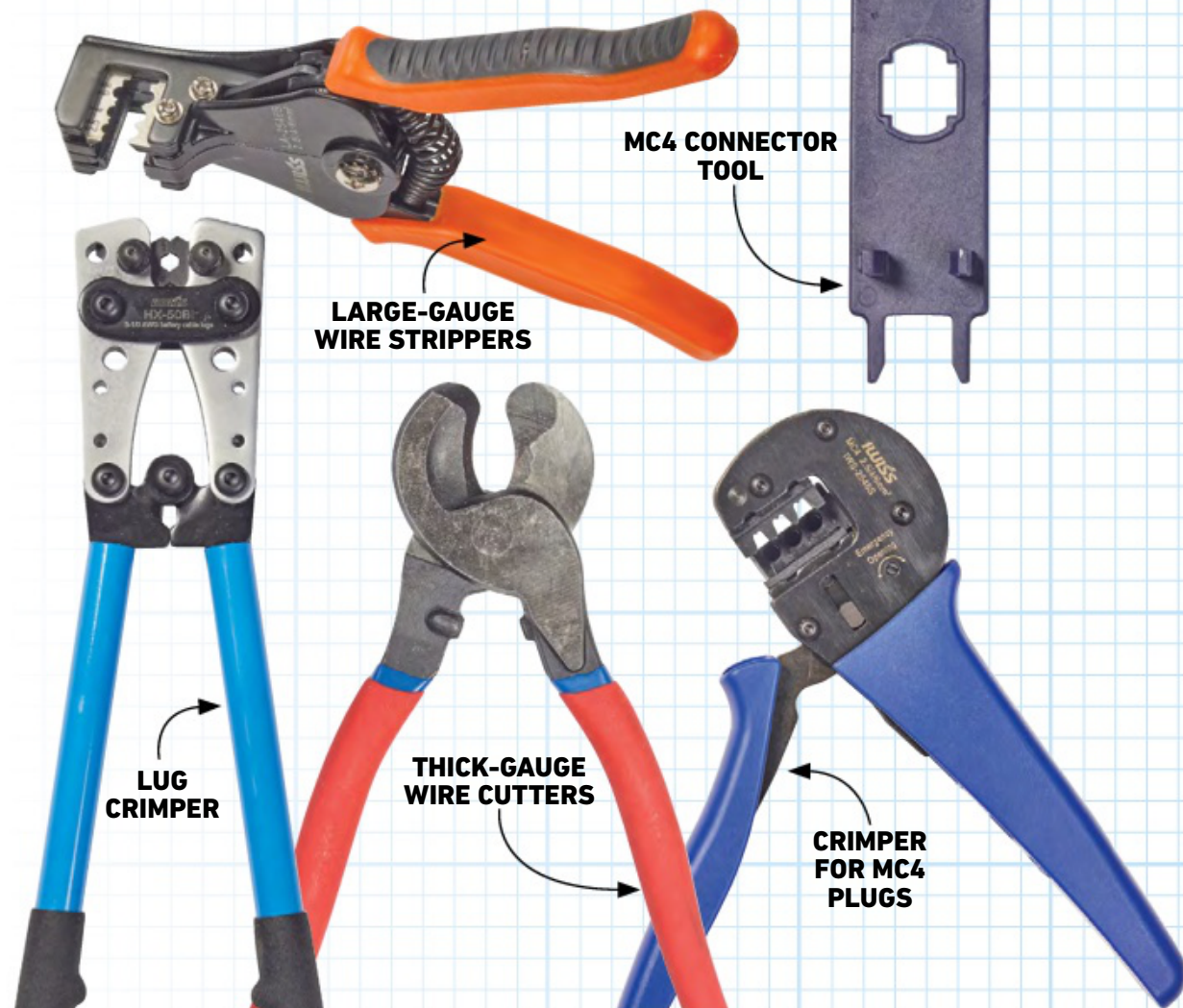
Wiring batteries in series doubles the voltage while keeping the capacity the same. Alternately, wiring the terminals in parallel keeps the voltage the same while doubling the stored capacity.

AMP-HOUR RATINGS

Battery capacity, measured in amp-hours (Ah), refers to the amount of energy a battery can store. For example, a 100Ah battery can deliver 100 amps for one hour or 25 amps for four hours or 50 for two. You get the idea.

ELECTRICAL TOOLS

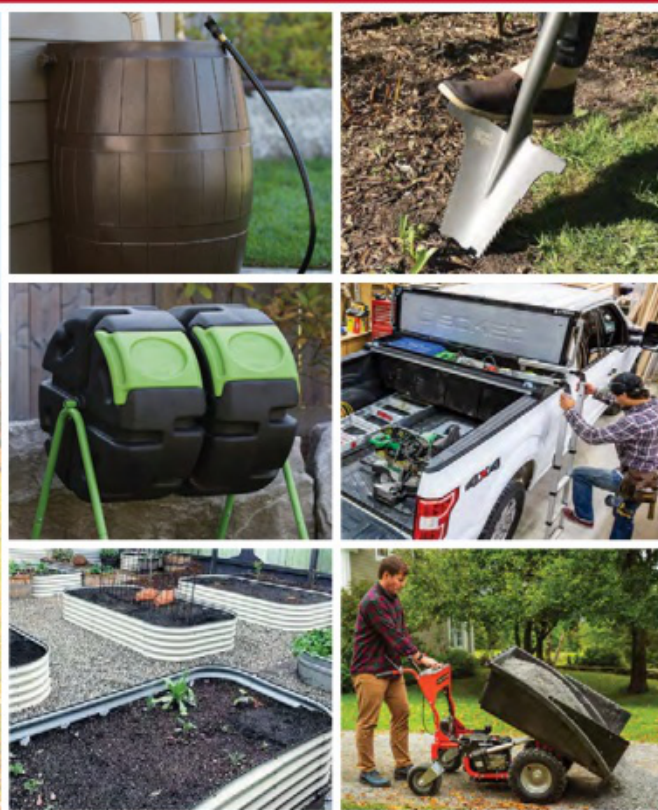
Specific to installing solar power systems



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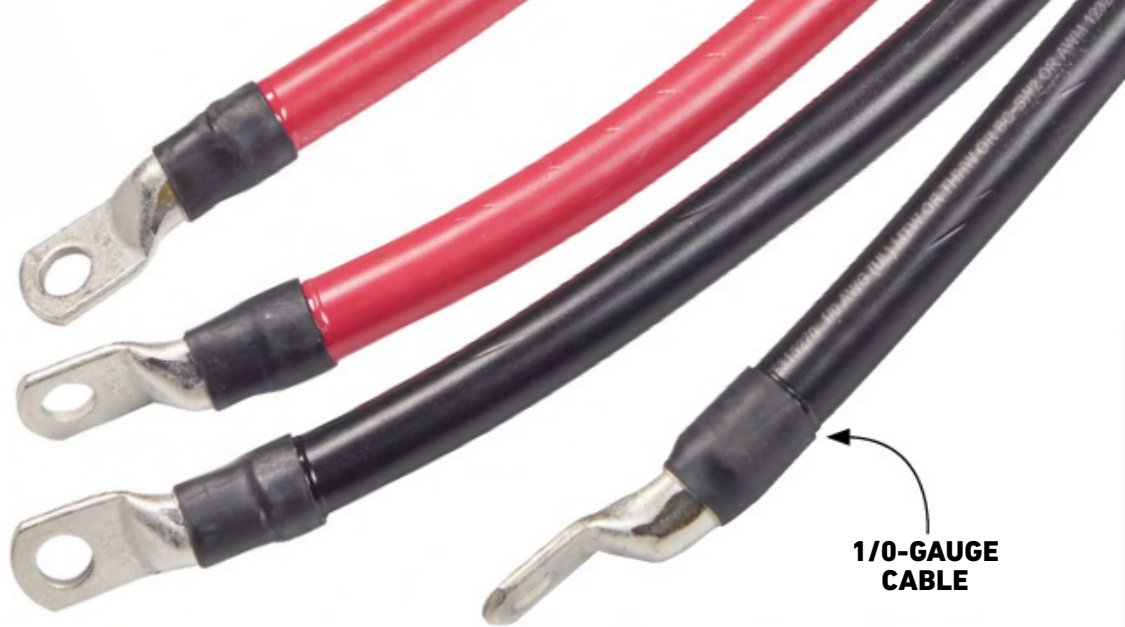
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MAKING CABLES

Battle Born supplied me with premade battery interconnects, but every solar power installation will be different, so don't count on premade cables working for you. Eric Carter suggests using 1/0-gauge cable for connecting the batteries to each other. Here's how to make your own.



STRIP THE CABLE

Automatic wire strippers make quick work of smaller-gauge cables, but they won't work with these larger cables. Using a utility knife, I rolled the cable on the benchtop just enough to score the insulating jacket. Don't press too hard; you'll cut the copper.



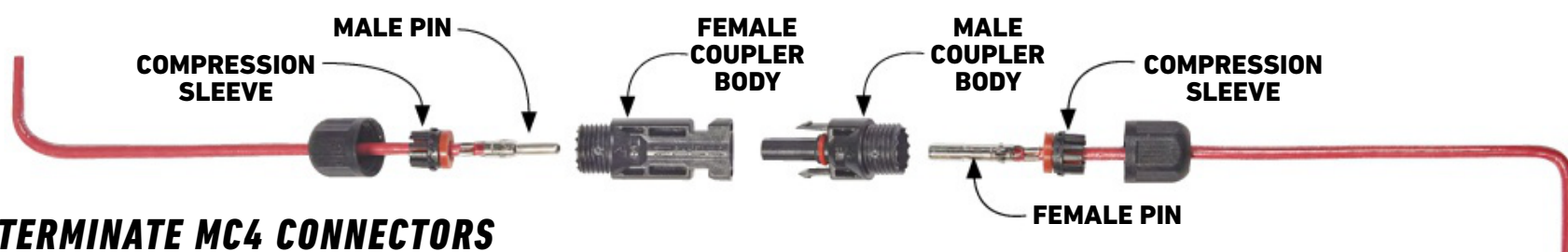
CRIMP THE CABLE LUGS

To crimp the heavy-gauge lugs, I used these large lever-action crimpers (\$40 online) and a quick jig I made to hold the cable steady. The best way to do this was to lightly crimp, rotate and repeat. Trying to crimp all at once often produced an ugly result.



PROTECT THE ENDS WITH HEAT SHRINK TUBING

To protect the crimped ends of my cables, I used double-walled adhesive-lined 3:1 shrink tubing. Cut the tubing to 1-1/2 in. long and heat it until it fully shrinks around the crimped cable end.



TERMINATE MC4 CONNECTORS

MC4 connectors are the standard for photovoltaic panels. They are rated IP67 waterproof and are easy to terminate with the right tools. Crimp the contacts to the cable and assemble the MC4 housing.

MOUNT THE PV PANELS

FIND A SUNNY SPOT

I had planned to mount the PV panels on the roof of our greenhouse, but because the structure faced almost perfectly south, I decided that wasn't necessary and mounted them near the ground.

MOUNT ON A STAND

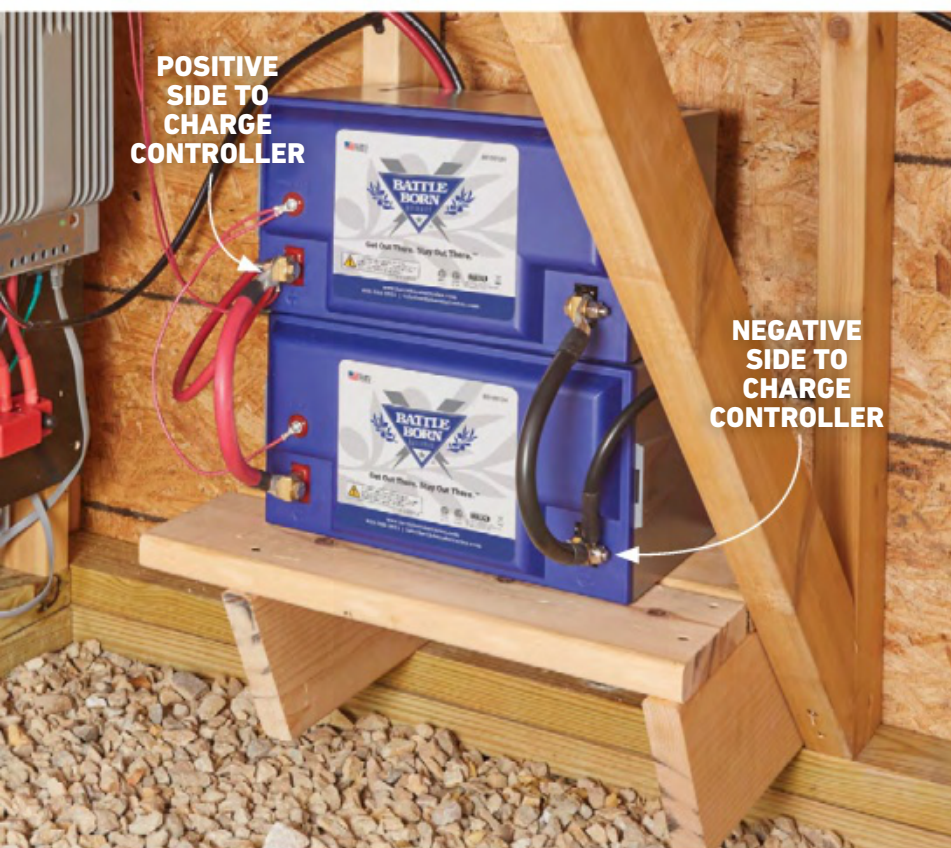
I mounted the adjustable bracket stand (\$150 online) to the foundation wall of the greenhouse and did my best to angle the panels to the sun's position in the midday sky. The optimum angle will change seasonally, and this bracket is designed to make those adjustments easily.



RUN WIRE

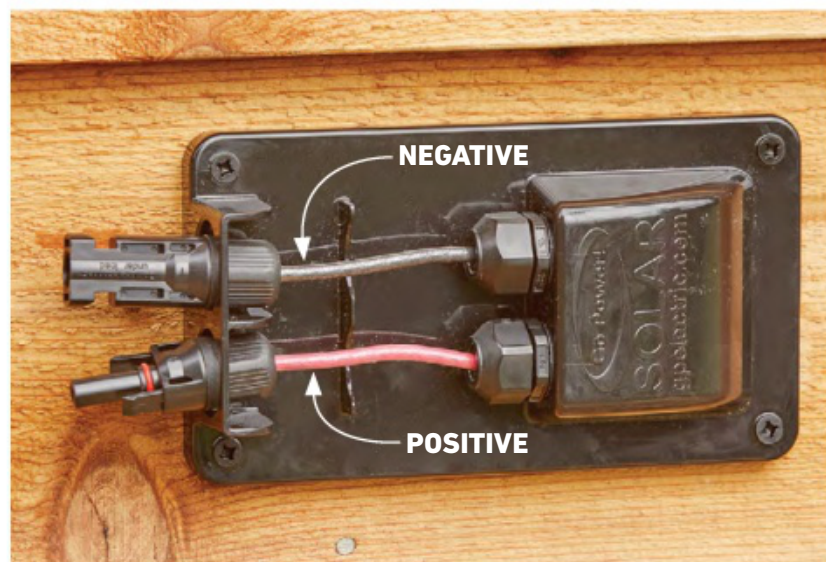
I used 10-gauge cable to connect the 12V, 400W array to the power distribution panel—only 20 ft. away. To avoid power loss, longer runs need heavier-gauge cable. Cable length/gauge charts are readily available online.

MAKE THE FINAL CONNECTIONS



MAKE THE BATTERY STAND

Because there is no liquid in lithium batteries, you can lay them in any position. This makes it easy to configure multiple batteries. I stacked two batteries near the power hub on a small ledge made from scrap wood.



ATTACH THE CABLE ENTRY PLATE

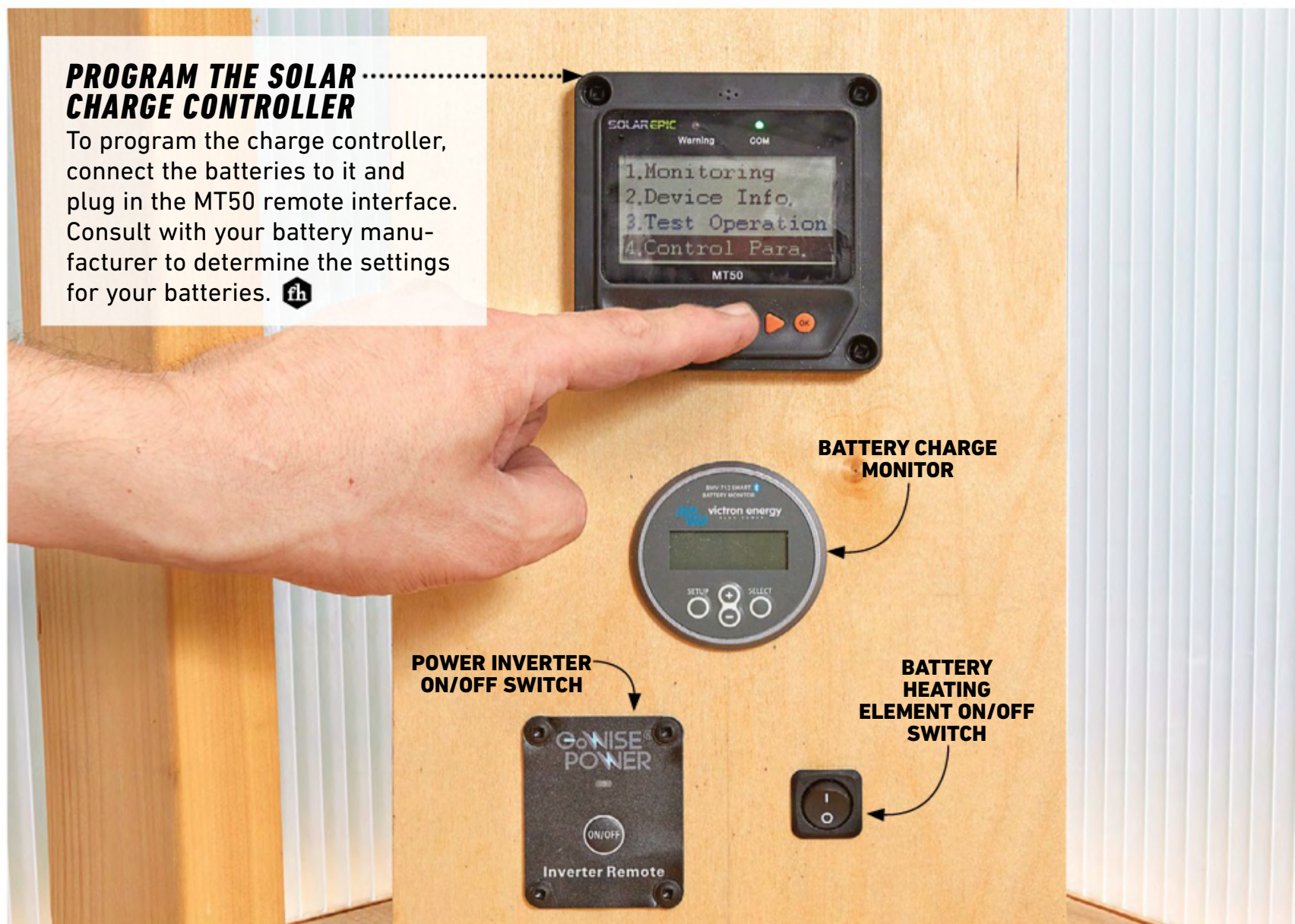
I mounted a pass-through box designed for MC4 connectors on the exterior of the building. This allows the panels to be easily disconnected from the structure if needed. On the interior side, run the 10-gauge cable to the solar charge controller.

DETERMINE POLARITY

Before plugging the leads from the PV array into the entry plate, check the polarity of the cables using a multimeter. The positive lead should connect to the positive side of the entry plate and that should follow all the way to the positive terminal on the solar charge controller.

PROGRAM THE SOLAR CHARGE CONTROLLER

To program the charge controller, connect the batteries to it and plug in the MT50 remote interface. Consult with your battery manufacturer to determine the settings for your batteries. 



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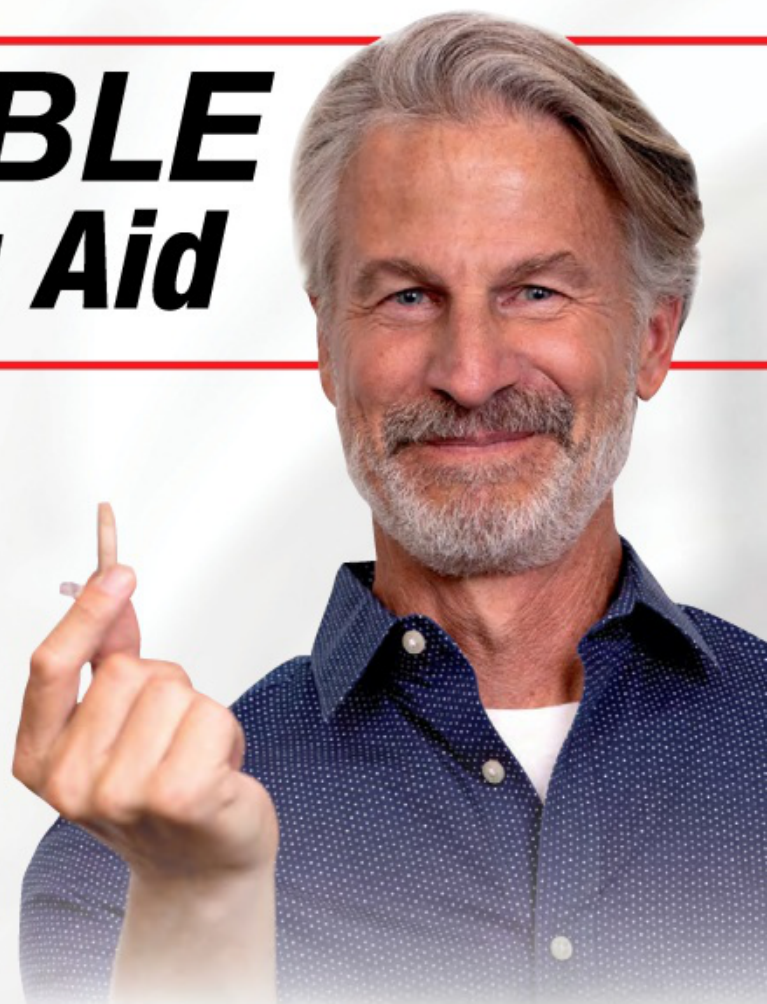
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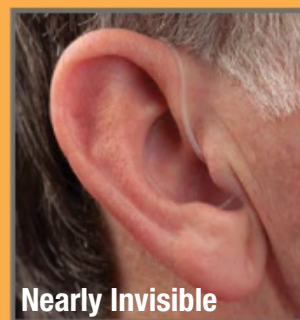
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TOOLS WITH HORSEPOWER

CHOOSE THE RIGHT WORK VEHICLE FOR YOUR LAND



UTILITY VEHICLE

Some of my favorite tools don't fit in a toolbox or on a workbench.

Take a close look at the tools on the following pages. If you have land to care for, you should consider adding a utility vehicle, tractor or zero turn radius (ZTR) mower to your tool shed. Here's what you need to know.

BY GLENN HANSEN



TRACTOR



ZERO TURN RADIUS MOWER



UTILITY VEHICLES

With the capabilities of small pickups and a much higher fun factor, utility vehicles (UTVs) are soaring in popularity with landowners nationwide. Consider them grown-up four-wheel ATVs; utility vehicles can carry up to six passengers while doing a whole lot more work. Yes, that makes them more difficult to store and tow than a small ATV, but if you have land, a UTV is worth the effort.

I've spent a lot of time testing UTVs over the years, and I recently added a Polaris Ranger 570 NorthStar (\$19,299, suggested retail price) to my tool kit for our greenhouse project. Here's what I learned.

If you've driven a car or truck in the last 100 years, you can drive a UTV. On the ease-of-use scale, UTVs are the champ. They have power steering, gas and brake pedals, automatic transmission and seat belts just like a truck. It might take a while to master the

response characteristics of a UTV's belt-drive continuously variable transmission (CVT). Finding the engagement point (how far to move the foot pedal before the vehicle moves) takes time to get used to. The advantages of a CVT? It automatically finds a good gear range for the situation, and the simple belt-and-pulley design allows performance upgrades with aftermarket components. The driver can easily select high- or low-range gearing, plus reverse.

Not all UTVs use a belt-drive CVT. The Honda Pioneer 1000 UTV uses a unique six-speed automatic dual-clutch transmission that features a manual paddle-shift option. This transmission won't slip in muddy or wet conditions like a belt drive can, but it's far more complicated mechanically. Kubota UTVs, like the company's compact tractors, use a hydrostatic transmission.

ON THE JOB

The first thing I did with the Polaris Ranger 570 NorthStar during our greenhouse build was load the cargo bed with the gravel we used for our foundation. This UTV can carry up to 500 lbs., and the bed's gas-assist lift helps dump loads easily. With its short wheelbase and tight turning radius, I easily transported tools, lumber and materials to the work site. One of my favorite features is the vehicle's TurfMode rear differential. With the push of a button, I can unlock the rear differential to make this a one-wheel-drive machine that treads lightly across any area I don't want torn by aggressive tires.

This Polaris Ranger 570 is powered by a fuel-injected four-stroke gas engine, making a reported 44 hp. UTVs with more powerful engines are widely available and may be a good choice if your work includes pulling a boat and trailer out of the lake or taking a work crew into mountain terrain. Bobcat, Kubota, Kawasaki and John Deere are among the manufacturers offering diesel-powered UTVs, a good option for owners of diesel tractors or other equipment. Polaris recently introduced the industry's first electric UTV; it was not in production at the time of this test.

You find the worth of a UTV like this when driving on rough terrain. On-demand all-wheel drive is standard on this UTV (and many of its competitors). With 11 in. of ground



clearance and four-wheel independent suspension, this Ranger confidently covers rough terrain. If you're doing fence work, accessing a tractor in the field or just need to get to a remote location, a UTV is an ideal choice. Plus, it delivers the convenience of your on-road pickup—passenger seats, power steering, a cab enclosure and more—while being purpose-built for off-road use. If you need the ultimate in off-road capabilities, consider a six-wheel Can-Am Defender with an 82-hp V-twin engine, six-wheel drive and a locking differential.

If you're interested in a work vehicle that plays too, a UTV is

your best choice. At 60 in. wide or less, most of these vehicles will fit on public-access off-road vehicle trails, and UTVs can drive on these roads legally in many states (check the local regulations).

MAKE IT WORK FOR YOU

By adding the right accessories, you can make your UTV the perfect work or play machine. This Polaris Ranger 570 NorthStar comes equipped with a winch mounted to the frame in front, plus a full cab with windows and a windshield wiper. Those are add-ons for many UTVs on the market. Many accessories are aimed at recreational users: Hunters can add rifle cases; sport riders can choose specific tires and wheels, and engine-performance kits.

Plenty of add-ons will help you get more work done too. You can add light bars and utility light options, mount a snowplow or powered snowblower, or add a heavy-duty bumper kit and brush guards. And a wide range of cargo racks and tool holders help you carry tools to the task. A UTV also makes it easy to tow a log splitter or chipper right to your fallen trees. Or tow a pull-behind mower or leaf vac to maintain turf-covered acreage.



TRACTORS

With long-running diesel engines and chassis made for chores, tractors are workhorses for any landowner. If you measure your property in the thousands of acres, you need a full-size tractor. For those with 1 to 100 acres, consider a compact or subcompact tractor.

A tractor's hp rating is one mark of whether a tractor is compact (about 25 to 50 hp) or subcompact (typically less than 25 hp). Specification charts aside, buy the tractor capable of doing the work you need done. If you need a tractor that can lift round hay bales, choose a compact or larger model. Many subcompact models have compact-tractor features in packages that are smaller, lighter and less expensive. And for most homeowner chores, a subcompact tractor will get the job done.



ON THE JOB

I spent some time on a Kubota BX2380 (\$13,615, suggested retail price) to learn the capabilities of a subcompact tractor. When I set up a test with a local dealer, the first question he asked was, “What implements do you want with it?” That’s the thing about a tractor. It doesn’t do much on its own, but it can do a ton of work with the right attachments. Tractor shopping begins with that “Whadda ya wanna do?” question. From there, you determine which tractor can do that work easily and within your price range.

Popular attachments include a front-end loader (\$3,750), a mid-mount mower (\$2,400), and a scraper blade (\$500) or disc harrow (\$2,100). These add-ons show how tractors work with different implements. Tractors use a hydraulic system to lift and articulate a front-end loader. The mid-mount mower is driven by a power-take-off (PTO) shaft. Many of the rear-mount implements you’ll pull are simply lifted and lowered to work. You can also run powered implements, like a posthole digger or brush cutter, with a separate PTO at the rear of the tractor.

To effectively carry and pull nearly any rear-mounted accessory, tractors use a three-point hitch system. This triangular steel attachment transfers the implement’s load to the tractor’s drive wheels and lets you easily switch between implements. Most



subcompact tractors use a Category 1 three-point hitch, while the largest farm tractors use Category 4 hitches. The three-point hitch on my Kubota BX was equipped with an additional quick-hitch accessory, allowing me to swap implements from the driver’s seat. As the popularity of subcompact tractors has increased, the availability of Category 1 three-point attachments has blossomed, making subcompacts much more than just big lawn mowers.

With its hydrostatic transmission, the Kubota BX tractor is a clutch-free automatic, and most subcompact tractors use a similar transmission. During my test drive I was reminded of the unique character of this transmission and the tractor’s forward foot pedal. While trying to fill the front-loader

bucket, I needed to use a bit more of the Kubota’s horsepower. I pressed down hard on the forward pedal as if I was driving that Polaris UTV and pulling a heavy trailer up a hill. With a hydrostatic transmission, that pedal-to-the-metal action essentially shifts the tractor into a higher gear range—the opposite of what I wanted. The tractor bogged down and I couldn’t fill the bucket. I realized my mistake, backed off the foot pedal, put the tractor in low and 4WD, then eased the throttle and loaded the bucket. The tractor’s reverse employs a separate heel-operated pedal.

Some subcompact tractors use gear-driven manual transmissions. These gear-drive transmissions are more efficient horsepower-wise, meaning there’s more power for your PTO-driven implements, plus better overall fuel mileage.

Because you might sit on a tractor for hours, comfort is a factor. While seated, you’re using a variety of controls, from drive and gear operations to hydraulics, hitches and PTO controls. Sometimes armrests help, and sometimes they’re in the way. And depending on your climate, a cab could be essential. A soft-sided cab keeps out wind, dust and bugs, and it can cost less than \$2,000. A hard cab costs four times that but enables heat and AC, plus comfort features like a stereo and more. You can save money by buying an aftermarket cab, but spending a bit more for a factory-made cab system ensures a perfect fit.



ZERO TURN RADIUS MOWERS

You can pull a mower behind your utility vehicle. Or you can use your subcompact tractor for finish mowing or rougher, brush-cut mowing. But if you have acres of turf to cut weekly, you need a zero turn radius (ZTR) mower. Not just for golf-course superintendents or landscape pros, ZTR mowers are increasingly popular for any landowner with an acre or more to cut, especially if you want a precise cut around trees, gardens, or a pool and patio.

When shopping, consider cutting width, cost and construction (and, of course, the cup holder!). I'll cover feature details and what to look for, but you should start with a budget. In the \$4,000 price range, you'll find many competitive mowers with 40- to 50-in. mowing decks. If you can spend about \$7,000, you can buy a ZTR with a 60-in. cutting width. To flip a cliché here, money is time. If you spend more to buy a mower with a larger deck, you'll cut more grass more quickly—usually. The extra width may make it harder to mow around trees and landscaping features.



ON THE JOB

I tried an Exmark Radius E-Series mower with a 52-in. cutting width (\$6,499, suggested retail price). As with most ZTR mowers, you turn the Exmark by manipulating individual lap-bar levers. The levers control the speed of the wheel on that side of the mower. When you push both levers forward simultaneously, both wheels turn at the same rate, propelling the mower in a straight line. To turn left, you push the right lever forward and pull back on the left lever. Do the opposite to turn right. The front tires swivel and are not connected to any steering input. Individual speed control on the powered rear wheels gives these mowers their unique capabilities. It also makes driving one a learned skill, especially on side hills where, lacking front-end control, a ZTR mower can be difficult to handle.

Cub Cadet makes a ZTR mower that features a traditional steering wheel for directional control. Using mechanical gearing and linkages to both front wheels and rear-end transmissions, Cub Cadet claims its mower can accomplish zero-turn-radius precision with a steering wheel you can operate with one hand.

Be sure your mower seat is comfortable and holds you in place well. Armrests are vital for lap-bar mowers. The Exmark Radius has height-adjustable lap bars, which is nice if you have more than one operator. Some Radius models feature a seat suspension system for increased driver comfort.



Most ZTR mowers use gasoline engines, as does the Exmark Radius, which is powered by a carbureted V-twin engine making about 24 hp. I don't want to say the engine doesn't matter, but ZTR mowers aren't sold on horsepower or speed, which is usually limited to about 10 mph anyway. A higher-hp engine can help if you're cutting long or wet grass, but the engine is not the differentiating feature of a ZTR mower.

A few companies, however, beg to differ. Ryobi expanded its outdoor tool offering last year with a line of battery-powered ZTR mowers. The company offers different battery platforms and cutting deck sizes, depending on the amount of work you need to do. You can also find electric ZTR mowers made by Greenworks, EGO and Cub Cadet.

WHAT TO LOOK FOR IN A ZTR MOWER

I appreciated a few other features on the model I drove. Consider items like this if you're shopping for a ZTR mower:

- **Ease of maintenance.** With no tools, I can access typical maintenance items for oil changes or belt replacement.
- **Deck lift system.** I can lift the deck with foot controls to navigate over obstacles.
- **Receiver hitch.** I don't need to tow with this mower, but I can if I want to.
- **Easy-adjust deck height.** The cutting height is easy to adjust at 1/4-in. increments.
- **Quick-adjust ROPS.** The rollover protection system folds easily for trailering or storage.
- **Accessories.** I can add a bag system and vacuum attachments, and more.

Look closely at a ZTR mower's cutting deck. The deck on the Exmark Radius is made from 10-gauge seam-welded steel. Some residential mowers use cutting decks made of thinner steel stamped from a single sheet. If you're mowing a few acres once a week, a mower with a stamped-steel deck will most likely be durable enough. But if you mow many acres or several properties, a fabricated steel deck might be worth the extra cost and weight.





HART 80V RIDING MOWER

If your lawn is an acre or less, you might need this Hart 80V riding mower with a 30-in. cutting deck (\$3,397). I spent several hours mowing an average-size suburban lawn or two over the summer, and here's what I learned.

REDUCED CUTTING TIME

I used to mow my lawn with a 56V walk-behind mower with a 21-in. deck. I could cut my grass in an hour—a little longer when I needed to do some string trimmer work (same 56V battery, all on one charge). With a 30% larger cutting area and more speed than my feet, this Hart rider cut my mowing time to less than 30 minutes. I was able to mow both my lawn and my neighbor's on one battery charge.

SMALL, BUT NOT TOO SMALL

This mower takes up minimal garage space (about 32 x 56 in.). At 6 ft. 2 in., I sat comfortably on the suspended seat. Thanks to the seat's fore-aft adjustment, it doesn't feel cramped; the three pedals (forward, reverse, brake) are easy to use, and the short wheelbase aids maneuverability.

QUALITY CUT

With two 15-in. blades under a 12-gauge steel deck, the Hart mower cuts well. I tested it on long and damp grass, on shorter grass, on hills and around a variety of

lawn obstacles. I set the deck for different heights from 1.5 to 3 in. The cut was always clean and even, though controlling the mower's speed downhill takes practice. I did bump the adjustment lever with my left arm a couple of times, and I didn't notice the cutting height change until a few passes later. The mower can mulch and side discharge, and an optional rear-mount bagging kit is available.

SHARP, BUT NOT ZERO TURN

A tight turning radius is essential in a riding mower; that's what makes ZTR mowers so popular. The Hart turns well, but I quickly learned to appreciate that this mower also cuts in reverse. I used that feature often when mowing around the trees in my yard. The Hart mower's rear wheels will get caught on bigger tree roots, but I learned to rock the vehicle so the spinning wheel can grab some turf—minor inconvenience.

NO GAS, NO OIL, LESS NOISE

I wish all my neighbors cared about quiet lawn tools as much as I do. While the spinning blades do make noise, this mower is much quieter than any other riding mower in my neighborhood. And when I'm finished mowing, I simply insert the plug from the charger into the mower's charging port. I admire that ease and convenience.

DR POWER BRUSH CUTTER

When we built our Getaway cabin last summer, we faced the same problem many landowners do. We had brush to cut; we had unwanted flora that was too much for a lawn mower and too small for a chain saw—and we had a lot of it. So we fired up a PRO MAX34 DR Power Brush Cutter (\$4,700).

Powered by a Briggs & Stratton engine with electric start, the PRO MAX34 looks like a lawn mower on steroids. It's a walk-behind unit with simple handlebar controls to engage the cutting blades and the self-propulsion drive system.

The area we needed cleared was mostly weeds and saplings. The PRO MAX34 is rated to cut weeds and brush up to 8 ft. high and saplings up to 3 in. thick. Our weeds weren't that high, but we pushed the limits on the sapling size. With its single cutting blade, the PRO MAX34 sliced through our growth with ease. The machine's two 18-in. tires roll smoothly over roots and stumps, and the mower deck glides on steel rails.

If you have weeds and growth to eliminate, a brush cutter might be right for you. 



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HOME CARE

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VOCs IN YOUR HOME

From vinyl flooring to plug-in air fresheners, different products in your home might emit harmful vapors. We talked to four experts so we could better understand how to lessen our exposure to volatile organic compounds (VOCs).

WHEN DID VOCs BECOME A PROBLEM?

VOCs have been around for a long time, though it's been only in the last couple of decades that science has discovered the extent of their dangers. Yet our exposure to them continues to grow.

"For one, we now spend more than 90% of our time indoors," says Oyvind Birkenes, CEO of Airthings air quality monitors. "Also, over the last couple of decades, scented products like candles, room sprays and even garbage bags have become extremely popular, especially in westernized countries like the U.S., which has contributed to the prevalence of VOCs."

While the EPA has banned extremely toxic chemicals like methylene chloride, it lacks the authority to regulate VOCs in indoor products that can off-gas for hours, months or years. Fortunately, there are ways to minimize your exposure to VOCs.

WHAT COMMON HOUSEHOLD ITEMS CAN OFF-GAS VOCs?

Nearly any interior finish that isn't glass, metal, ceramic, concrete or stone can off-gas, but alternative products are available with low- or no-VOC content. When buying building materials, look for certifications like SCS Indoor Advantage Gold, FloorScore, Green Seal and Greenguard.

PAINT

"VOC off-gassing is highest during and immediately after application, but paints can continue to off-gas for longer periods," says Nina Hwang, lead environmental scientist at Green Seal, a nonprofit that certifies eco-labeling. Buy certified low- or no-VOC paint and keep the work area well ventilated until the paint dries. Solvent-based paints contain higher VOCs than water-based coatings.

RUGS AND CARPETS

"Most VOCs from carpets come from the backing and the adhesive," says Docia Boylen, owner of Handyman Connection of



BY KARUNA EBERL

Golden, Colorado. For low VOCs, look for a Green Label or Green Label Plus certification for carpets and adhesives, and air out the space for at least 72 hours after installation. "A woolen carpet with a natural-fiber backing is also a great choice, since wool is naturally flame and stain resistant," says Boylen.

FURNITURE

Composite wood products, as well as the foam found in mattresses, cushions and padding, contain resins and adhesives that can include formaldehyde and other VOCs. "Emissions are highest when products are new and slowly drop over time," Hwang says. "However, off-gassing may continue for years."

Look for furniture that has been VOC tested by the

California Department of Public Health or certified by SCS Indoor Advantage or Greenguard. "Or buy secondhand furniture that has had more time to off-gas," says Hwang.

INSULATION

Building insulation is usually made from fiberglass, polyurethane or polystyrene, then treated with fire-retardant chemicals. "These products can leak VOCs into your air, especially during excessive heat," says Boylen. She recommends a formaldehyde-free brand, mineral wool insulation or sprayed foam products.

FLOORING

Because of its large surface area, flooring products like vinyl tile can be big contributors to VOCs in your home. "Fortunately, there is a

large majority of flooring that has been tested and certified," says Karen Righthand, vice president of corporate sales at SCS Global Services, which monitors third-party environmental certifications.

"VOC emissions from vinyl flooring are highest immediately after installation, but lower levels may continue for years," Hwang says. Also, use a low- or no-VOC adhesive if you can.

CLEANING PRODUCTS

For many, cleaning products offer especially high VOC exposure. Choose fragrance-free products or those certified by a reputable eco-label like Green Seal or Safer Choice.

"These chemicals are unfortunately all around us," Birkenes says, "but with education, monitoring and intervention, they can be mitigated successfully."

HOW CAN I LIMIT HARMFUL VOCs IN MY HOME?

- Ventilate. "Open your windows regularly to infuse fresh air into your living space," says Birkenes.
- Regularly replace air filters in indoor fan and HVAC systems, and create alerts to remind you to change them.
- Choose products certified low- or no-VOC and building materials like stone and tile that are naturally safer.
- Don't store products or buy in bulk. Buy only what you need, since VOCs can leak from containers like old paint cans and bleach bottles. If you must store them, put them in a garage or shed separate from the house.
- If you can't open windows, use air purifiers with active carbon and HEPA filters.
- Stop using air fresheners. "They have been targeted as a key source of VOCs in your home," says Boylen.
- Air out your clothes after picking them up from the dry cleaners.
- Get an air quality monitor that tracks VOCs and can alert you if your levels cross certain thresholds. "It can also provide insight into the exact times when your VOCs may be highest," Birkenes says, "which can provide context for what may be contributing to the problem based on your activity or where the device is located."
- Lastly, use common sense. "Listen to your nose," says Birkenes. "When something smells, it is more than likely emitting VOCs!"



READING CAR TIRE TREAD

Keep a watchful eye on tire wear to help ensure your safety and that of your passengers. The section of tire that touches the road is called the contact patch or footprint, and it's designed to match the size and weight of your vehicle. Surprisingly, the contact patch isn't much larger than the palm of your hand. When tires wear unevenly, the tread contacting the road is greatly reduced, which decreases steering control and increases stopping distances.

If you check tire wear as part of your regularly scheduled service or maintenance, look for an uneven wear pattern. If there is considerable wear, replacement may be the only option.

HOW TO PREVENT UNEVEN TIRE WEAR

- Avoid potholes and bouncing off curbs.
- Get your vehicle's wheel alignment checked at least once a year, especially after a rough winter.
- Avoid aggressive driving and braking.
- Rotate your tires every six months or 6,000 to 8,000 miles. This also helps tires run quieter and last longer.
- Keep suspension components in good working order.
- Have tires rebalanced if you notice vibrations or shaking at medium to highway speeds.
- Follow your vehicle manufacturer's recommended specifications, and make checking your tire pressure part of your monthly maintenance routine. Properly inflated tires are safer and last longer. Pick up a tire tread depth gauge, tire air pressure gauge and tire inflator, and use them regularly. Replace any tire if its tread measures 4/32 in. or less.



SIX COMMON TIRE WEAR PATTERNS—AND THE CAUSES

A CENTER WEAR: Overinflation causes down-the-center wear. It leads to a rough ride and less-responsive braking and steering. Overinflated tires are also prone to impact damage.

B OUTER EDGE WEAR: Underinflation, or low tire pressure, causes rapid wear on both outer edges of a tire. Besides causing poor fuel economy, driving on underinflated tires is dangerous. Tire sidewalls flex and overheat from low tire pressure, which can quickly lead to a blowout.

C EXCESSIVE INNER OR OUTER WEAR: When tires wear on only the inner or outer edge, your vehicle has a wheel alignment problem. It could be your wheels' camber angles, that is, the inward or outward tilt of the wheel when viewed from the front of the car, or the wheels' toe-in/toe-out measurements, that is, the angle/distance between the front of the tires on the same axle when viewed from above. Note: Caster, the other major alignment angle, can cause your car to pull to one side and/or create steering issues if out of spec. It rarely causes abnormal tire wear.

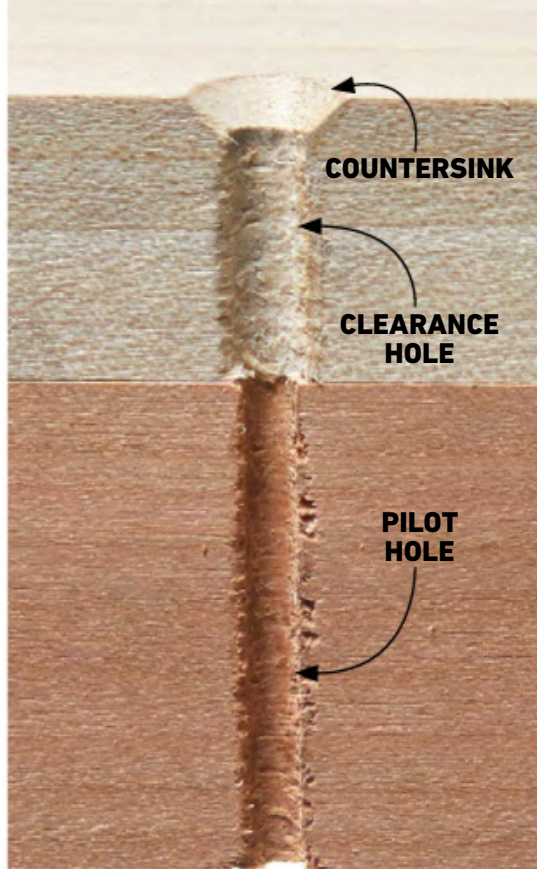
D CUPPING: Also known as scalloping, cupping results in patchy worn sections around the tire's circumference. It's usually caused by worn shock absorbers or struts, which are serious problems you should address ASAP. Have your vehicle's suspension checked, and replace any worn parts before getting a wheel alignment. Have your tires rotated and balanced to help even out tire wear.

E FEATHERING: When your car tires have feathered edges, you'll notice the noise before you see any wear. Try running your hand across the tire, and feel for angled or sharply diagonal tread on one side of the tire.

Feathering is almost always caused by an out-of-spec wheel alignment, and that's easy to remedy. Feathering can also be the result of taking corners at high speeds. Consider replacing your tires if feathering has caused excessive wear.

F FLAT SPOTS: Flat spots in the middle of a tire are probably caused by brake problems. Constantly slamming the brakes, as well as hydraulic or mechanical issues, can cause brake lock-up and abnormal tire wear whether your vehicle has standard or antilock brakes. Flat spots require professional attention.

BOB LACIVITA CONTRIBUTING EDITOR



PREDRILL AND COUNTERSINK

When you're driving screws into wood, any experienced woodworker would advise you to predrill so you don't split the wood. But what does that mean, exactly? Here's the lowdown.

*When you're attaching one piece of wood to another, you need a **clearance hole** through the first board (possibly with a **countersink**) and a **pilot hole** in the second board. A clearance hole is just large enough in diameter so that you can slide the screw right into it. The threads don't engage.*

A pilot hole's diameter should be about the size of the screw's shank so the screw doesn't act as a wedge. Only the threads work their way into the wood. This predrilling may be unnecessary if you're working with soft construction lumber, but it's still good practice if you're driving a screw within a few inches of the end of a board. For hardwoods like oak and walnut, predrilling is a must.

BRAD HOLDEN SENIOR EDITOR

IS IT OK TO PAINT STUCCO?

Some people say you should never paint stucco. Why? Because stucco is a breathable product that allows indoor humidity to escape through the walls. Paint seals the stucco, making that transfer impossible. It's true that typical latex paint seals the stucco, so that's a definite no-no. If you see a stucco home with paint flaking off, it's a safe bet that it's been painted with a latex paint. Humidity from inside your house gets trapped between the stucco surface and the latex paint, causing the paint to lose its bond. Once that happens, you'll need to have all the remaining paint sandblasted off.

So what do you do when you want to update the color of your stucco home? You need to use an elastomeric paint, which breathes and fills in hairline cracks. It also retains color very well. One of my favorites is Loxon from Sherwin-Williams. Loxon allows that all-important transfer of humidity through the paint. We've been using this product for 20 years with excellent results. Loxon is available in a primer and color in one, flat sheen, for about \$85 per gallon. On previously coated stucco, a gallon covers about 100 to 150 sq. ft.

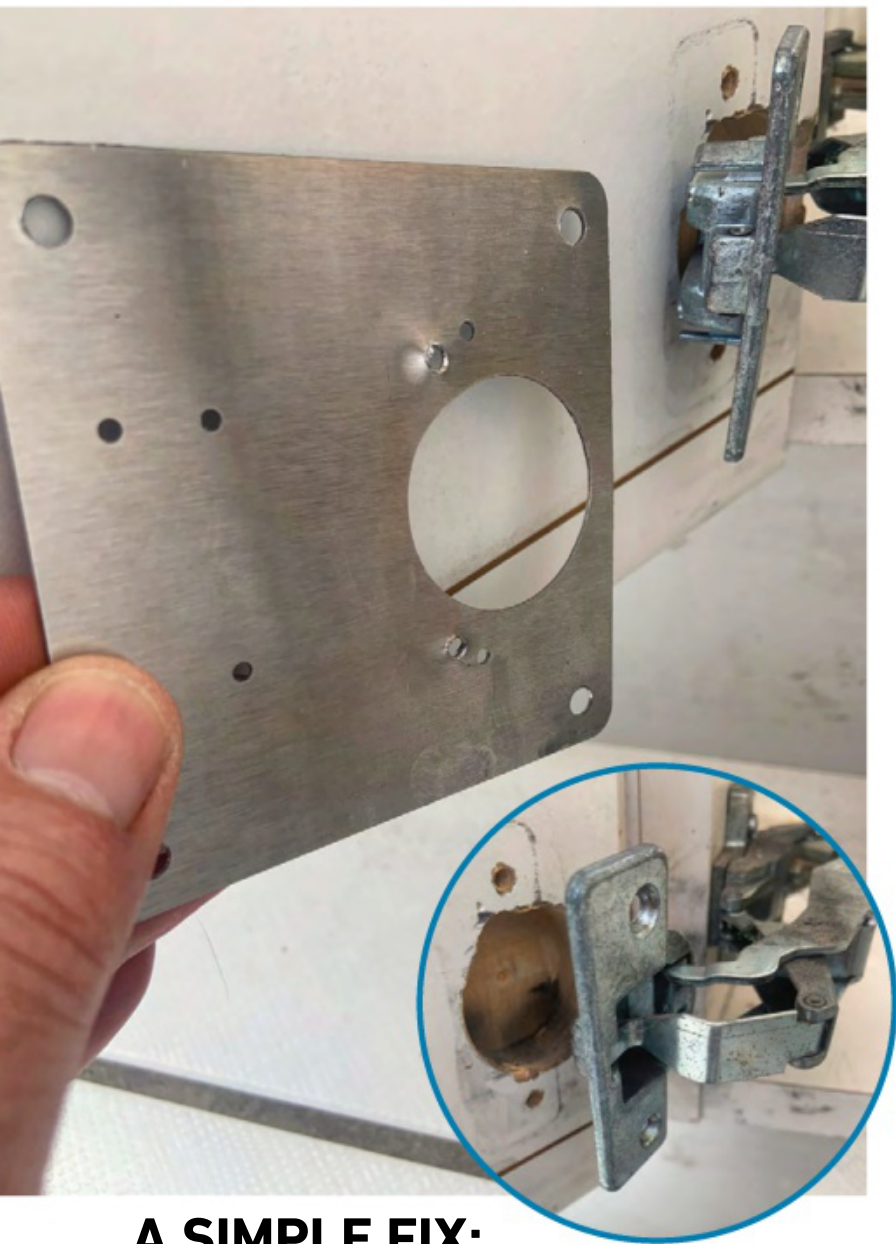
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A SIMPLE FIX: CUP HINGE REPAIR PLATE

If you have cup-style hinges on your kitchen cabinets, chances are you've encountered the problem of the hinge screws pulling out of the door or cabinet. In the past, I've solved this problem by either filling the hole with epoxy and redrilling, or oversizing the hole and gluing in a dowel. Both are acceptable repairs, but these hinge plates are easier. Search online for "cup hinge repair plate" and you'll find lots of options, most of which cost less than \$15.

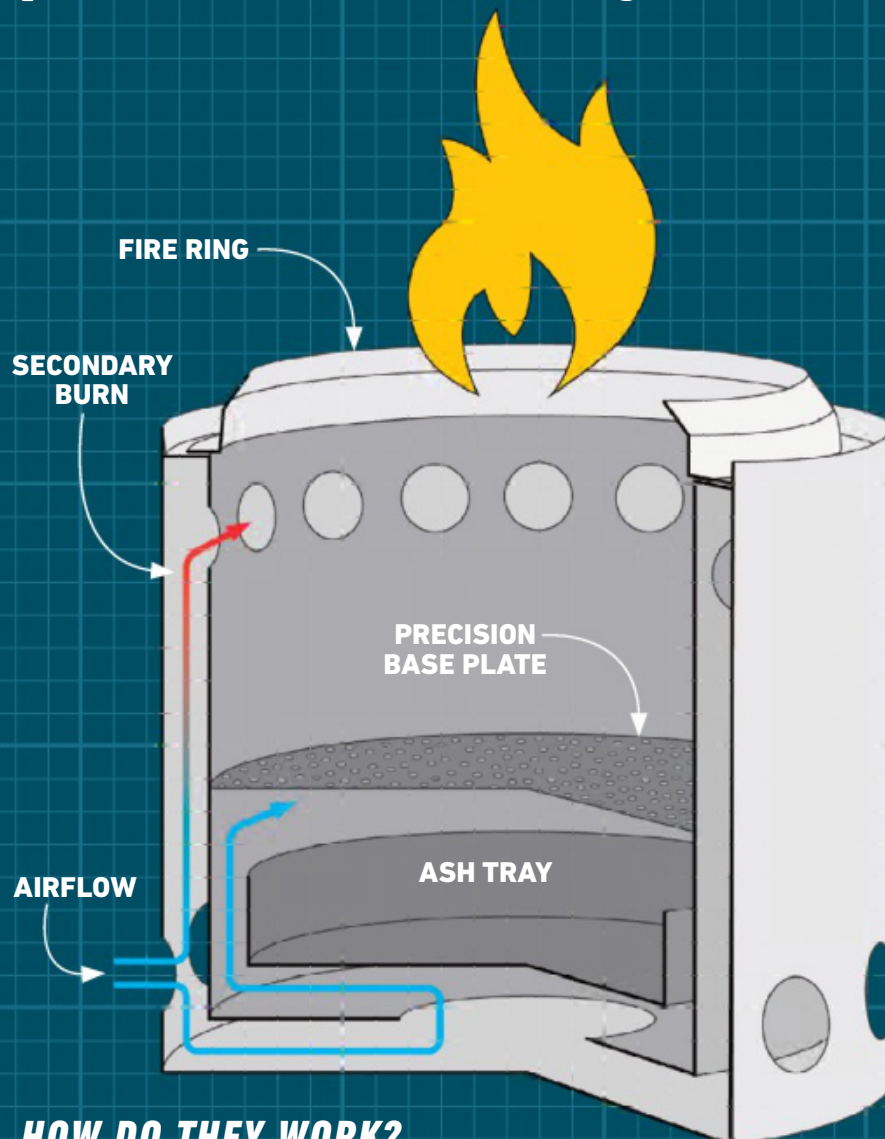
To install them, first unclip the hinges from their baseplates and remove the door. Next, remove the offending hinge. Slip the cup in the hole and see if the hinge screws line up with the predrilled holes in the plate. If they don't, no big deal. You can drill new holes where you need them. Also, the cup's fit in the repair plate may be a little snug. If so, file the cup or the hole just a little to make it fit.

Screw the hinge to the repair plate with the provided screws, and then attach the plate to the door using the four corner holes and provided screws. The repair plate is very thin, but you'll still likely need to readjust your door a bit. Sometimes it's the screws in the hinge baseplate (the part attached to the cabinet) that have pulled out; the other half of the repair plate is predrilled to handle that.

BRAD HOLDEN SENIOR EDITOR

SMOKELESS FIREPITS

With a traditional firepit, you burn wood and the heat radiates. That's the point. But the smoke radiates too—everywhere. And that's less fun. Smokeless firepits work to provide heat while minimizing the smoke.



HOW DO THEY WORK?

Firewood needs an ignition source and air to continue burning. Most of these smokeless pits look like airless containers, but look near the bottom and you'll see holes that feed the fuel with air. That is the primary combustion air, and all fires need it.

Smokeless pits are containers with inner and outer walls separated by air. The air heats, rises inside the wall and exits through vent holes on the inside near the top. This hot air mixes with flames, creating a secondary combustion that burns much of the escaping ash and smoke before it gets in your eyes.

BEST THING SINCE FIRE?

Smokeless firepits aren't perfect. They're not smoke free, but they do emit much less smoke than a typical firepit. The container style means less visible flames and less heat radiating to your bonfire friends. And they need a bit more care; don't leave your smokeless pit out in the rain. They're not cheap either. Expect to pay \$400 to \$700 for a smokeless firepit. You can add grilling accessories, which increase the versatility and the price.

GLENN HANSEN DEPUTY EDITOR



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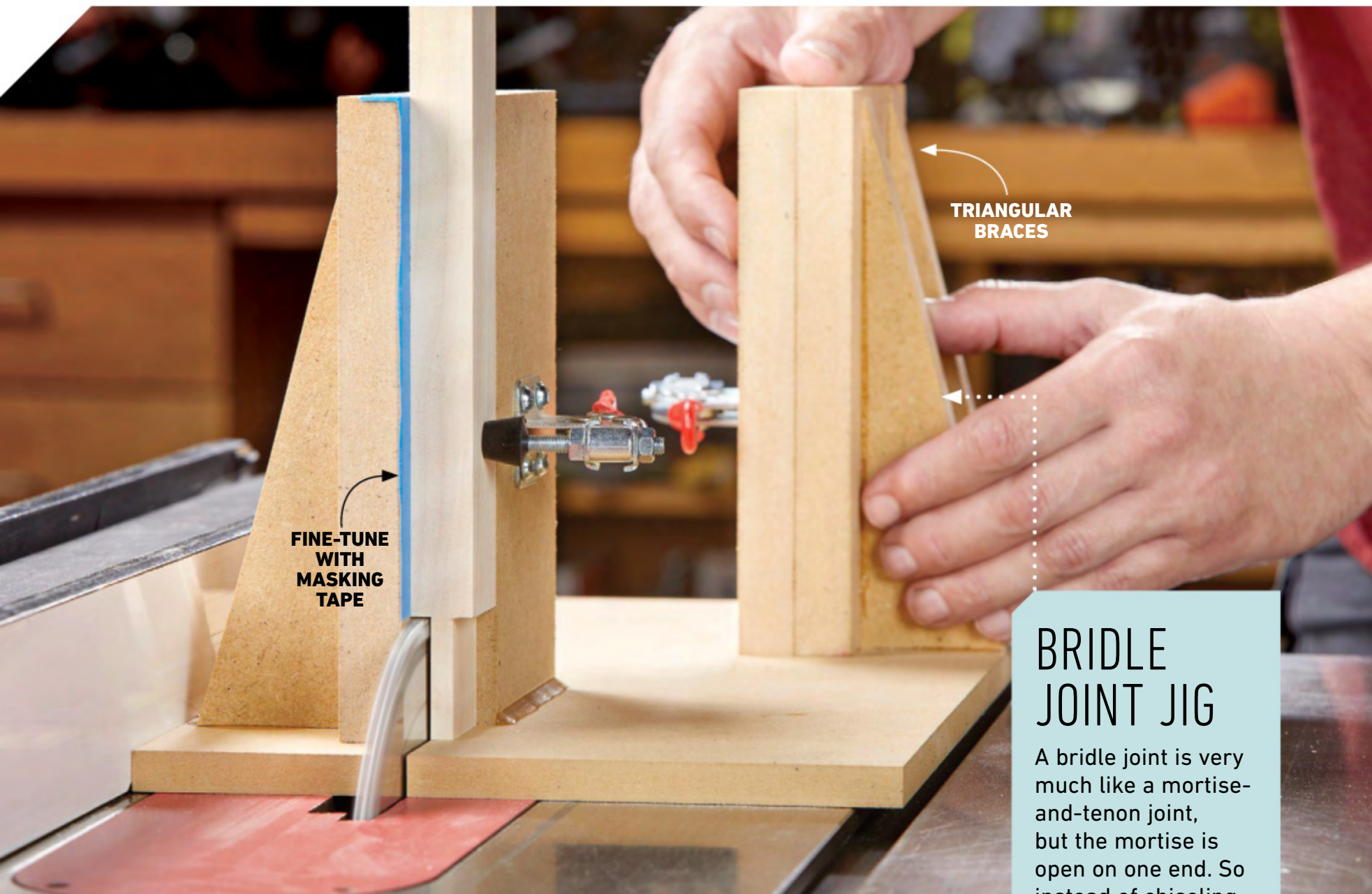
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BEST PRO TIPS



EXPERT ADVICE FROM THE JOB SITE



BRIDLE JOINT JIG

A bridle joint is very much like a mortise-and-tenon joint, but the mortise is open on one end. So instead of chiseling a recess into the wood to accept the tenon, you cut a slot in the end of the board. This jig makes both cuts of a bridle joint in 3/4-in. material and allows you to adjust for slight variations in material thickness.

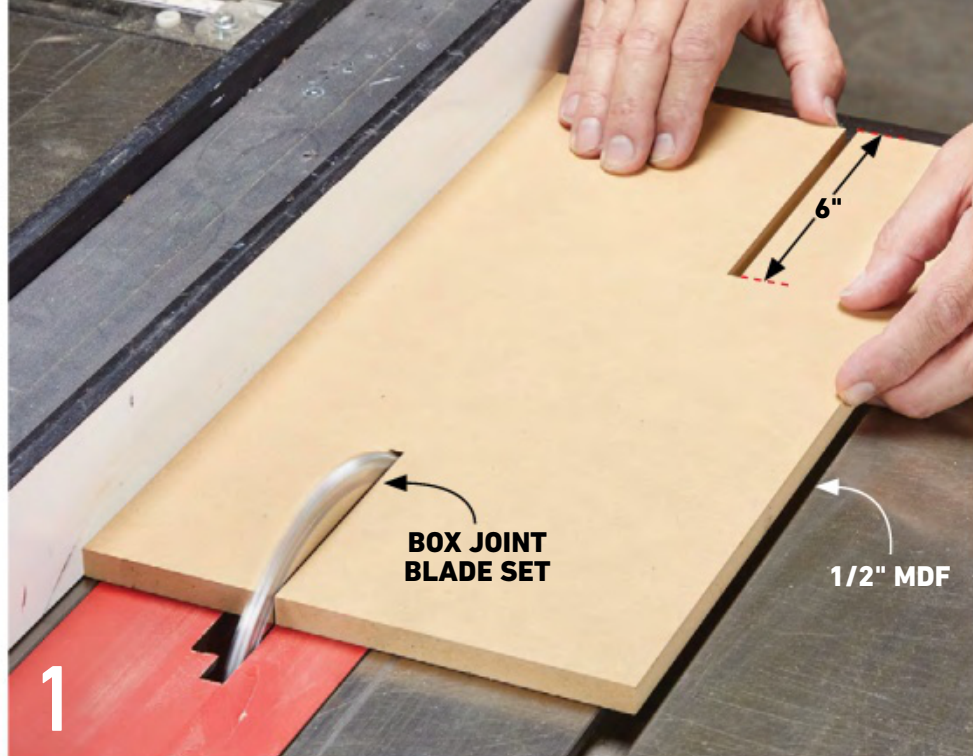
7 ESSENTIAL SHOP JIGS

INCREASE SAFETY, SPEED AND ACCURACY

Making shop jigs is one of my favorite things to do. It uses the analytical, logical and creative side of my brain, and it allows me to do better work safer and faster. After making jigs to cut parts for the Console Stereo Revival project (March '22, p. 22) and the DIY Crosscut Sled for the table saw (April/May '22, p. 56), I thought it would be fun to give you a sampling of the jigs I've made and used over the years, and show you how to make them yourself.

BY JAY CORK





1 CUT A KERF IN THE BASE

Set the fence 3 in. from the blade using your tape measure; the gauge on your table saw won't be accurate with this blade set. Cut a slot about 6 in. long on both sides of the base. I used a box joint blade set because it cuts a perfect 1/4-in. slot, but a dado blade works too.



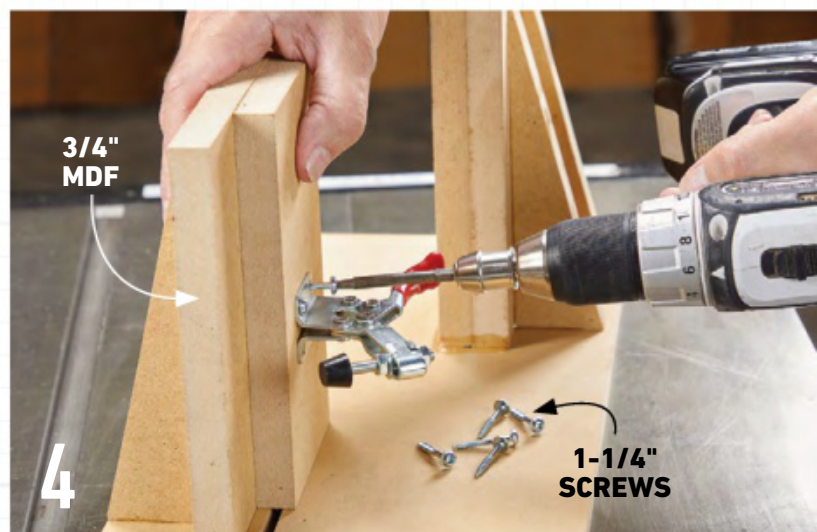
2 GLUE THE UPRIGHT SUPPORT

Keeping the part square, glue one support flush with the edge of one slot; this is for cutting the tenon. Glue the opposing support exactly 1/4 in. offset from the slot; this is for cutting the mortise.



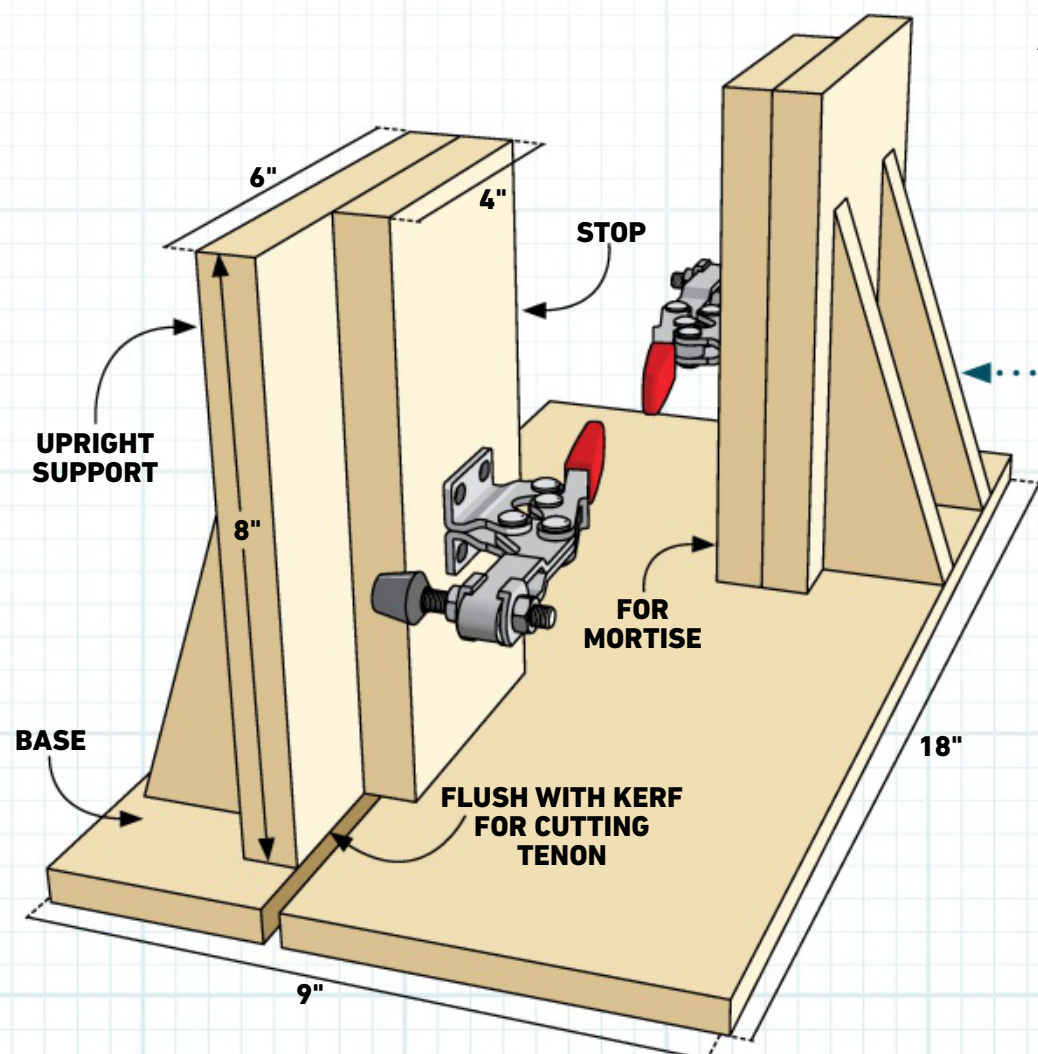
3 ATTACH THE STOP

Attach the back stop to the upright support. I used a square against the leading edge and 23-gauge pins to tack it. You could add glue, but the screws used to mount the toggle clamps will provide plenty of strength.



4 ATTACH THE TOGGLE CLAMPS

Position the toggle clamps 3 in. up from the base and attach them with 1-1/4-in. washer-head screws. I use a self-centering bit to predrill the mounting holes, but this isn't absolutely necessary.



PROVIDING SUPPORT

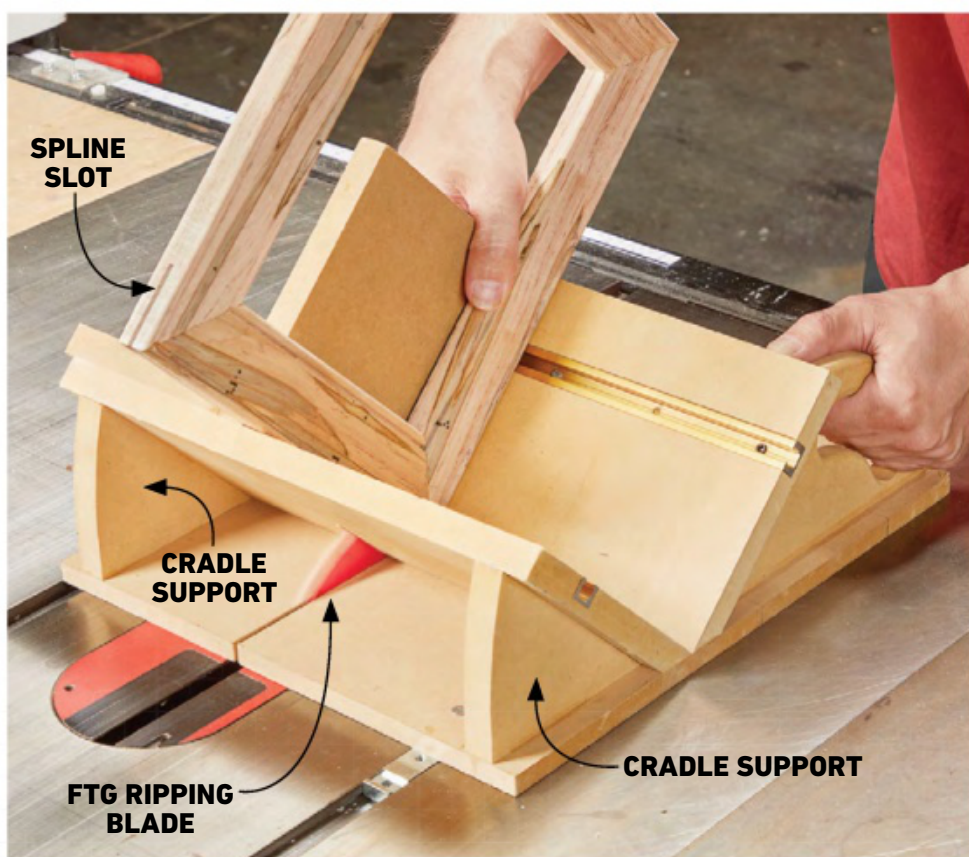
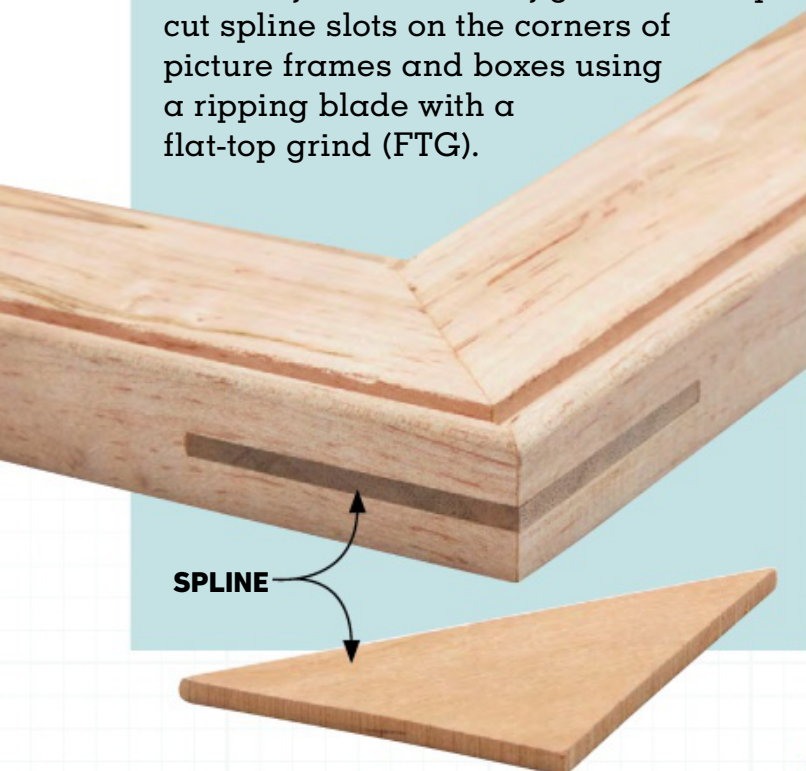
Cut some triangular braces for the upright support and attach them using a generous amount of CA glue. I used a square against the upright supports to ensure they stay perfectly plumb to the base.

PRO TIP

Not all stock is exactly 3/4 in. thick. Use masking tape to make fine adjustments to get the slot perfectly centered. Adding the same amount of tape to the other side of the jig makes the tenon just the right size.

SPLINING JIG

Splines are useful for strengthening a mitered joint. With this jig, I can safely cut spline slots on the corners of picture frames and boxes using a ripping blade with a flat-top grind (FTG).

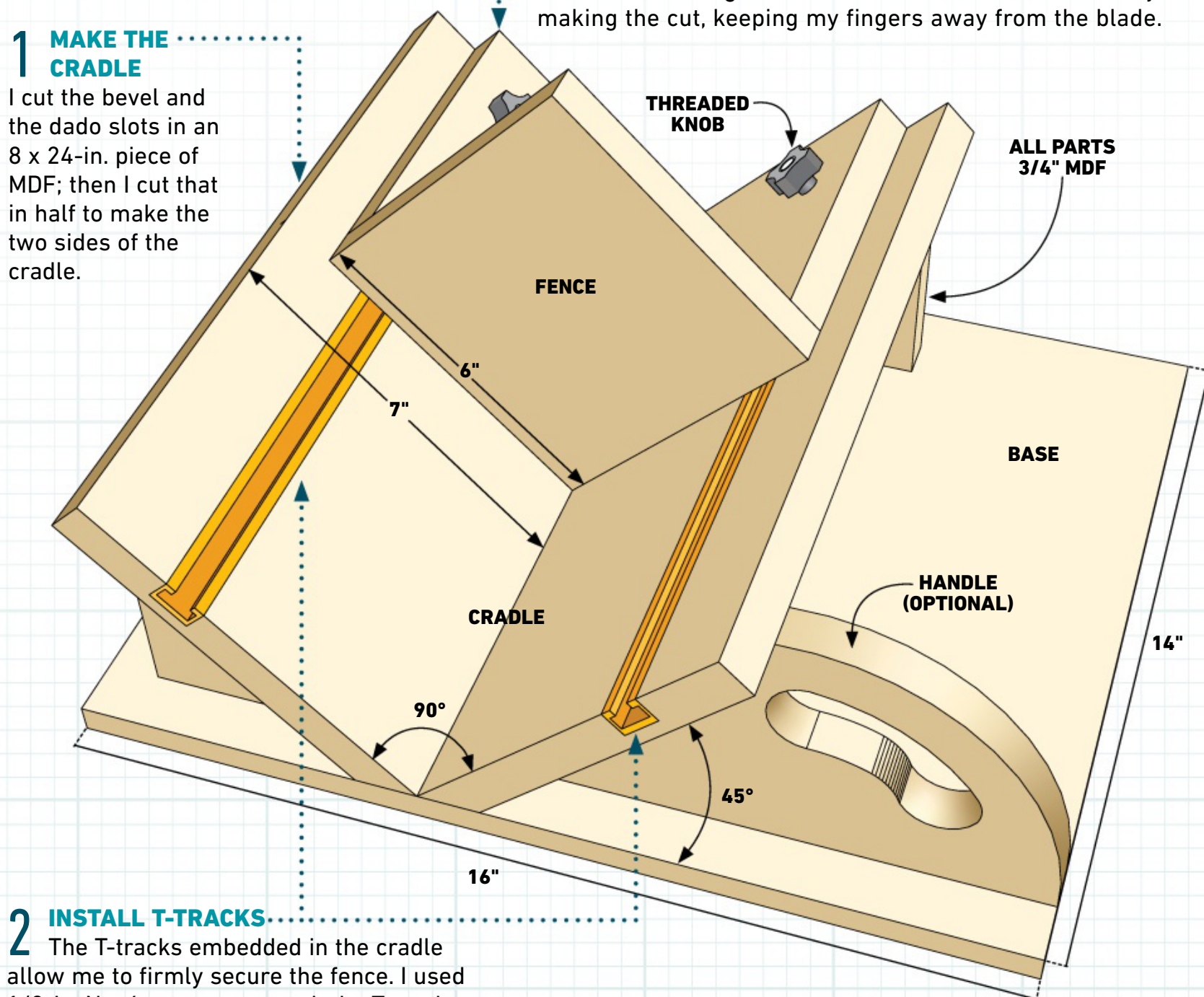


1 MAKE THE CRADLE

I cut the bevel and the dado slots in an 8 x 24-in. piece of MDF; then I cut that in half to make the two sides of the cradle.

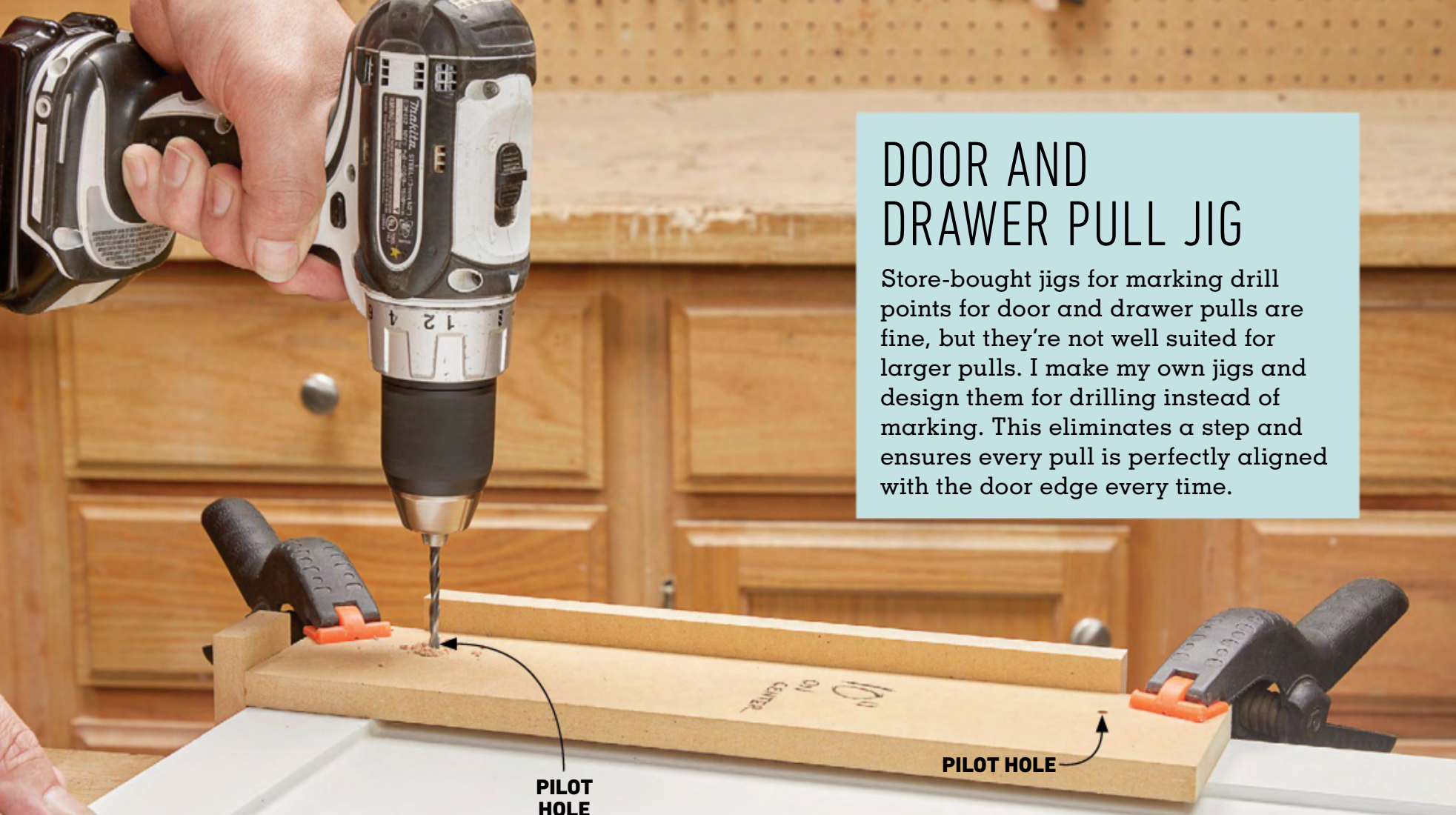
3 ADJUSTABLE FENCE

Make the fence from three parts, with holes drilled for T-bolts. This design allows me to hold the work securely while making the cut, keeping my fingers away from the blade.



2 INSTALL T-TRACKS

The T-tracks embedded in the cradle allow me to firmly secure the fence. I used 1/2-in. No. 6 screws to attach the T-tracks.

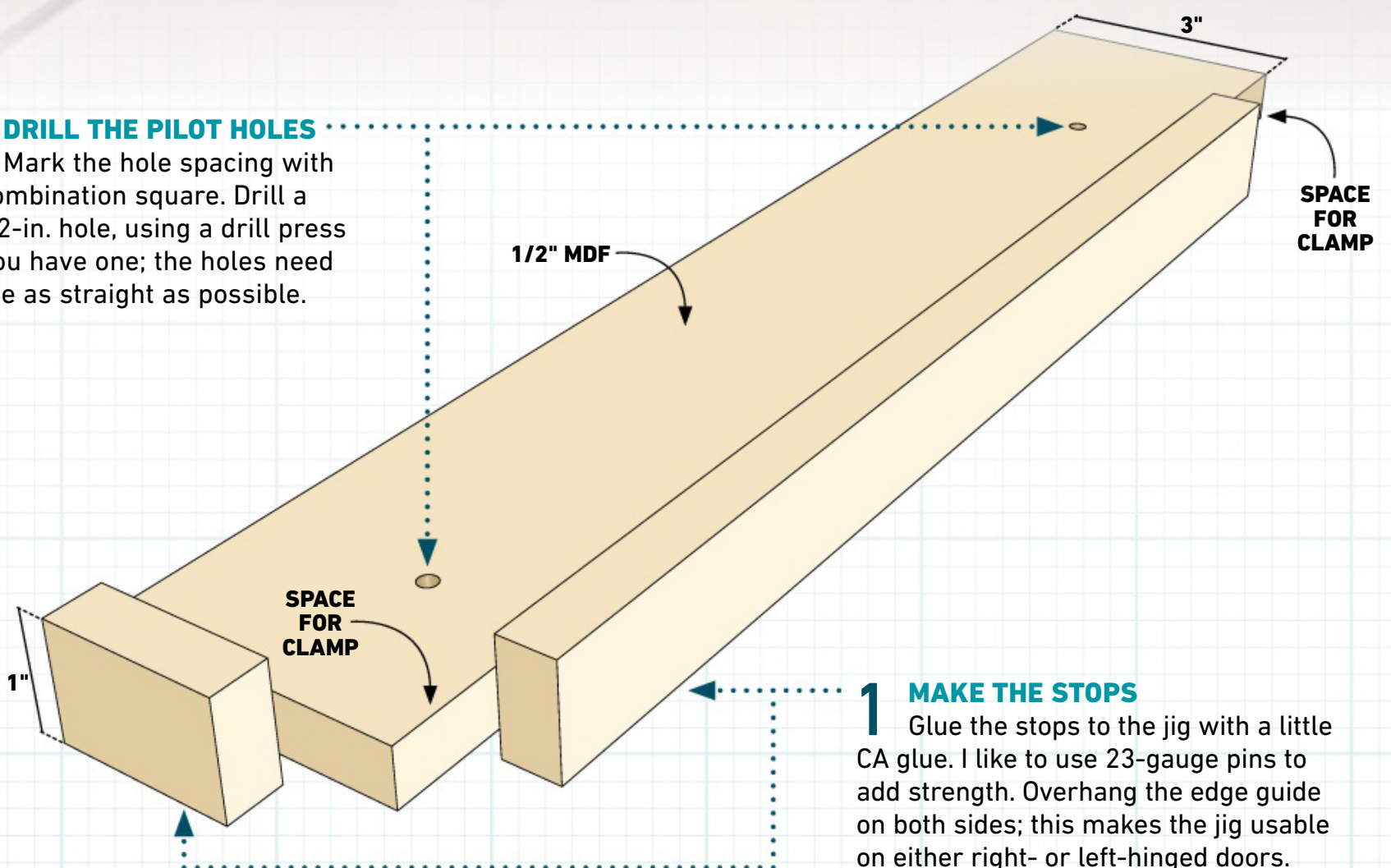


DOOR AND DRAWER PULL JIG

Store-bought jigs for marking drill points for door and drawer pulls are fine, but they're not well suited for larger pulls. I make my own jigs and design them for drilling instead of marking. This eliminates a step and ensures every pull is perfectly aligned with the door edge every time.

2 DRILL THE PILOT HOLES

Mark the hole spacing with a combination square. Drill a 7/32-in. hole, using a drill press if you have one; the holes need to be as straight as possible.



1 MAKE THE STOPS

Glue the stops to the jig with a little CA glue. I like to use 23-gauge pins to add strength. Overhang the edge guide on both sides; this makes the jig usable on either right- or left-hinged doors. Leave space at the corner and the top for two spring clamps.

SHOPPING FOR MATERIALS

For knobs and handles, T-tracks and anything else you need to make quality jigs, Rockler and Woodcraft have the best selections.

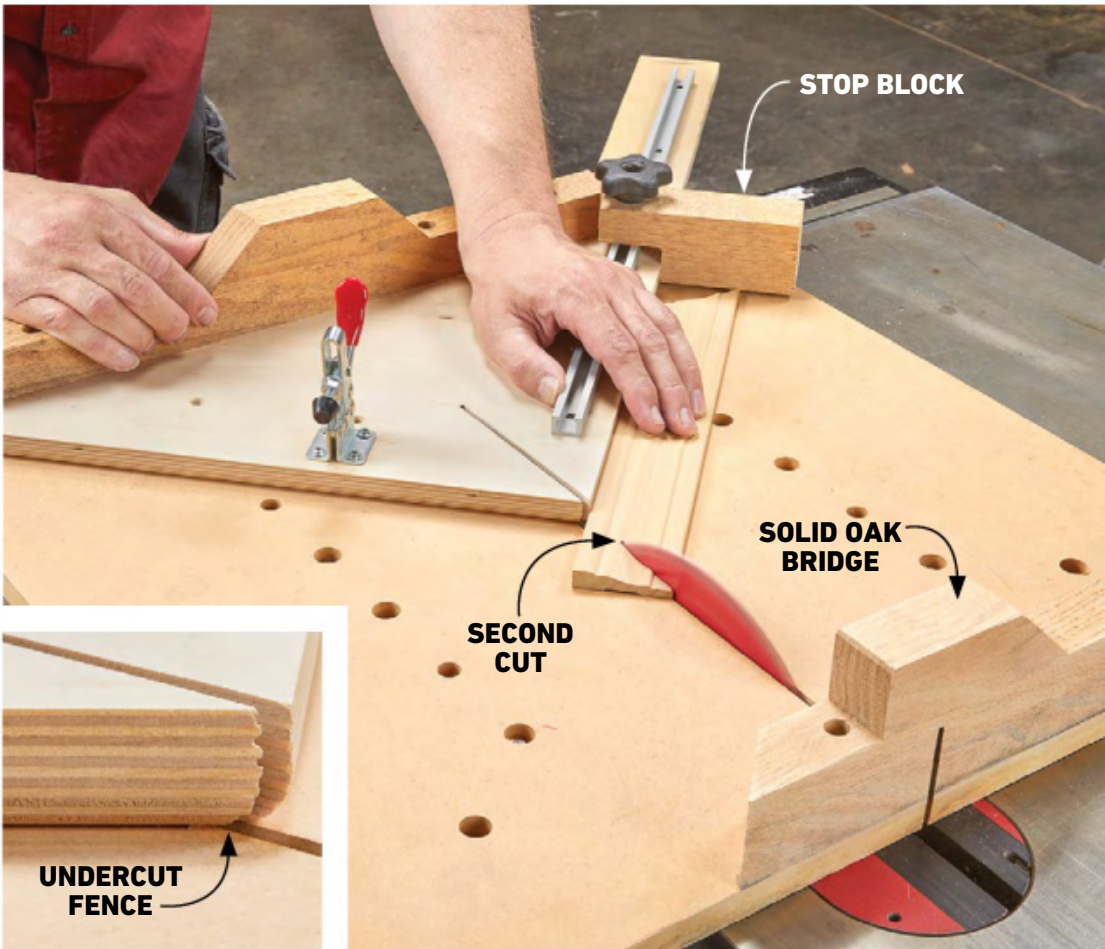
MEET THE EXPERT



JAY CORK BELIEVES ALL SHOPS SHOULD HAVE A WALL DEDICATED TO JIG STORAGE.

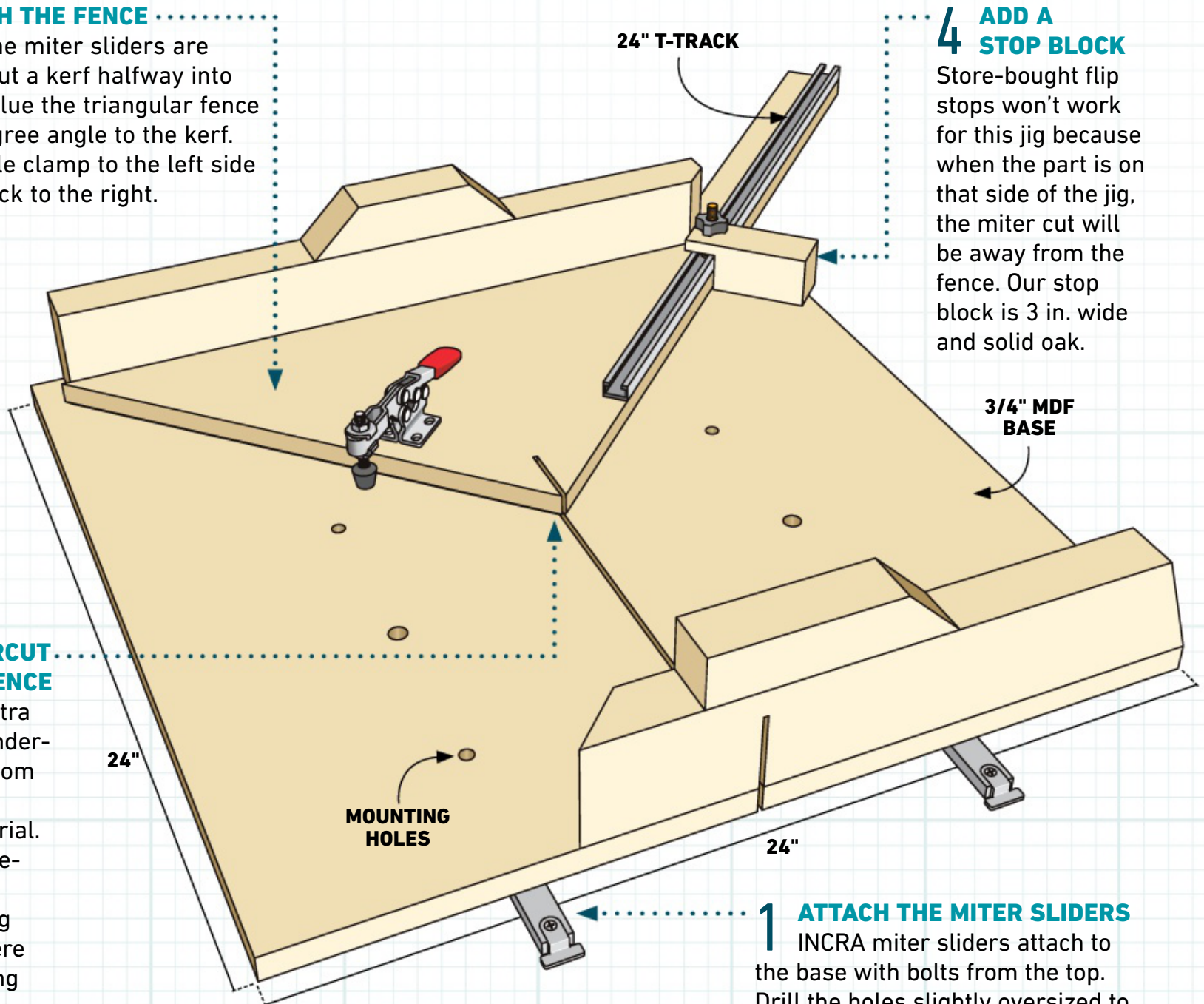
PICTURE-FRAMING JIG

This jig makes cutting mitered parts on the table saw repeatable and accurate. Similar to the table saw DIY Crosscut Sled I made for the April/May '22 issue, this one has a permanent 45-degree fence. The toggle clamp holds the stock for the first miter cut. Make the second miter cut on the left side (shown). The stop block ensures the opposing sides of the frame are precisely the same.



3 ATTACH THE FENCE Once the miter sliders are attached, cut a kerf halfway into the base. Glue the triangular fence at a 45-degree angle to the kerf. Add a toggle clamp to the left side and a T-track to the right.

2 UNDERCUT THE FENCE Take the extra step and undercut the bottom edge of the fence material. This will prevent debris from getting trapped there and affecting your cuts.

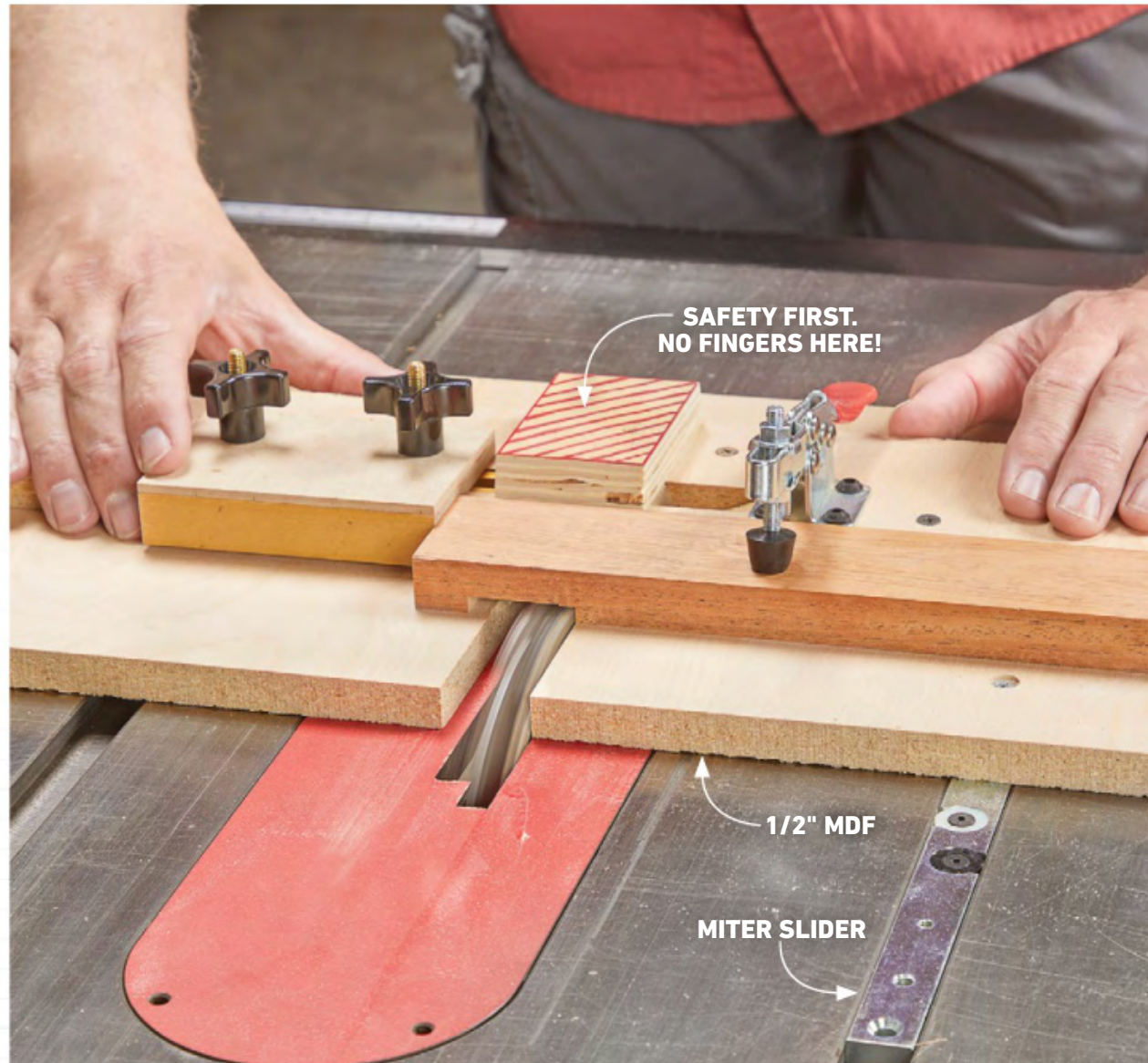


4 ADD A STOP BLOCK Store-bought flip stops won't work for this jig because when the part is on that side of the jig, the miter cut will be away from the fence. Our stop block is 3 in. wide and solid oak.

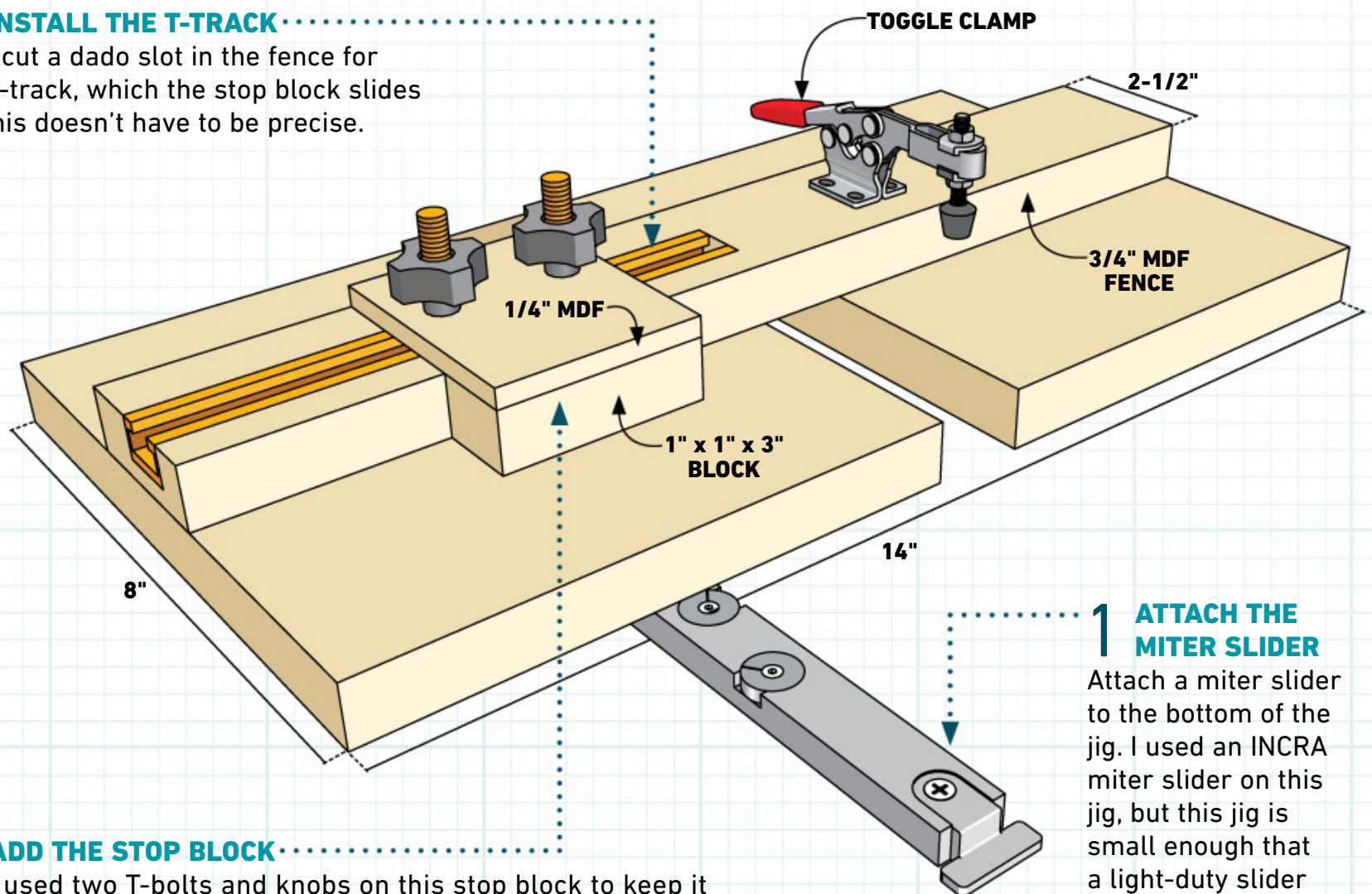
1 ATTACH THE MITER SLIDERS INCRA miter sliders attach to the base with bolts from the top. Drill the holes slightly oversized to allow for small adjustments.

HALF-LAP JIG

I made this jig for a production run of custom frames that I sold at local karate dojos. Inspired by Japanese architecture, the exacting design required 20 half-lap joints per frame! All these joints had to line up perfectly, and this jig made it a breeze.



2 INSTALL THE T-TRACK.....
I cut a dado slot in the fence for the T-track, which the stop block slides in. This doesn't have to be precise.



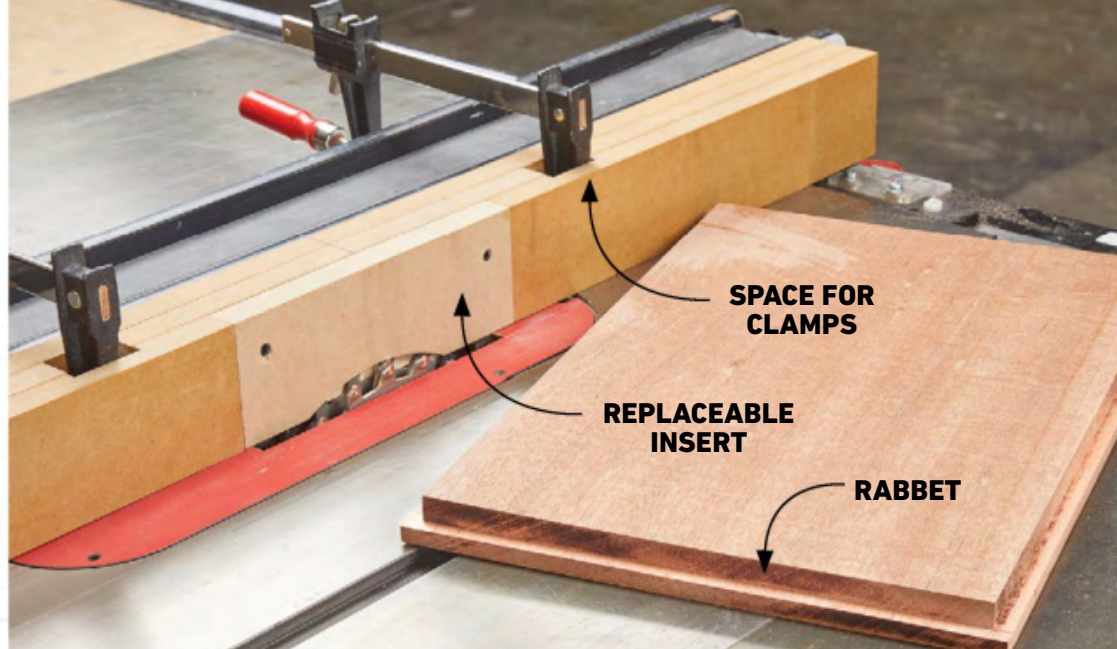
3 ADD THE STOP BLOCK.....
I used two T-bolts and knobs on this stop block to keep it from wobbling side to side. To make the stop block, first glue two parts together. After the glue dries, mark the center line for the T-track and drill the 1/4-in. holes for the T-bolts.

1 ATTACH THE MITER SLIDER
Attach a miter slider to the bottom of the jig. I used an INCRA miter slider on this jig, but this jig is small enough that a light-duty slider could be used.

BEST PRO TIPS

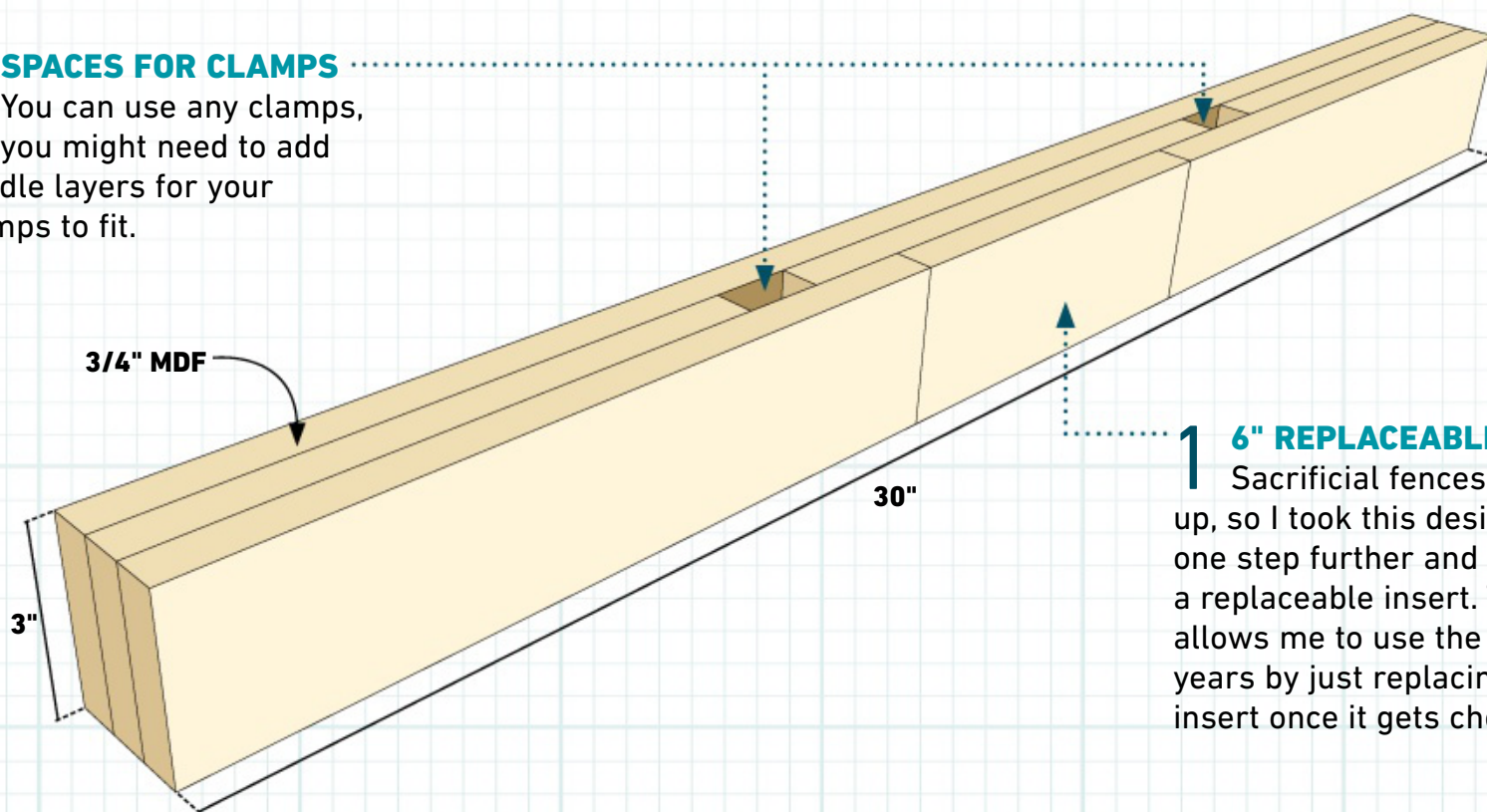
SACRIFICIAL FENCE

When you're making a rabbet cut, the last thing you want to do is cut into your table saw fence! This simple jig is made from three layers of MDF, with spaces for two clamps.



2 SPACES FOR CLAMPS

You can use any clamps, but you might need to add middle layers for your clamps to fit.



1 6" REPLACEABLE INSERT

Sacrificial fences get used up, so I took this design one step further and added a replaceable insert. This allows me to use the fence for years by just replacing the insert once it gets chewed up.



THE STORY STICK

Perhaps the simplest jig in any shop, the story stick can revolutionize the way you work. It simplifies any measuring or marking task, like the mortise locations on these stiles. Clamp the story stick to your parts, and then transfer the lines on the story stick directly to your parts.

■ SAVE YOUR SCRAPS

A story stick can be made from just about any long strip of wood; plywood scraps are perfect.

■ INCREASE ACCURACY

A stop block on one end and a strong spring clamp keep the story stick stable while you mark your part.

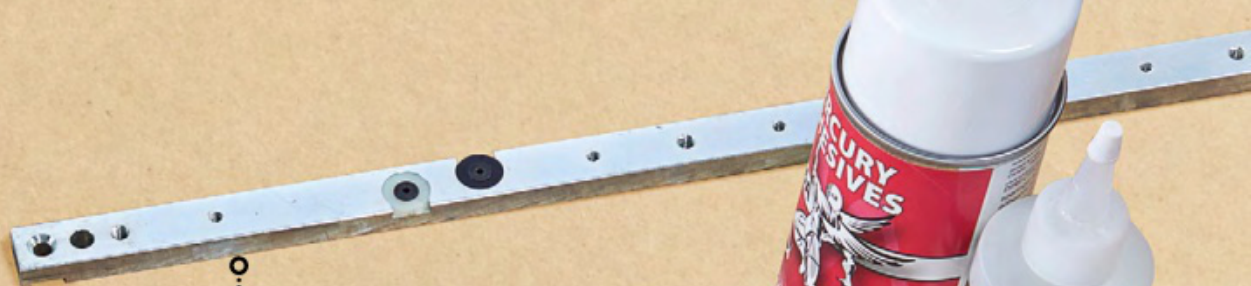
■ MAKE YOUR MARK

I use a marking knife to mark for mortises like these. It's much more accurate than a pencil. Set the knife in the mark on the story stick, slide the square up to it and score your mark. It doesn't get any more accurate than that!



JAY'S JIG KIT

No shop is complete without a way to make jigs, and these tools help me every step of the way.



MITER SLIDER

INCRA miter sliders are made of steel and come in 18- and 24-in. lengths.



ADHESIVE

I use thick CA glue and accelerator on every jig I make.



PINNER

A 23-gauge pinner is a perfect companion to CA glue.



MARKING SQUARE

This marking square from japanwoodworker.com is good for more delicate marking tasks.



DIGITAL ANGLE FINDER

I use this to check angles that aren't 90 degrees.



KNOBS

Find all the knobs you need at Rockler or Woodcraft. I use 1/4-20 threaded knobs.



TOGGLE CLAMPS

Find these online or at woodworking stores.



SQUARE

An accurate square is essential for making accurate jigs.



T-TRACK

There are lots of T-track options, but I prefer the INCRA brand.



CORDLESS DRILL

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LAUGHS AND LESSONS FROM OUR READERS

WHAT GOES UP...

To show my nephews how I practiced catching as a child, I was throwing a tennis ball up on my roof, letting it bounce a few times and then catching it. After a few throws and catches, I heaved one up and the three of us stood looking at the roof for the rebound. Nothing. We looked on the other side of the house, in the bushes and all around. No luck. Oh, well... I figured it would eventually show up.

Later that day I noticed the laundry sink in the basement wasn't draining. Hmm... plugged trap? Then we realized not one of the drains was draining. We called a plumber, who snaked a camera down the clean-out and found the tennis ball stuck in the sewer drain! Seems my throw to the roof was a perfect shot down the vent pipe. The \$500 service call was bad enough, but now I'm constantly getting my chops busted by family members holding tennis balls and asking if I want to play catch.

JOE LAROSA



NEW FACE WASH

The first room my wife and I remodeled in our new home was the laundry room. When we tore down the walls, we discovered a leak that had gone unnoticed for a long time. After I fixed the plumbing for the washer, my father volunteered to go downstairs to turn the water back on. My mother decided right then and there to sit in the chair I had been using, which put her at face level with the water connections. She said, "You closed these, right?" Before I could think, my mother got a full blast of water to the face.

JOE ROSEL

HOLY INTRUDER!

I built a permanent roof over my patio a couple of years ago. Recently I noticed water stains on the inside wall directly below the step flashing that seals the new roof to the house siding. I climbed up there to track down the leak. I looked for holes, checked for flashing that had slipped out of place and even flooded the area with a hose. No dice.

Then I climbed a ladder and held my head close to the wall behind a rafter to see if any light was shining through to reveal a hole. Inches away and staring right back at me was a bat. And directly below him were his urine stains.

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