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Factory-cut joinery puts this traditional framing technique within reach of any builder

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2019 HOUSES AWARDS

The Best Homes of the Year

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- Weathertight windows — PAGE 46
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FEATURES

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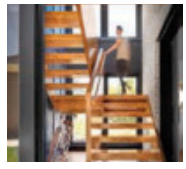
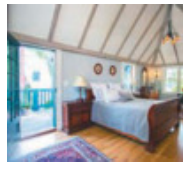

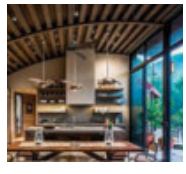


BEST HOMES OF THE YEAR
70


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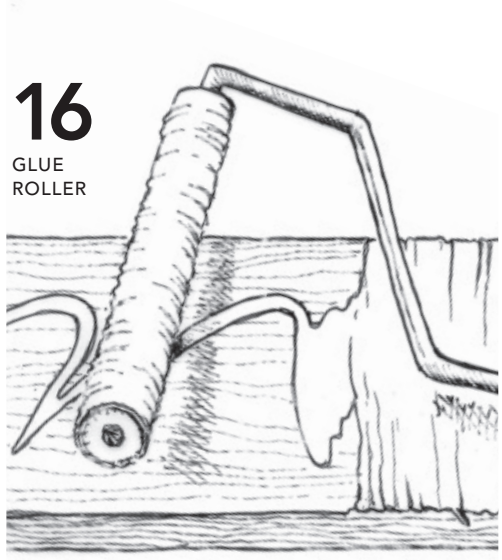

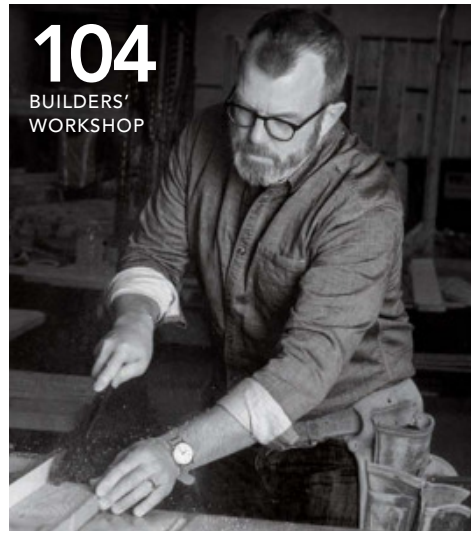

The Taunton Press
Inspiration for hands-on living®

ON THE COVER A crew assembles a timber-frame addition using machine-made components. See the full article on pp. 40-45. Photo by Patrick McCombe.

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The winner of this year's Editor's Choice Award harmonizes perfectly with its surroundings. See more photos of this and the other award-winning homes at FineHomebuilding.com/houses.

All it takes to cleanly cut a sheet of glass is a straight edge, a glass cutter, a flat work surface, and a few simple steps.

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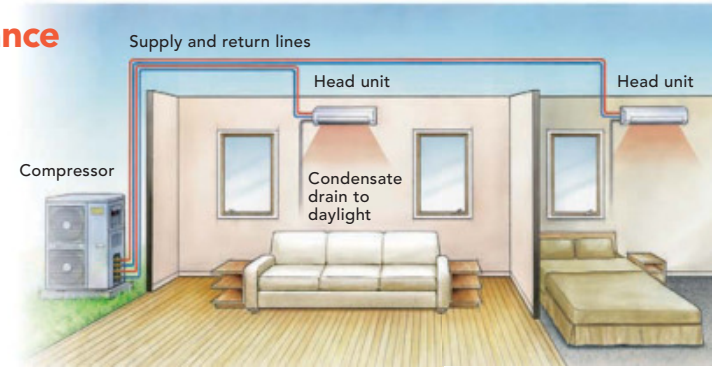
Ep. 165: Live From the Builders' Show

The *Fine Homebuilding* editors end IBS 2019 with a discussion about the evolution of roof sheathing and their favorite finds from the show.

Former *Fine Homebuilding* editor Andy Engel writes about the transition of a middle-aged man back into the trades—and all the cool projects he'll get to work on—in his new blog on FineHomebuilding.com.

High-performance HVAC

Ductless minisplit heat pumps are becoming the go-to choice for heating and cooling in well-insulated houses. Get clear explanations of this and more essential concepts on the Home-Building Cyclopedia blog.



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contributors

THE VOICES OF EXPERIENCE

STEVE PINK ("Waterproof Your Windows With Liquid Flashing," pp. 46-51) has been working on job sites since high school. When his National Guard unit was deployed to Iraq, he and a few fellow carpenters used their skills to get their unit into a safer space by building wood lofts inside a concrete building. In 2012, he joined the team at Hammer & Hand, a top-tier remodeling company in Portland, Ore., where he works as a lead carpenter and project manager.

KEN BOUVIER ("21st-Century Timber Frame," pp. 40-45) has been building and restoring timber-frame structures since the early 1970s, and founded South County Post & Beam in South Kingstown, R.I., in 1976. Drawing on the best of traditional joinery and implementing the most up-to-date machinery and engineering systems has helped him grow his business to include 30 employees and over 1000 successful projects, about 800 of which were full timber frames.

JOHN WHRITNER founded Whritner Builders in Hobart, N.Y., in 1995, and builds custom homes and remodels old houses all over New York's Catskill Mountains. In recent years, John has taken his skills around the country, building and renovating homes for HGTV's *Cousins Undercover*, *Vacation House for Free*, and *America's Most Desperate Kitchens*. In this issue, he writes about how to get everything level and square when tying in an addition (pp. 52-57).

JASON BLACK was born and raised in Louisville, Ky. After working for a couple of local Fortune 500 companies, Jason followed his true passion and founded his first construction business, building one or two homes a year while still working full time. He ultimately moved on to create Artisan Signature Homes. Jason has overseen the construction of over 100 homes in the Norton Commons community, including this year's *FHB* House, featured on pp. 64-69.

write an article

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letters

READER FEEDBACK

Cement conundrum. *The production of cement is a major source of carbon dioxide, but some research suggests that the material also plays an important role in reabsorbing carbon emissions.*

The science of concrete

This is in response to the Michael Maines article on eliminating the concrete-slab portion of an on-grade home (Building Matters, *FHB* #282). The construction method was interesting, but the claim that 10% of man-made greenhouse-gas emissions are from the manufacture of cement was news to me, so I did some research to satisfy my curiosity. I did find numerous articles estimating that the manufacturing process of converting limestone to lime contributes about 5% to the man-made portion of CO_2, but not 10%. The CO_2-creating culprit is the fossil fuels needed to create 2800° temperatures in the manufacturing process. The unexpected discovery I made was the unique ability of cured concrete to reabsorb CO_2 out of the air over time. Based on the results from a research team at the California Institute of Technology, it is estimated that 43% of all CO_2 created from the manufacture of lime since 1930 has already been reabsorbed into the cured concrete. In addition to this natural occurrence, researchers have discovered other materials and manufacturing methods that can make concrete not just CO_2 neutral, but a net absorber someday. Hopefully those ideas will become a reality over time. It is definitely a complex topic full of some very interesting research over a humble construction material that has basically built the world as we know it.

—DAVE SCHUELKE
via email

Feedback on recent tips

For several years I have been using the tip from Tom Manning about how to grasp bulbs in recessed light fixtures (*FHB* #282). The technique works just fine. I do one more thing, though: When it's not in use, I keep the tape tab on a piece of stiff silicone release paper (the kind used for backing self-adhesive packing labels), which I then toss in my box of spare light bulbs, ready for the next use.

—JOHN HUNTER
via email

I want to add a bit to the tip submitted by Stephen Beese in issue #281. When I install a "floating floor," I always save a few extra boards or tiles to use as follows: In the blank space where the refrigerator will be installed, place two loose boards spaced so the wheels are centered when the fridge is rolled back. Then cut the length (if needed) of two more boards to place on the installed floor in front of the refrigerator when it is rolled out for cleaning or other purposes. With one minor bump, the fridge will easily roll in and out and the new floor is protected. I do this every six months in my house and the process makes that movement much easier and protects the new floor.

—HAROLD SULTZBAUGH
Dunnedin, Fla.

On decks and patios

I had a big grin reading the dueling pieces on decks vs. patios (*FHB* #282). I have a small summer cottage on Michigan's Saginaw Bay, part of Lake Huron. It has a both a deck and a patio. The little house (700 sq. ft.) was built around 1929 and rebuilt in 1946 after moving ice knocked most of it down. The back wall is still 2½ in. out of plumb.

The patio was built about the time of that rebuilding. It's concrete, and I share the deck author's anxiety about the ants that have worked to undermine it ever since. It's slightly sunken these days because decades of wave-launched sand have built up the surrounding lawn, but it has sat there for 70 years.

The deck was my creation. We had record-high lake levels

Photo: Brian McAward

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"I built the deck to carry human loads, not to carry 20 ft. of ice."

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—JUSTIN FINK
editorial director

Email your own letter to us at FH@taunton.com.

in 1986 and the waves were coming over the 1946 concrete seawall, hitting the house. I added stone-filled gabions on top, but that left a washed-out area behind them. The solution was a treated-wood deck. It worked fine as a place to sit atop the seawall and gaze out over the bay. But then that old nemesis, the ice, moved in again. About 10 years ago in the early spring, a strong wind brought the ice sheet ashore. Once ice starts moving, it doesn't stop until it's ready. It hit the seawall, flowed over, and piled up almost 20 ft. high on top of my deck.

The deck was obscured, but it seemed certain that under all that ice it was a goner. I built the deck to carry human loads, not to carry 20 ft. of ice. Gradually the ice melted away, leaving my deck mostly intact, but with a permanent, gentle swayback look.

Maintenance? In 30 years, I've replaced two boards—one that was damaged by the pile of ice and another that had a punky surface. The main problem has been breaking deck screws.

So, deck vs. patio? Let's call it a draw at my place.

—CHRIS CAMPBELL
via email

Those tanks are full of air, not oxygen

I was flipping through my May issue when I came across an article about "Emergency escape and rescue openings" (Know the Code, *FHB* #282). As I was reading, I noticed the header "To the Rescue." This section explained that the minimum size requirement accounts for a firefighter in full gear to be able to enter and escape from the opening, "with an oxygen tank and mask." As a professional firefighter in Montgomery County, Maryland, I was surprised to read "oxygen tank." The cylinders on our self-contained breathing apparatus (SCBA) contain compressed air. I wouldn't want a tank of pure oxygen on my back in a fire—that could be deadly.

I just wanted to get this information out there, to ensure your readers are properly informed.

—COLBY G. POORE
via email

Another take on dry brick joints

Re: "Dry Joints in Brick Walls" (Ask the Experts, *FHB* #281), Robert of Sea Bright, N.J., wrote about horizontal joints with no mortar or wood furring strips in them that he found in a warehouse with brick walls that were built over a hundred years ago.

Brent Hull replied that the joints may have held nailer strips, been used in moisture control, or involved vibration dampening due to a local railroad line.

I have two added possibilities. First, wire lath or perforated, expanded, corrugated steel lathe may have had side edges tucked into the grooves, then locked in place with sheet-metal clips. There existed several firms, a few run by the Kahn family of industrial architects, that easily could have done some development along these lines.

Second, Edward T. Atkinson of the Factory Mutual Insurance Company of Boston was responsible for a building-design concept known as slow-burning construction, which was normally used in factories and warehouses. The emphasis was upon thick, inexpensive brick walls and thick floors and heavy floor and roof beams and posts. This was before Edison had reduced the cost of concrete and ushered in the age of reinforced concrete.

Atkinson had several concerns, including the tendency of masonry walls to fall outward during major fires. In intense fires, the bricks on the interior side of walls would expand. He introduced several ways to reduce such failures. It is likely that the purpose of dry joints was to accommodate masonry expansion during fires.

—FRANZ ZRILICH
Medina, Ohio

Correction

In "Patio vs. Deck Throwdown" (*FHB* #282), Brian Vanden Brink's photograph on page 70 should have included an architect credit: Polhemus Savery DaSilva Architects Builders.

Photo: courtesy of Chris Campbell

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tips&techniques

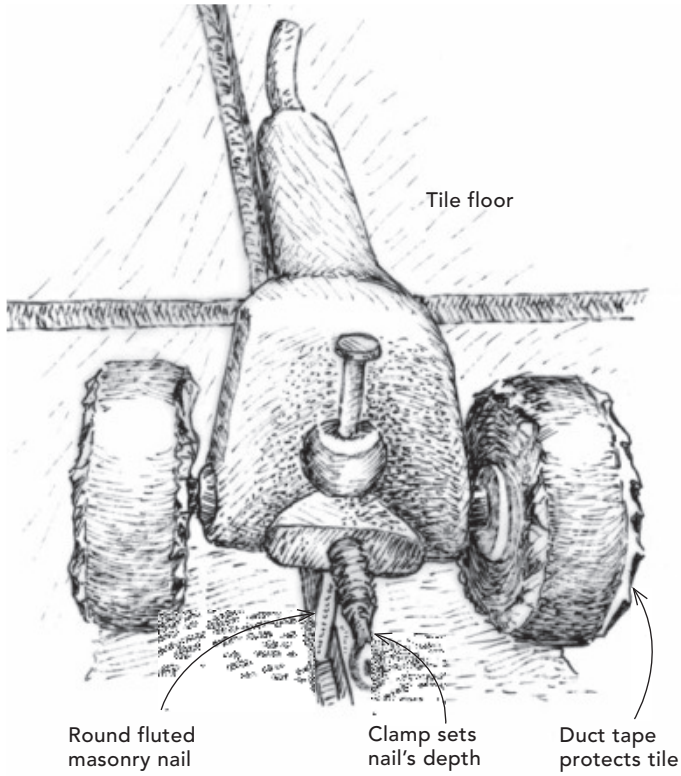
EDITED AND ILLUSTRATED BY CHARLES MILLER

Grout-space raking tool

Today I was tiling a floor and pondering why I always have a problem with some of the thinset squeezing up into the grout space or getting on the sides of the tile. This is not only poor cosmetics, but it makes for a weaker grout joint. So I took one of my brick-joint raking tools and converted it into a grout-space rake. First, I wrapped the metal wheels of the raking tool with duct tape to protect the tile surface, and then ground the point off of a hardened, round-fluted masonry nail. I inserted the nail and set it to the depth of the tile grout joint. Not only will it rake out all of the thinset down to the substrate, but the sides of the nail are like a hard file that will clean the edges of the tile off too.

You have to wait a few hours until the thinset has firmed up enough to be able to get out on the tile. Then just run the rake tool through all of the joints to clean out the extra thinset, and vacuum the joints with a shop vac. You'll end up with nice full-depth joint spaces and clean tile edges when you start to grout.

—GRANT LITTS
Norway, Mich.



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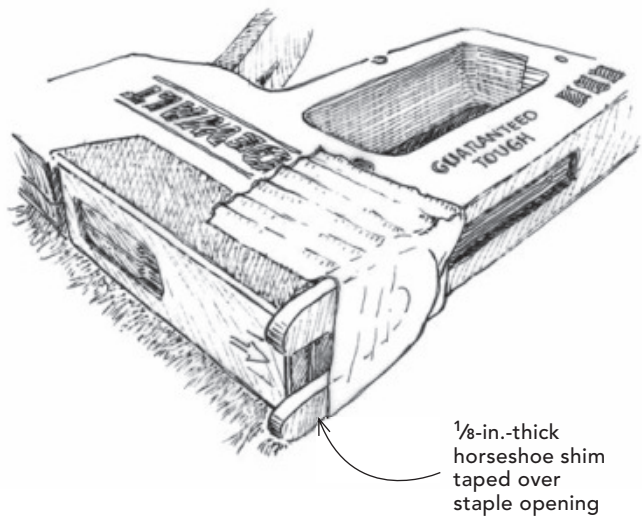

Staple standoff

I wanted to staple some low-voltage wire in my crawlspace, but neither my manual nor electric staple gun had a built-in standoff setting. So I improvised: I taped a ⅛-in. horseshoe shim around the piston opening on my staple gun, and that allowed me to shoot staples that stood proud by just over ⅛ in. Plus, the ends of the shim helped frame the areas where the staples would fall.

—NICK BURGER
via FineHomebuilding.com

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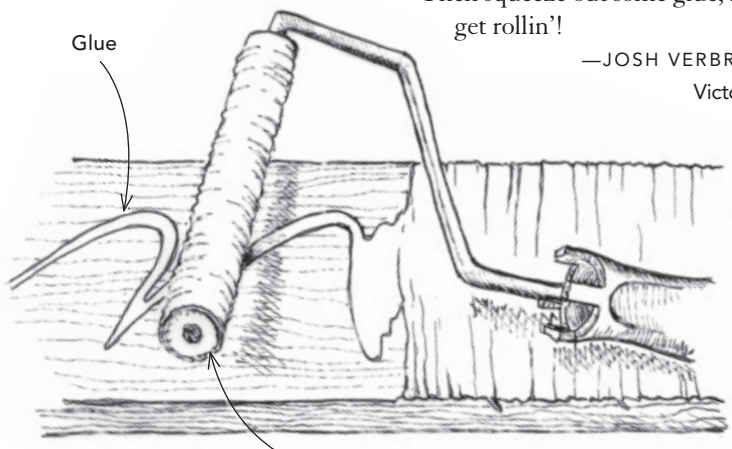
The glue roller

Gluing up some wood and don't feel like using your finger or buying a costly glue roller? Then grab your trim paint roller and a 4-in. foam sleeve. Tear away the foam from the sleeve, and use a wire brush on any residue until all that's left is the plastic. Then squeeze out some glue, and get rollin'!

—JOSH VERBRUGGEN
Victoria, B.C.

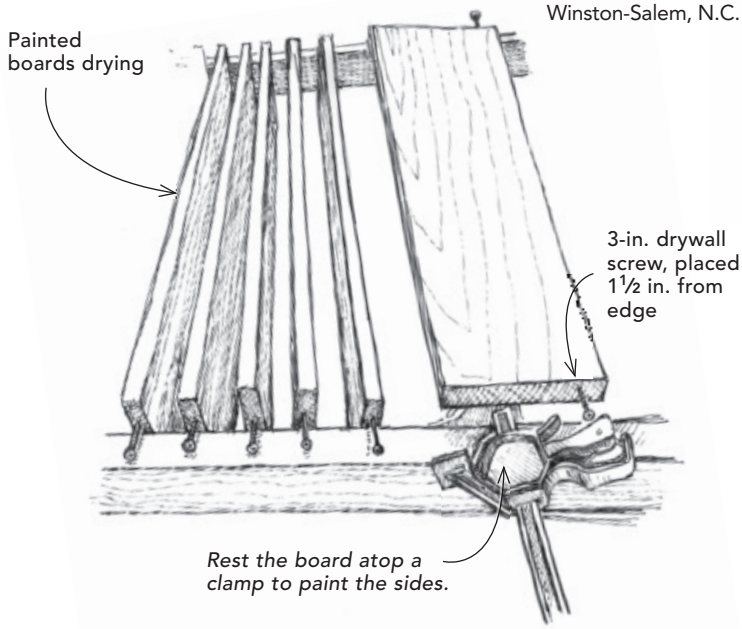


Remove the foam from the roller, and use the rig to spread the glue evenly.

Drying painted shelves

My method of drying shelves is to insert a long drywall screw in the end of each board, about 1½ in. from the edge. I rest the screws on two parallel sawhorses, allowing the board to hang in a vertical position. To paint a board's side and edge, I rest it on a clamp attached to one sawhorse as shown in the drawing below. Then I flip the board 180° to paint the other side. After I finish each board, I move it back to hanging vertically. I can get a lot done in a small space.

—STEPHEN BEESE
Winston-Salem, N.C.



Rest the board atop a clamp to paint the sides.

Making vent lamps work

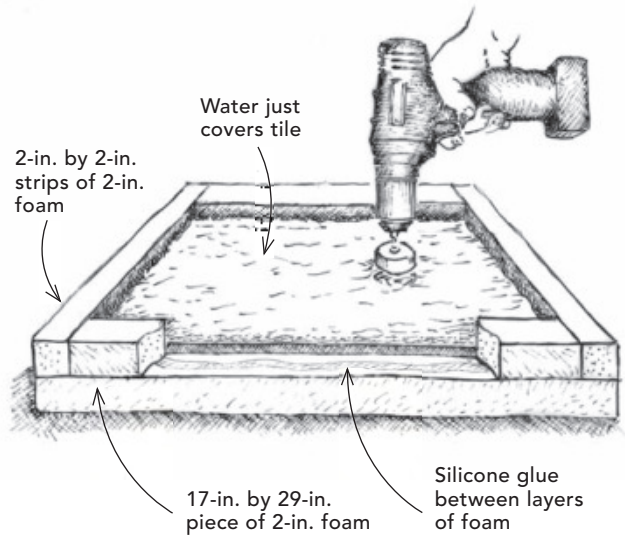
The lamps on modern vent hoods are often PAR lamps that are flush with the metal housing, making them harder to grab hold of to remove. Plus, because of the moisture given off while cooking, the threads on the base of the lamps get rusted/oxidized inside the socket. First, try to remove the stuck lamp by spraying WD-40 in the crevice around the lamp base. After the glass lamp face has dried, use a pair of rubber gloves to push it up and twist to remove it.

To prevent this problem in the future, apply some antioxidant compound to the threads of the new lamp base. This will prevent rust in this socket and act as a lubricant. Antioxidant compound has many different names, but it's the stuff that electricians use when connecting aluminum conductors at the service-meter base to prevent oxidation. The next time you remove that lamp, it will come out easily.

—MARCH COOVER
Dallas, Texas

Cut tile underwater

I needed to drill some holes in 12-in. by 24-in. tile, so I began with a piece of 2-in. rigid foam and cut it to approximately 17 in. by 29 in. I then cut some 2-in. by 2-in. sticks of the same foam and used silicone to glue



them around the border of the larger piece, as shown in the drawing above.

When I was ready to drill the tile, I placed it in the foam tray, poured in enough water to submerge the tile, and drilled my hole. The water prevented dust from filling the air and the foam supported the tile so it was less likely to crack as I drilled.

—JOTHAM PENNER
via FineHomebuilding.com

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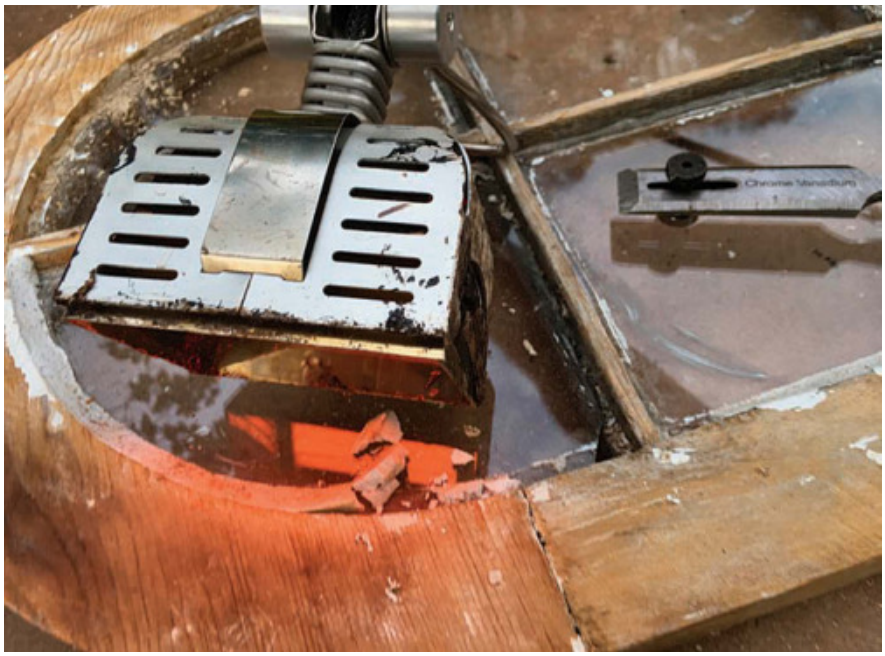

INFRARED PAINT REMOVER

My work as a restoration carpenter means countless hours stripping paint, so when I was offered the chance to try Speedheater's new Cobra, I quickly agreed. Speedheater tools use infrared (IR) radiation to soften multiple layers of paint for removal from the wood substrate. Compared to torches or heat guns, IR paint strippers operate at significantly lower temperatures (200°F to 400° F) so they won't vaporize lead or pose a fire hazard—if used correctly.

Essentially, the Cobra is a slimmed-down makeover of Speedheater's flagship Model 1100. I bought a Model 1100 in 2004, and it's been my go-to for stripping paint from clapboards and baseboards ever since. But it's not so good for softening paint that has built up in corners and crevices, so I was anxious to find out if the Cobra's smaller, shrouded heating element would do the trick.

I tested this tool on a variety of moldings, balusters, and window sashes, all of which were heavily paint-encrusted. It proved remarkably effective, softening thick paint in 1 to 3 seconds, but only after I mastered the procedure. What worked for me was to hold the Cobra in one hand (fingertips grasping near the neck, as if it were a pencil) and a sharp, pull-type scraper in the other. I hovered the face of the heating element about an inch over the doomed paint until it bubbled, then moved the heater along to soften the next section while I scraped off the debris from the previous one. With practice, I was able to keep the heater and scraper moving in unison.

When I reached the end of the line, I learned the hard way that it is crucial to have a safe, heat-resistant parking spot for the tool. During one pass, I melted the 6-mil poly I was using for ground cover; on another go-round, I melted the insulation on the power cord.

So how did it perform? On broad, flat surfaces, the Cobra couldn't match the speed of the Model 1100, due to its smaller heating element. But it excelled at stripping paint from intricate profiles. And it did its best work on window sashes: The heating element is perfectly sized for stripping the frames in one pass, and it softens rock-hard glazing putty better than anything I've ever tried.

Tom O'Brien, a carpenter and freelance writer in New Milford, Conn.

Speedheater Cobra

Head dimensions: 5 in. by 5 in.

Weight: 5 lb.

Price: $400

Photos: courtesy of Speedheater

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No-slip kneepads

I have several pairs of strap-on-style knee pads that I keep in my work van, but I rarely use them anymore. Instead, I've switched to Shock Doctor Ultra Knit Knee Supports, which are knee braces that I found on Amazon. Even though they're really made to give support and prevent injury during sports and fitness pursuits, I wear them under my work pants, especially on kneel-heavy days such as when I'm installing flooring or baseboard. The gel patella pads do a good job protecting my knees, but the best part is that the sleeved shape doesn't slide down my legs like ordinary knee pads. These knee supports aren't cheap, but I think the most important tool a carpenter has is his own body, so it's a small price to pay to keep mine strong, fit, and feeling good.

Grant Hoglund, a carpenter in St. Paul, Minn.

Shock Doctor Ultra Knit Knee Support

- Comes in four sizes (S, M, L, XL)
- Woven fabric is breathable and wicks moisture
- $50 each (sold individually)

Photo: courtesy of Shock Doctor

Cutting-edge router

Recently I've been using a Bosch GKF12V-25 cordless router. Powered by Bosch's 12v battery, the compact router is ideally suited to edge profiling—its asymmetrical footprint means more of the base rides on the wood than with a more typical square or round base with the bit in the center. There is a quick-release for coarse depth adjustments and a fine-adjustment thumbwheel. Depth is locked with a small knob opposite the depth control and the electronically-controlled motor maintains its speed. A locking collet allows one-wrench bit changes and there's a fuel gauge for battery status.

This router works well and a 12v, 2-amp/hr battery provides a reasonable runtime. I found I could mortise a single door's worth of hinges and a strike, but it was totally spent after making a cutout in ¾-in. plywood for a site-built hinge-mortising jig. As you might imagine, this router shines for edge profiling and it's nice to not have a cord, but for those already on a different cordless platform, I'm not sure it's good enough to warrant carrying another battery and charger. But if you're invested in Bosch's 12v platform, it would be a worthy addition to your finish-carpentry tool kit.

Patrick McCombe, senior editor

Bosch GKF12V-25

RPM: 13,000

Collet: ¼ in.

Price: $150 (bare tool)

Photo: courtesy of Bosch

Open wide. *Arranged like an overnight duffel, the Veto DR-XL allows easy access to the drills and bits inside. The bag comes with removable interior dividers.*

Superdurable tool tote

The wide variety of modern screws and fasteners plus the abundance of modern materials has ballooned my drill kit to a size where it requires multiple tool boxes. Managing all of them wastes time throughout the day, so I recently loaded all of my regularly used drill bits and accessories and my cordless drill and impact driver into a Veto DR-XL tool bag. In addition to my large collection of drill bits and driver tips for nearly every fastener imaginable, I also wanted some room for basic hand tools like a multitip screwdriver, utility knife, and tape measure.

The bag was a puzzle to set up. It comes with a removable interior shell with Velcro dividers, but the dividers didn't work with the small plastic boxes where I keep my drilling accessories, so I removed them. The DR-XL has 30 pockets that can hold a range of items from a Kreg Jig HD to a utility knife down to individual drill bits. On my bag there are eight exterior pockets that are underused or not used at all due to their location or size.

Despite these shortcomings, the DR-XL is made of durable materials that should keep it in service for many years, and it's flexible, so it can evolve as my drill-related kit evolves. I am confident that over time I will find uses for the pockets that remain unused. The price ($180) is fair given its quality and the amount of gear it can hold. It took time and effort to get my setup to where it is today, but now, instead of telling a coworker, "Yeah, I have that in my truck," I can say, "Yeah, I have that right here."

Ian Schwandt, a carpenter in Kent, Conn.

Safer stripper

I've tried some off-the-shelf environmentally friendly paint strippers and been unimpressed with the results. Although old-school methylene-chloride strippers work well, I hate using them because of their choking fumes, so I gave Dumond's Smart Strip Advanced Paint Remover a shot while refurbishing some reclaimed doors. While $55 seems like a lot for a gallon bucket, I can't knock the results. It only took about two hours for Smart Strip to eat through three layers of old paint, making it easy to remove with a plastic putty knife. Dumond claims it can take off up to 15 coats at a time from any type of interior or exterior surface.

For cleanup, just wipe down the surface with a wet rag or sponge to remove the residue, or you can use a power washer on exterior surfaces. Smart Strip takes slightly longer than methylene-chloride strippers, but it achieves the same result without the fumes.

Matthew Millham, associate editor

Photos: top and middle, courtesy of Veto Pro Pac; bottom, Patrick McCombe

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what's the
HELPING READERS MAKE CHOICES
difference?

Knowing the difference between a selection of tools or similar-looking products can make all the difference to your wallet and the quality of your jobs. Whether you're an apprentice or a veteran, weighing the pros and cons of basic building products is an endless, time-consuming task for builders. In this special section, we'll dig into a handful of topics, helping pros decide between options that have the potential to be considered all the same, though they are anything but. If you like what you read, you can find more at FineHomebuilding.com /whatsthedifference.

Brian Pontolilo, Scott Gibson, and Justin Fink contributed to this special section. Photos by Rodney Diaz and Melinda Sonido.

POWER TOOL ACCESSORIES

Drill bits from common to specialty

There is often overlap between what two different bits can drill, and particular advantages of different styles for different applications, making it difficult to know which drill bit to pull out of your tool bag for each task. Manufacturers vary widely, but characteristics are similar from brand to brand. Here's a quick rundown.

SEVEN COMMON BIT STYLES

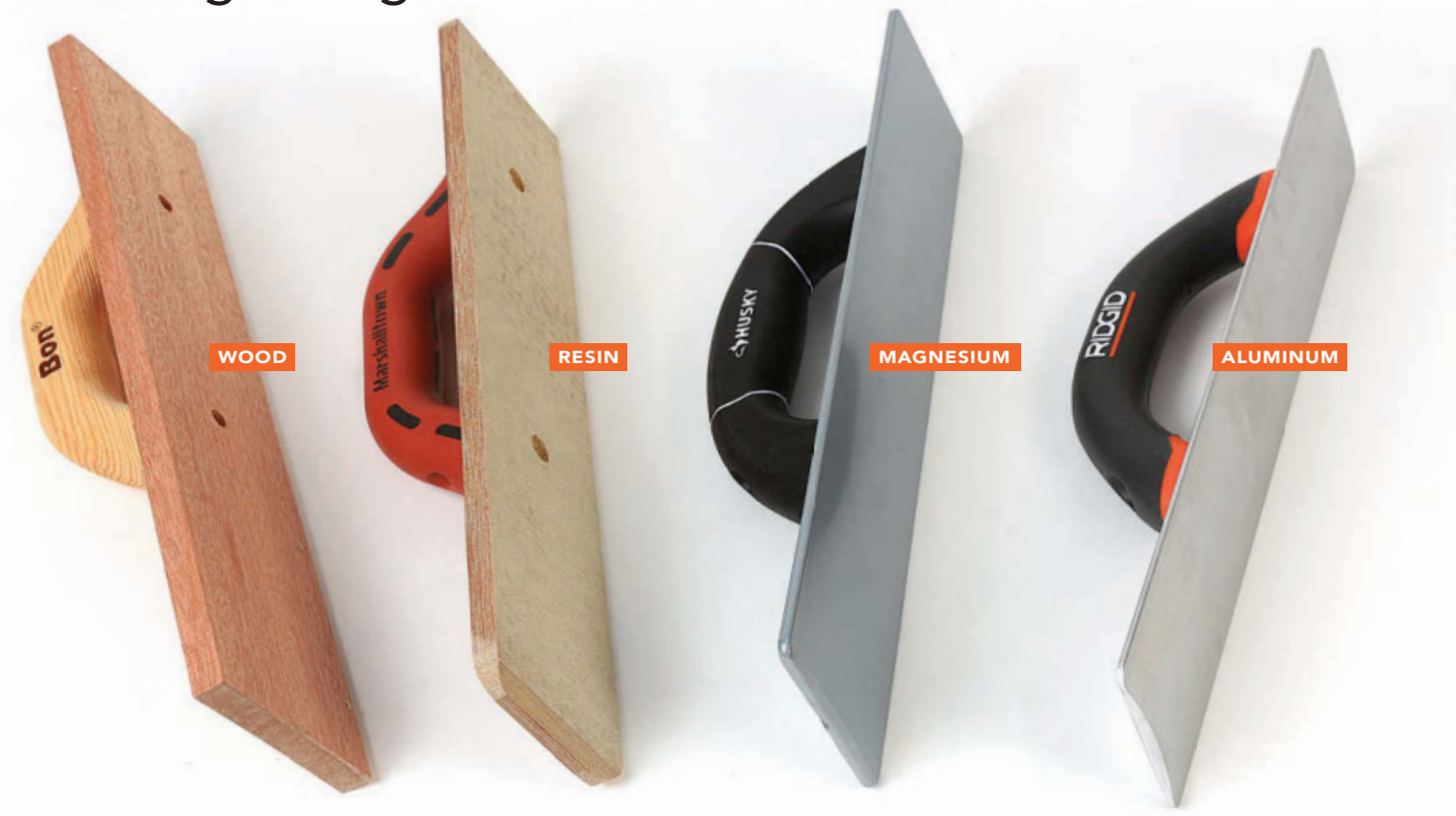
1 TWIST BIT When it comes to general drilling in most materials, twist (or spiral) bits are the go-to product. With a pointed tip and spiral flutes designed to eject chips, twist bits are used for everything from drilling pilot holes in wood or concrete to boring bolt holes through steel. In general, shorter bits are more durable and drill straighter holes, and longer bits are more likely to wander during drilling and may break in dense material or under too much pressure.

2 BRAD-POINT BIT These spiral bits with pointed tips are a good choice for boring clean and accurate holes in wood and plastics, and are designed to exit the material without blowout as well. Because they don't wander while cutting, brad-point bits are ideal for precision work, such as cutting holes for shelf pins. Brad-point-bit designs are often tweaked to match a variety of tasks, so if you're drilling into hardwood, for example, look for a brad-point bit labeled for that material.

3 SPADE BIT These bits are flat with a brad point flanked by two cutters, and are made for drilling holes in wood. Most spade bits today have hex shanks, and some are now available with a screw tip that pulls the bit into the material. Spade bits cut fast and are more affordable than other bit options that do the same work, but the results aren't particularly clean or accurate, so they are used for rough work.

CONCRETE

Choosing the right hand float



Once a concrete slab has been placed, screeded, and bull-floated, it's time for hand floats. A bull float, used to smooth most of a slab, tends to either pull a small amount of concrete away from the edges of the slab, or push concrete toward the edges. A hand float is used to level and smooth these areas so that they match the rest of the slab, and is also used around obstacles—such as pipes, drains, or columns—where more precision is needed. These tools are made in several shapes and sizes, from four materials, each of which can have a different effect on the concrete surface. Note that a steel trowel should never be placed on the concrete until all bleed water has evaporated. If used too soon, a steel trowel closes the pores of the concrete and traps water below the surface, which would more than likely cause the top layer to delaminate.

WOOD A wood float is the least expensive option, but it isn't durable over the long haul. Because a wood float is dragged over a rough concrete surface, constantly soaking up bleed water, and is hosed down after use, it's surface becomes rough and fuzzed up, and tends to pull and drag at the surface of the concrete rather than smoothing it. This effect can be useful at times, though, especially when working with really stiff concrete or concrete that is setting up too quickly. Wood is preferred when applying shake-on color hardeners, which need to be worked into the top surface of the slab.
Bon Tool 82-402 (16 in. by 3½ in.): about $6

RESIN Laminated canvas-resin floats have an extremely dense "waffle" surface that gives the concrete the same slightly rough texture as a wood float. The advantage to paying four times the cost of a wood float is that you get a much more durable tool. Canvas resin doesn't soak up water, so it won't fuzz up after repeated use on wet concrete and after being hosed off at the end of a job.
Marshalltown 4526D (16 in. by 3½ in.): about $28

MAGNESIUM Although they are slightly weaker than their aluminum counterparts, magnesium floats are lighter, and are often only slightly more expensive. Magnesium smooths the surface of fresh concrete and opens the pores for proper evaporation, all without pulling the surface like a wood or resin tool.
Husky 57501 (16 in. by 3½ in.): about $22

ALUMINUM Aluminum floats have many of the same characteristics as magnesium floats, but they are roughly 30% heavier and 30% stronger. Like magnesium, aluminum opens the pores of fresh concrete, allowing bleed water to evaporate.
Ridgid CM5001 (16 in. by 3⅛ in.): about $18

ELECTRICAL

The right cable for each job

There are two basic questions that guide the choice of which electrical cable to use for each job: the amount of current the conductors will carry, which dictates the necessary gauge, and where the wiring will be located, which dictates the type of jacket/sheathing used to protect those conductors. Note that although "wire" and "cable" are often used interchangeably, "wire" actually refers to a single electrical conductor. When multiple wires are bundled together, what you have is a cable. The two most common types of cable categories are nonmetallic and metallic, which describe the type of jacket protecting the cable.

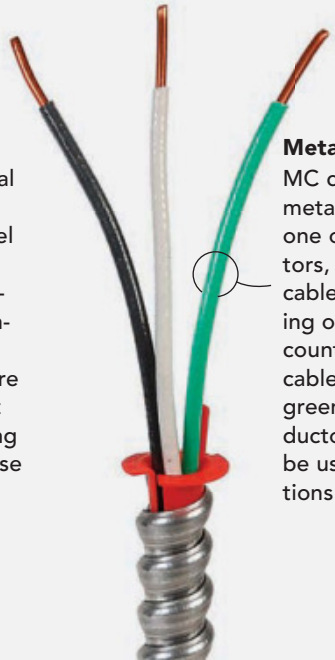
NONMETALLIC-SHEATHED CABLE

Nonmetallic-sheathed (NM) cable is intended for protected locations—inside wall cavities, for example, not out in the weather or buried in the backyard. Inside the sheathing are individual wires. "NM-B" means the cable is rated for locations where temperatures go up to 90°C (194°F). The gauge of the individual wires will determine how much current the cable can safely handle. The choice depends on how much current (amps) the device draws—information that should be available on a tag attached to the device.

METALLIC-SHEATHED CABLE

Armor-clad (often called "BX") and metal-clad cable are preferred by some electricians, and required in certain installations because the flexible metal sheathing is less prone to damage than the vinyl covering on NM cable. Because of the metal sheathing, AC and MC cable are more expensive than NM cable, and more difficult to cut.

Armor-clad (AC) cable
This cable consists of individual conductors wrapped in paper and an outer sheathing of steel or aluminum. Inside is a separate bonding wire that, in conjunction with the metal sheathing, serves as the grounding wire (by itself, the bonding wire is not an adequate equipment ground). Because the sheathing is the ground, you'll have to use metal, not plastic, receptacle and switch boxes.



Metal-clad (MC) cable
MC cable has a flexible metal sheathing and one or more conductors, but unlike AC cable, the metal sheathing of MC cable doesn't count as a ground. MC cable requires a bare or green grounding conductor. MC cable can be used in more locations than AC cable.

WORK GEAR

An inside look at work boots

When your feet feel good, your whole body feels good, and knowing what goes into a boot makes it easier to find the right one for the way you work. For pros, the most critical features are related to a work boot's insulation, safety toe cap, shank, and sole construction. Shown here is a cross section of Carhartt's CMF6380 6-in. work boot (about $145).

INSULATION Most boots are insulated, because insulation equals comfort. But insulation levels vary widely. For those working in mixed climates, the best advice is to have different pairs of boots for the summer and the winter, with insulation and breathability chosen to match the conditions. For winter work, consider sizing the boot up to leave room for additional layers of socks.

TOE CAP Toe caps prevent crushing injuries, and are often required by employers. Steel is the traditional choice for toe caps, and still favored by many for its thinness and light weight. The one major knock against steel is its tendency to make toes cold in the winter. Toe caps made from aluminum or, as shown here, a composite—plastic, kevlar, or carbon fiber—solve the cold-toes problem, but typically must be thicker than steel to reach the same level of protection. The plus here is that even when thicker, they are still lighter.

CONSTRUCTION Soles typically are joined to the upper part of the boot in one of two ways. The first option is cement (shown here), which is often higher in comfort but lower in durability, and cannot be re-soled when worn out. The more traditional and durable option is a Goodyear welt, in which a tough strip of leather, rubber, or plastic is stitched to the upper piece and the sole, locking the boot together. This type of construction is built for the long haul, and designed to be re-soled.

SHANK The shank of a boot is what provides support and structure for the foot. Like toe caps, steel is the most traditional choice here, providing excellent protection against punctures and offering a lot of support for those working on ladders or uneven terrain. Composite shanks (shown here) are lighter and more flexible, providing a bit of natural give under each footstep, but are more expensive and often aren't as puncture-resistant as steel.

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Like many modern-day retailers, The Home Depot offers pros the option to shop online and have any in-stock items set aside at their local store for same-day pick-up. This isn't just about convenience—the benefit is also a broader selection of options. The typical Home Depot store has more than 35,000 items in stock at any given time—impressive in its own right—but the company has also increased the number of available products nearly 30-fold on their online store, homedepot.com. With a website now boasting over one million items, The Home Depot gives pros the ability to shop online, with multiple delivery options.

Items that are in-stock at their local store will be set aside by an associate—ready for pickup in just two hours—and the pro is notified via email or text message when their order is ready at the store Pro Desk for fast checkout.

In most locations, The Home Depot has also rolled out orange lockers in the store, allowing pros to pick up online purchases without needing to check out. And if the ordered items are too large for easy pickup, they can be purchased online, sent to a local store, and then delivered to the pro's house—all arranged via the website.

The Home Depot has also rolled out express same-day and next-day local delivery for more than 20,000 of its most popular items to 35 major metros across the U.S. The new service is part of the company's overall five-year expansion of its delivery offerings for customers. Qualifying products for the new express-delivery feature include everything from power tools to lumber to roofing shingles, with delivery options starting at $8.99, free delivery on orders over $45, and the ability to choose a time frame in which the products will be delivered.

With this ever-expanding selection of delivery channels and an easily searchable website, The Home Depot is providing convenience and power to pros, who can choose exactly how they want to shop, and how they want their purchases delivered.

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4 FORSTNER BIT These bits are designed to make clean and flat-bottomed holes in wood. Another benefit of the design is that you can make overlapping holes or holes that overlap the edges of your material. These advantages are useful for removing material in a mortise in prep for final cleanup with a chisel. Forstner bits are also less likely to wander or create chips or blowout when cutting through knots, end grain, or other challenging material.

5 HOLE SAW A hole saw consists of an arbor that chucks into the drill, a twist bit that guides the cut, and a cylindrical saw that creates the hole. Some hole saws have fixed arbors; others have removable arbors so you can build a kit with different-diameter cylinders. If you need a clean cut in wood, choose a hole saw with more teeth per inch (TPI); and because these bits don't make the cleanest exits, cut from both sides.

6 AUGER BIT If you need to drill through timbers, an auger bit is a good choice. Made for drilling deep holes, these long bits have a screw tip that pulls them forward to keep the hole straight. There are two types of auger bits—those with a solid center (shown here: Bosch, $17) are more rigid, and those with a hollow center are somewhat more likely to flex, but they allow more material to be removed during long cuts.

7 SELF-FEEDING BIT A kind of hybrid, these bits have a screw tip to pull the bit into the material like an auger bit, an outer cylinder with cutters like a hole saw, and blades inside the cutting diameter much like a spade bit. Self-feed bits are good for boring large-diameter holes in wood, and are designed to provide a good balance of speed, accuracy, and clean holes. They aren't very efficient at removing chips, though, and a high-torque drill is a must with larger-diameter self-feeding bits.

SPECIALTY BITS

MASONRY BIT
If you need to make a hole in concrete, brick, or stone, use a masonry bit. With a blunt carbide tip and spiral edges, masonry bits are designed to hammer into the material while spiraling to clear chips and dust from the hole.

TILE BIT
The tungsten carbide point of these bits (shown here: Bosch, $5) shears the material instead of cutting it. Typically used with coolant to prolong the bit and make a clean hole, they work in ceramic, some porcelain, and nontempered glass.

COUNTERSINK BIT
These bits are designed for simultaneously drilling pilot holes and creating a beveled recess so a screw head can be set flush or below the surface. Bit sizes correspond to the screw diameter and length that will fill the hole.

SELF-CENTERING BIT
With a twist bit housed in a retractable sleeve, these bits are commonly used to drill pilot holes for hinge screws using the hinge itself as the template.

STEPPED BIT
Designed for drilling or deburring thin metal, stepped drill bits, such as the Milwaukee 10-step bit shown here ($120), have progressively larger diameters, so one bit can drill many different-size holes.

PLUG CUTTER
Like a hole saw without a pilot bit, a plug cutter removes a specific-diameter, slightly tapered round plug from a piece of wood that can then be used to fill a hole elsewhere.

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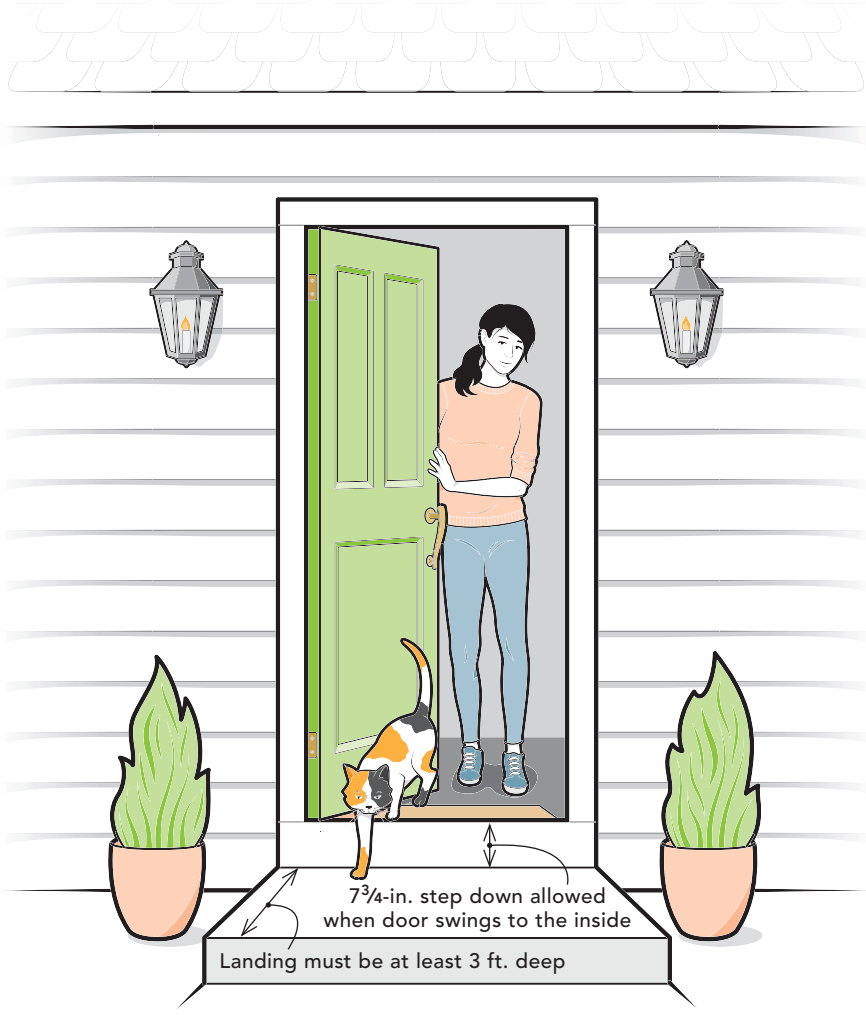
know the code
MASTER THE RULES OF HOME BUILDING

Landings for exterior doors

BY GLENN MATHEWSON

Every home must have one egress door, and it must be a specific size, with a specifically dimensioned landing on both the interior and exterior side of the threshold. These egress door and landing requirements have been around since before the 1971 One and Two Family Dwelling Code, the first edition of the predecessor to today's IRC, and remained essentially unaltered for years. But in the 2003 IRC, a change was made. While the egress door still has to follow the strict requirement of having no more than a one-step height difference (7¾ in. max) between exterior landing and threshold, an exception was added for all other exterior doors, which are now allowed up to two steps between the landing and the threshold. To this day, inspectors and builders still stumble on this section of the code, so it's a topic worth some clarification.

Though homeowners may not know which exterior door is their egress door, they have one, and it must meet some criteria. It must be side-hinged and offer a clear passage of at least 32 in. in width and 78 in. in height. There are more specifics outlined in the code, including from where to take these measurements; generally, the dimensions equate to a standard 3-ft. by 6-ft.-8-in. door. Also, each side of every exterior door (egress and non-egress) is required to have a landing, providing a stable place to stand while one's attention is focused on operating the door. This landing must be at least the width of the door and 36 in. deep "in the direction of travel" (with an exception for Juliet balconies accessed only by door), and



LANDING REQUIREMENTS FOR EGRESS EXTERIOR DOORS

The general requirement for the specified egress door is a maximum 1½-in. step from the threshold down to the landing on both sides of the door. However, recognizing the weather-related benefit of space between the door and the exterior landing, an exception allows up to a 7¾-in. step down to the exterior, provided the door does not swing to the outside over this dropped landing. There is no requirement for which direction an exterior door on a house must swing, but the direction will affect the allowable landing heights. In all cases, however, a storm or screen door can swing over the exterior steps and landing.

Drawings: Kate Francis

the landing can be sloped for drainage or construction tolerance up to ¼ in. per ft.

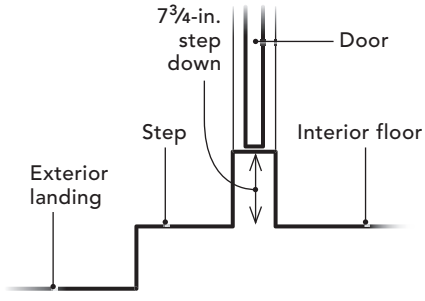
The change in the code provides some much-appreciated design flexibility for non-egress exterior doors. Balcony decks with cantilevered floor joists would place the threshold at the level of the exposed exterior decking if a step were not permitted. The penetration of the cantilevered deck joists through the exterior wall is a difficult and critical flashing juncture—raising the door a step up the wall allows for a well-flashed and drained sill below, along with some much needed detailing space between the door and the deck. I've also seen multiple situations in which a house is designed with a taller beam in the rim-joist area of a floor, underneath an exterior wall. When a deck and door is eventually added, the beam would have been quite a tragic discovery if not for the step allowance. Instead, the door is simply installed one step up in the wall, above the beam. According to the code, no raised landing need be built on either side. The understanding is that the door is an "extra" in a private home with greater occupant awareness and minimal expectation of use. The probable hazard is assumed less than the front entry door, which is typically the required egress door.

With all that said, remember this: The code does not guide you to maximum safety; it simply ensures minimum safety. The safest door is still a door with no steps, but only if the weather-resistive integrity from the exterior can be maintained. Whether it's for yourself or a client, consider the location of each door and the assumed purpose and estimated frequency of use. Then select the right-size door, landing, operation, and steps that offer the most weather-resistive design and safest occupant use within the given budget. After all these wise choices are made, double check them against the minimum code requirements.

Glenn Mathewson is a consultant and educator with buildingcodecollege.com.

LANDING REQUIREMENTS FOR ALL OTHER EXTERIOR DOORS

For all non-egress exterior doors, the 2003 code update allows a 7¾-in. step down on the interior, and up to two steps down to the landing on the exterior (regardless of which way the door swings, it can only swing over one step). This allowance provides some design flexibility. For example, by allowing two steps up to a total of 15½ in., an exterior door can access a grade-level landing with just a single stair tread in between. This rule also provides the ability to drop the height of a deck ledger for increased weather resistance and ease of fastening to the house, all without requiring the space needed to build a full raised landing.



An exterior door can access a grade-level landing with just a single stair tread in between for a total height of 15½ in.

21st-Century Timber Framing

A mix of modern and traditional methods creates an engineered frame that goes up fast

BY KEN BOUVIER

In 1976 I worked on my first timber frame. We dismantled a prerevolutionary-era house frame, moved it to a new site, and reconstructed it into a new home. That project got me hooked on timber framing—four decades and more than 500 projects later, I still love it.

In the early days, we focused on moving and restoring old frames, but now the majority of our work is building new frames from scratch, using machinery that our timber-framing forbearers couldn't have imagined. The increase in productivity has allowed me to grow our company to 30 employees and build dozens of timber frames every year. Our automated methods also mean that our employees—who often have the bad knees and bad backs that come with a lifetime of construction work—can continue their careers much longer than if they were moving and assembling timbers without machinery.

Our most powerful tool is a Hundegger K2i, a CNC multihead machine that cuts the timbers to length and does the majority of the joinery. After our team designs the joinery and tells the machine how to make the cuts, we can put a timber in one end and a nearly complete piece of the frame comes out the other. But it can't do everything. At a minimum, the joints need to be cleaned up with hand tools; the machine also can't make large curved parts, because they don't fit inside. We make those and the other problem pieces with portable power tools and traditional mallets and chisels. Reclaimed timbers and frames are cut fully by hand.

The photos in this article show a frame we made and assembled for the historic B.F. Clyde's Cider Mill in Mystic, Conn. The 15-ft. by 24-ft. space, which will be covered with board siding to match the existing barn, is a cider storage room that will hold tanks of fermenting cider. The tanks' great weight is why the floor is framed with LVL joists. The building is also close to the coast, so it has additional bracing for wind loads.

We can help engineers and other specifiers, who often have little experience with timber framing, design their timber-frame structures for almost any residential or commercial application. This frame, which has 115 pieces, took about five days to build in our shop. We delivered it to the job site on an equipment trailer early one weekday. With the help of a local crane operator, our three-person crew lifted the first pieces off the trailer around 9:30 a.m., and we finished assembly around 3 o'clock. □

Ken Bouvier is president of South County Post & Beam in West Kingston, R.I. Photos by Patrick McCombe, except where noted.

CUT THE FRAME IN THE SHOP

A 6000-sq.-ft. steel building holds the 90-ft.-long joinery machine, and there's another 13,000 sq. ft. of shop space for hand work, finishing, and dry fitting.

MACHINE-MADE COMPONENTS

Most frame parts are cut to length and the joinery is made with a German-made Hundegger K2i CNC joinery machine, but the machine-cut joints often need corners squared and stray wood fibers trimmed.

To see a video of the joinery machine in action, visit FineHomebuilding.com/magazine.

Photo this page bottom: courtesy of Ethan Biederman

FINE-TUNE THE JOINERY

Joinery and cuts are fine-tuned and chamfered with traditional timber-framing tools, including block planes, chisels, and mallets. The heavy timbers are handled with forklifts to boost efficiency and prevent injury.

DRY-FIT THE PARTS

Once all the components are ready, individual frame sections are assembled and made square with pipe clamps, ratchet straps, and dead-blow hammers. Sturdy sawhorses put the parts at a comfortable working height.

DRILL THE TENONS

Once the pieces are together and square, the framers drill holes through the tenons using the machine-cut holes in the mortises as a guide. The pieces are then taken apart, banded, and placed on pallets for delivery.


1


2


3


4


5


6

ASSEMBLE THE FRAME IN THE FIELD

1 SORT THE COMPONENTS
The frame parts are delivered to the job site on an equipment trailer or on one of the company's truck cranes. The parts are labeled (in an inconspicuous spot) so the frame can be easily assembled using plans with corresponding labels.

2 BUILD THE FIRST BENT
The parts to a single bent are laid out on the floor system on scrapwood spacers so the tapered end of the peg can stick out on the other side of the joint. A 4-lb. dead-blow hammer is the preferred tool for driving the waxed oak pegs.

3 LIFT WITH A CRANE
Bents are lifted and positioned with a crane to save time and prevent injury. Most residential frames can be assembled using a relatively small truck crane, because the parts generally don't weigh more than several hundred pounds.

4 PLAN FOR UPLIFT
Uplift on this frame is partially controlled with U-shaped hold-downs attached to all four corners of the building. The hold-downs are anchored to the concrete foundation with threaded rods set in epoxy.

5 PLUMB THE CORNERS
Corners are plumbed and temporarily braced and then knee braces that connect to the top plate are fastened to the post. This building, which is only a few miles from the coast, has additional bracing to withstand 110-mph winds.

6 FLY-IN THE TOP PLATES
With both gable-end bents in place, the top plates are lifted into position. A tag line prevents the beam from spinning as it's raised. Clean nylon straps are used for lifting because they're less likely to leave marks on the timbers.

7 FASTEN THE CORNERS
Corners are locked together with 8-in. structural screws and metal straps let into the top plate so the board siding will fit tight to the framing. These modern connectors help a traditional-looking frame meet modern code requirements.

7

SET UP THE RIDGE

Before lifting the ridge beam into place, the short posts it bears on and reinforcing braces are assembled on the delivery trailer. Whenever possible, roof components are assembled on the ground to minimize working at height.

MAKE IT FIT

The roof of this timber-frame addition tucks under the eave of the existing building. The ridge height was planned to leave enough room to fit 2x6 tongue-and-groove sheathing and shingles under the eave.

FILL IN THE WALLS

Vertical posts form the sides of window and door openings and receive horizontal nailers for the barn's vertical board siding. The posts fit into mortises on the top and bottom, where structural screws hold them in place.

TIE THE FRAME TO THE FLOOR

The final step is to drive structural screws to connect the frame's bottom plate to the LVL band joist. This step helps to control uplift during high winds. Predrilling prevents splitting the LVL.

START THE SCREWS

Pairs of 8-in. structural screws make a sturdy, code-compliant connection between the rafters and the top plate. Starting them while the rafters are on the ground saves time and eliminates the frustration of dropping screws.

SET THE RAFTERS BY HAND

To save an hour of crane time, these relatively lightweight rafters are lifted into place by hand and fastened with structural screws.

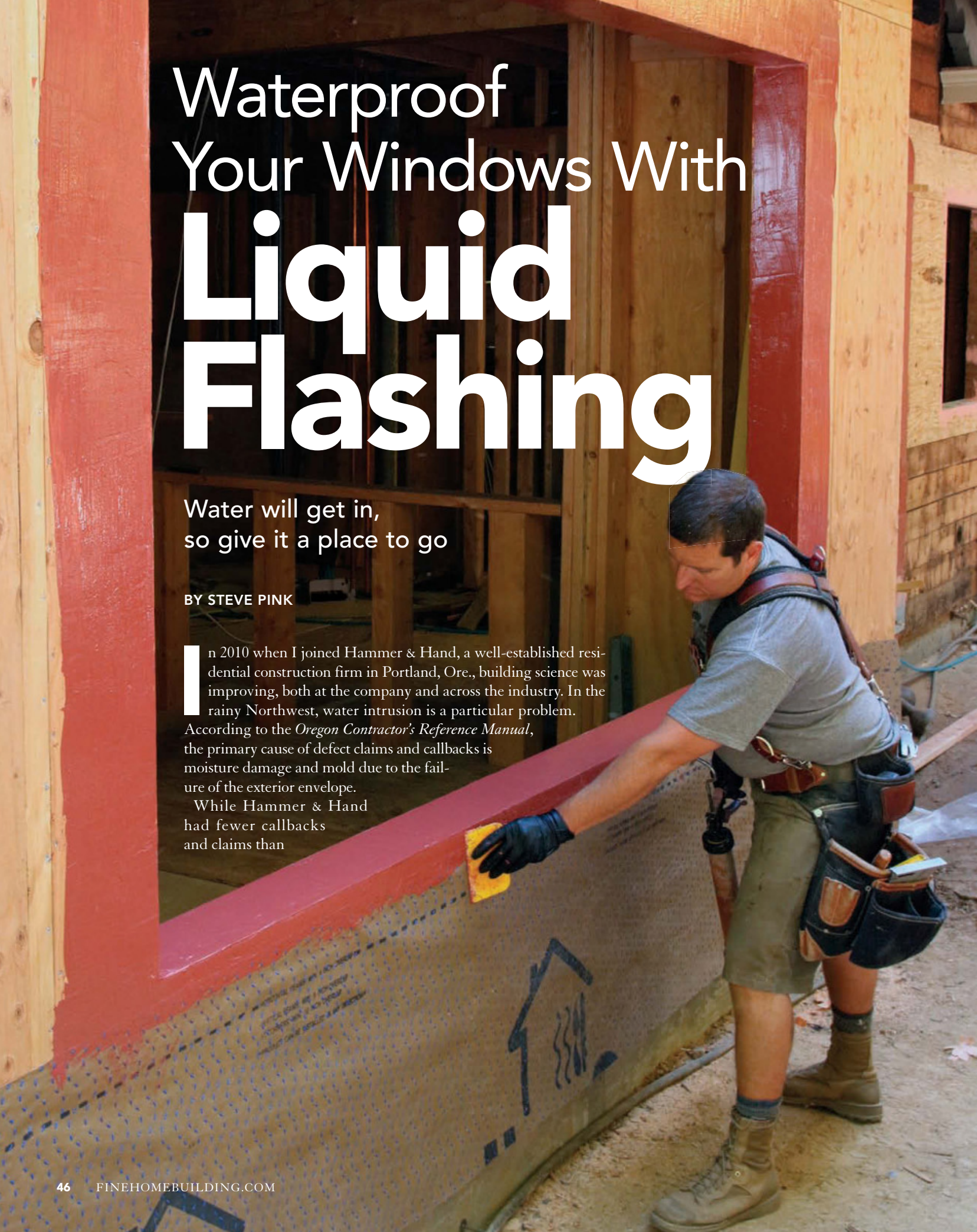
Waterproof Your Windows With Liquid Flashing

Water will get in, so give it a place to go

BY STEVE PINK

In 2010 when I joined Hammer & Hand, a well-established residential construction firm in Portland, Ore., building science was improving, both at the company and across the industry. In the rainy Northwest, water intrusion is a particular problem. According to the *Oregon Contractor's Reference Manual*, the primary cause of defect claims and callbacks is moisture damage and mold due to the failure of the exterior envelope.

While Hammer & Hand had fewer callbacks and claims than



PREP THE OPENING

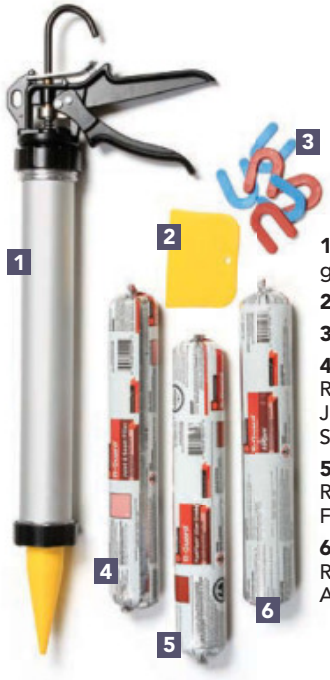
Not-so-rough opening. *Liquid-applied flashing requires a clean, smooth surface. Use a router and flush-trim bit to cut the sheathing flush to the framing, free of burrs and jagged edges. If a recip saw is your only option, knock down rough areas with a belt sander after cutting.*

Bevel the sill. *When water gets past the window, the beveled sill directs it outward onto the water-resistive barrier (WRB). The easiest way to angle the sill is to install a piece of bevel siding (be sure allow for the added height in the rough openings).*

TOOLBOX

New standard for water management

At $25 per 20-oz. tube, liquid-applied flashing is pricier than traditional materials, but eliminates water problems. A 3-ft. by 4-ft. opening requires one tube of Joint & Seam and two tubes each of the other products.



1 Sausage gun
2 Spreader
3 Shims
4 Prosoco R-Guard Joint & Seam Filler
5 Prosoco R-Guard FastFlash
6 Prosoco R-Guard AirDam

Fill holes and seams. *Apply Joint & Seam Filler to all plywood-to-stud connections, nail penetrations, and plywood seams. Make sure there are no globs or voids and the surface is relatively flat.*

Product photos: Melinda Sonido

APPLY THE LIQUID FLASHING

Coat the inside. *FastFlash must extend inside the rough opening at least 1 in. past the window jamb. These windows have extension jambs that cover the full stud, so all of the jack stud is covered.*

most, our former co-owner—and self-proclaimed building-science geek—Sam Haggerman, went looking for solutions. He heard about a liquid-applied window flashing developed by Building Envelope Innovations (BEI), an Oregon manufacturer, based on their findings that all windows eventually leak, and water will always get in. One of the inventors, Tom Schneider, cited a test conducted by Tatley Grund, a Northwest remodeling company that specializes in water intrusion. Prior to installing any new window, Tatley Grund gives the sill a simple test for watertightness: They tape over the weep holes and fill the sill track with water. If the water level drops at all, the window fails. Twenty percent of windows fail.

BEI brought their liquid-applied system to market, partnering with Prosoco, who dubbed the product FastFlash and made it part of their R-Guard system. Schneider pointed our bosses to independent tests performed after five and ten years on windows installed using the FastFlash system, which showed zero evidence of failed flashing.

I wasn't convinced, but despite my skepticism, orders came down that it was time to "get into the goop." And the bosses really could tell who had complied by the globs of pink and red goop on their boots, clothes, and hair.

Change your thinking about water

To understand how to use liquid-applied flashing, and why, you have to change your thinking about water. The old motto, "Think like a raindrop," becomes, "Water is like a snake. Give it a place to go, and it will leave you alone." We're dealing with water management now, accepting that it will eventually get into the flashed opening. So the idea is to create a completely waterproof opening and an aquatic exit strategy. Everything about our approach to liquid-applied flashing follows that philosophy.

Eight years later, the griping and groaning has stopped and we're better at keeping the goop out of our hair and clothes. Nitrile gloves take care of our hands. More importantly, we've installed hundreds of windows using this new flashing system, with zero callbacks for water intrusion.

Best practices for liquid flashing

The following is our company's approach to liquid-applied flashing. Although there are too many contributors to name, the introduction of liquid flashing to our workflow was a company-wide effort, and we relied on countless product experts and researchers to guide us. It starts with the rough opening, which needs to be flat and stable. After properly nailing the sheathing around the edges, we trim the

sheathing flush and get rid of plastic remnants from collated nails. Then we install a piece of bevel siding on the sill, another critical step. If and when water gets in, the pitched sill directs it outside the window opening onto the exterior drainage plane formed by the water-resistive barrier (WRB). Make sure to allow for that piece of siding in your rough opening! I add ⅝ in. to the height of all openings on our master list.

The first liquid-applied product is R-Guard Joint & Seam Filler, which goes over all nail heads, joints, and seams to create a flat, unbroken surface for the FastFlash that follows. For new construction, we often do this step with the walls lying on the ground, which is easier than moving a ladder around. Dry time is anywhere between four and 24 hours, depending on weather and humidity. Chemically, Joint & Seam is similar to FastFlash, just thicker and more fibrous. FastFlash is smoother, with a darker color that let's you see how thick it's going on. If you can see plywood peeking through, it's too thin.

With the rough opening filled and flat, a broad, unbroken layer of FastFlash is applied to create an impermeable barrier wherever

SEAL THE TRANSITION

Housewrap is next. *If the window is close to the bottom of the sheathing, a single-layer WRB will do. If not, install a 12-in. to 16-in. transition strip that extends 9 in. beyond both sides of the opening.*

Seal the top edge. *Apply FastFlash along the seam to create a waterproof seal, and work the seam with a trowel or spreader to embed the WRB in the liquid product.*

One last pass. *Inspect the entire flashed opening and fill any dents, gaps, and holes. Allow 24 hours for them to dry fully.*

INSTALL THE WINDOW

Gap the sill. *Install the window per the manufacturer's specs, but shim it off the sill. It's critical that water has a path to the exterior. All that's required is a 1/16-in. to 1/8-in. gap.*

Gap the window off the building, too. *A drop of FastFlash holds shims in place. These windows have a factory-installed sill, so shims are slipped behind it prior to fastening. On a nail-fin window, put the shims behind the fins, and don't tape or seal the bottom fin.*

Flashing a head casing

If we are installing a head casing, we peel back the WRB and install a traditional piece of metal head flashing. To seal its top edge to the plywood sheathing, we apply a light bead of FastFlash or Joint & Seam below it, nail it down, and trowel more product over the top edge, embedding it in the goop as we do with the top edge of the WRB below the sill. Then we fold down the WRB flap and tape its sides to keep water out.

water might reach. It extends into the opening past the inside of the window frame, and out onto the sheathing all around. How far it extends onto the plywood is determined by research that shows that wind-driven rain can travel up to 9 in. in any direction before it starts dripping down.

Below the sill we install an extra piece of WRB, troweling on more FastFlash to seal its top edge. I was most skeptical of this detail. The idea of installing a vertical transition without a proper 4-in. lap seems like asking for trouble. But once I saw how the WRB becomes embedded in the liquid flashing, I was convinced.

After the FastFlash dries—also anytime between four and 24 hours depending on weather conditions—we inspect the opening for any voids or gaps, and touch it up as needed to ensure a continuous, impermeable surface. If the goop gets on the window or some other unintended spot, let it fully dry and peel it off.

After that, we install the window per the manufacturer's specs, but always gap it up off the sill and forward off the sheathing, and never apply sealant or tape at that lower exterior edge. This is the critical escape path for any water that gets in. With a flangeless window like the one we're using here, tape is ideal to bridge the exterior gap between window and framing (and will later be hidden by casing). Backer rod and a large amount of liquid flashing would also work, but would be needlessly expensive. If a flanged window is being used, apply FastFlash under the flange and then apply tape or more

Tape the sides and top only. *We use 3M Air and Vapor Barrier 3015 tape to flash the front of the window. This multilayer, elastomeric, self-sealing film sticks incredibly well to just about anything. Later, casing will hide the tape. Do not tape the bottom edge of the window.*

SEAL THE INSIDE

Install backer rod first. *Fill the gaps around the window with the appropriate-size backer rod, setting it about ½ in. deeper than the outside of the framing where possible. You won't need it for gaps smaller than ¼ in., like the one at the bottom of the window.*

Seal the entire opening. *When R-Guard AirDam comes in contact with the back edge of the FastFlash, it creates a chemical bond that is the last line of defense against water intrusion. The seal at the bottom edge forces any water outward and off the beveled sill.*

Work the bead. *Use a ½-in. tuck pointer with a rounded tip to work the material. Make sure the AirDam comes in contact with the window frame as well as the FastFlash in the rough opening, creating an unbroken seal. It's okay if the backer rod and bead bump out around shims or nail plates, as long as the seal is continuous. Wait a day, reinspect for gaps, and then give the AirDam two more days to dry.*

FastFlash over the flange onto the surrounding sheathing. After the window is in, we create a continuous seal along all four inside edges using R-Guard AirDam, which acts as a backstop for anything that makes it past the window and siding.

Finally, we use FastFlash (or Joint & Seam) in one last spot, to seal the top edge of the traditional window flashing above the head casing (or exterior window frame), much the same way we seal the top edge of the WRB below the rough opening.

I'm a believer

While highly skeptical at first, I've come to trust this method of window flashing. Each part of the process is easily inspectable, and gaps or holes are obvious. If we find any, the fix is quick and easy. Now I don't have to worry that an errant utility-knife blade has cut a hole in the peel-and-stick pan, or that an improperly folded or creased detail will cause damage down the line. And when it comes to a radius or diamond-shaped window, the liquid-applied membrane is a no-brainer, replacing a risky series of folds, cuts, and adhesions.

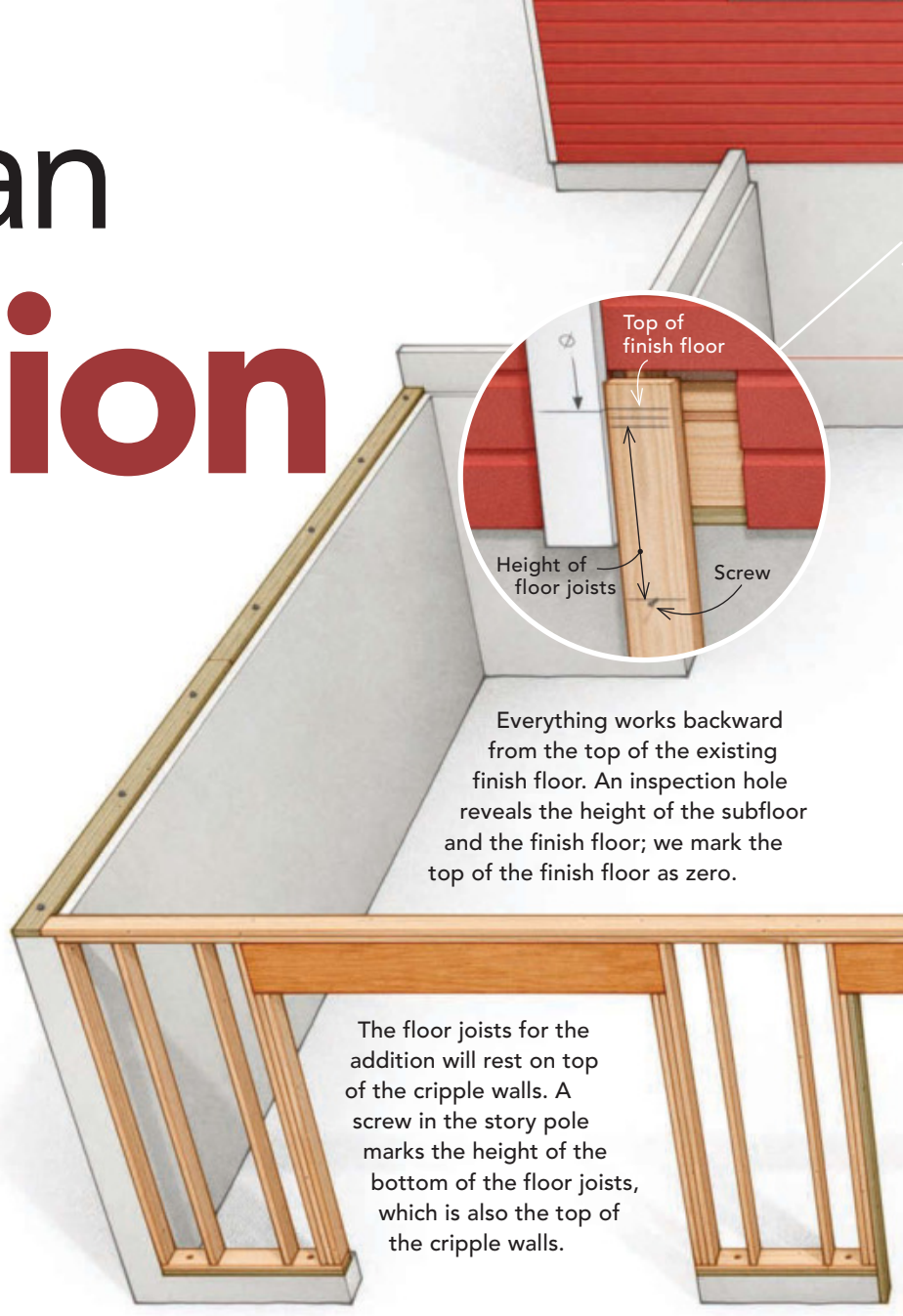
By the way, Prosoco's air- and watertight flashing system has also been embraced by the Passive House movement, with its intense emphasis on air-sealing. □

Steve Pink is a lead carpenter with Hammer & Hand in Portland, Ore. Photos by Asa Christiana, except where noted.

Tying in an Addition

Tips and tricks for matching new floor heights to old and getting everything square

BY JOHN WHRITNER



Everything works backward from the top of the existing finish floor. An inspection hole reveals the height of the subfloor and the finish floor; we mark the top of the finish floor as zero.

The floor joists for the addition will rest on top of the cripple walls. A screw in the story pole marks the height of the bottom of the floor joists, which is also the top of the cripple walls.

For a lot of reasons, building an addition can be trickier than building a new house. On this project, we needed to match the height of the new floor to that of the main floor of the existing structure, and the new foundation jogged and stepped, resulting in two different cripple-wall heights. Any difference in elevation from new floor to old would telegraph, so everything had to be spot on.

Stepped foundations are a bit harder to check for square. Even if they're good at the bottom, the walls may be out a bit at the top. Setting up stringlines or lasers to check takes time, and in the end only tells you what you have to deal with—they don't square it up for you.

Unless something is really out of square at the bottom, I don't bother squaring up the mudsills on the front end; I build the cripple walls so they can be adjusted after they're up. I also avoid math as much as possible, and rely on a story pole, a builder's level, and a tape measure to simplify finding the stud heights for the cripple walls. The setup for this is easy and nearly foolproof.

Story pole + builder's level

Site-made story poles help keep things consistent, whether it's the height of door and window trim, siding, or framing. In this case, a story pole helps me figure out the cripple-wall heights.

Since the old siding will be stripped, I cut an inspection hole through the side of the house to expose the existing floor and mark its elevation on a scrap of 2x that will stay screwed to the side of the house for reference. For a story pole, I pick a straight 2x4 that runs from the ground to above the finish-floor height. I attach it next to the more permanent block and transfer the floor height to it. Then, I measure down and mark the thickness of the new floor-

Check for square. *Use a long tape to measure diagonally both directions across the foundation's rectangles to check for square. The diagonal measurements for each major section need to be within 3/4 in.*

Drawing: Christopher Mills

USE A TAPE AND BUILDER'S LEVEL TO DETERMINE THE WALL HEIGHTS

The top of the cripple walls should be level with the bottom of the floor joists.

Story pole

Level's plane

These marks indicate the top of the stem walls. The distance from these marks to the bottom of the new floor joists gives you the height of the new cripple walls.

Stem walls

For stem walls taller than the builder's level, hook the end of the tape measure on top of the stem wall and pull down. The measurement in the level's crosshairs is the distance from the level's plane to the top of the wall.

For stem walls shorter than the builder's level, reverse the tape and measure up. In all cases, transfer measurements to the story pole, holding the tape in the same orientation as it was when measuring, and mark at the tape's hook.

Find the top. *Pull a tape measure down from the top of the stem wall, and sight the tape in the crosshairs of the builder's level. Note that measurement, and swing the scope to the story pole.*

Transfer to the story pole. *Move the tape up until the measurement in the scope matches that from the stem wall, and mark the hook end of the tape, which is at the stem-wall height.*

LAY OUT AND BUILD THE CRIPPLE WALLS

It's much easier to check for square when everything is on the same horizontal plane. As long as the foundation is close to square at the bottom and the concrete stem walls are close to plumb, we don't get too fussy, knowing that we can adjust and square up the cripple walls after they're in place.

Lay out the mudsills. *Snap lines 5⅝ in. from the outside edges of the lower stem walls to position the 2x6 pressure-treated mudsills.*

Bolt the mudsills. *Bore ¾-in.-diameter holes in the mudsills for the ½-in. anchor bolts. The extra room allows flexibility in adjusting the mudsills and cripple walls if something is out of square.*

Build the walls. *Bore 1¼-in. holes in the bottom plates of the cripple walls at anchor locations. Use the measurements from the story pole to determine your stud heights, deducting the thickness of the plates and mudsill from the height difference between the bottom of the new joists and the top of the concrete stem wall.*

ing and subfloor, and the depth of the new 14-in. I-joists, and drive a screw to mark where the new joists will land on the cripple walls to pull a tape from later. Then I turn to the builder's level.

A builder's level is similar to a transit, except that it can swing 360° in a horizontal plane. It's like a laser level in that respect, except it doesn't project a line. When you look through the level's scope, the horizontal crosshair maintains the same elevation while it's swung in any direction. It needs to be set on a solid tripod on a stable surface and leveled to work, and the leveling bubble shouldn't move from the center as you rotate the scope 360°.

Before figuring out the cripple-wall heights, we determine if the stem walls are level. A crew member hooks a tape measure to the top of the stem wall and pulls straight down; whatever measurement is in the crosshairs of the level's scope is the vertical distance from the plane of the level to the top of the wall. Using this method, we pull at least three measurements on each wall section, one near each end and another in the middle. The longest measurement represents the highest point of the stem wall. (If the stem wall is below the level's line of sight, pull the tape from the stem wall straight up; in this case, the shortest measurement is the high point).

Here, the stem walls were level. If they hadn't been, we would have either shimmed between the mudsill and bottom plate to level the walls, or, if the discrepancy were really bad, cut the studs to different heights.

Next, we need to figure out the heights of our cripple walls. To do this, we do the same thing we did to determine if they are level, hooking a tape on the top of the stem wall and pulling down (or if the stem wall is below the level's line of sight, we simply reverse the direction of the tape). Whatever measurement I see in the scope's crosshairs is the measurement I want to see when I swing the scope to the story pole. Let's say the measurement from the top of the stem wall is 24 in. I then swing the scope to the story pole, and a crew member extends his tape up until I see 24 in. in the crosshairs. Then he holds that position and marks the story pole at the hook end of the tape, which represents the top of the stem wall.

Once the stem wall's height is marked on the story pole, hook onto the screw and measure down to that mark. Whatever that measurement is will become the height of

Tip 'em up. *After lifting the cripple walls, tack them to the mudsill and to each other with 3-in. construction screws.*

Check your work. *Tack a scrap of 2x on top of the cripple wall to represent the double top plate, then pull a tape down from it and sight the measurement with the builder's level. Then pull a measurement from the screw marking the joists on the story pole. The two measurements should match.*

the cripple walls. I deduct 4½ in. for the bottom plate and double top plates, and another 1⅝ in. for the mudsill. Whatever's left is the stud height.

Build to adjust

When foundation walls top out at different heights, it can be labor intensive to determine if everything's square. Rather than taking hours to figure this out by setting up stringlines and trying to use a plumb bob on a blustery day, I plan to make it so everything can be adjusted if necessary once the cripple walls are in. If we get the cripple walls up and plumbed and discover something's out of square, we can adjust them in place.

But first, I need to make sure everything's close. There's only so much adjusting you can do with an out-of-square foundation. We measure the distance between the ends of parallel walls to see if there are any obvious problems. To get a rough idea of the foundation's squareness, we check them for plumb with a long level, then pull diagonals using the highest point on the shortest walls as horizontal baselines. As long as they're pretty plumb and the diagonals are within ¾ in. or so, we should be safe. If everything's close, we may be able to make all of our adjustments on the tallest wall once we've built up to it, but that's not a guarantee.

Layout for the mudsills starts with lines snapped 5⅝ in. in from the outside edge of the foundation's lower-height walls. We cut the PT mudsills for the lower walls, and locate and drill ¾-in. holes for the ½-in. anchor bolts so they can be adjusted to the lines—or off the lines later if necessary. Initially, we install the mudsills right to the snapped lines, and tighten them down.

Next, we cut the top and bottom plates for the cripple walls. Before laying out the plates, we transfer all of the anchor-bolt locations to the bottom plate and drill them out with a 1¼-in. bit. Using the stud heights we determined from our story pole, we cut the studs on a miter saw, and assemble the cripple walls on a table or on parallel pieces of 2x laid on the ground and spaced to support the top and bottom plates.

We initially tack the cripple walls in place with 3-in. construction screws; we won't nail them off until we're sure everything's square. If we get the cripple walls up and plumbed and discover something's off, we can fine-tune the cripple walls on the mudsill, or we can loosen the mudsill and move the sill and

Work from short to tall. *Start with short cripple walls, then move onto the taller ones. This way, the tall walls can be tied into the shorter ones without extra bracing to hold them up.*

TIE IT ALL TOGETHER

The same procedure used on the taller stem walls is used to find the stud height needed on the shorter stem walls, except the tape gets turned around. Here, we measure up from the short stem walls, note the measurement, and transfer it to the story pole. The main difference is that the hook of the tape here is down; you still need to match the measurement when transferring it to the story pole, and mark the hook end of the tape.

cripple walls together. Once the first cripple wall is in, we double-check its height against the story pole by tacking a piece of 2x stock onto the top plate to represent the double top plate, and pulling a measurement down. The number in the crosshairs of the builder's level should exactly match the number pulled down from the screw representing the bottom of the joist on the story pole.

Once all of the cripple walls are up and similarly checked for height with the builder's level, we plumb and brace them and straighten them out. Without a floor to attach the braces to in what will become the garage, we cut pieces of 2x, jam them between post footings and the mudsill, and nail them to the mudsill. Then we attach another 2x to a stud, push the wall in or out as necessary, and nail the diagonal to the wedged horizontal.

Once all that work is done, we can check our diagonals on a level plane. On this job we were out ⅜ in., and were able to adjust the mudsill on the highest foundation wall, which didn't have a cripple wall, to compensate. But if we'd needed to adjust any of the cripple walls, it would have been relatively easy to back out the screws tacking them to the mudsills, make our adjustments, and reattach them, or loosen the nuts on the j-bolts if needed. □

John Whritner owns Whritner Builders in Hobart, N.Y. Photos by Matthew Millham.

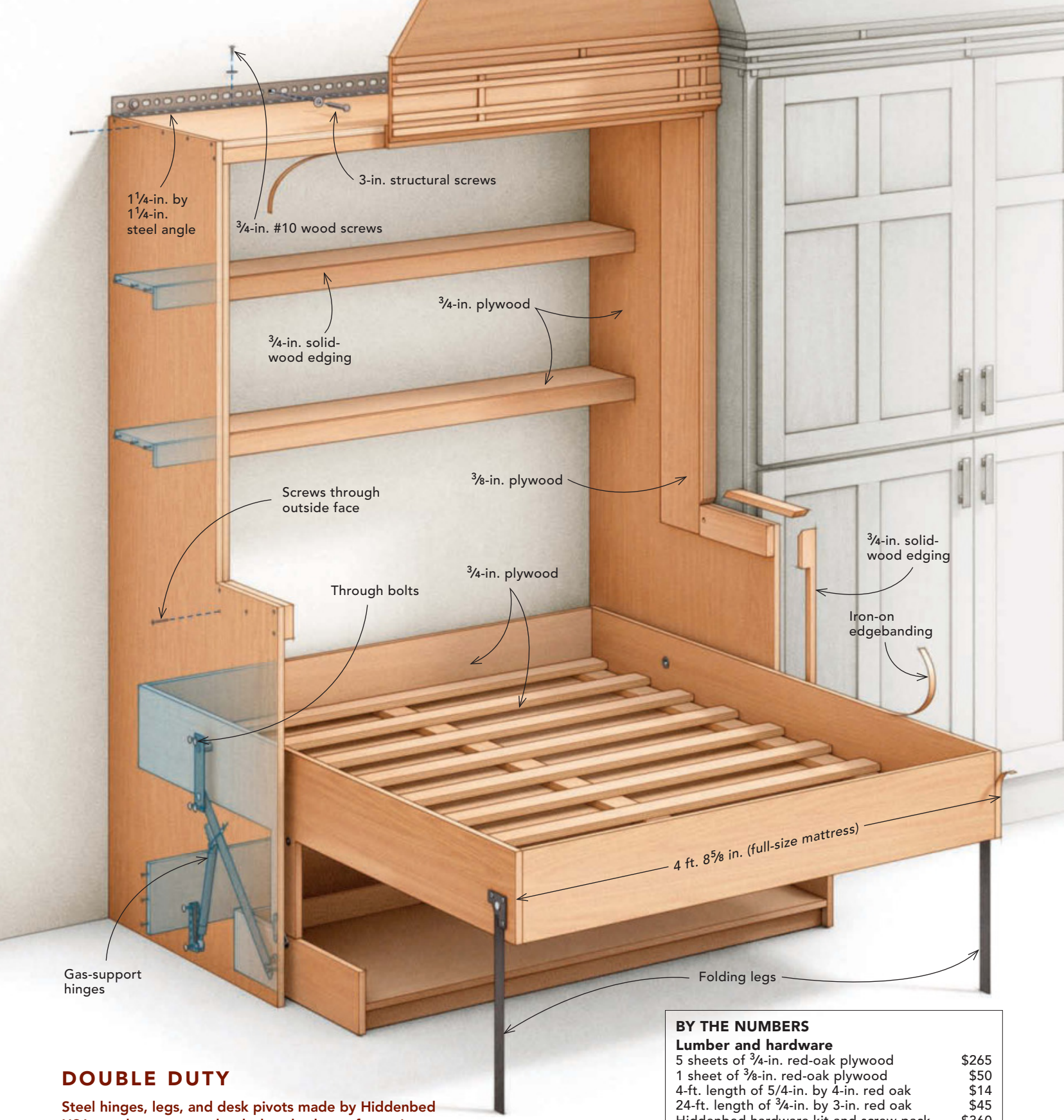
Tack them in place. *Screw the taller walls to the mudsill and to the shorter walls. Use pressure-treated studs where they'll contact masonry, and use Sill Seal at this interface.*

Plumb and brace. *Use a plate level and muscle to plumb the wall sections and corners, and cross-brace with 2x material screwed to the inside of the walls so it doesn't interfere with sheathing.*

Check for square. *Once everything is built up to the same plane and the corners are plumb, pull diagonals to check for square.*

Straighten and brace. *Use a stringline and gauge block to straighten walls, and check for plumb with a plate level. Lumber wedged between footings and the mudsill and tacked in place provides nailers for bracing where the ground is too frozen or unstable for stakes.*

Cap it off. *After everything is plumb, square, and straight, add the double top plates to lock all the wall sections together.*



DOUBLE DUTY

Steel hinges, legs, and desk pivots made by Hiddenbed USA are the secret to the desk-to-bed transformation. Hardware, direct from the manufacturer and from several online sources, is available for twin and double beds in both vertical and horizontal arrangements, and for queen beds in vertical only. You can cut the plywood parts yourself using provided shop drawings, or you can buy them precut in several wood species from the hardware manufacturer. You can also have the parts cut at a local cabinet shop with CNC toolpath files provided by the hardware manufacturer.

BY THE NUMBERS

Lumber and hardware

5 sheets of ¾-in. red-oak plywood	$265
1 sheet of ⅜-in. red-oak plywood	$50
4-ft. length of 5/4-in. by 4-in. red oak	$14
24-ft. length of ¾-in. by 3-in. red oak	$45
Hiddenbed hardware kit and screw pack	$360
5-ft. length of 1-in.-sq. metal tubing	$25
4-ft. length of 1¼-in. punched angle	$10
TOTAL:	**$769**

Labor

Cutting and edgebanding 47 parts	24 to 30 hrs.
Assembly	24 hrs.
Installation	12 hrs.
TOTAL:	**60 to 66 hrs.**

Photo facing page: David Dilks, courtesy of Nathan Rinne. Drawings: Christopher Mills.

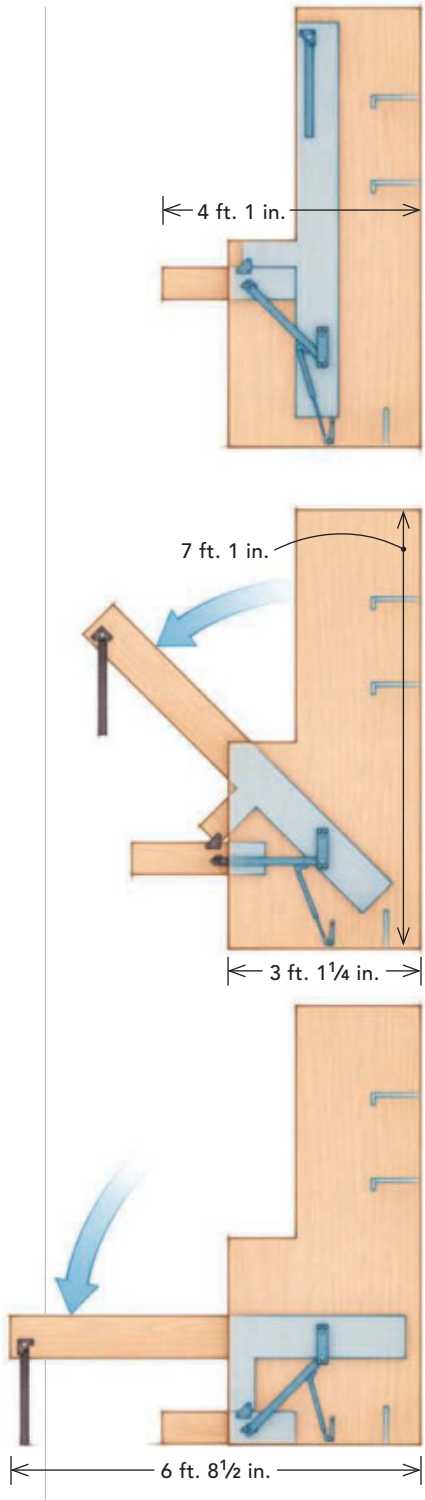
Build a Desk Bed

This practical built-in allows you to quickly convert your home office into a bedroom

BY NATHAN RINNE

The home office has always seemed like a luxury to me. Unwilling to give up a spare bedroom, I've settled for a small desk in a corner of my living room for years. I'm sure this is a dilemma for many people. The first time I saw a desk bed by Hiddenbed USA, I was blown away. It's similar to the Murphy-bed concept, but in addition to the foldaway bed, there is an attached desk. Not only that, but the desk remains parallel to the floor as the bed is opened and closed, so you can leave everything on it.

After viewing a web video of a desk bed (see one at FineHomebuilding.com/magazine), I knew I had to build one. I pitched the idea to prospective clients for years before I finally got a call from



HIDING IN PLAIN SIGHT

A counterbalanced lift mechanism, rotating desk hardware, and folding steel legs allow the desk to convert to a bed in seconds. The desk, which can hold up to 45 lb., stays parallel to the floor as the bed is lowered, so you can leave everything on it.

CUT AND PREP THE PARTS

The casework is made from ¾-in. plywood with appearance-grade veneers on both sides. Exposed edges are covered with solid stock or edgebanding. Prepping the parts is labor intensive.

Metric measurements. *The 31-page collection of shop drawings included with the hardware kit shows how to cut and drill every part for the bed, desk, and case. The measurements are metric and must be followed precisely or the bed won't open and close correctly.*

Make space. *Cutting the plywood and handling the uncut sheets is physically taxing and takes up a surprising amount of room. An empty one-car garage is about the smallest space that will accommodate the cutting and assembly of a double- or queen-size desk bed.*

Band the edges. *You can conceal plywood edges with solid stock, or you can use edgebanding tape with hot-melt glue on the back. The glue is heated with a clothes iron, and then the edgeband is rolled with a laminate roller.*

a couple looking for a conventional hidden bed with closets on both sides. After I offered them a ridiculously good deal, they agreed to incorporate the desk into the design, and I had my chance to give this project a go.

It turned out to be a fun, if slightly grueling, undertaking. As with every new project in the carpentry business, I learned a lot, including how I would do some things differently the next time around. Here are some of the lessons I learned.

Multiple kit options

These beds come in vertical and horizontal configurations in twin, double, and queen sizes. My clients wanted closets on both sides of the bed, but I had only a 13-ft. wall to work with. They opted for a vertical full bed (4 ft. 5 in. wide), which is the smallest size that will sleep two people. This decision is important not just for overall design but also because the gas pistons that lift and lower the bed are matched to the anticipated size and weight of the mattress. Although you can order these beds as kits with the plywood parts already cut, I decided to cut the parts myself so that I could scribe the casework to better fit the bowed wall on which it was being built.

I ordered the hardware kit and bought the oak plywood and 1x face-frame stock from a local supplier. Somehow during the hardware ordering process I was never told that there's also a kit with all of the nuts, bolts, screws, and fasteners to assemble the bed and the desk. Fortunately, my local home center had most of what I needed and substitutes for the rest, but it was an unanticipated hassle. (My advice: make sure to specify both kits [$360] when you place an order.)

Based on my experience, the total cost of materials for this project starts at around $800 when using the most basic stain-grade, rotary-cut red-oak plywood and matching solid stock. Depending on the species and the cut of the plywood, the prices can climb much higher.

All the small details, all the big parts

Building the bed using the 31-page instruction manual was challenging. For example, the dimensions are metric, and converting those dimensions to fractions leaves you with numbers that are too fine to use easily. (Ever mark 1/64 of an inch?) For someone like me who has never thought outside of the imperial-system box, this took some getting

BUILD THE DESK

Steel reinforcement. *The desk, which is almost 5 ft. wide, requires a piece of steel tubing to prevent it from sagging. The 1-in.-sq. tube is cut to length, drilled, and then fastened with 1½-in. screws to the underside of the plywood desktop.*

Swiveling desk sides. *The sides of the desk are edgebanded and screwed to the desktop. Pivots, included in the hardware kit, are secured through the sides into the top with screws and through bolts. A clamp and a wood spacer ensure that the sides overhang the top evenly.*

Pockets for the apron. *A 2-in.-wide plywood apron hides the desk's steel reinforcement. It's fastened to the bottom of the desktop with screws in closely spaced pocket holes drilled using a pocket-hole jig.*

Strong, swiveling connection. *Color-matched machine screws and matching T-nuts fasten the desktop's top pivot in place. The through-bolted connection allows the desk to remain parallel to the floor as the bed is raised and lowered, and it can support up to 45 lb. on the desktop.*

Center seam. *The double- and queen-size versions of a desk bed are wider than a single sheet of plywood. A seam in the center of the panel looks better than if it were offset. The two roughly 2-ft. 4-in. panels are joined in the center with wood glue and biscuits, and the seam is hidden with ¼-in.-thick flat stock.*

Site-built bed springs. *Slats made from 4¾-in.-wide pieces of plywood consume the offcuts from larger pieces, support the mattress, and allow air circulation underneath. The completed bed box is unwieldy and weighs 120 lb., so you'll need help getting it to its final location.*

used to. My solution was to run out and buy a metric tape measure.

I should also mention that there are nearly four dozen pieces to cut and a substantial amount of holes to drill in precise locations. If you are not proficient at reading diagrams or are just looking to save time, you can get the plywood parts precut from Hiddenbed USA. You can also get toolpath files from the company and have the parts cut locally by a CNC shop, which is what I would do in the future.

Having the parts cut by a CNC shop has advantages when space is a concern, because cutting and organizing the parts for these huge boxes takes a lot of time and space. Also worth noting is that the cabinet that holds the bed is too big to fit through a 36-in. door and must be assembled in the room where it will reside.

Although the parts are big, the joinery is straightforward. The plans call for Confirmat screws to assemble the cases, but I used high-quality construction screws and wood glue. I concealed the screws on the bed cabinet with the 24-in.-deep wardrobe cabinets on both sides of the bed cabinet.

Once the bed cabinet is assembled and in place, you have to attach the bed frame. It's heavy and awkward, so you will definitely need a helper. You also have to create a sturdy cabinet-to-wall connection so that the massive bed box won't tip as the bed is raised and lowered. I used a 4-ft. piece of punched steel angle (like what you would use to hang a garage door) that I screwed to the top of the bed cabinet and into the studs with structural screws.

Making a massive box look good

After the cases for this project were in place, it became obvious that the panel concealing the bottom of the bed was simply too plain. Taking cues from the homeowners' Craftsman-style decorating, I decided to add some applied wood strips. Using ¼-in.-thick solid oak, I tested the layout of the applied molding until I thought it looked right.

One good thing about the expansive bed cabinet is that you have a good amount of space to create on. My advice is to step back and look while experimenting until the arrangement looks right to you. □

Nathan Rinne is a finish carpenter in Roach, Mo. Photos by Patrick McCombe, except where noted.

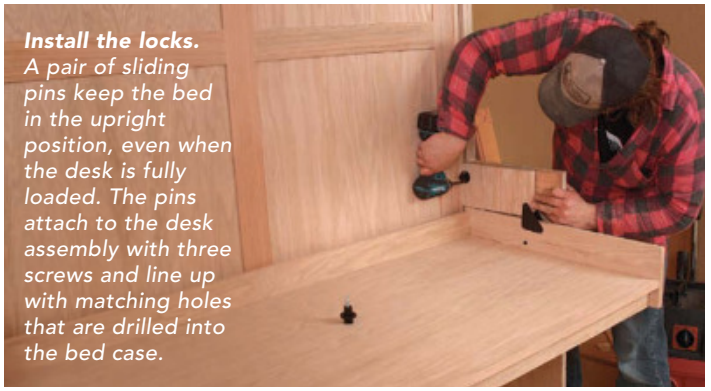
ASSEMBLE IN PLACE

The case for the bed is too large to fit through a 36-in. door, so you'll need to assemble it in the space where it will reside. Once the parts are screwed together, the case is plumbed and fastened to the floor and wall framing with structural screws.

Double drilling. *The hinge and lift mechanisms require identical holes for through bolts on both sides of the cabinets. It's faster and more accurate to drill both sides at once. Triple-check their locations so that the mechanisms work correctly when the desk bed is complete.*

Mount the hardware. *The hinges and lift supports are bolted to the bed cabinet's sides using locking nuts and through bolts. Gas pistons help balance the weight of the bed box and the mattress. The pistons are matched to the bed size.*

Connect the bed to its cabinet. *The bed box is connected to the hinges with large-shouldered through bolts (included with the kit) that are tightened with a 10-mm hex wrench. Most hex-key assortments don't include a wrench that big, but you can find them at auto-parts stores.*



Install the locks. *A pair of sliding pins keep the bed in the upright position, even when the desk is fully loaded. The pins attach to the desk assembly with three screws and line up with matching holes that are drilled into the bed case.*

Cover the edges. *Exposed edges on the case are covered with 1¼-in.-wide solid stock, which also hides the gap between the folding bed box and the bed cabinet. The stock is fastened with 18-ga. brads and wood glue. Miters hide the stock's end grain.*

The Power of

Building houses and community

A neighborhood rises. *Drawing on the narrow lots, front porches, and sidewalked streets of early 1900s urban streetscapes, the town plan is intended to foster community interaction.*

The 2019 *Fine Homebuilding* House is part of a planned New Urbanism community outside Louisville, Kentucky, called Norton Commons. A central theme of the three previous *FHB* Houses was the high-performance details that help them achieve net-zero energy. With the Kentucky house, we'll be focused on the importance of design—both the urban planning of the Norton Commons development and the design choices for the house.

An antidote to sprawl

In the early 1990s, a Louisville family was looking to sell 600 acres of land that had been an educational farm. Concerned about the farm's progressive legacy, they were particular about potential buyers. They wanted a better development model than the sprawl of repetitive houses on dead-end streets far removed from retail spaces, which, by zoning custom, were plopped together like an asphalt island miles from the residential areas.

The landowners ended up partnering with a pair of developers enamored with New Urbanism, a design movement that combats urban sprawl by breaking down typical

Good Design with New Urbanism

BY JASON BLACK

FOLLOW THE BUILD IN THREE PARTS

- **Planning & Framing**
- **Envelope & Mechanicals**
- **Design & Reveal**

In this three-part series, we explore the design and construction of a traditionally styled house in Kentucky. This installment recounts the neighborhood's impact on the design and the home's production framing.

Follow the build at FineHomebuilding.com/fhb-house and via our social channels.

segregated zoning for residential and commercial spaces and creating walkable communities (see sidebar, p. 66). The developers were committed to bringing Andrés Duany on board to create the town plan. About 15 years earlier, Duany's firm, Duany Plater-Zyberk, had introduced New Urbanism ideas to Seaside, Florida. Also called a Traditional Neighborhood Development, Seaside struck a chord with people for the quality and human scale of its architecture.

Creating engagement

One of Duany's principles that particularly struck the Norton Commons developers was the idea that design shapes behavior. We see this in the way the master plan seeks to build community by creating opportunities and places for natural interactions between people. The community incorporates mixed-used development with different types, sizes, and price points of residential housing, and adds business, retail, restaurant, and community spaces—including a post office, schools, churches, and a YMCA—on the same blocks as residential space. By densely developing the area and including the resources that

WHAT IS NEW URBANISM?

The goal of New Urbanism is to create developments with a higher quality of life for residents. Guiding principles include:

Walkable/pedestrian centric
- Most locations within a 10-minute walk
- Sidewalks on both sides
- Buildings close to street

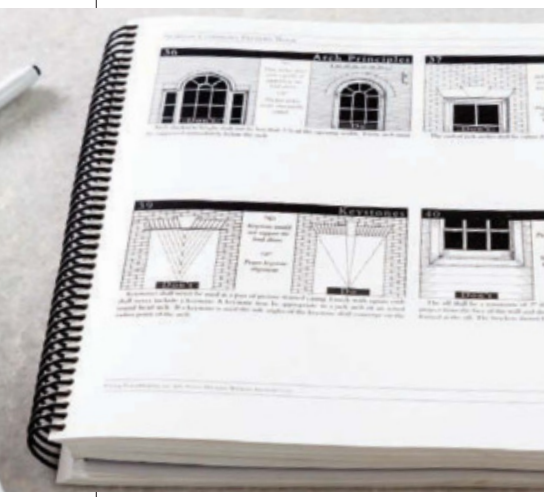
Mixed use
- Shops, offices, apartments and homes

Diverse housing
- Mixed use within neighborhoods, blocks, and buildings
- Housing of different sizes for different ages and income levels

Good design
- Emphasis on beauty, aesthetics, and human scale

Traditional neighborhood
- A defined middle and edge with public space at the center

Increased density
- Buildings, residences, shops, and services close together



A COMMON ARCHITECTURAL DESIGN LANGUAGE

One reason that the houses in Norton Commons strike a chord is that they look good. They fit in with their surroundings and appeal to the eye. Builders in the town must be approved—once they are, they receive a 90-page pattern book that serves as a design bible for the development. Much like Marianne Cusato's *Get Your House Right*, the book delivers graphic design guidelines in an easy-to-understand right/wrong format.

Drawings: Trevor Johnston

Deeply comfortable

Consistent ground temperature below the frost line is used to narrow the temperature differential that the heat pump must overcome.

sustain those who live there, all daily actions take place within the community. There is no need to leave the neighborhood in the morning and return at the end of the day. My experience bears this out: I have lived in several houses in Norton Commons over 11 years; my company, Artisan Signature Homes, has an office here; my wife, Gretchen Black, has her interior design office here; my kids have gone to school in town; and our favorite restaurant is down the street.

This mix of commercial, retail, and residential space is only one part of New Urbanism community creation. The development is laid out so that no home is more than a 10-minute walk from one of the town centers. With necessities and recreation so close by, people leave their cars at home. The primacy of the pedestrian is reinforced by sidewalks on both sides of the street, and by the fact that cars are shunted to the back of the properties—garages are in the rear and accessed by alleyways. Wide front porches draw people out from behind their front doors and create moments of interaction with neighbors. As a homeowner in Norton Commons, I've been struck by the number of clubs and activity groups. I think it points to the success of the master plan in creating a sense of community: People find themselves face to face often, and this familiarity makes them comfortable beginning a conversation or offering a hand.

The house lots in Norton Commons are extremely tight—without good urban planning, the lack of even a moderately sized lawn might be a liability. But in this environment with lots of nearby, easily accessible parks and green spaces, the neighborhood streetscapes are broken up. These communal areas foster additional human interaction. Of the 600-acre town plot, 150 acres are devoted to open space, including a small park just a few lots from the *FHB* House.

Building in a planned community

The lot on which we are building the *FHB* House is a hair under 37 ft. wide. With our 3-ft. setbacks, there are only 6 ft. to the houses on either side. In such close quarters, the success of the design hinges on the creation of private and inviting indoor and outdoor spaces. For this house, Gretchen Black—our designer—and I use the garage in the rear of the lot to create a courtyard space that connects to the great room and includes an outdoor bar integrated with the garage. Done properly (as we believe this one is), our small, 674-sq.-ft. backyard will feel more private than the ½-acre lots we've seen developed in other neighborhoods.

The town plan addresses the issue of mechanical noise from neighboring houses. During the first phase of development, Norton Commons allowed central-air-conditioning systems and had designated active and passive sides for each lot to determine where condensing units could be installed. Corner and interior lots led to problematic placements, and compressor noise was still an issue. As a remedy, all of the buildings—residential and commercial—in the town's North Village, where our house is being built, must have ground-source heat pumps (see sidebar, right).

As a builder of spec houses, we appreciate working in a master-planned community because it ensures a high design standard and home buyers consider the neighborhood desirable. The flip side of the high design benchmark is that our choices must all be approved by the town architect. This extends beyond simply exterior colors and finishes: The architect has the final say on the massing, volume, and even ceiling heights of all the houses.

Maximizing a small footprint

To create the sort of living space we want in a house only 30 ft. wide, we have to finish the basement—and its rooms must be pleasant spaces. They shouldn't feel like an afterthought. We start with a full 9-ft.-high finished ceiling. Our lot—and indeed the whole village—is dead flat, so a walkout basement is not option. The required egress, a window well, is an opportunity to bring natural light into the basement bedroom

Ground-source heat pumps

The most common residential "geothermal" system we see in the United States is a ground-source heat pump. A heat pump can transfer heat in both directions to either warm or cool a space. This closed-loop ground-source system pumps glycol through a buried loop to transfer heat between the earth (below the frost line) and the conditioned house. The fairly constant ground temperature (around 60°F in this part of Kentucky) is ideal for heating and cooling because the difference in temperature isn't enormous. The operating coefficient of performance is likely to be in the 4 to 5 range instead of the real-world COP of 3 that you might see with a minisplit system.

This level of performance—and silence—comes at a price. This house relies on two 350-ft. vertical wells. Because this type of heating/cooling system is required of all buildings, the developer contracts for all of the wells on a block before it comes into development and then charges the builder $7000 per lot. The mechanical equipment costs about $15,000 more than the 93%-efficiency gas-fired furnace systems we typically see installed in new homes outside of Norton Commons.

with an en suite bathroom. The adjacent space, which has no natural light, will be finished as a media room with a bar.

For the above-grade stories, the town plan dictates that the first-floor ceilings be a minimum of 10 ft. high and the second-level ceilings be 9 ft. Customers appreciate the height, a hallmark design element of classic turn-of-the-20th-century homes in the most popular neighborhoods in the Louisville city limits.

While we embrace the ceiling heights and architectural moldings of that era, we also incorporate open living spaces that wouldn't be part of that time period. These considerations drive some of our framing choices. Especially because of their height, we have found it's well worth the added expense to frame kitchen walls with engineered studs. The finished walls are dead flat and plumb, which makes a world of difference for the cabinet and counter installers. On this project we specified Weyerhaeuser Trus Joist TimberStrand studs. We also used their TJIs for the floor system, as they're dimensionally stable and handle long spans. To satisfy our clients, the floors need to be quiet and stiff. On top the Weyerhaeuser TJIs we use AdvanTech subfloor adhered with their proprietary polyurethane subfloor adhesive for long-term silent performance. The crew also screws the subfloor to the joists.

We're attuned to homeowner comfort because no matter what amenities we provide, our clients won't be happy if there are cold or drafty spots. We began using Zip System sheathing and tape when it first came out because it creates a very tight envelope. Some might consider our wall framing old school, but the 2x4 exterior walls meet our local codes. Now that Zip System's R-sheathing is available in our market, we've adopted it to beef up the insulation in a 2x4 wall—and because it provides continuous insulation on the exterior, reducing thermal bridging and ensuring more even interior temperatures. Plus, unlike fastening foam over the sheathing, which is another step added to the build, R-sheathing has foam already adhered. □

Jason Black is a founder and owner of Artisan Signature Homes in Louisville, Ky. He has weekly updates of the build on his YouTube channel, Building a Better South. Photos by Tim Furlong Jr.

PRODUCT KNOWLEDGE

Weyerhaeuser TJI

- Strong, stable, and lightweight
- Long spans for open floor plans
- Easily cut for plumbing and ductwork

PRODUCT KNOWLEDGE

Simpson Strong-Tie

- Quik Drive system for fast, accurate, standing subfloor fastening
- Self-feeding screw-drive systems and fasteners for a variety of repetitive fastening scenarios
- Structural connectors for safer, stronger framing

PRODUCTION FRAMING

The house is framed quickly by a production-framing crew. The material choices are driven by cost, ease of installation, and their contribution to a durable, tight building envelope.

2019 KENTUCKY HOUSE INDUSTRY SPONSORS

The *Fine Homebuilding* House is supported by a host of industry sponsors. As a brand, we're not comfortable telling you to put products in your homes that we wouldn't put in ours. So, we've worked closely with our design and build team to identify appropriate products to include in this build. Our sponsorship model is built upon an invitation-only basis. Visit FineHomebuilding.com/fhb-house for a complete list of project partners and for more information on the materials used in the build.

HOUSES

powered by Fine Homebuilding

2019 HOUSES AWARDS

FOR 32 YEARS, our annual HOUSES issue has honored homes of distinction. The award-winning projects are chosen because they demonstrate key design-build lessons. HOUSES has evolved over the past three decades, and it continues to do so. This year, the bulk of the content will be online—a move we believe will appeal to a new generation of builders. At FineHombuilding.com/houses, you'll find additional photos, videos, and full-length coverage of the homes introduced in the following pages.

76

BEST SMALL HOME

Built on a tiny 20-ft. lot, this smart and affordable spec home challenges market norms with stylish design choices and customized details, all within a mere 14-ft. by 56-ft. footprint.

After devoting over a decade at a global interdisciplinary architecture and design firm, **ALEX WU** founded Alex Wu Architect in 2016. His idea was to slow down and practice a more measured design philosophy that supports time for living.

Architect and builder photos courtesy of the award winners

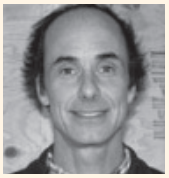
BEST NEW HOME

By knowing where to splurge and what can wait, these homeowners prioritized durable materials and energy efficiency on a limited budget.

DAN PORZEL owns Cedar Street Builders, and built Indiana's first certified Passive House. **DAVID RAUSCH** earned his degree from the University of Cincinnati and serves on the Indiana Board of Registration for Architects & Landscape Architects.

BEST REMODEL

This Greek revival features a clear distinction between traditional elements and modern updates, with a livable, comfortable open floor plan full of eclectic and honest details.



SHAWN HARRIS studied architecture at Roger Williams University, and after gaining experience at an architecture firm, delved into the profession of residential construction. He built his first home at 27, and has since focused on bridging the architecture and construction trades.

BEST TRADITIONAL HOME

This Tudor revival showcases the hallmarks of the historic style with a winning combination of authentic details, flawless craftsmanship, and modern livabillity.

Focusing on residential design, **FRANK SHIRLEY**, founder and principal of Frank Shirley Architects, captures the charm and craft of historical buildings while ensuring they are well-suited for 21st-century living. His book *New Rooms for Old Houses* is a guide for homeowners renovating antique homes.

BEST ENERGY-SMART HOME

Built by determined homeowners, this net-positive Passive House is low maintenance, with a tight shell and an on-site rainwater collection system that provides all of the home's water.

GEORGE OSTROW founded VELOCIPEDE architects 21 years ago to focus on deep-green projects in the Pacific Northwest. His Seattle firm has completed net-zero-energy, net-zero-water, LEED Platinum, Built Green Emerald Star, and Passivhaus projects, including many with 100% FSC-certified wood.

EDITOR'S CHOICE

This house, built directly into the hillside, is thoughtfully designed to protect the surrounding habitat and ensure it will perform and age well in its rugged environment.

DAVE MENDRO is principal of Neumann Mendro Andrulaitis Architects, specializing in sustainable homes with a deep sense of place.

RICH COFFIN owns RHC Construction, Inc., a general contracting company in Santa Barbara, Calif.

READERS' CHOICE

Our readers' favorite house of the year has a new open floor plan, enhanced outdoor connections, and energy-efficient systems that helped it acheive Earth Advantage Institute's Platinum rating.

KEYAN MIZANI founded eMZed Architecture with Alexia Zerbinis in 2004, providing creative and resourceful architectural services with an emphasis on sustainability. Keyan received a Masters in Architecture from the University of Oregon, and is an Earth Advantage–certified Sustainable Homes Professional.

Get the Big

Though you can't tell from looking at it, Kelsey and Tyler Johnston's modern farmhouse is something of a compromise. Costs for site work, utilities, and unforeseen truckfuls of stone for a 350-ft. driveway on 8½ acres of Indiana farmland tempered their ambitions for a Passive House. They shifted focus to getting the best performance they could afford in order to get the permanent parts of their new home right.

The most important decision was the simple, compact box shape, which makes any structure more affordable to build, insulate, air-seal, heat, and cool. The Johnstons concentrated their spending on harder-to-change components like Zip System sheathing with taped seams, 2x6 walls filled with sprayed cellulose insulation, and premium aluminum-clad wood windows, all of which combine to create an airtight envelope. Cement-board siding, ipé accents, and a standing-seam metal roof add durability while accentuating the house's clean lines. To free up cash for these and other higher-performance choices, they deferred plans for a deck, bought Ikea cabinetry, and installed less expensive flooring.

An unvented dryer, a heat pump for heat and air conditioning, and an energy-recovery ventilation system complete the energy-efficient package. They also chose an induction range and LED lights, which use less energy and produce less ambient heat than conventional options. Making the house all-electric means that renewable energy sources, when added, will be able to power everything in the home. □

Asa Christiana is a freelance writer in Portland, Ore. Photos by Chris Bucher.

SPECS

Bedrooms: 3 **Bathrooms:** 2 **Size:** 1800 sq. ft. **Location:** Yorktown, Ind.

Architect: David Rausch, davidrausch.com **Builder:** Dan Porzel, cedarstreetbuilders.com

ONLINE EXCLUSIVES
For more on this project, visit FineHomebuilding.com/houses.

IPÉ ACCENTS ALL AROUND
A rolling ipé shutter blocks intense summer sun, lowering cooling loads. Similar ipé details on the porch and around select windows add interest and continuity while breaking up the verticality of the board-and-batten siding.

Floor-plan drawings: Patrick Welsh

Things Right

Knowing where to splurge and what can wait results in a smart starter home

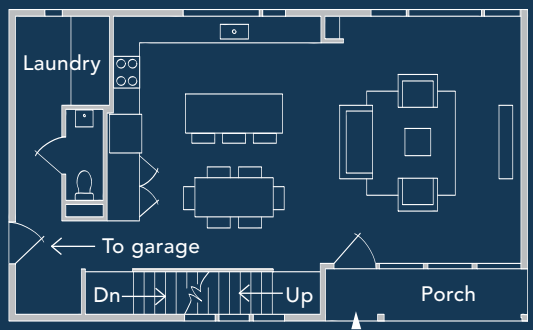
2019 HOUSES AWARD
BEST NEW HOME

BY ASA CHRISTIANA

SHAPED TO SAVE
This 1800-sq.-ft. modern farmhouse's efficient box shape reduces energy use while durable siding and roof materials will last a lifetime, lowering maintenance costs.

AMPLE LIGHT

To keep the compact house open and functional, bedrooms are relegated to the second floor, leaving the main floor wide open for living, cooking and dining, and a flood of natural light. The stairs and windows were splurges worth making, adding to the style, comfort, and durability.



First Floor

Second Floor

North
0 2 4 8 ft.

An 1850s home is revived and reconfigured with a modern floor plan

BY SHAWN HARRIS

2019 HOUSES AWARD
BEST REMODEL

A Greek Revival

Bold moves. *As with many remodels, improving this home's function meant finding a way to connect the kitchen with the living room. To get this done, we did two big things: removed the home's two masonry chimneys, allowing more flexibility in the rooms on both floors, and opened up the load-bearing wall between the original entry and living room using a steel I-beam.*

The original portion of this quaint Rhode Island home was built in the mid 1800s. The one-and-a-half-story Greek-revival cottage featured a stone foundation, clapboard siding, well-proportioned exterior trim, and 6-over-6 double-hung windows on the first floor with fixed windows installed in the frieze board beneath the traditional roofline. In the 1900s, the house was added onto—twice. A single-story addition on the back side was eventually built up into a two-story addition that unfortunately missed the mark of the original home's character. Instead, the two additions combined for a tall, narrow, and bland mass.

In all that time, the house had just three owners. When our clients Daniel Heyman and Vincent Renou found it, the house had fallen into a state of disrepair after sitting empty on the market for months. Immediately recognizing its potential, they began the transformation.

Like most homes of that period, the floor plan consisted of small, isolated rooms on the first floor and barely usable second-floor bedrooms with only enough height to stand near the center of the room. With the clients' input, we modernized the floor plan and updated the entire house. Our intention was to make a clear distinction between the historic character of the original home and the spaces that were added later, improving function and performance along the way. □

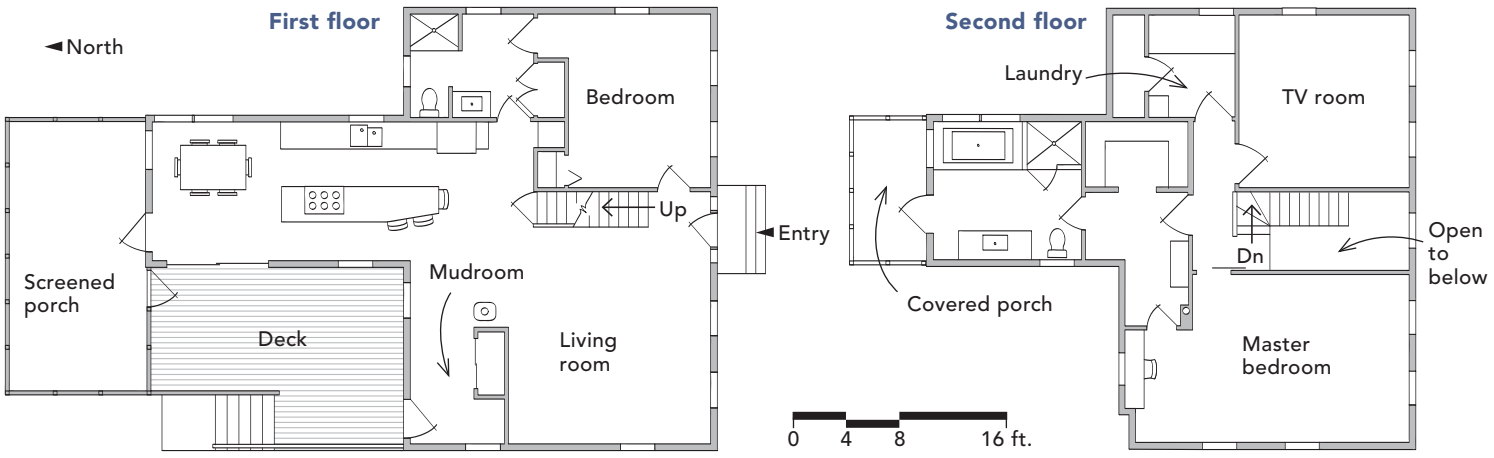
Shawn Harris is a founder of Sixteen On Center, a design-build firm in Tiverton, R.I. Photos by Nat Rea.

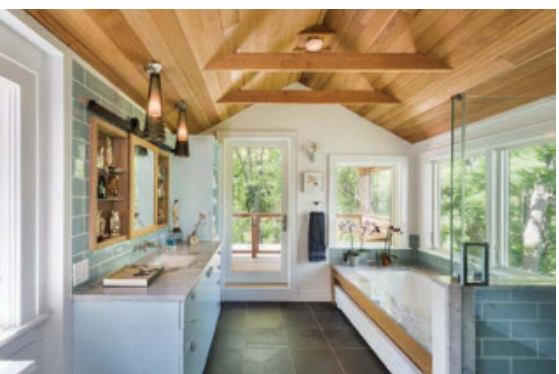
Floor-plan drawings: Patrick Welsh

Alterations meet authenticity. *We made a clear distinction between the original house and the additions. The clapboard siding, trim details, and first-floor double-hung windows were repaired, but left to their original character. The second-floor windows were upgraded to operable units, and we added a south-facing photovoltaic array.*

ONLINE EXCLUSIVES
For more on this project, visit FineHomebuilding.com/houses.

is Born Again





MAKING THE MASTER SUITE WORK

We changed the second-floor circulation by moving the door to the second bedroom and eliminating a good portion of the hall. The new master bath provided a unique opportunity. Because we had 20 ft. under the addition's roof to work with, we were able to create a spacious bath with a covered porch on the back of the house.

SPECS

Bedrooms: 3

Bathrooms: 2

Size: 2200 sq. ft.

Location: Tiverton, R.I.

Architect/Builder: Sixteen On Center, sixteenoncenter.com

Small and Skinny

2019 HOUSES AWARD
BEST SMALL HOME

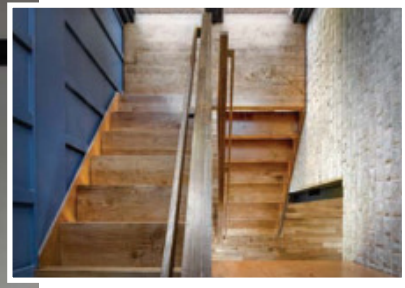
Challenging market norms with a thoughtful modern design

BY BRIAN PONTOLILO

When Alex Wu started his own architecture firm in 2016, he decided to make his first project a spec home. Finding a decent lot in the Atlanta area proved challenging, and many of the more ideal building lots wouldn't be right for what Alex had in mind. He was planning to build a well-designed home that would be smart, small, stylish, and affordable. Alex's project would be an outlier in a market where the norm for spec homes is to put as many square feet as possible on each lot by building a big box of a house outfitted with all the latest popular finishes, to be sold at a premium.

The lot Alex ended up building on is a mere 20 ft. wide with an immovable utility pole planted on the street front. The local zoning setbacks would have allowed only a 6-ft.-wide home to be built on the property, so Alex's first order of business was to apply for a variance. He got it, and the approved plans allowed him to build a 14-ft.-wide house—still an awfully skinny structure—by reducing the side-yard setback from 7 ft. to 3 ft., and reducing the front-yard setback from 30 ft. to 10 ft. Still, Alex had to build a three-story house to get the minimal space he needed to make the home marketable to buyers—but it's the customized details that make it uniquely attractive. □

Brian Pontolilo is a former *Fine Homebuilding* editor. Photos by Garey Gomez.



Strategic spot. *A modern open-riser stair made of maple plywood makes a design statement in the entryway. The brick from the front of the house and the board-and-batten siding from the back of the house are used for the interior walls, bringing continuity to the design.*

Floor-plan drawings: Patrick Welsh

SPECS

Bedrooms: 2, plus home office

Bathrooms: 2½

Size: 1650 sq. ft.

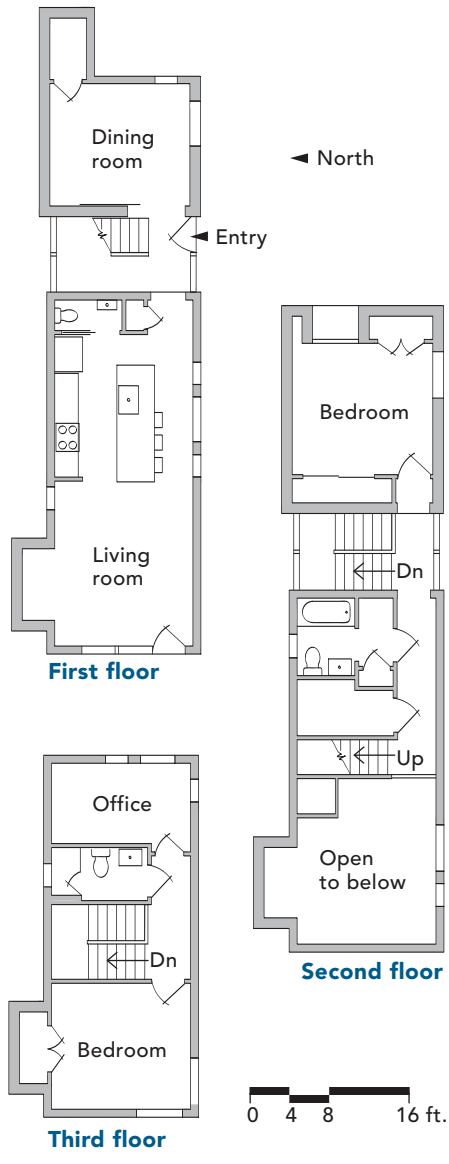
Location: Atlanta, Ga.

Architect: Alex Wu Architect, awu-arch.com

Builder: F.M. Studio, fmstudiollc.com

DESIGN INGENUITY

Alex's aim was to show that spec houses and investment properties can be designed and built with custom details. In celebration of the architecturally diverse Atlanta neighborhood, he designed a modern brick cube at the front and a more traditional three-story gable form at the back, separated by entry doors. The vaulted family room is surprising in such tight quarters—most spec builders looking to maximize square footage and profit would have made the space above the living room into a bedroom.



ONLINE EXCLUSIVES
For more on this project, visit FineHomebuilding.com/houses.

House of Tudor

2019 HOUSES AWARD
BEST TRADITIONAL HOME

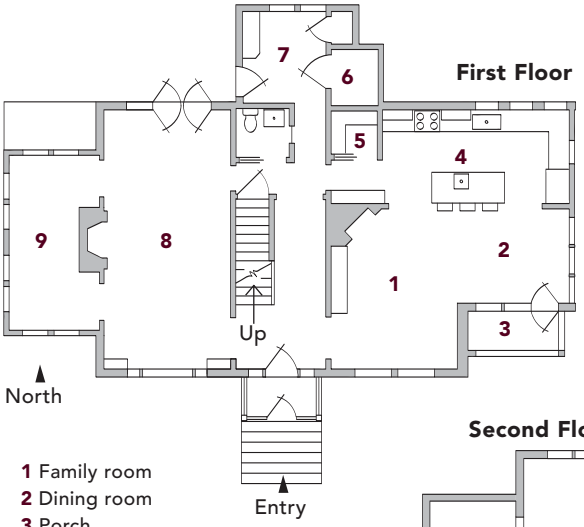
A blandly styled, ho-hum home is gutted and reborn

BY BRIAN PONTOLILO

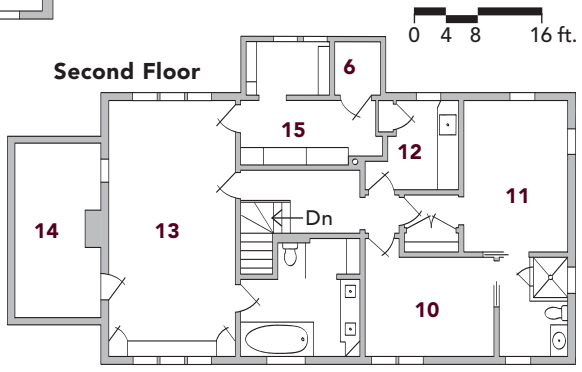
A number of traditional styles would have been appropriate for the fixer-upper purchased by retired couple Bob and Susan. They settled on a Tudor revival, and brought in Frank Shirley Architects to do the design.

As it was, the house was lacking in character, but it had a few details that helped Frank achieve the Tudor look on the street-facing facade. The first-story brick veneer, for instance, was stripped of the existing white paint. The second-story overhang on the southeast corner was already in keeping with the Tudor style.

Timber framing and waddle-and-daub are no longer common building techniques, but three-coat stucco on the second-story walls and applied decorative timbers maintain the style of these types of construction. Frank's intent was to create the look of structural posts and



1 Family room
2 Dining room
3 Porch
4 Kitchen
5 Pantry
6 Elevator
7 Mudroom
8 Living room
9 Sunroom
10 Office
11 Bedroom
12 Laundry
13 Master bedroom
14 Deck
15 Walk-in closet



SPECS

Bedrooms: 2
Bathrooms: 2½
Size: 2900 sq. ft.
Location: Cambridge, Mass.
Architect: Frank Shirley Architects, frankshirleyarchitects.com
Builder: Kistler & Knapp Builders, kistlerandknapp.com

"Before" photo: courtesy of Frank Shirley Architects. Floor-plan drawings: Patrick Welsh.

Exposing the structure. *The oak timbers of the cathedral ceiling are pickled with a subtle gray finish for a little less contrast in the bright master bedroom.*

beams with the regular spacing of the decorative timbers—particularly around the windows—and the use of diagonal timbers to brace the corners. He even used a decorative curved timber in the gable above the front entry. The boards used to create the timber-frame look are oak, as an original Tudor frame would have been. But instead of being finished with tar, they are painted a deep forest green. The dark-color frame and the creamy stucco have enough contrast to clearly reference the notable black-and-white aesthetic of original Tudor homes.

The home's asymmetry is more of a nod to the revival movement than it is to the original Tudor style. But the tall brick chimney, with clay chimney pots atop each flue, harken back to 16th-century Europe. Two more exterior details worth noting are the copper gutters and downspouts and the slate roof.

To make the Tudor connection inside, Frank used white-oak flooring throughout the house, spec'd diamond-patterned leaded glass in a few places, and designed the master bedroom to have exposed roof framing. To make this cathedral ceiling work, the roof assembly is unvented, with R-50 closed-cell spray-foam insulation between the rafters.

Frank is quick to admit that the Tudor-revival style does not lend itself to affordability. "This project was expensive and intense," he says, "not quick and easy. But this house should last for generations." □

Brian Pontolilo is a former *Fine Homebuilding* editor.
Photos by Randy O'Rourke, except where noted.

ONLINE EXCLUSIVES
For more on this project, visit
FineHomebuilding.com/houses.

Nine Elements of the Tudor-Revival Style

Tudor architecture was a short-lived yet influential style during the first half of the 1500s. The Tudor-revival style emerged in the late 1800s at the same time as many other revivals. Though the designs depart in some ways, Tudor revivals are still a close representation of original Tudor homes. Here are some telltale signs to look for.

1 **HALF-TIMBERING** Instead of covering the timber-frame structure, the Tudors chose to leave it exposed and infilled the frame, a construction method known as half-timbering. Most modern Tudor-revival homes are stick-built and the half-timbering look is decorative.

2 **CROOK FRAMING** Tudor homes often had Y-shaped or curved timbers used purposefully for posts and beams, a building technique known as crook framing. This is often re-created in the decorative frames of Tudor revivals.

3 **BRICK AND STUCCO** Though it is not the only option, brick and stucco is the most common cladding combination used to infill the frame on Tudor-revival homes. The use of brick dates back to 16th-century England and the original Tudor movement, and stucco is a modern take on the original waddle-and-daub plaster.

4 **STEEPLY PITCHED ROOFS** At a time when thatched roofs were still common and in an area of the world with snow loads to consider, it made sense for Tudor roofs to be steeply pitched. Tudor-revival homes maintain this detail, though slate has become the roofing material of choice for those who can afford it.

5 **CROSS GABLES AND DORMERS** During the Tudor period, commoners were spending more money on their homes, and the shapes of houses were more elaborate. Many featured cross gables and dormers, which are common on Tudor-revival homes.

6 **GANGED WINDOWS** Often tall and narrow, Tudor and Tudor-revival homes are known for having multiple windows grouped together. Historically, glass was expensive. The more windows a house had, the wealthier the homeowners. This is less true today, but the asymmetrical and ganged window arrangement is still a significant feature.

7 **CONTRASTING COLORS** In medieval Europe, exposed oak timber frames were often covered with tar for longevity. This created a stark contrast between the frame and the light-colored earth plaster (among other materials) commonly used for walls. Today, designers re-create this contrast using dark-stained or painted decorative framing with white or cream-colored stucco, or red brick veneer.

8 **TALL CHIMNEYS** Tudor homes were among the first to have concealed fireplaces and brick chimneys. The chimneys were often decorative in appearance with fancy chimney pots at the top, and this detail is maintained in the Tudor-revival style.

9 **OVERHANGING SECOND FLOORS** For tax reasons, it was advantageous to minimize the area of the first floor. For that reason, many Tudor homes had cantilevered second floors. Modern architects use this detail to give Tudor-revival homes character and to cover outdoor spaces.

Hilltop Harvest

Two determined homeowners build their own Passive House

BY GEORGE OSTROW

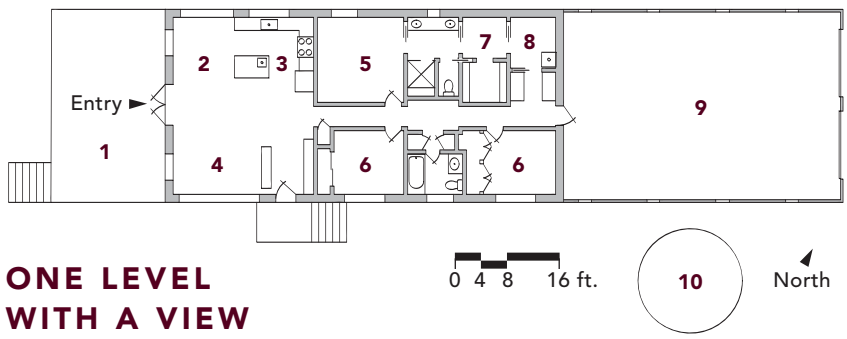
Long-time environmentalists, Gary and Marian Aamodt wanted their next home to be comprehensively green: low-VOC and net-positive energy, with formaldehyde-free materials, FSC-certified lumber, and solar electricity and hot water. To reach their ambitious goals on a limited budget, the Aamodts had another uncommon request: They wanted to do the construction themselves. In my practice, I welcome homeowners taking on portions of the design or construction effort, but I'd never had clients who wanted to build an entire house with their own hands.

The homeowners' DIY plan led me to keep the design and buildability dead simple. The cross section is the same throughout—an insulated floor, walls, and ceiling over a crawlspace in the living area, switching to exposed framing on a slab in the garage. This simplicity minimized thermal bridges and helped the homeowners frame their first house with relative ease. In the living half of the house, I used a frame-within-a-frame strategy to adjust the insulation thickness as needed to achieve Passive House certification.

Building a Passive House requires an extreme level of airtightness. The Aamodts addressed each hole as the build progressed, caulking the backs of nails and screws and applying tape and mastic on every joint.

The Aamodts built their own house over the span of six years. The house is net positive, has an EUI of 2.03, and is comfortable in 90°F weather without any air conditioning—and these two determined people achieved more than I dared to hope. □

George Ostrow is principal at VELOCIPEDE architects in Seattle. Photos by Asa Christiana.



ONE LEVEL WITH A VIEW

The rectangular floor plan transitions from garage to bedrooms to an open living and dining area to a large deck with beautiful views of the Cascades.

1 Deck
2 Dining
3 Kitchen
4 Living
5 Master bedroom
6 Bedroom
7 Closet
8 Laundry
9 Garage
10 Rainwater tank

Floor-plan drawing: Patrick Welsh. Drawing face page: Dan Thornton.

Rainwater to the rescue. *The site had one substantial defect: no water. All the water the homeowners need flows from the roof into a gutter, through debris filters, and into this 8800-gal., PVC-lined storage tank. The water is then pumped through filters and a UV light in the garage to make it potable.*

SPECS

Bedrooms: 3 **Bathrooms:** 2

Size: 1340 sq. ft. **Location:** Carnation, Wash.

Architect: George Ostrow, velocipede.net

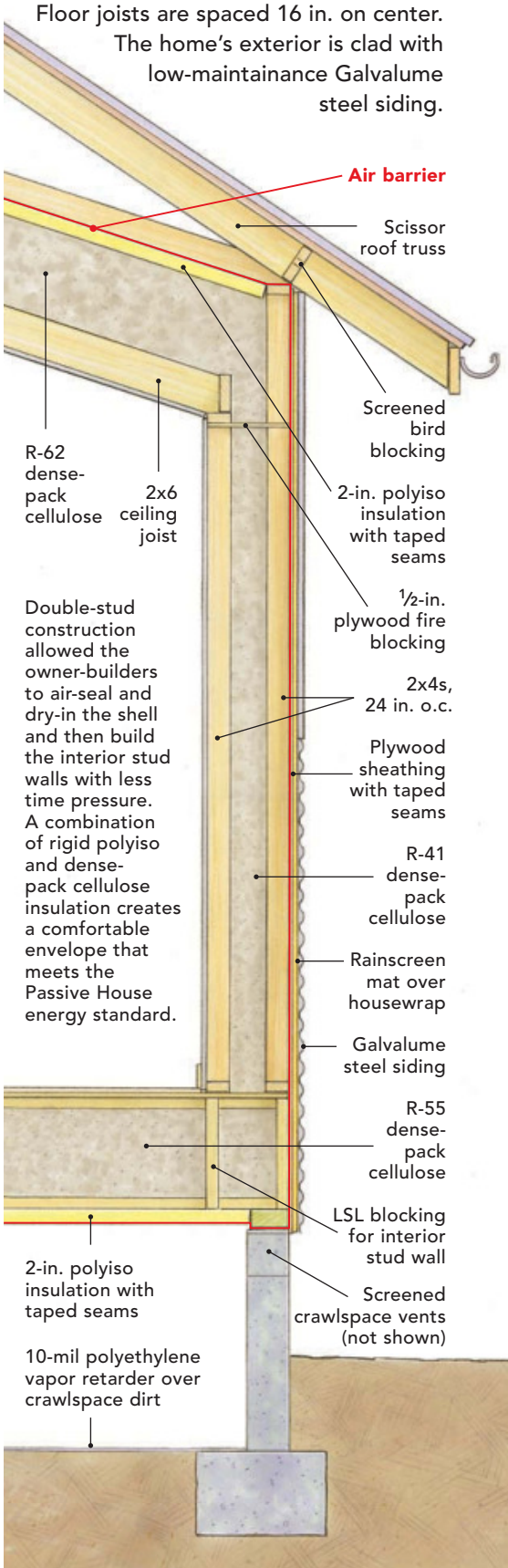
Builder: Gary and Marian Aamodt

ONLINE EXCLUSIVES

For more on this project, visit FineHomebuilding.com/houses.

A TIGHT SHELL THAT'S EASY TO BUILD

To minimize thermal bridging, eliminate unnecessary lumber, and make the house easier to build, the roof trusses, ceiling joists, and wall studs are stacked on top of each other 24 in. on center. Floor joists are spaced 16 in. on center. The home's exterior is clad with low-maintainance Galvalume steel siding.



Rugged Modernism

2019 HOUSES AWARD

EDITOR'S CHOICE

A site-inspired structure, Ricon Ranch is exceptionally sensitive to its fragile surroundings

BY KILEY JACQUES

Site solution. *A T-shaped or hammerhead turnaround was mandated. A variance allowed for a bend in the T—the long leg of which is used as the main driveway, while one of the short legs wraps down the side of the main-house garage, providing easy access and a parking space for guests. The other terminates in a center hub connecting the main house and the guest house.*

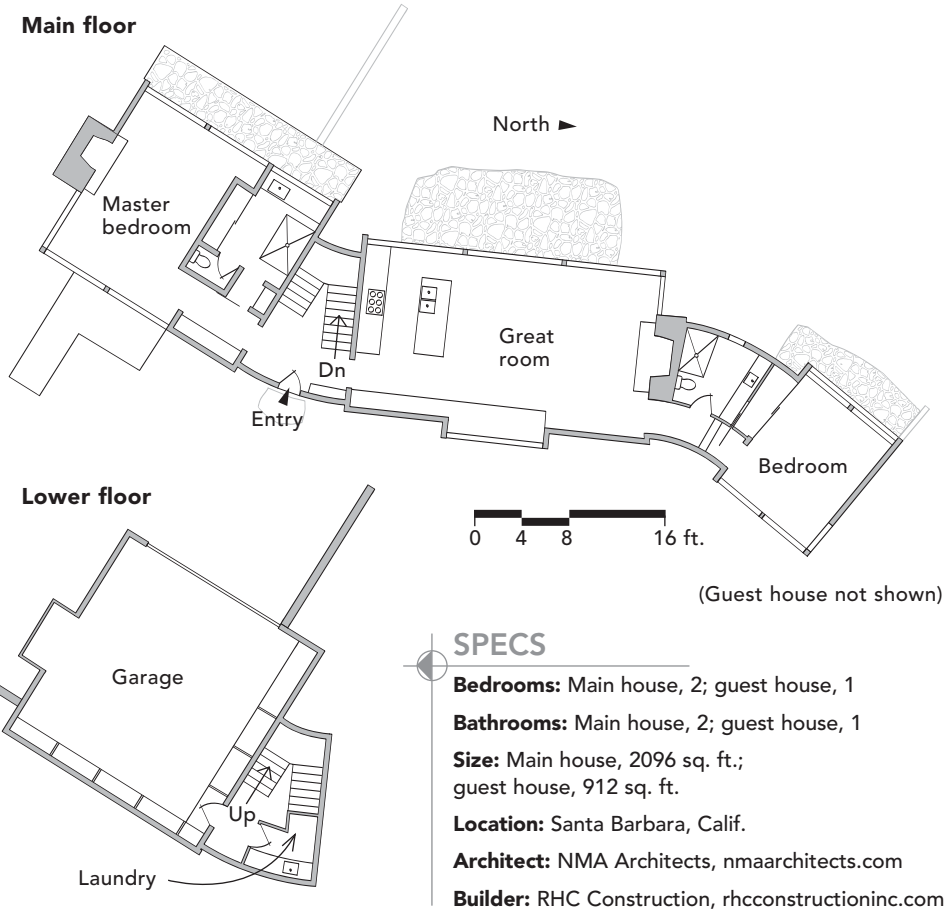
For 18 months, Rich Coffin, his wife, Krista, and architect Dave Mendro spent their time planning and building Ricon Ranch. They even developed a mission statement: The house should be organic to the land, warm in character, and in keeping with their surfing/ranching lifestyle. Additionally, given the region is subject to high winds and wildfires, all of the structures were to be weather- and fire-resistant as well as easy to maintain. The time they devoted to understanding the site paid off. Once construction was underway, they had a plan in place for protecting the surrounding coastal riparian habitat.

Because the 2-acre buildable area was constrained by specimen oak trees, the main house was situated outside of their drip lines and was designed to follow the contours of the sloping topography, hence the building's "S" shape. This helped minimize grading and the need to cut into root zones. The loca-

Floor-plan drawings: Patrick Welsh

Settling into the landscape. *Integrating the natural beauty of the site into the living spaces was the highest priority. The main house is oriented to the west, offering views of the hills and a sharp ridge line across the valley. The curvature of the two houses integrates with the ridge, making the structure feel right at home.*

Smoothing the seams. *The roof's copper material is low maintenance and its natural patina blends in with the scenery. A sheet-metal company was brought in to handle the seams; the goal was to achieve a soft look that would work with all of the curves. The sandstone-colored plaster emulates the eroded sandstone in the landscape.*



(Guest house not shown)

tion of the guesthouse was also partly determined by zoning requirements—because of the limitations set by the trees, the structures ended up being closer together than desired.

To address the issue of strong winds, the house was built into the hillside, a design strategy inspired by ancient Mesa Verde cliff dwellings. Construction materials played a large role in the fire-protection plan, which includes a defensible space and fire-retardant landscape.

Researching traditional Andalusian features typical of early Californian homes gave the team a pool of design ideas. They also looked at architect Mickey Muennig's work; his Post Ranch Inn in Big Sur, Calif., informed the curved roofs—arguably the most distinguished feature contributing to the rustic-modern aesthetic. □

Kiley Jacques is design editor. Photos by Ciro Coelho.

SPECS

Bedrooms: Main house, 2; guest house, 1

Bathrooms: Main house, 2; guest house, 1

Size: Main house, 2096 sq. ft.; guest house, 912 sq. ft.

Location: Santa Barbara, Calif.

Architect: NMA Architects, nmaarchitects.com

Builder: RHC Construction, rhcconstructioninc.com

ONLINE EXCLUSIVES

For more on this project, visit FineHomebuilding.com/houses.

2019 HOUSES AWARD

READERS' CHOICE

Timberline Transformation

This Readers' Choice home started life as a 1960s ranch that offered beautiful views of Mt. Hood—but not much else. The new owners' dream was to renovate the home, combining durable materials in creative ways to achieve a finely crafted, low-maintenance house in which they could retire. Their goals included integrating an open floor plan, enhancing outdoor connections, creating bright interiors with plenty of daylight, and using energy-efficient systems. eMZed Architecture and Kropf Construction West worked with the owners to carry out this complete transformation.

The majority of the existing foundation was retained, including the daylit basement, though interior walls were relocated and spaces repurposed. The entry and stairway were moved and a large central fireplace was removed. The east end of the living area was extended by 10 ft. and the master wing grew by 7 ft. in order to include a shower room, which connects to the yard. The majority of the roof was removed and re-framed to replace the 8-ft. ceilings with vaulted interiors lit by a continuous line of clerestory windows. A new deck capitalizes on views of Mt. Hood and the patio to the south accesses the yard. For added visual interest, the entry roof flares up and features a cantilevered canopy below to shelter the porch.

A high-efficiency heat-pump HVAC system helps reduce energy use while providing greater thermal comfort. Exterior insulation was added along with a ¾-in. rainscreen cavity and fiber-cement siding. The new roofs are double-layered, consisting of 2x12 rafters fully insulated with dense-pack cellulose, sheathing (the air barrier), and 2x6 rafters above insulated with 3½ in. of Roxul and topped with 2 in. of ventilation space. The existing basement exterior walls were retrofitted with 1½ in. of rigid foam plus 3½ in. of dense-pack cellulose in the interior, while the floor received 2 in. of rigid foam between the slab and the subfloor. Once complete, the project achieved Earth Advantage Institute's Platinum rating. □

Maureen Friedman is *Fine Homebuilding*'s administrative assistant. Photos by Eckert & Eckert Photography courtesy of eMZed Architecture, except where noted.

"Before" photo: courtesy of eMZed Architecture. Floor-plan drawing: Patrick Welsh.

Deconstructing before reconstructing. *Originally built in 1961, the house was completely renovated in 2017. All lumber removed during the deconstruction was salvaged, reused, or donated. The remodeled house has metal roofing and fiber-cement and metal siding.*

A dated ranch adopts building-science strategies and an open floor plan

BY MAUREEN FRIEDMAN

SPECS

Bedrooms: 4

Bathrooms: 3

Size: 3900 sq. ft., plus 650-sq. ft. garage

Location: Lake Oswego, Ore.

Architect: eMZed Architecture LLC, emzeddesign.com

Builder: Kropf Construction West LLC, kropfwest.com

Lovely and light-filled. *Finely crafted cabinetry, casework, masonry, and tile create a modern yet comfortable feel throughout the home.*

ONLINE EXCLUSIVES
For more on this project, visit FineHomebuilding.com/houses.

Fine Homebuilding®

2020 HOUSES AWARDS

Call

Do you want your project featured by *Fine Homebuilding*?

We're always on the lookout for homes that showcase craftsmanship, energy efficiency, and smart design. From cozy cottages to urban lofts, from seaside getaways to starter homes on a budget, we want to hear about your project. This issue is not limited to new homes; we're also eager to see remodels that breathe new life into tired old houses.

Go to FineHomebuilding.com/houses to submit a project and become eligible to win one of our HOUSES awards. Submissions also may be emailed to fhcallforentries@taunton.com or mailed to our offices at: Fine Homebuilding, 63 South Main St., Newtown, CT 06470.

Entries deadline: July 19, 2019

The Taunton Press
Inspiration for hands-on living®

BEST NEW HOME

For our Best New Home, we look for the project that successfully meets its design challenges with a superior level of craftsmanship and detail appropriate to its architectural style.

BEST REMODEL

Our Best Remodel Award goes to the project that successfully identifies problems with an existing house and solves them with practical design solutions and construction techniques.

BEST SMALL HOME

Our award category targeting homes under 2000 sq. ft. focuses on the functionality of living spaces, material choices, exterior details, budgets, and construction techniques.

for Entries

Photo by Trent Bell

BEST ENERGY-SMART HOME

Here we look for a project that incorporates a climate- and site-specific approach to energy efficiency and respects the lifestyle needs and budget constraints of the homeowners.

BEST TRADITIONAL HOME

This award goes to the new home or remodel that best exemplifies a traditional architectural style. The best project will be contextually appropriate and executed with authentic detail.

EDITOR'S CHOICE

The Editor's Choice Award always stirs debate in our office. Designed to recognize innovation, aesthetics, or ingenuity (or a combination of all three), this award always offers a surprise.

INTRODUCING A NEW VIDEO SERIES BY
FineHomebuilding

BEHIND THE BUILD

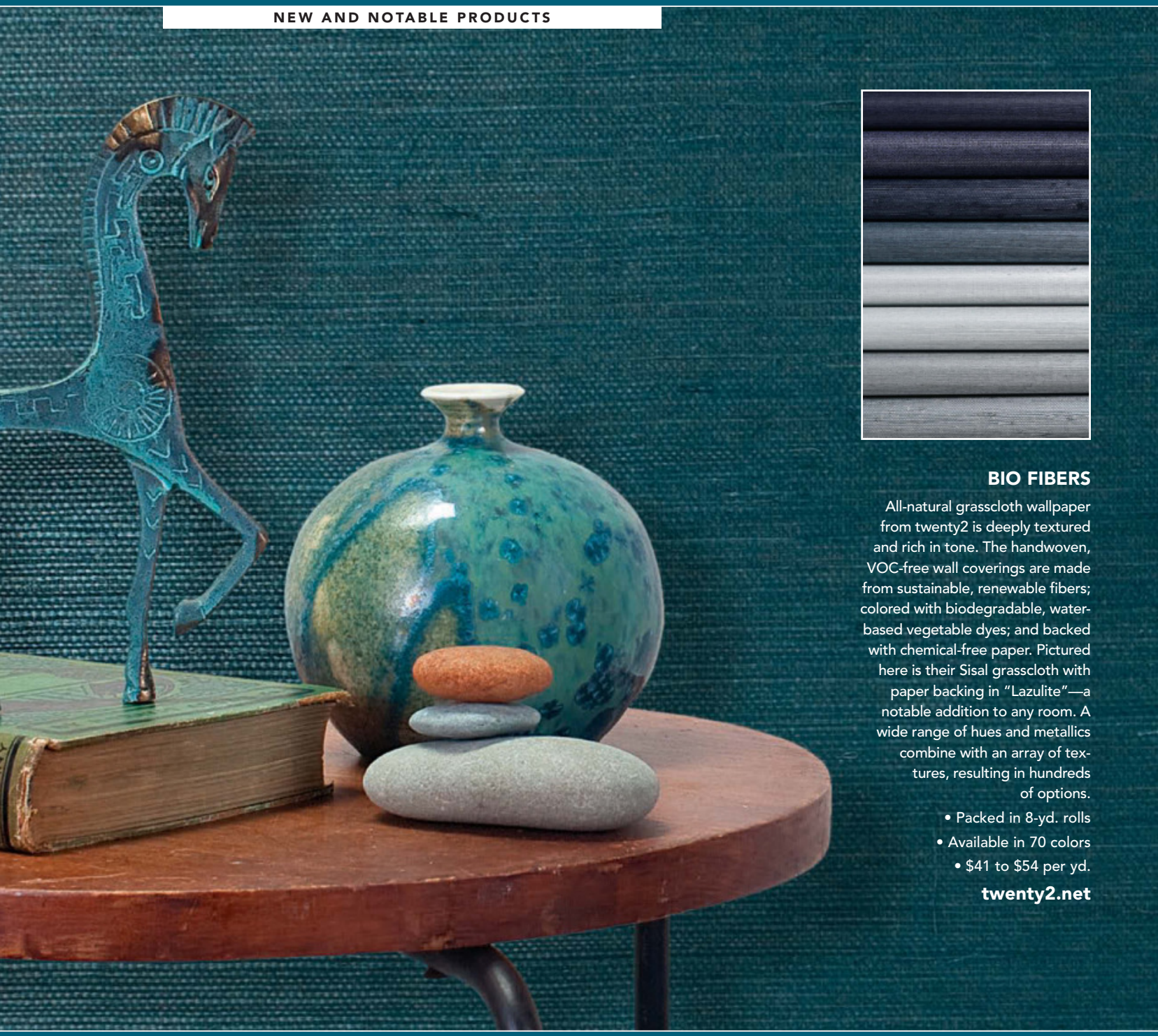
supported by Pella

Join *Fine Homebuilding* Ambassador John Hourihan as he tours homes that focus on the details that reflect a true level of craftsmanship. In our Behind the Build series, John goes one-on-one behind the scenes with builders to see what solutions they've found with a wide variety of window and door products that fit each home's style, climate, and personality.

Watch the series now: FineHomebuilding.com/blog/behind-the-build

SPEC

NEW AND NOTABLE PRODUCTS



BIO FIBERS

All-natural grasscloth wallpaper from twenty2 is deeply textured and rich in tone. The handwoven, VOC-free wall coverings are made from sustainable, renewable fibers; colored with biodegradable, water-based vegetable dyes; and backed with chemical-free paper. Pictured here is their Sisal grasscloth with paper backing in "Lazulite"—a notable addition to any room. A wide range of hues and metallics combine with an array of textures, resulting in hundreds of options.

- Packed in 8-yd. rolls
- Available in 70 colors
- $41 to $54 per yd.

twenty2.net

Curated by *FHB* staff. Photos courtesy of the manufacturers, except where noted.

EASY-TO-AIR-SEAL ELECTRICAL BOX

Any builder who has struggled to maintain a continuous interior air barrier or strived for a soundproof wall will tell you that the weak link is always the electrical box. It's difficult to properly seal the knockouts where the electrical cables enter the box. Airfoil electrical boxes provide an extra layer of knockouts in line with the first, creating a chamber that can be filled with any sort of low-expansion foam after rough-in is complete. Boxes are available in all the common shapes and sizes, with pricing starting at just under $4 apiece.

airfoilinc.com

ZIP SYSTEM GETS SOME COMPETITION

LP's newest line of sheathing may look familiar to any builder who has worked with Huber's Zip System sheathing—except, of course, for the change in color. Just released, LP's WeatherLogic panels (lpcorp.com) are structural sheathing with an integrated WRB—fasten to the framing, tape the joints, and the house is air- and weathertight. Huber has filed a lawsuit claiming that the system infringes on at least seven Huber patents.

RECESSED MINISPLIT

Mitsubishi's new MLZ ductless minisplits are the answer to every customer complaint about the eyesore of a conventional wall-mounted minisplit system. While ceiling-cassette minisplit systems aren't new, Mitsubishi has designed this one to fit between the joists without the need for headers or other altered framing.

- Unit can fit between 2x8 joists 16 in. on center, and is fully accessible from below for maintenance and servicing
- Three models, ranging from 9000 Btu to 18,000 Btu in cooling mode and 12,000 Btu to 21,000 Btu in heating mode
- Prices start around $1000; outdoor unit not included

mitsubishicomfort.com

Photos: this page top and bottom left, Melinida Sonido; facing page top: Justin Fink

ACOUSTICAL SOUND BARRIER

Stopping the transmission of noise through walls or floors requires a two-pronged approach: Stop sound as it travels through the air, and also as it travels through the structure. Airborne sound can be controlled with good air-sealing techniques and sound-dampening materials such as batt insulation. To control the vibrations, the best one-and-done solution may be mass-loaded vinyl. Very thin but also heavy, a roll of mass-loaded vinyl has the feel of a roll of lead flashing—your brain can't quite reconcile the disparity between size and weight. But it's this heft—1 lb. per sq. ft. at ⅛ in. thick—that makes it so useful for stopping sound. It can be fastened to framing with screws or pneumatic staples, it provides a sound-transmission class (STC) rating of 26, and it's available from a variety of manufacturers, including Acoustiblok (acoustiblok.com) and SoundSense (soundsense.com).

OLD SCHOOL MEETS DIGITAL

Each of Urbanears' speakers provides a sound experience. The largest, Baggen, is tagged "loud and mighty," while the midsize Stammen is "neat and powerful," and the Lotsen is "small and capable." All are mod and fabulous. The sleek design makes them inconspicuous yet noteworthy, and the wireless system can hold up to seven playlists or stations and connects to any music-streaming service. Controlled with knobs, the speakers allow you to navigate your music the old-school way—with a twist and a push. Use them as Bluetooth speakers or hook them up to a turntable for a retro groove.

- Six colors: vinyl black, indigo blue, concrete grey, goldfish orange, plant green, and dirty pink
- Subwoofer and two tweeters
- Three sizes ranging from $199 to $349

urbanears.com

CLASSIC FIT

Part of Big Chill's Classic Line, this range brings a distinctly 1930s feel to the kitchen. Traditional industrial-style details include slender teardrop knobs with rounded backplates and metallic trim finishes. Metal hardware and a towel bar fixed above the range's window enhance the unique look.

- Available in 30 in., 36 in., and 48 in.
- Colors: matte black, French blue, Cabernet, cream, stainless steel, white, and over 200 custom colors
- Rim finishes: brushed brass, chrome, satin nickel, and copper
- $4995 to $6995

bigchill.com

Photos facing page: top left, Georffrey Gross; product photos, Rodney Diaz

QUICK CONNECTORS FOR TIMBER FRAMING

This modern construction method might not impress timber-frame purists, but it does provide a quick and easy way to build a beautiful post-and-beam structure. T-shaped T-Rex connectors are screwed in place and then slid into slots cut into the ends of the posts and beams. To connect the wood to the hardware, aluminum pins are driven through holes bored through the timbers and hardware, securely fastening the assembly together. T-Rex connectors are available for various sizes of posts and beams, including both rough-sawn lumber and standard nominal lumber, with prices for a 3½-in. by 3½-in. connector starting at $24 each.

ctpostandbeam.com

ONE SINK, FOUR CONFIGURATIONS

Genius for its flexible design, the Farmhouse Quartet sink by Native Trails can be installed apron-style, or in front/back of or behind a counter. It's made of NativeStone, a combination of natural jute fiber and cement—a mixture that is exceptionally durable and roughly 40% lighter than conventional concrete sinks. A recipient of the Good Design Award, this bow-edge sink is an earthy, artisanal twist on the traditional apron-front design.

- Finishes: ash, slate, and pearl
- 33 in. wide; 9¼ in. deep; 10¼-in. apron
- Crack-, stain-, and scratch-resistant
- Undermount installation
- $1885

nativetrails.net

ask the experts

YOUR QUESTIONS—PRO ANSWERS

The horizontal vs. vertical sheathing debate

On an episode of the *Fine Homebuilding* Podcast, someone said that installing structural sheathing horizontally on walls is superior to vertical installation, but APA (the Engineered Wood Association) maintains both installations are equal provided the panels are attached to framing or blocking. Can you please cite a source that explains the case for horizontal sheathing being better, or at least clarify which, if either, orientation is superior?

—KEVIN BRENNAN
via email

Associate editor Matthew Millham responds: If all we're talking about is shear, where the load is parallel to the wall, you're right that there's no difference in performance between vertical sheathing and horizontal sheathing with the edges blocked. But that's just part of the story.

Structural sheathing panels have a "strength axis" that runs parallel with the panel's length unless marked otherwise. On roofs and floors, sheathing is installed perpendicular to supports because this is the orientation that results in the strongest roof or floor. Wind loads perpendicular to a wall are similar to floor and roof loads, and installing sheathing horizontally makes walls better at resisting wind pressure.

One place this issue shows up is in the American Wood Council's *Wood Frame Construction Manual* (*WFCM*), where there's a table for wall-sheathing requirements for wind loads. Here, it's clear that horizontal sheathing outperforms vertical, especially at higher wind speeds. For example, in areas categorized as Exposure B—places where obstructions, such as suburban or wooded areas, temper the wind—a ⅜-in.-thick panel with a span rating of 24/0 (meaning it can be used on roofs with supports up to 24 in. on center, and not as floor sheathing) can handle three-second gusts up to 195 mph when installed horizontally on studs spaced 24 in. on center. Installed vertically, the same panel can only handle gusts up to 110 mph on the same stud spacing.

The IRC, meanwhile, allows you to orient the sheathing in either direction for wind loads, but includes an important exception: If you're using 3-ply plywood panels of any thickness on studs spaced greater than 16 in. on center, the IRC wants the panels installed with their strength axis perpendicular to supports (in other words, horizontally) to handle wind pressure. In those products, the grain of the face plies is typically oriented with the long axis of the panel (creating the strength axis), and the single alternate ply in the middle doesn't provide enough strength for it to handle wind pressure when the panel is installed vertically. And where designing for wind is required—mainly coastal areas of the southeast where hurricanes are common—the IRC points builders to the *WFCM* and other resources for guidance.

STRONGER SHEATHING SUPPORT

When you're relying on sheathing to handle both shear and wind pressure, horizontal is the way to go.

Photo: Tim Furlong Jr.

Replace damaged board floor sheathing

My parents recently bought an older home. We removed multiple layers of old flooring, and in doing so damaged some of the tongue-and-groove board sheathing to the point that it needs replacing. I'd like to replace the boards with OSB or plywood panel sheathing, but I'm wondering if it's safe to just cut the old boards back to the walls since they run at an angle to the

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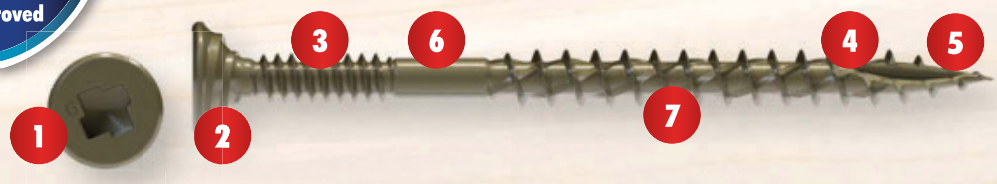

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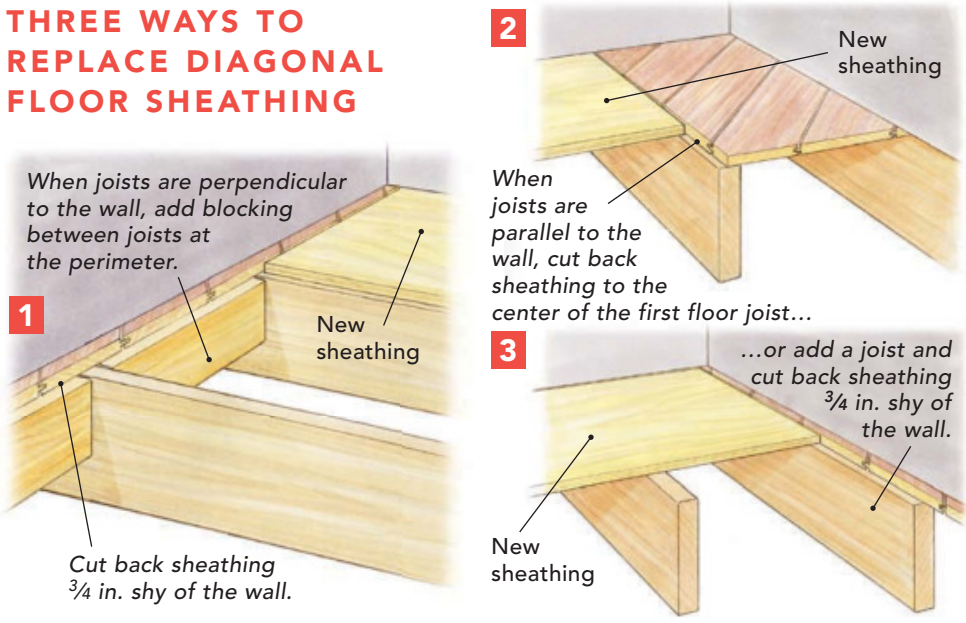
THREE WAYS TO REPLACE DIAGONAL FLOOR SHEATHING



joists. If I cut the boards back, some of the loose ends won't have anything to sit on, and I assume that's bad. What's the best way to handle this situation?

—BOB HOUSE
via email

Editorial advisor Mike Guertin responds: You're right to be cautious about cutting the boards along walls. Leaving unsupported edges can lead to squeaks and other problems with the flooring. There will be two different conditions at the walls—those that run parallel to the floor joists, and those that run perpendicular. The approach to supporting cut edges of the planks is different for each.

Walls running parallel to the floor joists may have a floor joist running along the edge—if you're lucky. If so, cut the planks at the center of the joist. But when there's no joist along the edge, you can install one from below if the floor is over a crawlspace or basement. It can be challenging to slip in an extra joist, so you may want to try a different approach. Instead of cutting along the wall, locate the first floor joist on the room side of the wall and cut the floor planks along the joist's center (see #2, above). You will still have some of the planks exposed along the edge of the wall, but at least the cut edge of the planks will be supported.

Cutting floor planks along walls running perpendicular to the floor joists leaves some or all of the planks unsupported because the boards are run diagonally. The remedy is simple: Just add a row of blocking between the floor joists to support the cut edge (#1, above). Remove the baseboard and cut the planks about ¾ in. out from the face of the wall. Then toenail or screw 2x blocking under the cut edges of the planks. The blocks don't need to be the full depth of the floor joists. All that's needed are 2x4s or 2x6s to support the edges of the cut planks.

The solid-board planking can easily split when nailed close to the edge into blocking or joists. So blunt the tips of the nails before driving or drill clearance holes through the planks before driving nails or screws. Regardless of which approach you follow, whenever you can, squeeze some construction adhesive into the joints between the plank edges and the joists or blocking to help prevent squeaking.

Water in ducts

While remodeling a bathroom in my 1978 ranch house in northern Indiana, I nicked an insulated flex duct in the ceiling and water started pouring out. The ducts are connected to a heat pump that is primarily used for cooling, though it does supply some supplemental heating on either end of the heating season. All of the ductwork is in my unconditioned attic, and it's mostly sitting on top of the blown-in cellulose insulation. Every fall, I close off the supply vents and put 2 in. of rigid foam in the returns. I plan on replacing the ducts, but I don't want a repeat of the same situation. What's causing this water problem, and how I can stop it?

—WILLIAM
via email

Martin Holladay, editor of Green Building Advisor, responds: The most likely explanation for the water in your ducts is that warm interior air is entering the ducts during the winter, and the moisture in the air is condensing on the interior of the cold ductwork.

There are two possible ways to solve this problem. The first is to keep your ducts warm. Installing ducts in a vented unconditioned attic is always a bad idea. Ducts belong inside your home's conditioned space. The best solution is to convert your vented unconditioned attic into an unvented conditioned attic; one way to accomplish this is to install closed-cell spray foam on the underside of your roof sheathing. This solution is effective but expensive.

A less-perfect solution is to leave your attic as is, but bury your ducts in insulation. Before you attempt this work, however, visit GreenBuildingAdvisor.com and enter "buried ducts" in the search box. Read up on the caveats before proceeding. Either of these solutions should keep your ducts warm enough to prevent condensation.

The second possible remedy to your condensation problem is to prevent indoor air from entering the ducts during the winter. Your attempt to plug the ducts with rigid foam was well-meaning but ineffective—almost certainly because your plugs weren't airtight. Next time, use high-quality tape to get a good air-seal. Remember, you're battling the stack effect, which is a powerful driving force. Air near your ceiling is eager to escape, so do a good job with the tape.

Drawings: Dan Thornton

Understanding rainscreens

BY MICHAEL MAINES

Of all the advances in building science over the last 25 years—new technologies, products, and approaches to building safe, durable houses—perhaps the simplest and most versatile is the ventilated rainscreen. I first learned of rainscreens in *Fine Homebuilding* issue #137, published in 2001. They seemed simple and logical. With input from Dr. Joseph Lstiburek of Building Science Corporation, author Mark Averill Snyder explained how a rainscreen can help address peeling paint on siding, and he shared details on how to do it.

More than 18 years later, rainscreens are common on high-performance buildings—even required by code in a few places—yet many builders turn instead to "low-maintenance" synthetic cladding systems. These systems can do damage to the underlying structure, and they often cost more than traditional natural materials. They also come with a higher carbon footprint than those from renewable resources. Other builders use natural materials but omit a rainscreen, which can lead to premature failure.

A rainscreen defined

A rainscreen is a system of materials used to create a gap between the siding and the water-resistive barrier (WRB). It helps keep the entire wall assembly dry by allowing for both water drainage and airflow. You might ask, Isn't that the job of the siding? Yes and no. Virtually all common siding systems will leak at some point, especially when subjected to wind-driven rain. A rainscreen enables water to drain away from the structure. Because many siding materials—including wood, fiber cement, stucco, masonry, and concrete—can absorb water, they are considered reservoir claddings, which means they benefit from being able to dry on the back side, as do the sheathing and the rest of the wall assembly.

In cold climates, rainscreens allow walls to dry without compromising the integrity of the siding or its finish, and in hot climates they can assist with cooling. Rainscreens also create a zone of lower pressure differential compared to the exterior, which reduces the force of windblown rain.

Different sizes for different purposes

With a gap of 1/16 in. or less, even the thinnest rainscreens—sometimes called "drainscreens" because they don't allow for airflow—are still effective. Martin Holladay, editor of GreenBuildingAdvisor.com, describes the two types of drainscreen products as "wrinkled" and "bumpy." A common wrinkled wrap is DuPont's Tyvek DrainWrap. With its shallow vertical drainage channels, it looks a lot like regular Tyvek housewrap in need of ironing. The bumpy wrap that I see most often is Benjamin Obdyke's HydroGap, which is a standard WRB covered in closely spaced plastic nubbins.

In his 2011 article "Building Science Digest-013: Rain Control in Buildings," building scientist John Straube discusses how even thin gaps can allow water to drain. But, he notes, they are not deep enough to also provide airflow or block capillary water movement. I think they are best used in low-risk situations such as relatively dry climates or unheated buildings. To break capillarity, which can move water to places you don't want it, Straube recommends the gap be at least 1/4 in., though he says 3/8 in. is safer. According to Straube, the wetter and colder the climate zone

Photo: Patrick McCombe

and the more water the cladding is capable of absorbing, the thicker the rainscreen should be.

So-called vented rainscreens are open only at the bottom to allow for some airflow, which helps accelerate drying before problems caused by trapped moisture can occur. But for improved drying, the best rainscreens, ventilated rainscreens, include openings at both the top and bottom of the wall. The two most common methods for creating either vented or ventilated rainscreens are plastic mesh mats and rainscreen strips. Plastic mesh mats like Benjamin Obdyke's Slicker Classic, which is available in various thicknesses, work well under some siding types, particularly wood shingles. Thicker versions, such as Obdyke's Slicker Max and Mortairvent by Advanced Building Products, are great for keeping mortar from clogging the required gap behind brick cladding. But because they are compressible, they can make it tricky to install some types of siding. The other common option, rainscreen strips, can be made of wood, plastic, or metal. If you are installing horizontal siding, use vertical rainscreen strips under it; with vertical board siding, use horizontal rainscreen strips. Note that shingle siding can be installed over horizontal strips.

Several commercially available rainscreen strips—including Cor-A-Vent's Sturdi-Batten, which is made of polypropylene, and the aluminum Roll-On Rainscreen and steel FM3-VHV (both by Advanced Rainscreen Furring)—have gaps so they will drain even when installed horizontally. The other option is to install the rainscreen strips on an angle to allow both horizontal nailing and vertical drainage as well as airflow. Wood rainscreen strips do not need to be pressure treated or otherwise rot-resistant. The little bit of water they may come in contact with will evaporate quickly—that's one of the main reasons to use a rainscreen.

In climate zones 5A and 6A, if I am putting horizontal siding over solid sheathing, I often spec ½-in. CDX plywood ripped into strips because it is cost-effective and durable, and I have found that OSB swells too much. When the siding is going to be installed over continuous exterior insulation, the furring strips used to attach the insulation double as a rainscreen, but CDX strips aren't stiff enough—nor are any of the commercially available products. I spec 1x3 boards, which are called strapping here in the Northeast. Some builders prefer to use thicker material, but most will say that 1x lumber is stiff enough if the right care is taken when fastening the strips.

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"Basket house" approach

Robust rainscreens are good in damp climates for easy drying. In cold climates, they ensure moisture moves from the interior to the exterior wall without affecting siding finishes. And in hot climates, the venting channel at the top creates a chimney effect for exhausting hot air before it enters the building.

Some builders take it one step further, creating what carpenter John Deans at Emerald Builders refers to as the "basket house" approach for its resemblance to woven wicker. It calls for two full layers of 1x strapping to ensure that no siding fasteners penetrate the WRB or the airtight layer, which is often at the sheathing. Though the first layer of strapping does penetrate the WRB, the holes are safe behind the strapping. Reggie Lebel, owner of Emerald Builders, used this approach recently on a project I designed. It reached an extremely tight blower-door test of 0.125 ACH50. Another company, Ecocor, builds panelized Passive Houses using a similar approach (see "Making Passive House Mainstream," *FHB* #270), and always tests below 0.40 ACH50.

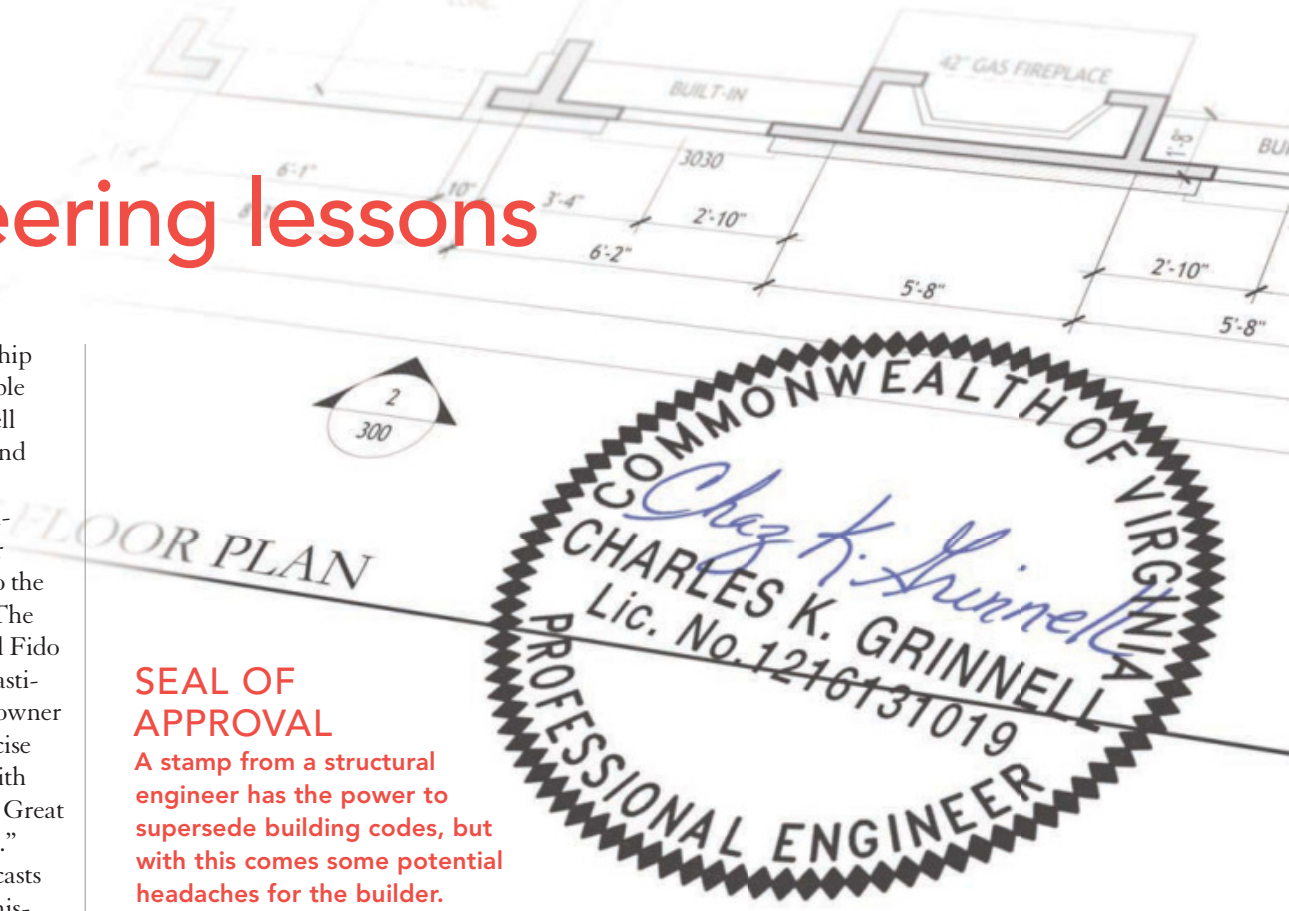
Contributing editor Michael Maines is a building-science consultant in Palermo, Maine.

Getting the details right

- **In most cases, flashing should extend behind the WRB, not to the outer face of the rainscreen strips.**
- **In fire-prone areas, check with your code official—sometimes thicker rainscreen gaps are not allowed due to their chimney effect, or they may need to be blocked at the top. Combustible exterior insulation might be forbidden, too.**
- **To keep pests out, use window screening—preferably metal—or a corrugated plastic product like those made by Cor-A-Vent over openings at the top and bottom of the wall. You can also use perforated metal J-bead made for this application.**
- **Standard vinyl siding is essentially its own rainscreen because the back is open, which minimizes capillary action, and the panels fit together loosely enough to allow for some airflow, so a separate rainscreen is not necessary.**
- **Check the installation instructions on the cladding you intend to use to make sure it's compatible with your rainscreen system.**

BY SCOTT McBRIDE

Engineering lessons



SEAL OF APPROVAL

A stamp from a structural engineer has the power to supersede building codes, but with this comes some potential headaches for the builder.

The uneasy relationship between tradespeople and architects is well known. We are like cats and dogs, mutually suspicious denizens of the same backyard, prowling around for our livelihood in service to the same master or mistress. The contractor is like a faithful Fido who goes chasing enthusiastically after every bone the owner tosses. "You want an exercise room on the third floor with quarry tile on the ceiling? Great idea! Sure, we can do that." Meanwhile, the architect casts a cool feline gaze on the misguided meandering of the client and the builder. Stealthily she steers the discussion to a higher plane. Like the lisping Persian cat in the movie *Babe*, her "purputh" is to be beautiful.

But there is another animal who appears less frequently in the jungle of residential construction. Years may pass with nary a sighting of this rarefied creature, for he prefers the cooler climes of commercial construction. The blood in his veins runs ice cold, and he gives no heed to the shrill bark of a disgruntled carpenter or the screech of an architect whose masterpiece has just been compromised. A hired gun, he is brought in only when these lesser mortals reluctantly acknowledge that they are out of their depth. Stand back—the structural engineer has arrived.

My first experience with an engineer occurred while remodeling a decidedly cockamamie house for one of my best customers. The previous owner, an artist who was long on ideas and short on construction experience, had built the place in the days when my rural county had no building code, so there was no check whatsoever on the man's "creativity." I had already spent years off and on trying to rectify the unfortunate results, which included termite damage, siding failure, and an energy performance that was roughly inverse what it should have been. When my customer announced that he wanted to undertake a whole-house remodel, I threw up my hands. "Enough already!" I cried. "I can't do this on my own."

Fortunately, the owner, a software consultant, was on board with the idea of bringing in an expert to think through the various challenges, and so we contacted a PE (professional engineer). The guy was terrific. He sent out a draftsman with a laptop—a real CAD wizard—to record the existing conditions, and within a couple of weeks we had a fully baked plan to put this faltering structure firmly on its feet. Questions arose as the job unfolded, but the engineer was available to provide answers. When the project was completed, it was clear that the engineer's fee was money well spent, and I had peace of mind knowing that every beam and footer was certifiably capable of doing its job.

By contrast, my next experience with a structural engineer was nothing short of a bummer. The project was a contemporary wing added to an old farmhouse, and the idea was to emphasize, rather than disguise, the transition from old to new. The addition featured a hybrid timber frame linked to a glass curtain wall by custom steel connector plates. An existing stone chimney—a prominent element now located inside the addition—was problematic because it had no footer. A mezzanine and spiral staircase

Drawing: George Retseck

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also had to be accommodated, all jammed within a 20-ft. cube. Obviously, there was plenty of square-rooting to be done.

An engineer did a set of drawings which were appended to the architect's design set, but as the job progressed there were structural issues that still needed resolution. It then became apparent that there was no clear understanding between the client and the architect about who was going to pay the engineer for the follow-up work. I needed answers, but the client didn't want to pony up. And here's the rub: When the building department accepts engineered plans, primary decision-making about structural issues is out of the builder's hands. When a building inspector sees an engineer's stamp on the drawings, his ears prick up. The stamp means that the usual code criteria doesn't necessarily apply. This lets the inspector off the hook for code enforcement as long as he enforces the engineer's requirements. Woe unto the builder who says, "Well, there's nothing on the drawings about how to fasten this mezzanine ledger, so I'll just hang it like a regular deck ledger." If he does, the inspector may arrive at the framing inspection and say, "So where are the engineer's specs on that ledger?" If a description of the as-built assembly goes back to the PE for approval and he gives it a thumbs down, there will be a lot of work with a cat's paw—a risk no experienced builder wants to take.

Another painful incident on this project involved erroneous requirements. The written specs called for special high-grade bolts. Sourcing these was a major headache. I had to go to an industrial supply house, sift through their stock, and back-order the sizes they didn't have. The lead time for the back order held up the entire show. When I mentioned these difficulties to the engineer later, he expressed surprise. "You didn't need special bolts for this," he said. "But that's what your specs called for!" I replied, choking back the ire in my voice. "Oh, well, that was a mistake." I suppose an assistant in his office got a little careless with the cut-and-paste function. The takeaway: Question authority. If a specification seems onerous, it doesn't hurt for the builder to push back a little to make sure the resulting quest for an exotic product is truly warranted.

There is another pitfall that awaits any builder who labors under the auspices of an engineer—information overload. You might think, "Gee, this is great. The geek does all the thinking while I go along for the ride, upping my game in the process." Well, fasten your seatbelt, my friend. You are about to be inundated with a flash flood of tables, technical jargon, and unfamiliar specs that will make your head spin. And you need to understand every word of it—in a hurry.

I had a client who originally wanted a timber-frame home, but he grew tired of waiting on his architect. I ventured innocently that the wide-open interior spaces he desired could be achieved with engineered lumber. The client liked the idea, so the architect's preliminary drawings were sent to an engineer for a framing plan. Engineers love engineered lumber such as LVLs and I-joists because performance data is readily available with far fewer variables than solid wood. I had experience with most of the products the engineer specified, except one—a PSL post. Parallel strand lumber is a layered product, like OSB, that is produced in dimensions suitable for posts and beams. This job called for two 20-ft. PSL posts supporting a triple LVL ridge over a high-ceilinged foyer. The posts also carried girders for the second-floor joist system.

All of this had already been framed when late one night I was reviewing the manufacturer's technical data on my computer. I reached the bottom of the page, which I had read through many times, when my index finger must have rolled on the mouse and suddenly I realized there was another page that I had not read before. Curiously I scanned it to the bottom, where, in small type—almost like a footnote—was the brief admonition: All fasteners into the PSL posts must enter perpendicular to the chip layers, not between the layers. I hadn't given this the slightest thought! I suddenly saw disaster barreling toward me.

I did not sleep a wink that night. Waves of nausea rolled over me as I headed to the job in the cold light of dawn. The project was located far back in a mountain hollow, giving me plenty of time to weigh my options if the dice rolled the way I was sure they would. Bankruptcy surely wouldn't be that bad. Or I could escape to Mexico and start a new life.

Pulling up to the site, I flung the truck door open and clambered up a ladder to the first-floor deck. I peered frantically through the mist in search of fate's verdict written on the side of the nearest post. Would I see chunky chips or layered lines where the hangers were fastened? Wait—could it be? Yes! I was saved. Both posts were oriented the right way—no thanks to me.

Don't get me wrong. I have the utmost respect for the engineer and his knowledge. I have seen buildings fail, and it's not a pretty sight. But to survive in the jungle, it's a good idea to know who you're dealing with before you stick your head in the lion's mouth.

When a building inspector sees an engineer's stamp on the drawings, his ears prick up. The stamp means the usual code criteria doesn't necessarily apply.

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Scott McBride is a builder and writer in Virginia.

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CELEBRATING PASSION FOR BUILDING

A carpenter by trade, Scott Simpson has been building custom homes on the north shore of Chicago for 25 years. Unlike many builders, he followed no family footsteps into the industry—he's just driven by a love of craftsmanship. It wouldn't be until after pursuing a 4-year psychology degree at Loyola that he'd turn his attention to the trades as a profession. "I had my eyes on graduate school, but I just love carpentry," he says. "I still love it all these years later."

As Simpson built out his business, he experienced the dearth of skilled men and women to do the work he needed done in the way he and his clients expected it to be done. So he started a training program, originally conceived to feed talent into his business. It has since grown to be much more.

Revolution Workshop sits on the west side of Chicago and trains young adults ages 18 to 30 in the skills necessary to enter the construction workforce. Backed by a board of directors and supported by staff, the program is churning out students who not only have the knowledge for entry-level building careers, but who also leave fully kitted with the gear necessary to step onto a job site. Some of the students do end up working for Simpson's firm, now a design/build company. Others follow different paths into the trades.

What motivates a boots-on-the-ground carpenter and business owner to reach beyond the stressful challenges of running a construction firm to provide a community outreach and training program like Revolution Workshop? For Simpson, it simply comes down to a mantra he learned many years ago: "Become a man for others." He certainly builds better for it.

—Rob Yagid, executive director, Keep Craft Alive

"If one student ends up with a successful career in the trades, I'll be thrilled. I just know that they'll all be better and more motivated people for going through this program."

SCOTT SIMPSON
BUILDER AND FOUNDER OF REVOLUTION WORKSHOP
NORTHBROOK, ILL.

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