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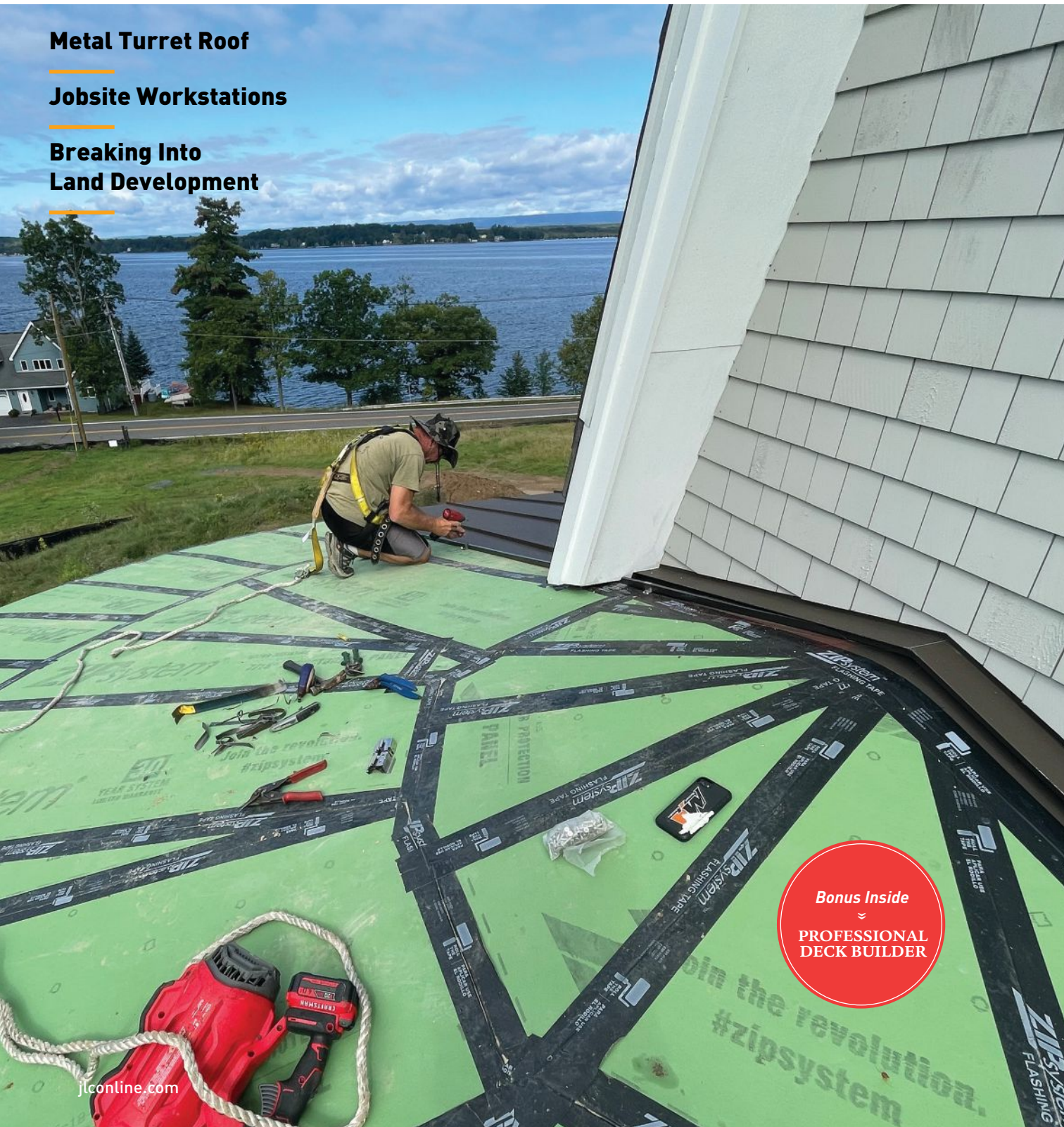

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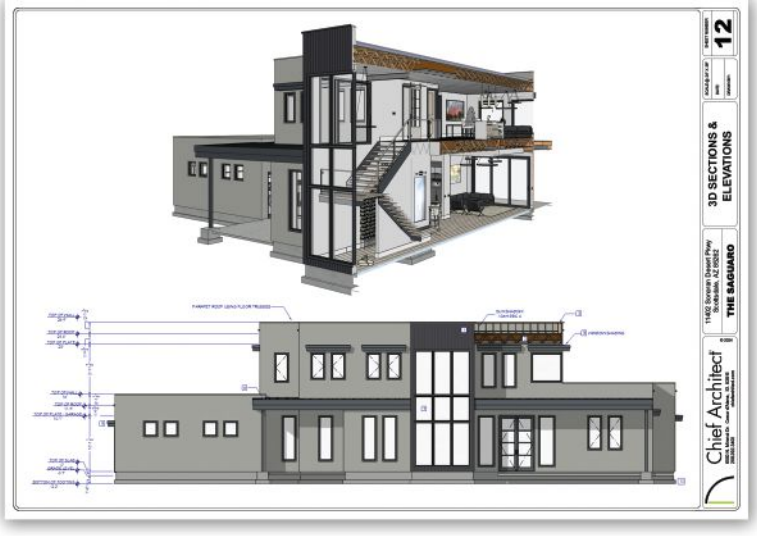

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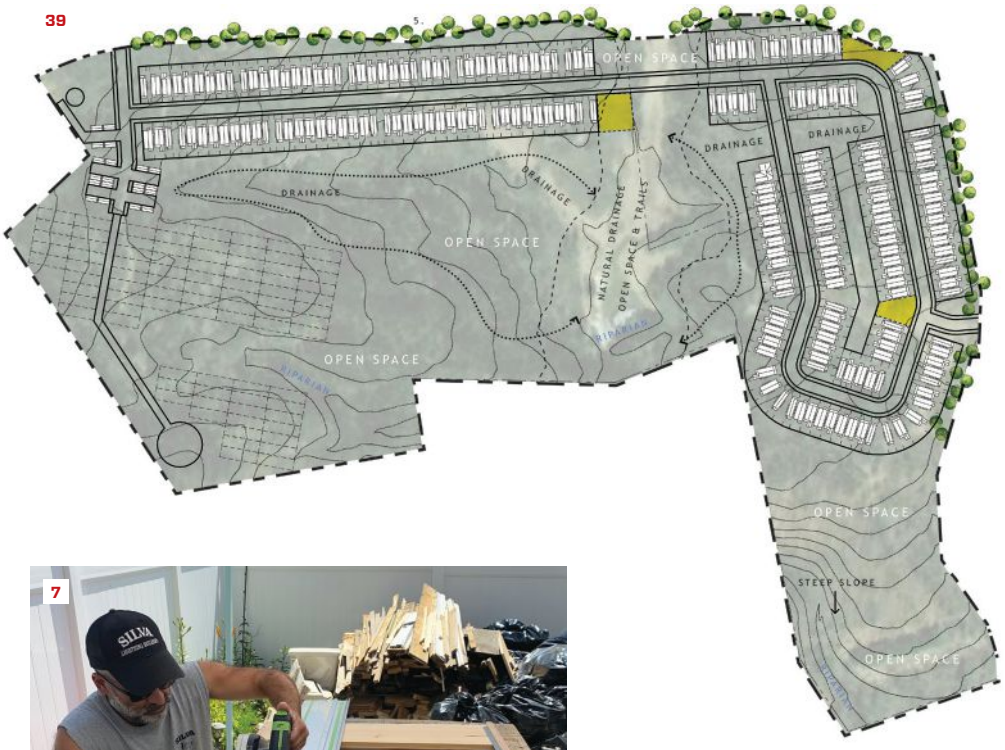
Contents



FEATURES

On the cover: A Squared Away Contracting team member installs one of the tapered standing-seam panels for a circular porch roof on a home near Saratoga Lake in New York. Photo by Tony Blue. See the story on page 27.

DEPARTMENTS

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Clayton DeKorne, Chief Editor, JLC Group, cdekorne@zondahome.com
Andrew Wormer, Executive Editor, JLC Group, awormer@zondahome.com
Laurie Elden, Managing Editor, lelden@zondahome.com
Vincent Salandro, Associate Editor, Products, vsalandro@zondahome.com

Carolyn Sewell, Design Director, csewell@zondahome.com
Alice Ashe, Art Director, aashe@zondahome.com

Contributing Editors: Jake Bruton, Mark Clement, Rob Corbo, Ted Cushman, Tim Healey, Dave Holbrook, Doug Horgan, Jake Lewandowski, Roe Osborn, Emanuel Silva, Gary Striegler, Nicole Tysvaer, Tim Uhler

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Downsizing a Pocket-Door Kit

BY EMANUEL SILVA

In a previous article, "Installing a Pocket Door" (May/23), I described the installation of one of Johnson Hardware's commercial-grade pocket-door kits, which are assembled on site. For a recent project, I chose to use a prefabricated pocket-door assembly—also from Johnson Hardware—for a couple of reasons, which I'll describe in a bit more detail below. But when it came time to pick up the door and the pocket-door assembly, it turned out the lumberyard didn't stock the assembly in a size that matched the door.

Solid-core door. I was replacing a standard hinged door with a 2-foot 2-inch solid-core birch door, the maximum size that would fit in the tight space available for it. Solid-core doors are heavy, which is why I like to use them with pocket-door hardware; the weight helps them to roll more smoothly on their track.

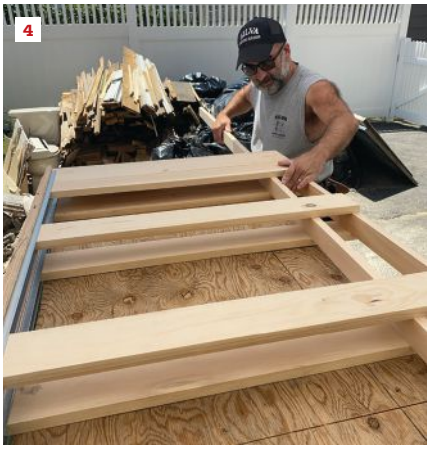
Johnson Hardware's 2710/2711 series of prefabricated pocket-door frames come in sizes to fit 24-, 28-, 30-, 32-, and 36-inch-wide doors. Even if the company offered a size to fit a 26-inch door, I would have had to order it and wait to have it delivered. But the lumberyard did have a 30-inch prefab unit in stock, which I could cut down to fit to keep the job moving, so I loaded it into my truck and brought it to the job. Trimming these units is relatively straightforward and, in this article, I'll describe how I did it.

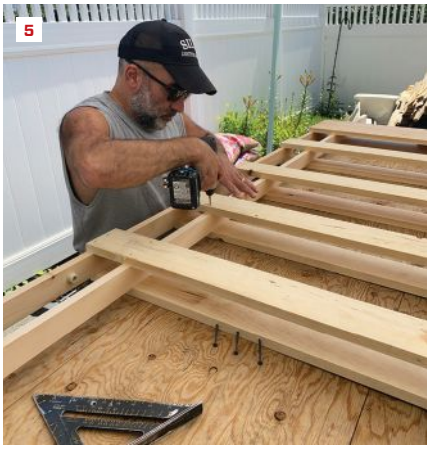
Trim to fit. Compared with Johnson's pocket-door kits, which come knocked down into easily transported boxes, the prefab units are bulky. The 30-inch unit I bought actually measured 61 3/4 inches wide by 84 1/2 inches tall and, while it wasn't particularly heavy, maneuvering it into the cramped area where it would be installed was tricky. But compared with the kits, the prefab units feel a lot sturdier, with horizontal blocking and metal split jambs that are reinforced with plywood rippings, which make the jambs more rigid and less likely to bow. And, when I don't have to modify the frame to make it smaller, installation of a prefab unit is a lot quicker than assembling a kit on site.

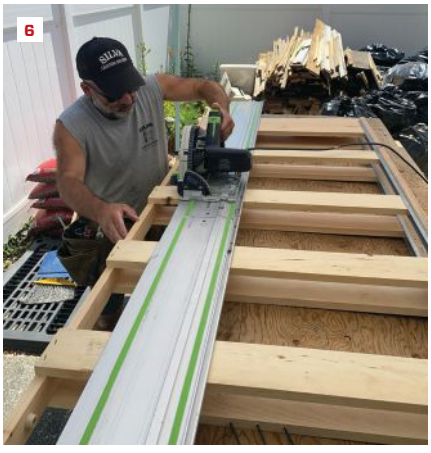
To fit the unit in the rough opening, I

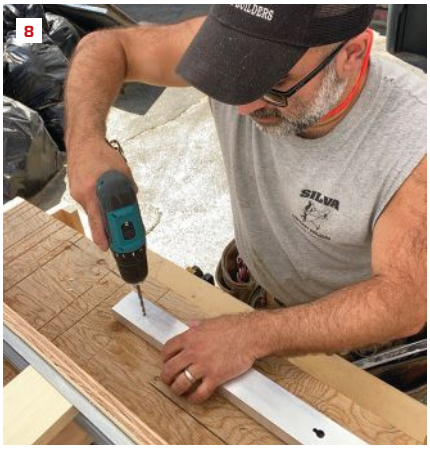
Photos by Emanuel Silva

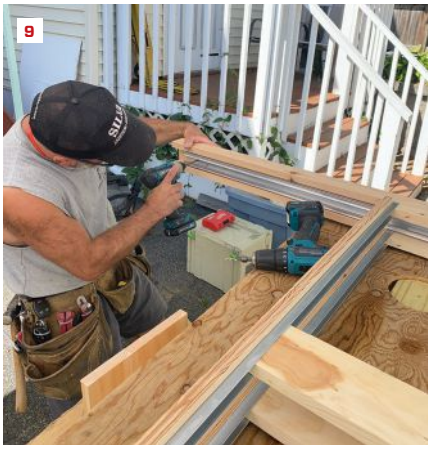
The fully assembled Johnson Hardware 30-inch pocket-door unit was ready to install in the rough opening … except for one problem: It was 8 inches too wide **(1)**. To trim it to fit, the author started by unscrewing the aluminum track from the door header **(2)** and marking the new width required for a 26-inch door on the header **(3)**.











After ripping a 1x4 to width to match the pocket-door unit's existing jamb, the author inserted the ripping into the frame **(4)** and oriented it on the layout marks on the header and the horizontal blocking. Next, he screwed the frame to the new jamb **(5)**, which he then used to guide the placement of the track saw as he trimmed the frame to size **(6)**. After flipping the unit over and completing the cut on the other side, he cut 8 inches off the aluminum track **(7)**, drilled a new fastener hole in the track **(8)**, and remounted it to the header. He used the track's new length as a guide when marking and cutting the header to length **(9)**.

needed to trim the total width by 8 inches, so that it would measure 53 3/4 inches wide. After unscrewing the aluminum track from the header, I ripped a 1x4 to the same dimension as the existing jamb on the framed pocket, on the side of the unit that gets buried in the wall. Next, I measured and marked the new jamb location on the framed pocket so that its width would be 4 inches less, or sized for a 26-inch rather than 30-inch door. Then I slipped the new jamb into the frame, leaving the existing jamb intact for the time being.

With the top of the new jamb aligned with my layout mark, I drove a GRK structural screw through the header assembly and into the jamb. I continued to fasten the jamb to the horizontal blocking with more screws, checking with a tape measure as I went that the old and new jambs were parallel to each other.

Once the new jamb was secured to the pocket-door frame, I used a track saw to trim the unit to the new width, aligning the track with the edge of the jamb. After I'd cut the box frame on one side, I flipped the unit over and completed the cut on the other side, separating the old jamb and short horizontal blocking offcuts from the original unit.

Next, I trimmed the aluminum track to length using a cordless DeWalt 4 1/2-inch trim saw equipped with a regular carbide-tooth blade. Before refastening the track to the header, I needed to drill a new fastener hole in the track, to replace the one that was removed when I shortened the track. I also had to remove the rubber end bumper from the old jamb and

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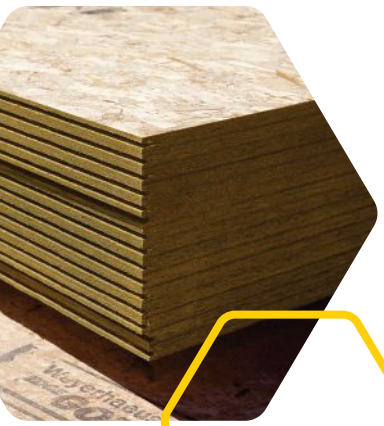

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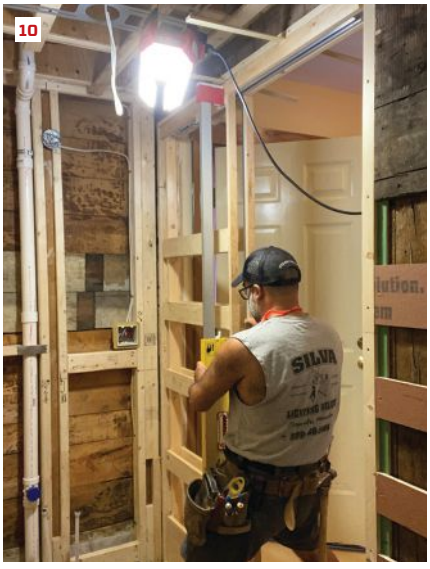
10


11


12


13


14

The author used shims to make sure the track would be perfectly level when he screwed it to the rough opening **(10)**, and he carefully checked that the jambs were square to the header and plumb before screwing the frame to the floor **(11)**. He primed and painted all four edges of the door before installing the mounting hardware and hanging the door from the track **(12)**. After installing the strike jamb and the drywall, the author used 18-gauge brads to fasten the trim to the split jamb **(13)**. For perfect miter joints, he preassembled the door casings and installed them as units **(14)**.

remount it in the corresponding position on the new jamb. To complete the resizing operation, I also trimmed 4 inches from the end of the header.

Installation. Once I had managed to maneuver the unit into the rough opening, it took only a few minutes to install. First, I screwed the header assembly to the rough-opening header, using shims to make sure the track was perfectly straight and level. Then I made sure the box frame was plumb and perfectly square to the header before screwing through the jamb into the wall framing, using shims as necessary to keep the jamb straight.

Before mounting the hanger hardware on the door, I primed and painted all four edges. Then I hung the door from the rollers, using the supplied offset wrench to fine-tune the door so that it was perfectly parallel with the strike jamb.

When the door opening needs to be trimmed, the manufacturer recommends using screws on the hanger lock side of the split header trim, so that the trim can easily be removed at a future date if necessary. But I don't like the look of screw heads on trim work, even when they're dressed up with decorative washers. Instead, I used an 18-gauge brad nailer to fasten the trim in place. A pocket door doesn't need to be removed very often and, if it does, it's easy enough to pry off trim that has been nailed in place with 18-gauge brads.

Emanuel Silva, a JLC contributing editor, owns Silva Lightning Builders in North Andover, Mass. He can be reached at silvalightningbuilders@gmail.com.

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Cutting Corners

BY THOMAS DUGAN

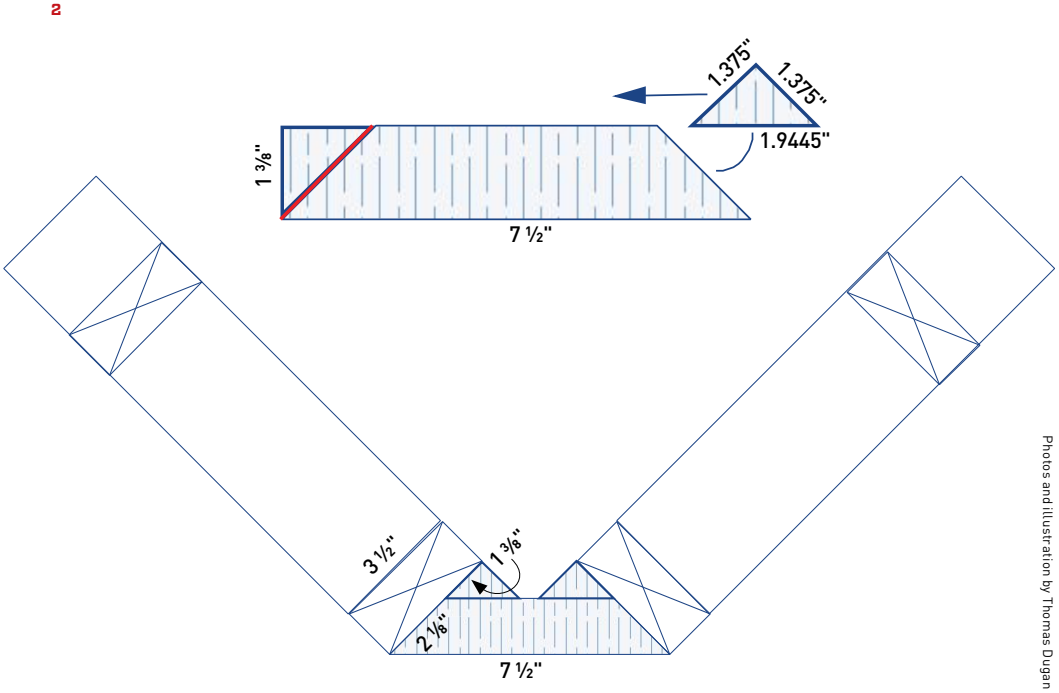
For years, I've been thinking that there had to be a better way to "clip" the outside corner where two walls meet at a right angle so that the drywall wouldn't incur as much damage from things banging into it. While products such as plastic corner caps are available to provide protection, these 90-degree corners are not attractive architecturally—to my eye, anyway—and appear harsh and intrusive. I also think that they hinder the smooth flow of traffic.

The standard way to create a clipped outside corner with 2x4 framing is to rip 45-degree bevels along the outside edges of the end studs, then fill in the gap with a "mini-wall." But this method involves a lot of extra studs and cuts and makes the angled corner clumsily intrude on the inside corner of the adjacent space.

My simple, one-board, two-cuts solution creates an attractive outside clipped corner while preserving the 90-degree corner on the inside. I do this by making two 45-degree rips along the edges of a single 2x8, then attaching the rips to the narrower face of the 2x8, as shown below. With the rippings oriented toward the inside of the corner, this one-stud assembly can be used to replace typical two- or three-stud corners.

These bevel cuts are easy to make using either a circular saw or a 10-inch table saw, with a helper or other support to catch the rippings. The only trick to sizing the rippings correctly is to make sure that the

To frame a clipped 45-degree outside corner while preserving a standard 90-degree inside corner where 2x4 stud walls meet at right angles, the author rips both sides of a 2x8 at a 45 degree angle **(1)** to the dimensions shown in the drawing **(2)**. Then the triangular-shaped rippings are nailed to the 2x8 to make the corner stud assembly **(3)**, which he uses to replace the studs where the walls meet.



Photos and illustration by Thomas Dugan

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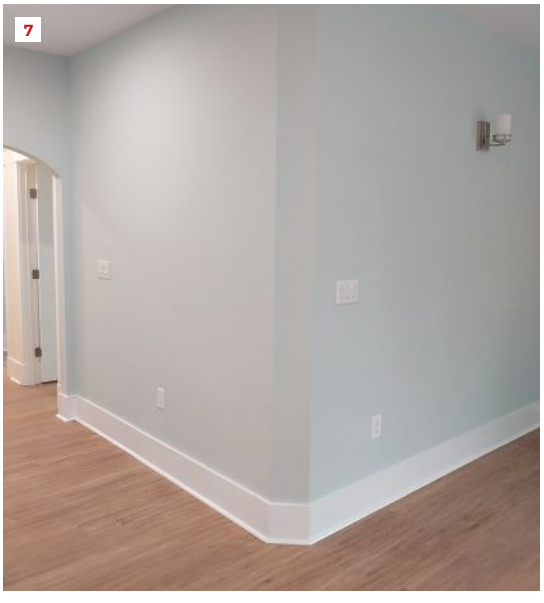
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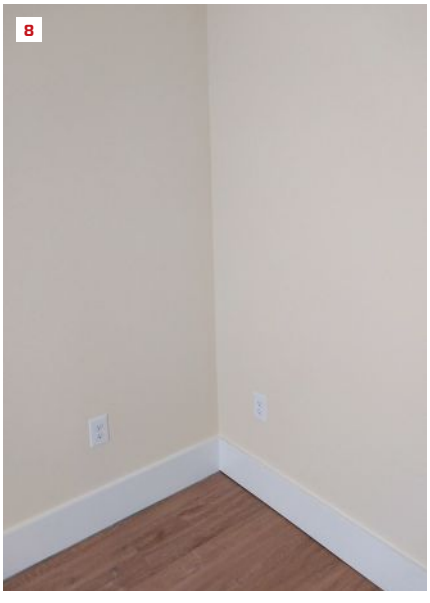
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Once the walls are framed and the corner stud assembly has been installed, the top and bottom plates can be clipped to match with a reciprocating saw, flush cutter, or multi-tool **(4)**. After hanging the drywall, workers trim the corner with a pair of splayed adjustable plastic corner beads and then mud the joints **(5, 6)**. The clipped outside corner adds a subtle architectural element to a room or hallway **(7)** without involving complicated framing or changing the look of the inside corner **(8)**.

kerfs run right down the middle of the edges of the 2x8. You are looking for slightly less than a 2-inch hypotenuse on the miter cut (see drawing, previous page).

This detail requires that the wide corner stud merge with the two adjoining 2x4 walls, but there's no real trick to laying it out. The top and bottom plates are run like a normal 90-degree corner, and once the new corner is installed, you simply cut the exposed points off with a reciprocating saw or flush cutter.

When it's time to tape the drywall, plastic corner bead that opens up for the 135-degree angles is used to finish the outside corners. It's a simple detail, but I've found that everyone who's seen this architectural feature—including other builders—really likes it.

Thomas Dugan is a semi-retired general contractor in coastal North Carolina who specialized in building hurricane-resistant homes.

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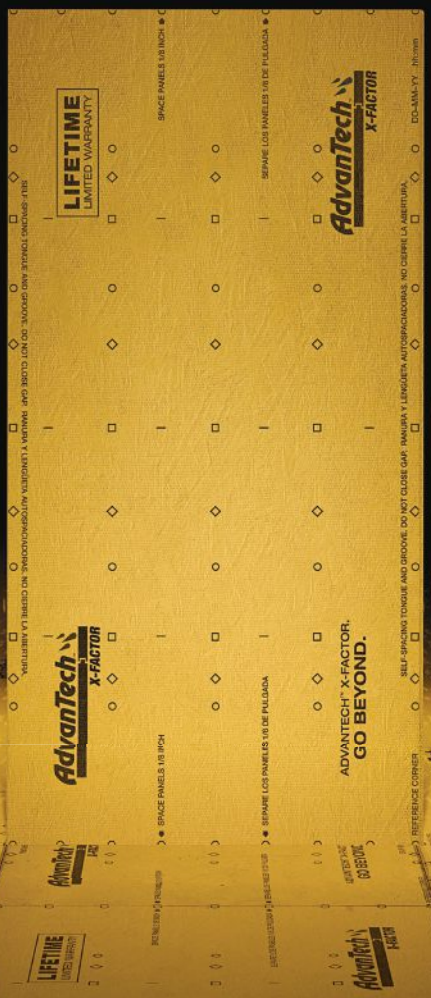

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BY JASON S. BISCHOFF

Avoiding Costly Structural Repairs

In my role as a project manager for a national structural engineering firm that specializes in residential design, I have the opportunity to learn about thousands of construction errors on a regular basis. Our firm has more than 65 engineers on staff working on projects across the U.S., and we are regularly tasked with providing quick turnaround retrofits to resolve construction errors to keep projects moving forward. From this well of experience, we've compiled a short list of the common construction errors with the most impactful retrofit requirements, along with some recommended preventative measures. Most of the situations described here can be avoided with oversight and awareness but are likely to balloon into major problems when overlooked. In most cases, the longer a construction error goes unaddressed, the more expensive it becomes to correct.

OUT-OF-SQUARE FOOTINGS AND FOUNDATIONS

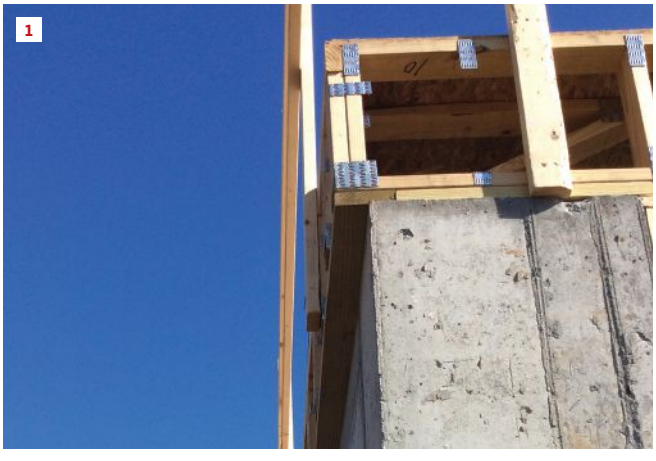
The need to keep footings and foundations square should be obvious, right? Still, nothing will stop a job quicker than finding out the foundation wall forms are overhanging the edge of the footing or the sill plates are overhanging the foundation walls. When these problems occur, it is worth pausing and reaching out to a design professional for direction on how to compensate. In some cases, the solution may be as simple as fastening a ledger to the side of the foundation to provide support for an overhanging sill plate. But in more drastic instances, more extensive or creative modifications to the foundations may be required. Depending on the scenario, it could be a much more difficult repair after the walls have been poured and even worse once the framing is installed.

Prevention: Measure twice, pour once. Make sure all measurements are checked prior to pouring. We recommend having an established process that clarifies whether the builder or the foundation contractor is accountable for verifying all dimensions prior to pouring the walls and footings and before any framing is set. Preferably, this is defined in writing in the subcontractor agreement.

OUT-OF-LEVEL FOUNDATIONS

A foundation that's not level shouldn't be much of an problem if it's caught early. In an ideal situation, the framers install their sill plates as level as possible, shimming where necessary and checking level as subsequent levels are framed. It is imperative to check for level across all bearing points of a foundation. For example, if exterior wood-framed walls are bearing on a perimeter stem wall determined to be level, but the interior bearing walls are supported on a slab that is too high or too low, that is a recipe for major retrofits to those framed walls if not addressed early.

Prevention: Builders and their subcontractors need to ensure they are building from a level baseline, across all bearing points of the structure. A datum point should be established at one of the structural bearing points, and a laser or builder's level should be



Photos by Mulhern + Kulp Structural Engineering

Measure twice, pour once. Solutions for a mis-poured foundation **(1)** will vary, but the sooner the mistake is identified, the greater the range of options will be to fix it. **Check allowable loads.** Manufactured pipe columns each have their own rated load-carrying capacity listed on the label. In this example, the center column of numbers shows the allowable loads **(2)**.

Check for level at every level. An out-of-level floor has telegraphed all the way to the top wall plates, resulting in roof trusses that have no bearing.

used to verify that the rest of the structural bearing points are at the same elevation as the datum point.

INCORRECT STEEL PIPE COLUMNS

Not all pipe columns are created equal (in the literal sense). For typical adjustable steel pipe columns, each manufacturer has its own rated load-carrying capacity. Many manufacturers require screw jacks to be embedded in the concrete, while others may have varying capacities for when the screw jack is not embedded. All column capacities will vary with the height of the column—so the column will have less capacity in a 9-foot basement versus an 8-foot basement. A good set of structural plans will provide thorough column specifications or provide column design loads to enable the correct column to be selected.

Prevention: First, ensure that the full specifications include the size and type of column and that the rated capacity of the columns is stated on the construction documents. Second, make sure your firm sources the appropriate column called out in the specifications that achieves that rated capacity. Third, verify that the installers are aware of the installation requirements (for example, they know whether the screw-jack assembly needs to be encased in concrete, know which end is designated as "top," and so forth) and are clear on where each column is to be placed. This is especially important when columns with differing load capacities are specified for the same house.

OUT-OF-LEVEL WALL TOP PLATES

Wall top plates that aren't level often go hand-in-hand with out-of-level foundations. Experienced framers will ensure they are building from a level foundation—and they also will check for level at each framing level. Modern construction practices often rely on precut studs or prefabricated wall panels to increase the speed of production. If these components are not checked as they are installed, an out-of-level floor condition can go unnoticed until an "easy" fix is no longer viable.

Prevention: It's good practice for builders and subcontractors to check for level at each floor. Also, they should make no assumptions about installing prefabricated components—everything should be measured and verified as the components are installed at each level.

BALLOON-FRAMED WALL CONSTRUCTION

As of the 2021 IRC, the code provides specifications for wood-frame load-bearing stud walls up to 12 feet tall. Any walls that are taller than 12 feet are required to be engineered to resist both gravity and wind loading. A stacked wall is not adequate to resist wind forces against the face of the wall—the studs need to be continuous over the full height of the wall. The balloon-framed construction information should be provided on the construction documents and,

Weak hinge. A stacked gable end wall in a vaulted ceiling creates a "hinge" point in the wall that may provide inadequate resistance to wind loads. To avoid this condition, tall walls should be balloon framed.

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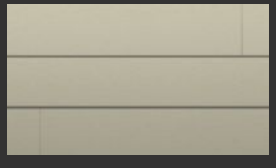

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depending on conditions, may be designed in a variety of ways. Make sure framers are aware of the design intent—that they know why they are being asked to build in a specific way. We feel that having the framers understand the design is the best way to ensure that the final construction matches the design provided in the construction documents. This also makes sure it happens at the beginning of framing, as retrofits can be especially tricky after the exterior wall sheathing has been applied or windows and doors have been installed.

Prevention: We always recommend that builders go through the plans with the framers to review and understand how balloon-framed walls are intended to be framed. If there are any questions about the design, the builder should reach out to the building designer for clarification. This is especially important for tall walls with multiple openings, like a great-room window wall where additional king studs are required.

SUPPLIER SUBSTITUTIONS

Unapproved supplier substitutions have become increasingly prevalent in recent years with the supply-chain issues that have plagued our industry. Builders and their suppliers will often make substitutions on the fly to maintain schedules. All material substitutions should be verified with the design professionals—but the reality is that doesn't always happen. We are often questioned about substitutions well in advance of construction—but there are still many cases where a material substitution is caught only after it has been installed. This can lead to costly structural repairs if the material or product used as a substitute for what was specified was not adequate.

Prevention: An experienced builder knows that any structural material substitutions need to be verified by the design professionals. It is not the supplier's responsibility to select an "equivalent" material or product—it is up to the professional who prepared the construction plans to make that determination. And while builders may have good reasons for pushing ahead to get the job done, they may not always be aware of the many factors that the engineers consider when integrating materials into a structural design. It's well worth a little extra time to ask the designer for clarification when you need to make a substitution.

SHEAR WALL/BRACED WALL CONSTRUCTION

Bracing walls is an especially important aspect of wood frame construction that can be easily overlooked. The shear-wall construction is especially important in regions with high wind speeds and/or high seismic activity, but it should not be overlooked in areas with low wind speeds, either. It is especially important to understand given the shift in code requirements over the past 10 to 15 years. When designing for even low-wind-speed regions, engineers are required to detail and specify proper load paths for both lateral and uplift loads.

Prevention: Knowledge is power. We recommend builders review the plans prior to construction so they are aware of these requirements and ensure that the framers understand and follow all notes, details, and specifications. Shear wall engineering and

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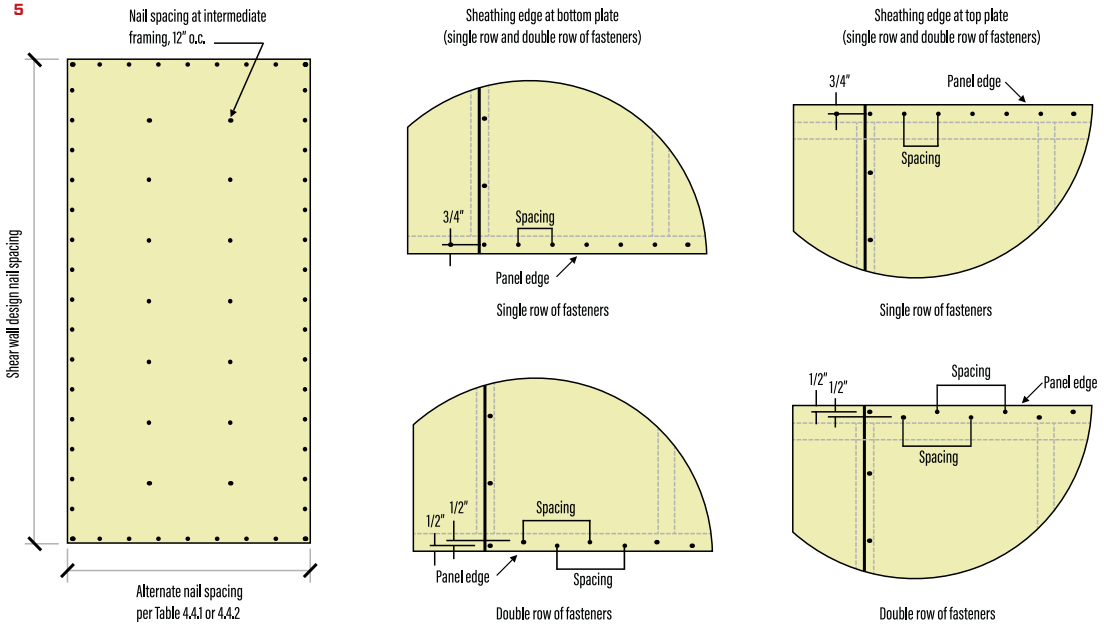

Nailing is critical to an effective shear wall. This illustration shows nailing specifications from the ANSI/AWC 2021 edition of *Special Design Provisions for Wind and Seismic*.

Illustration adapted from ANSI/AWC 2021 *Special Design Provisions for Wind and Seismic*.

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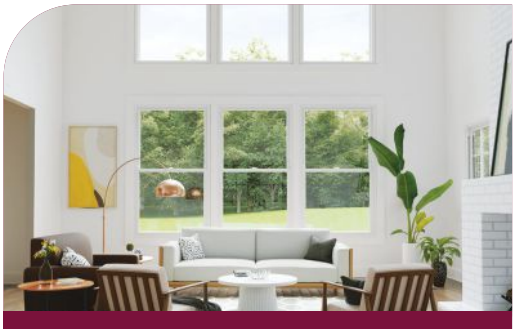

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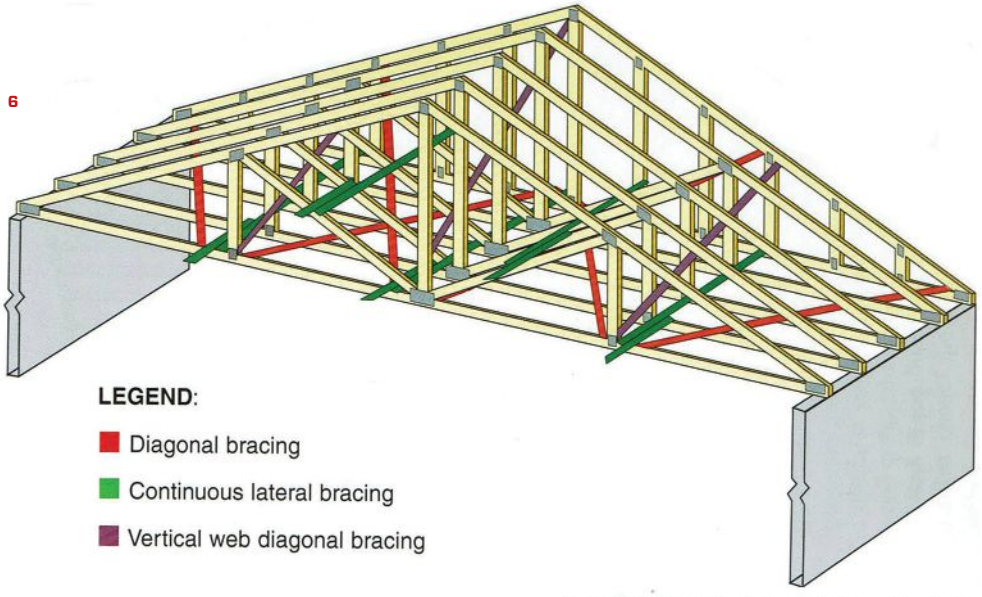

Note: Top chord sheathing not shown for clarity.

Permanent bracing is critical to the structural integrity of a trussed roof assembly. The truss manufacturer and building designer are responsible for providing the bracing requirements, while the builder is responsible for installing the bracing correctly.

detailing is an easily misunderstood aspect of construction. When in doubt, ask for more clarification from the engineer prior to moving forward when possible. Based on feedback from builders, we've found that providing graphic details that depict a condition—in lieu of written descriptions on the structural plans or within the structural notes—is often the best way to help field personnel understand the design.

INCORRECT ROOF TRUSS BRACING

Roof truss bracing is commonly installed incorrectly on the projects that we inspect or review, even when it's clearly detailed on the structural plans and truss shop drawings. This is largely due to the complexity of the bracing requirements and the fact that those requirements come from multiple sources. The truss manufacturer is responsible for providing the bracing requirements for individual truss members. This is the most easily recognized portion of the bracing that is shown on the truss shop drawings. However, there is another level of bracing that is required, known as the "Permanent Restraint or Roof Truss System Bracing." This bracing is specified in the BCSI (*Building Component Safety Information*) manual under Chapter B3 and may also be provided on the construction documents. The silver lining here is that most truss bracing is easily modified or retrofitted. In most cases, truss bracing is easily added, but it's easier if it can be added during the construction phase.

Prevention: A builder's construction team working with roof trusses should have access to and familiarity with Chapter B3 of the BCSI. In those 15 or so pages, diagrams and graphics are provided to help present the material. It is also important that builders understand that they are responsible for installing the bracing correctly, even if the building officials don't see it or properly enforce it. Our firm has been involved in multiple situations where improperly installed and/or missing truss bracing wasn't caught until a homeowner's third-party inspector went through the house. It is much easier to complete the truss bracing correctly during construction than it is to disclose to a homeowner (or whole community of homeowners) that a critical structural component was never installed.

Ultimately, reviewing the plans, details, and other construction documents with the various trades prior to starting a project and providing adequate oversight will pay dividends in avoiding costly errors and time-consuming delays. If something in the construction documents is unclear, seek out the design professionals. It is in everyone's best interest to clarify design intent before starting or continuing with any project. Also, builders can empower their trades to think of the project as a team effort and point out issues and deficiencies as soon as they are identified. This investment in coordination will help reduce mistakes before construction progresses too far, avoiding repairs that become much more costly down the line. The number of requests for added clarification (or RFIs) that our firm receives is far lower than the number of (often costly) structural repairs we prepare for common construction errors. Customer service is an integral part of our firm's operations, so we actively encourage questions and feedback from our customers to ensure they are receiving constructable and cost-efficient designs.

Jason S. Bischoff, P.E., is project manager at Mulhern & Kulp Structural Engineering, a national structural engineering firm specializing in residential design based in Ambler, Pa.

Courtesy *Building Component Safety Information* manual (2006)

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Standing Seam for a Circular Turret

Prefalz aluminum coil stock bends like copper and comes in multiple colors

BY TONY BLUE

While on a layover at Chicago's Midway airport, I pulled my phone out to check my work email. A homebuilder we work with had sent me a set of drawings for an upcoming custom home overlooking Saratoga Lake in upstate New York, so I pulled out my iPad for a better look: multiple metal roofs, a concave cupola, a swooped entry, one large radius turret. "Sweet," I thought. Custom standing-seam projects are the type of work my guys specialize in. Then I read back through the email—hold up, they want a dark bronze-colored steel roof, not copper? Dang it; with that much custom and curve work, it's far preferable to use a more malleable metal like copper.

At the time, I was on my way home from attending the International Roofing Expo in Dallas, where I had chatted with representatives of Wuko, a roofing-tool company from Austria, about a unique aluminum sheet-metal product it offers called Prefa Prefalz.

What makes Prefalz unique is that it shapes and folds more easily than domestic aluminum or steel sheet metal, almost like it's softer. Prefalz also has a durable, gritty-textured coating that does not scratch easily. After carefully examining the Prefalz panels and talking to the Wuko crew (some of whom are skilled metal roofers), I was determined to find a job for this product.

While waiting for my next flight, I called the project manager and told him I had a product I wanted to try on his job. The catch? Since it was a special order from Austria, I didn't know how long it would take to get it. About two weeks later, I had a sample approved and the product—Prefalz in brown coil—ordered. I would have the material in just three to four weeks.

TURRET PAN LAYOUT

As much as this product worked out great for the various types of curved and flat roofs on this project, for this article I'm going to

Photos by Tony Blue

Prefalz painted aluminum coil stock comes in 500mm and 650mm widths **(1)**. Here, the author demonstrates how he uses his shrinker/stretcher tool to bend metal to a radius **(2)**, a step that was needed to form the drip edge to match the curved eaves of the turret. First, though, a metal brake was used to slit a 10-foot length of 650mm coil stock to 3 1/4-inch widths with 1-inch legs on each section, followed by shrinking/stretching guided by lines scribed to Ram Board to represent the curved eaves. Then metal benders were used to form the 3/8-inch roll hem for the kickout on the bottom leg **(3, 4)**.

break down the turret installation. The first thing we did was snap chalk lines on the roof deck for the pie-shaped pans, enabling us to visualize the layout and determine quantities. This is a small step that can help eliminate a costly math error.

On this turret, each standing-seam pan would measure 20 1/4 inches across the bottom eaves edge and taper to zero at the top point. Another way to think of the pan layout is as a series of isosceles triangles with a base of 20 1/4 inches and a height of 224 5/8 inches.

Prefa is a European company, so the aluminum coils we used came in 650mm, or 25 3/5-inch, widths (500mm widths are also available) **(1)**. After sending the material through a standing-seam-roof-panel machine to form 1-inch mechanical lock standing seams, we would be left with a 22 3/5-inch-wide panel. Choosing 20 1/4 inches for the widest point of our pie pans would leave us with extra material for another set of seams. Our plan was to get two pie pans out of one flat sheet, to minimize waste.

DRIP EDGE

On site, we traced the roof edge to a piece of Ram Board so that we could match the curve when fabricating the drip edge back in the

Workers ran a 228-inch-long section of coil stock through a standing-seam-roof-panel machine to form a female leg along one edge, then snapped a diagonal line on the pan following layout lines that they had already snapped on the floor **(5)**. Next, they flipped the section around and formed another female leg along the other edge **(6)**. When cut diagonally, each section will yield two pie-shaped pans **(7)**.

shop. There, I mocked up a 3 1/4-inch-by-10-foot piece of drip edge to be sure it would work before making the rest. My guys then took 10-foot sections and slit the necessary stretch-out (a term for the width of metal needed) and started forming the radius drip edge.

This process starts with bending each 3 1/4-inch-wide piece to 90 degrees on the shop brake, with a 1-inch leg and a 2 1/4-inch leg. We then used a step shrinker/stretcher tool, which squeezes its jaws to either shrink (pull together) or stretch (pull apart) the section of metal that's in the jaws, with a worker stepping on the pedal to form a curve. In our case, we stretched the 1-inch leg **(2)**. This is a tedious task, but gradually the metal begins showing its curved form.

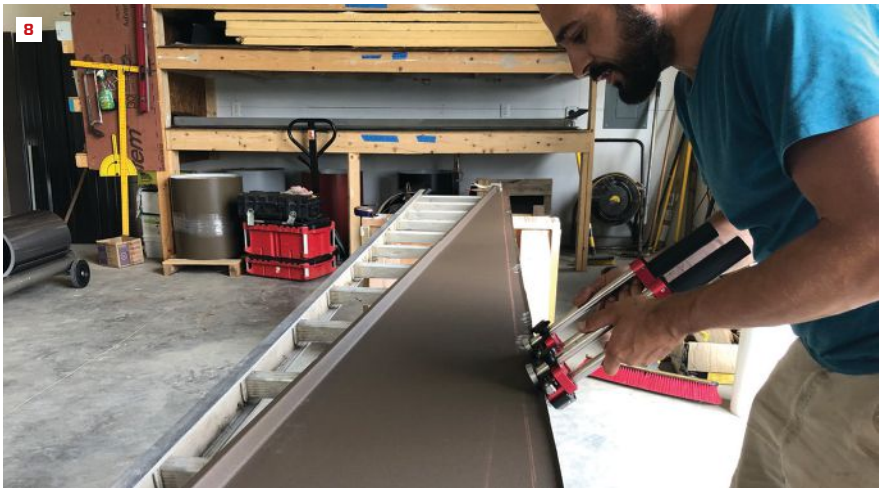
After the curved drip edge conformed to the layout on our template, we finished by forming the 3/8-inch hem for the kickout on the bottom leg with a set of roller benders **(3)**. Unlike drip edge for a shingle roof, we don't need the leg that runs back onto the roof but, instead, hold the drip edge in place with cleats. The standing-seam pan's eaves edge is hemmed onto this, locking it all together **(4)**.

PIE-SHAPED PANS

The next step was to make the pie pans. Over the years, I've learned from my mistakes, which often cost me a lot of money, sometimes taking months or a year to recoup. To alleviate risks, I've learned to "soft start" projects whenever possible to avoid turning a small mistake into a big one. What I explain next is an example of a soft start.

To be sure that our plan to cut two pans out of one section would work, we snapped lines on the shop floor to represent one of the standing-seam pans in full-scale. With these lines as a guide, we then made a test pan before moving forward.

To do this, we cut a 228-inch-long section from the coil and sent it through a standing-seam-roof-panel machine, forming only the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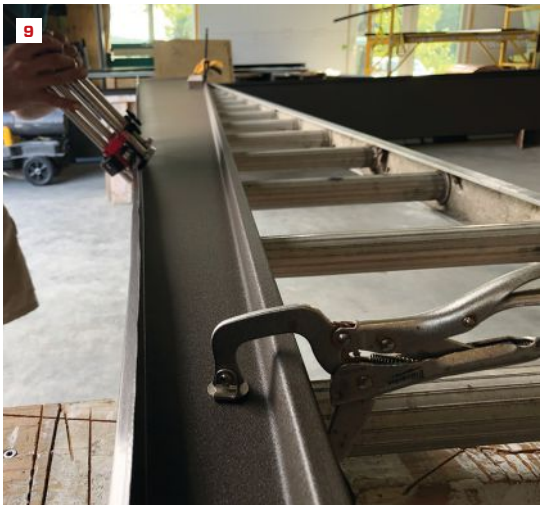
After one of the sections with two female legs had been slit into two pie-shaped pieces, a worker used a roll bender to hand-form first the 1-inch vertical leg **(8)**, and then the 3/8-inch horizontal leg **(9)** for the male leg on each tapered panel. In addition to the 34 tapered panels, several full-width standing-seam panels would also be needed to complete the porch roof **(10)**.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female leg of the pan and leaving the other side flat. Then we flipped the section around and sent all 228 inches back through, forming a female leg on the other side **(5)**. We then cut the section in half lengthwise at a long angle to make two pie-shaped pans and hand-formed the male leg on the other side of one of the pans **(6, 7)**.

Fabricating only this first pan and checking it against our full-scale sketch on the floor of the shop turned out to be a good idea, because we discovered the pan wasn't long enough. To account for the angle being cut at the eaves (and therefore some additional waste), we had to add 6 inches to the length of each pan, or 12 inches total to each section for two pans.

Once we were dialed in, we shifted into production mode to fabricate the 34 tapered panels we would need. While the machine formed the female legs, the guys used roll benders to hand-form the male legs, first forming the 1-inch-vertical **(8)** and then the 3/8-inch-horizontal legs **(9)**. It's one of those tasks that may seem mundane, but being in the shop with the radio on and the fan going isn't too bad during a hot summer day **(10)**.

INSTALLATION

We transported everything to the site in a trailer, and the fruits of our labor were sweet. The drip edge fit like it should, though had it needed some tweaking, we have a hand-held shrinker/stretcher that we can use on site **(11)**.

Workers used Prefalz coil stock to fabricate cleats to hold the drip edge in place along the eaves **(11)**, as well as the kickout flashings where the porch roof meets the wall and the wall flashings installed before siding **(12)**. Pan installation began where the flat section of the porch shed roof ended **(13)**. As the panels were installed, workers used a small set of roll benders to create the radius hem, then hand tongs to complete the joint **(14)**. Shown here is the completed turret roof **(15)**.

We started the pan layout from the straight sections on the front-porch shed roof and ended at the wall in the back. When installing standing-seam panels, we screw down clips over the male leg of the panel approximately every 24 inches **(12)**. The female leg of the next pan goes over the top and is double locked (the metal is folded over two times), creating a strong, watertight connection **(13)**. We do this with a combination of a hand seamer and a cordless-drill-powered seaming tool that drives up the seam and rolls it over twice.

To hem the eaves edge of the pan onto the drip edge, we used a small set of the same roll benders we used while fabricating the radius drip edge. Then we closed the hem off the rest of the way with a set of hand tongs **(14)**.

We purposely made fewer pans than we needed, knowing that we might need to adjust the last few panels if the final one was not exactly parallel with the wall (and it wasn't). We were able to fabricate the last couple of pans on site to cheat that and straighten out the sight lines, which are important with metal work. A pan that's a few inches different in width from top to bottom where it meets a wall would be noticeable.

In the end, I found that the Prefalz material was well-suited for the porch turret and the other curved work on this project. At about two-thirds the cost of copper with similar workability, this is a great option for clients who are looking for a metal standing-seam roof with a consistent color and textured finish **(15)**.

Tony Blue owns @SquaredAwayContracting in Greenwich, N.Y. He is a general contractor and also specializes in standing-seam and custom sheet-metal work.

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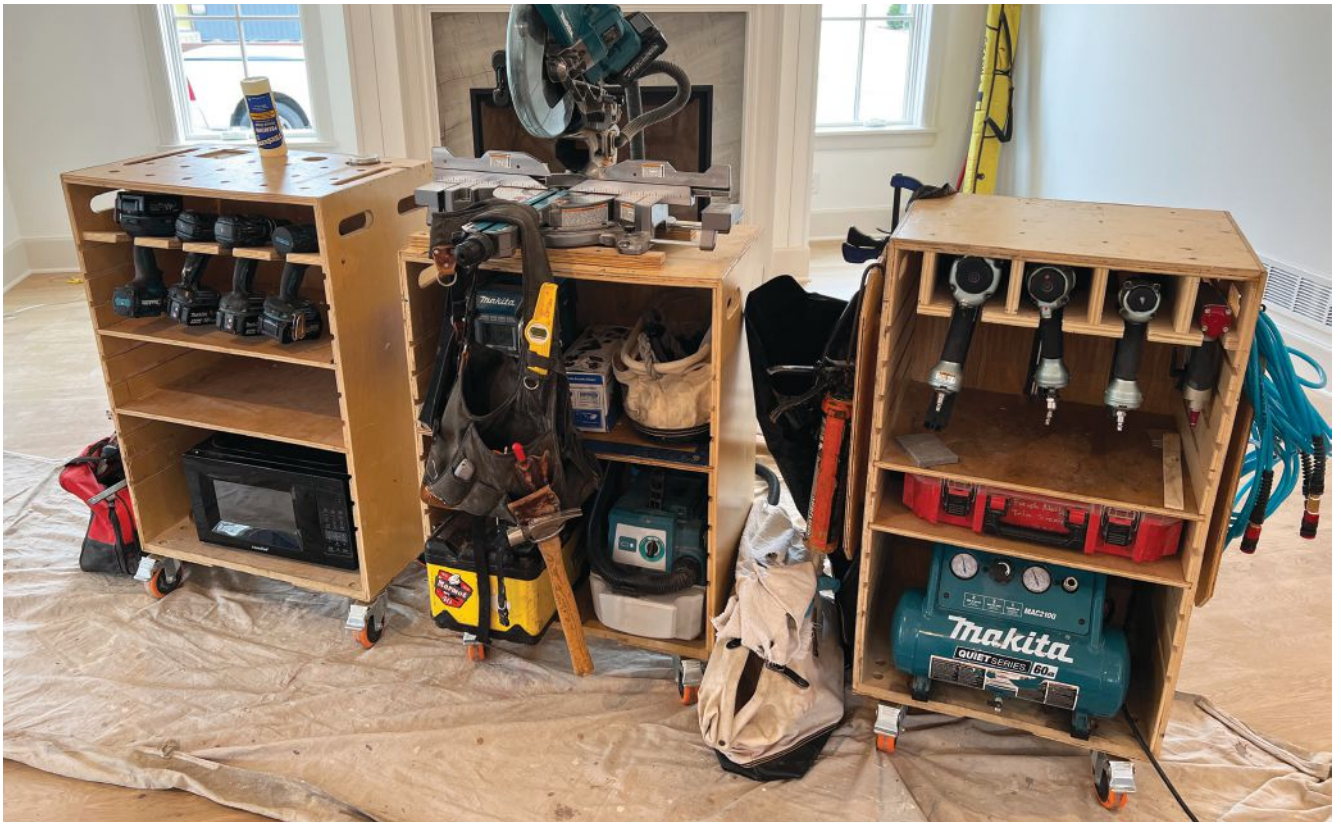


Jobsite Workstations

An idea book for setting up a well-appointed workshop on the jobsite

BY BRIAN CAMPBELL

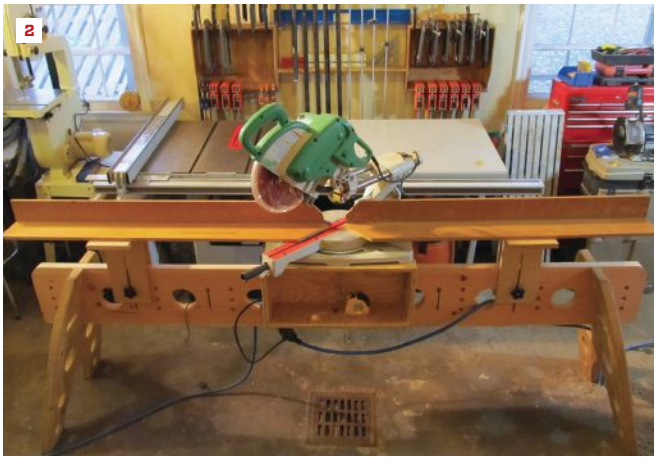
For as long as I've been a carpenter—some 30 years now—there have been two starkly different approaches to setting up a jobsite: One is the "get 'er done" style, and the other is the "gentlemanly" style. In the first approach, the carpenters want to get in and get out, and their setup is makeshift—a table saw and chop saw plunked down on a driveway or a floor—and they just "deal with it." Of course, there are always going to be jobs in which you are doing such a small task that it warrants setting a tool on the ground for one or two cuts. You don't need to spend half an hour setting up for a job that takes 10 minutes.

For most jobs that last a full day or more, however, I have always preferred the second approach: to bring the civilization, so to speak, of a well-appointed workshop to the jobsite so I don't have to crawl around on the ground to make my cuts. "Work like a gentleman," I would joke with others but only half in jest. Toward this more gentlemanly approach, I'm constantly adapting my on-site shop setup to make my day run as smoothly and stress-free as possible. I think this quest to remain organized and efficient on the jobsite lends itself to efficiently producing clean work.

Photos by Brian Campbell

SAW STATION

My first foray into making a jobsite workstation came soon after I got my first miter saw and before miter saw stands were commercially available. This first stand **(1)** was a short table on casters



The author's original miter saw stand **(1)** worked well but had limited other uses and was bulky. He replaced it with a plywood sawhorse system that can be broken down into flat pieces for transport **(2)**.

with folding wings for stock supports. It did the job but was bulky and took up a lot of room in the truck. Also, the wings weren't that stable and had limited use as a work surface for other tools. (This is a downside to many commercially available units, too. The supports function perfectly to support the stock, but that's all they can do.) The main feature I strive for is adaptability. I want a setup that can be configured to fit the space I'm working in and serve as a workstation for a wide variety of tools. Often, my miter saw and small jobsite table saw are central to the setup. But I also need a surface for using a track saw, routers, and a circular saw and doing glue-ups, sanding, and so forth.

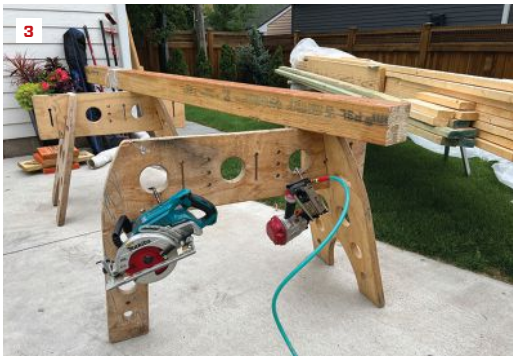
Toward making a more adaptable station that could be broken down flat for easy transport, my next venture was to experiment with the "Tri-horse"—a set of three-legged sawhorses I invented that are made from 3/4-inch plywood **(2)**. The rail and legs join with slots so they can be set up quickly. The three-legged design lends a distinct advantage over traditional sawhorses: It won't rock when placed over uneven terrain. In the middle third of the rail and legs, I cut holes and slots that reduce the weight without compromising strength; provide places to hang and hold tools; and accommodate accessories that extend the functionality of the horses **(3–6)**. For example, sawhorse support brackets from Rockler on the ends of 2x4s allow me to connect two different size Tri-horse units together in varying configurations that can expand and contract to accommodate the size stock I'm using and space I have available **(10)**. The slots are also helpful when I'm using track saw clamps.

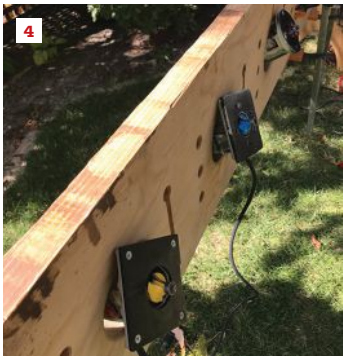
For stock supports, I made "T" brackets from plywood. These have two legs spaced an inch apart so they can be slipped over the top rail, adjusted to the height I need, and tightened in place with a bolt with a star knob inserted through a slot in the rail **(7)**. These T-brackets come in handy for a variety of other uses, independent of the workstation: I use one to clamp doors on edge when working on either the hinge side or the latch side of a door. I can also use one to hold a vertical length of 2x4 to serve as a "dead man" to support handrail or other material that I need to hold in position at a fixed height to join or scribe.

For a table to hold my miter saw on the Tri-horse, I made a "saddle box" from two plywood boxes joined by a piece of plywood on top. I leave a 1-inch slot between the two boxes so the assembly can slip over the top rail of the Tri-horse, creating a small table to support the miter saw **(8)**. For later versions of this stand, I use clamp brackets from a Trojan Work Center **(9)**. These work well, though the brackets are no longer readily available. I also add dog holes to the saw table so it can function as an effective work surface for planing and clamping material.

MORE THAN JUST A SAW STAND

For some jobs, I just need a saw stand, but for most jobs, I want to accommodate a wide range of tools and material sizes or allow other carpenters working with me to use it. Versatility is key in any workstation because I do many different types of jobs. For deck work, where I need stock support for long material, I join two different size Tri-horses end-to-end—overlapping the rails to extend stock support—and supplement with folding roller supports **(11)**.

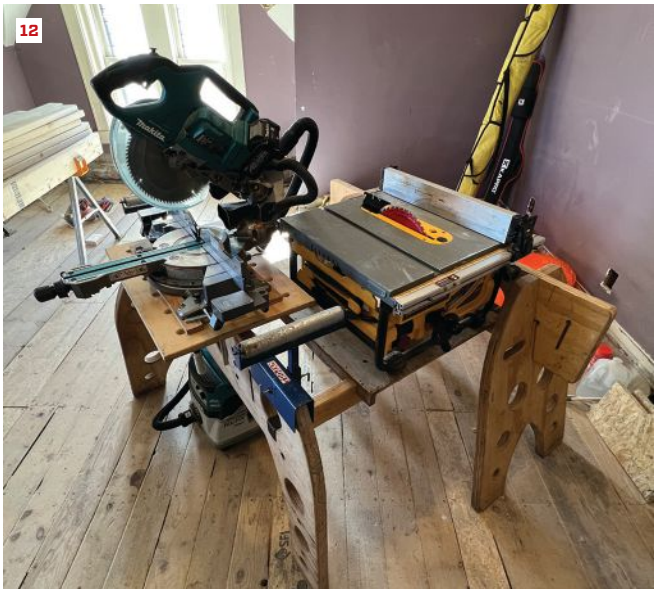


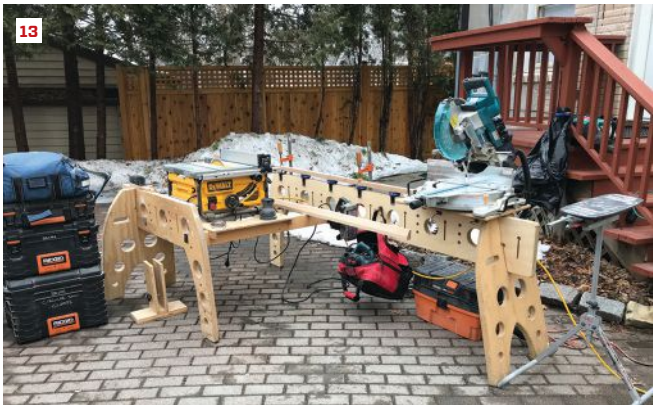


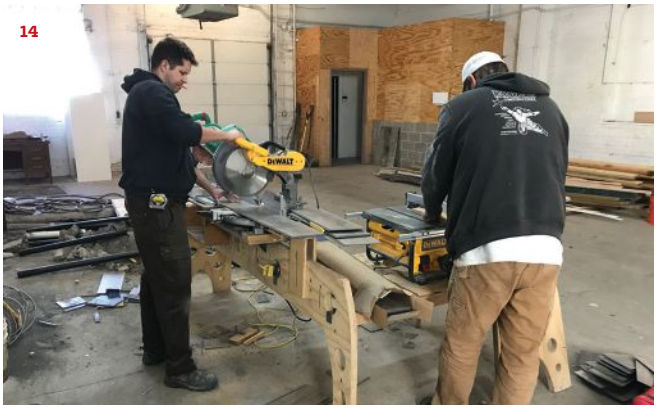
The holes in the rails of the author's "Tri-horse" sawhorses reduce the weight but also serve as places to hang and hold tools **(3, 4)**, including "difficult" items, such as a framing square **(5)** and a 4-foot drywall square (see **(6)**, below).

The adjustment bolt for the stock support can also be placed above the rail to hold the support where there isn't a slot **(7)**. The author cut handholds in the saddle box to make it easier to lift the miter saw on and off the Tri-horse rail **(8)**.

The miter saw table can also be secured to the rail with Trojan Work Center clamps **(9)**. Metal brackets for holding 2x4s clip into the rail holes **(10)** to create a support table where the author typically places a table saw. The disks on the right-hand rail are rubber-topped Rockler "bench cookies," which clip to the rail to provide an additional work surface.







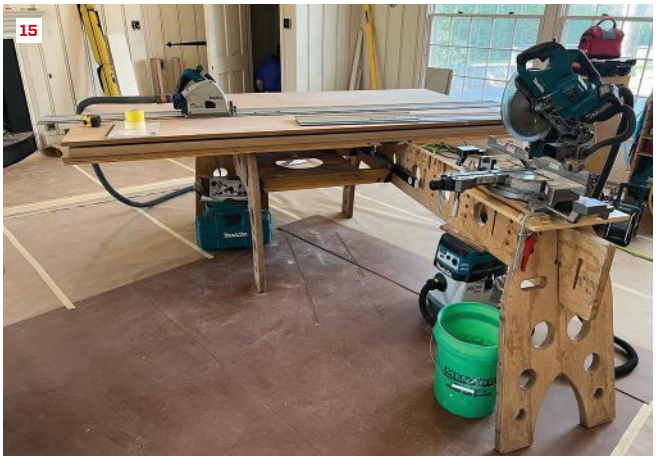
For deck work, the author configures the workstation to support long material **(11)**. When space is tight, the workstation can be configured to take up a small footprint **(12)**. This configuration **(13)** allows one carpenter to work efficiently. When two carpenters are using the workstation at the same time, the author configures it so they can work comfortably without getting in each other's way **(14)**.

I don't like to use roller supports alone with floppy, heavy deck boards because they move around too much; the fixed T-bracket on the Tri-horse rail helps keep the material steady. (Husky makes a folding "glide support" that's like a roller support but holds long, floppy material steady. I use more heavy-duty ones made by Ryobi, which have been discontinued but can still be found used.)

On the flip side, with a shorter rail, I can form what I call the world's smallest workstation for use in tight spaces **(12)**.

While I typically set up the workstation for a miter saw and a table saw, I can remove the table saw and throw a piece of plywood over the top when I need to create a larger assembly table or a track-saw station **(15)**.

When I'm working by myself, I usually set up the miter saw and table saw at right angles so I can use either tool without having to take extra steps **(13)**. When working with this configuration, I try to set up sawhorses behind me to stage my material, so



By removing the table saw and placing a piece of plywood over the top, the author can create a track-saw station **(15)** or large assembly table. Bora's Centipede expanding table offers a useful worktable that sets up quickly **(16)**. For a small work vehicle, the author built rolling drawers—one the width of a miter saw **(17)** and one the width of a table saw **(18)**—that can serve as workstations for small jobs.

I can turn around and grab it when I need it, without walking too far. When more than one carpenter needs to access the workstation, I turn the tools so that two people can work without being in each other's way, and I make sure that both saws shoot sawdust into the same pile (and not on the other guy) **(14)**.

One note on setting up a cut station: Consider orienting the station at a diagonal to the area you are working on. Many times, carpenters will set up facing the area where the trim or siding or whatever is being involved, with one person cutting and handing the material over to the people installing it. But to hand the material back and forth in that setup, you have to walk around the workstation. If you set it up diagonally, transferring material back and forth is easier. Also, when you're set up in a room, orienting the station diagonally allows you to work with the longest material possible. The key is to think through the efficiency of your setup as you would if you were setting up a permanent workshop.

Brian Campbell is a finish carpenter in the Twin Cities of Minnesota.

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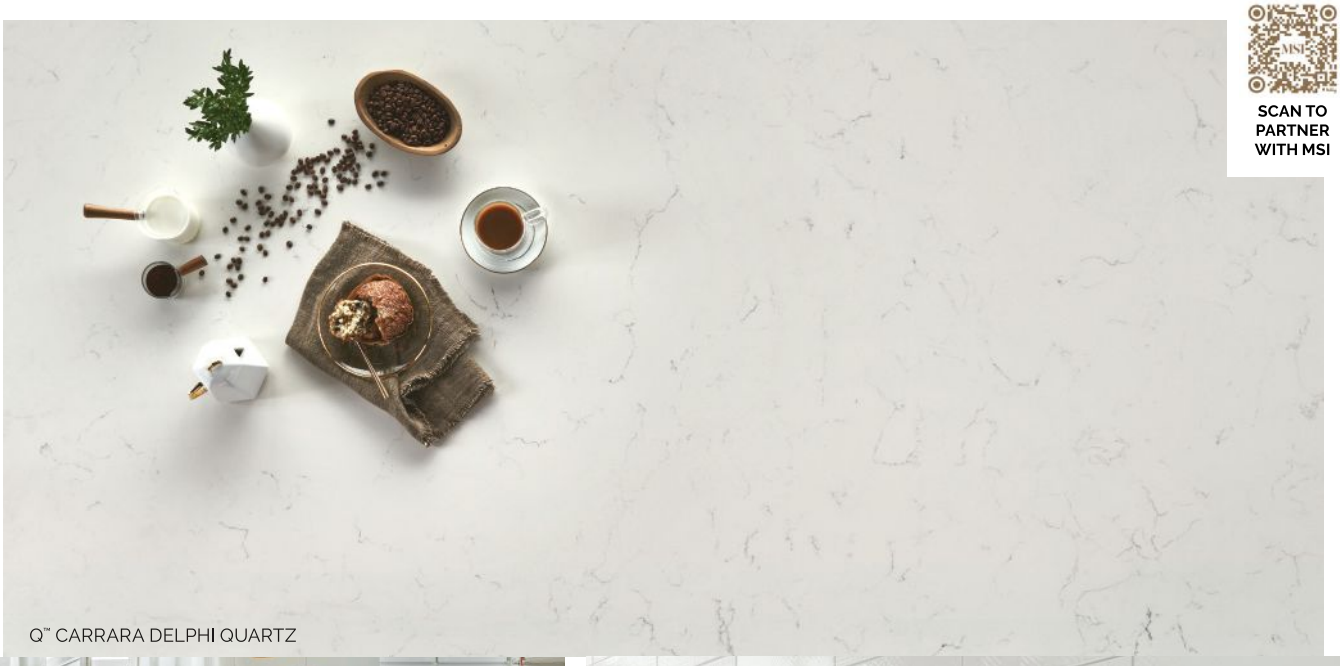

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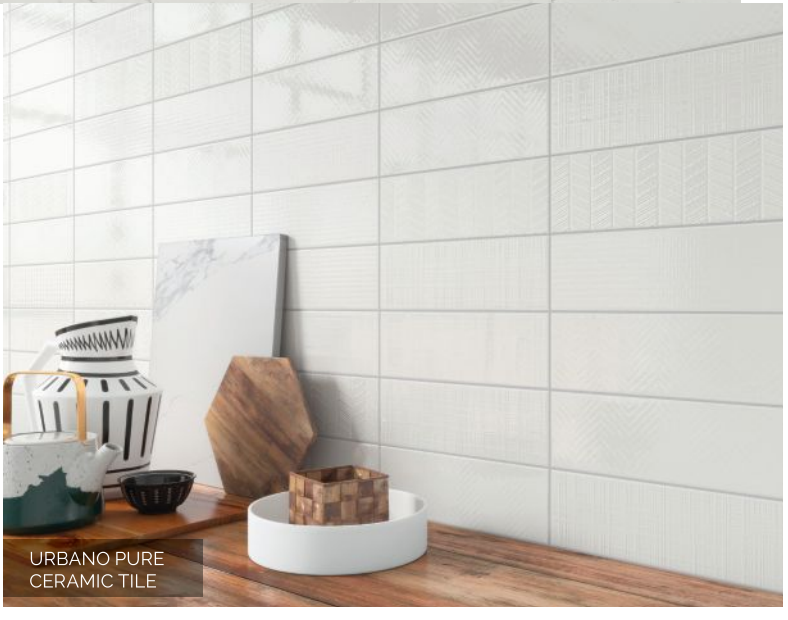

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Photo: Rob Howard

Making the Leap to Real-Estate Development

Going from builder to developer will tax your management skills to the extreme

BY CHARLIE WARDELL

Rob Howard's first development project was Duke Street Cottages, a "pocket neighborhood" of 11 high-performance, affordable homes in Granite Falls, N.C. Howard has been a general contractor since 2001, and his company, Howard Building Science, completed the state's first Zero Energy Ready Home in 2015. He has also served as a local director of construction for Habitat for Humanity. The project seemed a perfect fit.

But while building the homes has been straightforward, Howard's on-the-job training as a developer has included some surprises. Water service, for instance. "I had no concept of how much it would cost," he says. He had budgeted $50,000 to bring water to each home, but the estimates from county-recommended utility contractors ranged from $75,000 to $105,000. It was looking like a deal killer.

Rather than giving up, he started making calls, including to the building inspector. "I asked if I could use a plumber rather than a utility contractor," he recalls. "The inspector said yes, but he had to inspect it." Howard eventually found a plumber who agreed to do it for $45,000 per home.

Detours like this are typical of those faced by builders or remodelers taking a first step into development. In fact, this step is more of an entrepreneurial leap. Development can be financially and personally rewarding, but it's also complex and risky with lots of opportunities to go broke.

If you're contemplating this leap, you should start with plenty of research and networking. The basics of land development are too complex for a short magazine article to cover in any depth, but there's no shortage of educational resources available, from Meetup groups to online and in-person courses. Take advantage of them.

What follows is a general picture of what this business is like from the perspective of newcomers to the development game. Coming from a variety of backgrounds, they share their on-the-ground stories of challenges they faced when starting out and how they

To get permits for the close spacing of homes, Duke Street Cottages in Granite Falls, N.C., was required to have a certain amount of common area. Builder/developer Rob Howard accomplished this with a courtyard in the middle of the property.

overcame them. All started with small projects, but some hope to grow their development businesses.

From these conversations, three broad-based conclusions emerge. The first is to start small: You will make the most mistakes on the first project, and those mistakes will be easier to absorb with 10 rather than 100 units.

The second is that while it's natural to fall in love with a project vision, it's unwise to fully commit before completing due diligence. You also need a willingness to walk away if perceived risks start to outweigh potential rewards.

The third is that even as the local market, the land, and the estimated project cost will be factors, so will local politics and personalities. To succeed, you will need highly developed technical and interpersonal skills.

IT'S A TEAM SPORT

All successful builders know how to manage people, but development can tax those skills to the extreme. You will have more subcontractors to manage, more government officials and neighbors to appease, and more red tape to navigate.

Since you can't do it all yourself, you'll need to build a team of people who are able to perform each part of the due diligence. Obvious needs include a real estate professional to gauge marketability, an attorney with development experience, a surveyor to lay out plot lines, an architect to design homes and landscapes, and a civil engineer to scope out land-related issues. Most developers, even small ones, will also need to sell the project to investors, who (if they're smart) will want to see confirmation of that due diligence.

One of the first steps is to consult with a real estate pro to

Photos, opposite: Rob Howard

Rob Howard focused on offering high-performance (zero-energy ready) homes at an affordable price. The homes at Duke Street Cottages included a rainscreen on top of SIPs **(1, 2)** with Hardie fiber-cement trim and siding **(3)**.

estimate rents or sales prices. For instance, Howard looked at several properties with a real estate agent before choosing one that seemed to offer the needed returns.

First-time developer Joel Florek of LaPorte, Ind., had enough experience to do this himself. Florek had built a rental portfolio of 150 units by remodeling and rehabbing multifamily properties. Then in 2023, he decided to purchase land and build eight town houses.

The problem was that no project like this had been built for decades. "If you're building something that hasn't been done in a long time, you can have terrible comps," he says. So, he looked at towns of similar size and demographics to develop his own comps, a process that was more art than science. It worked. "We got better results on some units than others, but overall, we have had strong returns," he says.

You also want to know if the land will support the vision. Former real estate broker Brice LeConte had worked on a couple of small apartment buildings and other projects but recently embarked on a land development project called Derby Ridge in Stratsburg, Va. Like Howard, he wants to offer small, Zero Energy Ready Homes to people with average incomes, in part because local communities want them. LeConte sought advice from his architect when vetting potential locations. "I needed to see high-level concepts," he says. The homes he had in mind needed to look good on the plot he ended up purchasing.

The site plan itself needs to be done by a civil engineer, who will consider constraints like setbacks, easements, buffers, and road widths. It's a good idea to have the engineer sketch out a preliminary site plan and run it past the appropriate people in the zoning department before going further.

To streamline permitting, Joel Florek chose lots at the edges of an existing apartment complex **(4)**. Town homes **(5)** were new for the town, which made it challenging to forecast return on investment, but Florek found good comps in other towns with similar demographics.

"You need to see if you can fit what you want on the property," says Dan Shabeldeen, of Shabeldeen Engineering in Hickory, N.C., who works with Howard. If the profit goals require 10 homes but the topography or zoning will support only eight, that parcel won't work. It's best to know before you buy.

When Howard is serious about a piece of land, he and Shabeldeen walk it together. "We talk about the topography. Is there anything I'm not seeing? How will roads connect to the adjacent community? Are sidewalks needed? Where is the water and sewer access?"

Water is a common obstacle. When we spoke with Casey Malm, a builder in Polson, Mont., in May 2024, he was getting ready to start his first development on land that's part of the Flathead Indian Reservation. "The tribe has decided to limit the number of new wells," says Malm. "We've had to be creative. We looked at tying into the city, at cisterns, at tapping into adjacent properties, and other options." These alternative approaches won't stop the project, but they will increase the cost of water. Malm wants to build attainably priced homes, and the increased water costs will make that goal tougher to reach.

ENTITLEMENTS AREN'T EASY

Identifying and vetting the land is one thing; getting the project through zoning is another. According to the people I spoke with, this is the most frustrating part of the process.

"Fees can be expensive and zoning restrictions can add a lot of time," says Howard. "There's a great deal of back-and-forth with the municipality and fine-tuning of the plan. If the property needs to be rezoned, you will need planning board approval, and the city council will have to bring it up at a public hearing. This can take several months and there's no guarantee it will be approved."

The developer also needs to think through the flow of people and traffic. "Expect to have lots of conversations about this," says Florek. "You might have to pay to extend sidewalks to an adjacent neighborhood. You may need traffic studies. You may need a traffic light."

These requirements can necessitate a change in plans. For instance, parking was an issue when Howard was seeking approval for an upcoming development in Hickory, his second one. He was targeting the aging-in-place market, but to meet the city's parking requirements while also fitting enough units on the property to make it financially viable, he will have to build town homes with parking underneath. That means stairs. "The target demographic has had to switch to a younger crowd."

Landscaping plans can also add time. For his eight town homes, Florek bought three small lots on the edges of an existing multifamily development, but his project didn't conform to the original site plan. "We had to go through the entire plan review process from the beginning," he says. "We needed a new landscape plan, with details that included a count of the trees and shrubs."

These are just a few of the many requirements that municipalities can demand. You can't always predict which ones they'll emphasize, but you will be better able to handle whatever comes up if you put time into understanding the official requirements.

"In my area, every community has a 300-ish-page zoning document detailing specs on parking, setbacks, height restrictions, and numerous other issues," Florek says. "It also includes things like the limits on the numbers of homes per acre, depending on design. It can get crazy."

Florek advises anyone considering a new development to get a handle on local requirements as early as possible.

Photos: Joel Florek

From Concept to Completion

The steps outlined here show the basic process needed to find, permit, and develop a piece of land. This is a high-level overview and should be viewed only as a starting point for more research.

1

Find good mentors.

Work with seasoned people who will have your back and answer any questions you may have.

Define business model.

Do you want to build for-sale condos or rental cottages? Where? What is the market for the type of housing you want to build? Different project types vary greatly when it comes to raising money, permitting, and construction.

2

3

Assemble your team.

You will need a real estate agent, architect, general contractor, civil engineer, lender, and investors.

Find a site that will accommodate the project.

Perform the needed due diligence.

4

5

Line up funding.

Work with lenders and investors to secure capital.

6

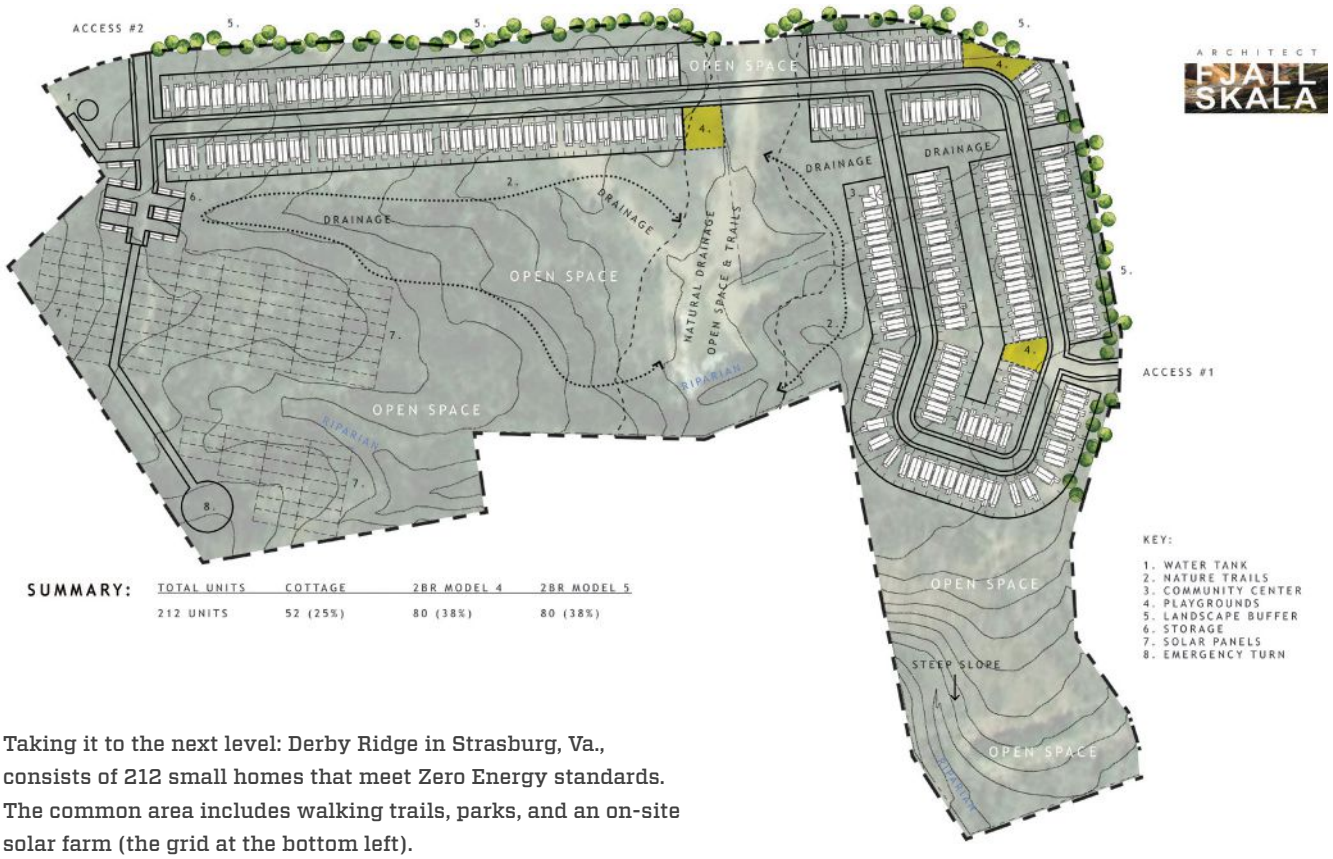
Approval process has multiple steps.*

- ☐ Confirm that no federal permits will be required.
- ☐ Schedule an appearance before the planning commission or zoning board for approval. (This may include a public hearing.)
- ☐ Determine whether the property will need rezoning, variances, and/or a subdivision plan.
- ☐ Post required construction bonds and pay any impact fees.
- ☐ Sketch a preliminary plan and seek feedback from staff in the zoning department.
- ☐ Obtain grading and other permits for site work.
- ☐ If the project seems like one that's likely to get permitted, create a final site plan that incorporates staff feedback.
- ☐ Secure building permits.

**These steps adapted from the NAHB's "Land Development Checklist."*

Begin construction.

With permits in hand, start the development.



Taking it to the next level: Derby Ridge in Strasburg, Va., consists of 212 small homes that meet Zero Energy standards. The common area includes walking trails, parks, and an on-site solar farm (the grid at the bottom left).

YOU NEED ALLIES

The permitting process—as well as everything else—will be harder if there's resistance from the community. That's why you need to work at getting as much of the community as possible on your side. This point can't be over-emphasized: You need to know how to win people over.

Before deciding to buy a property, you should gauge the risk of NIMBYism. "Opposition from neighboring property owners can sway the planning board," Howard says. "You want to find out who they are. Is anyone in the neighborhood on the town council? Will anyone make problems?" Many of the answers will be anecdotal but still useful. "My engineer is on the planning board and is pretty good at predicting whether there's someone in the neighborhood who will complain," he says. In some cases, it might be easier to look elsewhere.

Howard also points out that approval is much harder in the more expensive parts of town, so he looks for land in areas already under development. That was the case for the Hickory project. "DR Horton had already bought an old municipal golf course across the street and intends to build 250 to 300 homes. Compared to them, we're just a blip."

Sometimes, local attitudes are a challenge. For instance, when Malm first moved to Montana three years ago from California, he found that many locals strongly resent newcomers driving up home prices. "Developers are treated as the enemy in a lot of places, but the fact I was from California made it worse here."

His secret to getting approvals has been making an effort to learn what the community wants and being willing to work with them to provide that. Like most of the U.S., Polson needs affordable housing, which is why Malm—as well as everyone else interviewed here—is targeting this niche.

"A lot of communities have town hall meetings on the need for affordable housing," says Malm. "You can win people over by showing up and showing them that you want to provide it."

Even with noble intentions, you can still run into opposition. Malm's advice is to treat everyone respectfully, to try to understand their point of view, and to be patient. "Especially in small communities, if you piss off one person, it can snowball and you can have a lot

of problems," he says. "That's why I approach every conversation as if I'm being interviewed for a job."

This served him well when he first arrived in town as a new single-family builder. "In the beginning, some subs charged us 25% over market pricing." That's no longer the case, and Malm credits getting to know people and showing them that he is committed to helping the community. "If you don't rub people the wrong way, it makes a big difference."

LEARN TO RAISE CAPITAL

Another group of people that most developers have to win over is investors. This can take time; in fact, you need to start this work before you even think about getting into the development game. "The time to look for investors is not when you need money," Florek says. "You need to build those relationships in advance."

If you're successful and want to grow, your investors will grow with you. LeConte raises money by courting family offices (privately held companies that handle investment management for a wealthy family) and high-net-worth individuals. For his first project, he collected amounts ranging from $20,000 to $50,000 but has since found people with deeper pockets. "First they write small checks. If you succeed, they give you more."

LeConte also puts his own money into his deals. "If you want people to believe in you, then you have to believe in yourself, and show it," he says. "The deal has to make sense, but people ultimately invest in the person. Some of my investors I knew from my days as a broker. They thought 'if Brice takes the same energy to this as he did to his brokerage, he'll be successful.'"

Florek also started by raising $20,000 apiece from small investors and now has people offering him as much as a half-million for future projects. "From a financial perspective, you need to be able to present yourself as a financially astute, investor-minded business person," he says. That can be a challenge for even the best builder. "There are many who I would trust to build a home but would not be confident in to manage a development operation."

EXPECT THE UNEXPECTED

Let's say you've drawn up a great plan, gotten approvals, raised money, and won the community over to your side. While chances are high you'll be successful, there will likely be additional bumps. Our sources say that the likelihood of unhappy surprises after work starts is higher with land development than with home building.

Excavation issues seem to be the most expensive. "Where we are, there can be a lot of rock," Malm says. "[If there's more than you expect], it can put excavation well over budget."

LeConte has also run into surprises. "We have hit water lines and sink holes we didn't know about. A geotech study is important, but it doesn't get everything."

Shabeldeen has seen parcels near town that looked like they were never developed but were former homesites. "Once digging started, we found a buried oil tank or an old septic system," he says. Removing them, of course, added to the expenses.

Florek knows a developer who found an underground oil tank. He found a buried electrical service cable that wasn't on the survey and would have ended up under the corner of one building. This particular town let him move the building 8 feet to clear the cable, but others might have made him start the permitting process from scratch.

Everyone I spoke with recommended a contingency budget for such issues. Most advised adding around 10% to the estimate for each trade. Possible subs will vary by project but might include those for tree removal, demolition of existing structures, excavation, road building, water and sewer, electrical service. A more turnkey approach is to use one sub to coordinate all this work. "I use a site development company who holds all the contracts for site work," Leconte says. "This simplifies the process for me." In this case, the contingency will be based on the site development company's fee.

WHO SUCCEEDS?

As mentioned earlier, personality is as important to a developer's success as technical knowledge and management skills. An entrepreneurial personality will be an asset. "A developer is a creative person who takes risks," LeConte says. "Both [creativity and risk taking] are part of who I am."

Another asset is patience. The sheer amount of uncertainty makes it even more of one in development work. "This business is way more stressful than building," Malm says. "The schedule is beholden to county approvals and there's never a time allotment given to you. You may end up sitting on large amounts of money that's doing nothing, so keeping a calm head is really beneficial."

Diplomacy and the ability to work with different parties' agendas are also crucial. Hotheads and those with a thin skin can easily sabotage themselves by making enemies. "You need to figure things out and calmly deal with the punches," Florek says.

What can carry a new developer through the inevitable ups and downs? The promise of financial rewards are crucial, but so is vision. While the project vision shouldn't be inflexible, it needs to be strong enough to carry you through.

As Florek says, "Your vision and your ability to communicate are the keys to success in this business."

Charlie Wardell has been writing about the residential building and remodeling business since 1990.

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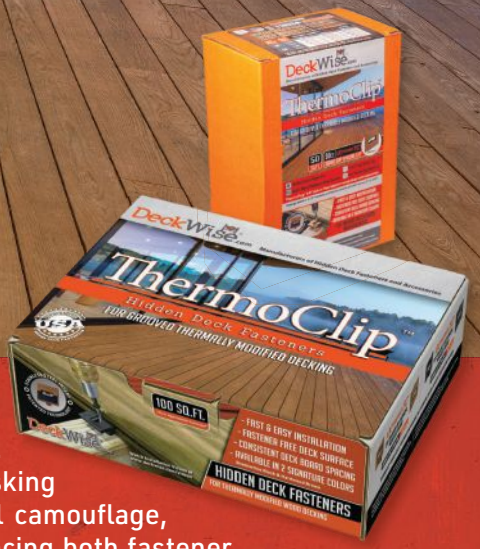

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AN 80S-ERA RANCH HOUSE UNDERGOES A FIRE-RESISTANT MAKEOVER

Renovating in a wildland-urban interface led contractors to seek materials that were both resilient and stylish.

There's no sense living in Petaluma, Calif. if you're not taking advantage of sweeping views of rolling hills and acres of farmland.

That's why an 80s-era ranch house was the perfect candidate for a near whole-home renovation. Here, the unassuming structure was transformed into a stylish retreat with multiple decks to take in the sprawling scenery.

While the area is beautiful, there's also the ever-present threat of wildfires. The property is located within a wildland-urban interface (WUI), where flammable landscapes and houses intersect. That meant the contractors, Adam Diamond and Paul "Pace" Blair, owners of Diamond Home Restoration, needed fire-resistant materials appropriate to the region. Building with WUI-compliant decking and roofing and Class A flame-spread rated siding and trim not only helps to safeguard structures and their contents but is a code requirement in more and more municipalities.

DECKING IT OUT

The project included four new decks, the largest of which spans nearly the entire front of the house. In addition, there's a small deck off the primary bedroom, a deck off the newly added breakfast nook and French doors in the dining area open onto a deck that steps down to a back patio.

Their search for WUI-compliant decking was met with the special-order fire-resistant Reserve Collection by TimberTech in Reclaimed Chestnut. "In this region, WUI is directing our entire approach now," Blair says.

The original plans called for a round deck on the back which would have required extra footings and more labor, exceeding the project's budget. To stay within costs, Diamond and Blair built an octagonal deck to achieve a similar look.

SIDING IN WHITE

The house's front elevation received an upgrade with a large dormer and a grand entryway. Likewise, the backside of the house now features a small dormer and a bump-out to accommodate the breakfast nook.

The old wood siding was replaced with AZEK Exteriors Board and Batten Siding, along with the brand's shingle siding and trim. These products have a Class A flame-spread rating.

"We've used a lot of AZEK trim in the past but not the siding, but we loved the way the corner boards and window and door trims integrated with some of the other siding we've used," Diamond says. "And we want to eliminate any need for caulking and those allow us to do that."

Their first time using the PVC siding went smoothly.

"This stuff cuts like butter," Diamond says.

AZEK Classic White Trim, Sheet and Batten strips are white and don't need to be painted.

"They wanted the house to be white, so the fact that we could use that product and not paint it meant we could save on that budget and apply that money to the actual material," Diamond says.

Ensure both beauty and fire resistance in your designs by incorporating AZEK Exteriors and TimberTech products at timbertech.com/about/fire-resistant-decking/.

Produced by Zonda Media, a Delaware corporation
marketing.zondahome.com

BY VINCENT SALANDRO

1. Aluminum Railing With Mesh Infill
The combination of aluminum posts and rails and 2 3/8-inch stainless steel mesh infill gives Westbury Sorrento Mesh Railing from Digger Specialties a contemporary look. Preassembled sections of the deck railing include top and bottom rails and mesh infill and are available in 4-, 5-, and 6-foot lengths, 36- and 42-inch heights, and 12 standard powder-coated colors; a variety of posts with base plates and either flat or ball caps are sold separately. diggerspecialties.com

2. Groutless Stone Panel Profile
Dutch Quality Stone's Dry Stack is a stacked-stone profile in an easy-to-install panel form that doesn't require grouting between ledge stones. Panels measure 2 and 4 inches high, 5 to 24 inches long, and 3/4 inch to 2 inches thick. Choose from seven color options, including the newly launched coal crest. A carton containing 12 square feet runs about $60. dutchqualitystone.com

3. Accent Aluminum Cladding Trim
Available in bronze, carbon, or gold, Millboard's Envello Décor decorative and structural aluminum trim fits into the grooves of Envello Shadow Line+ composite siding, adding a metallic band between vertical boards to accent pop outs and rooflines or provide contrast across the entire exterior. When used with Shadow Line+ siding, the UV-resistant trim can span up to 35 1/2 inches on-center and is fire-rated, according to the manufacturer. millboard.com

4. Lightweight Circular Saw
Milwaukee Tool's new lighter and faster-cutting version (model 2833-20) of its M18 Fuel 6 1/2-inch circular saw weighs 6.3 pounds (bare tool) and features a 6,000-maximum-rpm brushless motor and electronics that the manufacturer says ensure maximum performance and protect against overload, overheating, and over discharge. Other features of the saw include an arbor lock, which allows easy blade changes; depth and bevel adjustment levers; an electric blade brake; a rafter hook; and an LED light. It retails for $230 (tool only). milwaukeetool.com

5. Composite, Multi-application Wall Panels
Designed for interior spaces, 3A Composites' Monarc composite wall panels comprise two sheets of 0.12-inch aluminum bonded to a fire-retardant mineral core in a continuous extrusion process. According to the manufacturer, the panels may be used for wet wall applications and require no trim work or grout. Finishes include options inspired by stone, wood, and metal. 3acompositesusa.com/monarc

6. Built-In Linear Shower Drain
QuickDrain WallDrain linear shower drains are unobtrusively built into the wall. Made of 18-gauge, 316L marine-grade stainless steel, the drain has a 12-gpm capacity for a 2-inch outlet; to accommodate shower sizes from 96 to 144 inches, drains can be linked together. Presloped PET panels for both curbed and curbless showers eliminate the need to float a pitched mud bed and wait for it to cure, and the system can be installed in less than one day, according to the manufacturer. quickdrain.com

7. Aluminum Railing With Cable or Baluster Infill
Available with either horizontal cable or picket infill, the RailFX Oasis Railing System is fabricated from extruded aluminum in a textured black finish in 36- and 42-inch heights. For cable infill, the posts are predrilled for cable installation and can be spaced up to 8 feet apart with an included cable brace (the maximum unsupported span for cable is 4 feet); an insert slides into a top rail to secure cable braces. For picket infill, the balusters install in preformed holes in top and bottom rails. The 3-inch posts for both infill options can be surface-mounted only. railfx.net

8. Large-Scale Sliding Patio Door
Upgrades to Simonton MaxView Multi-Slide Vinyl Patio Doors from Cornerstone Building Brands include new black and bronze co-extruded exterior color options, expanded custom sizes up to 10 feet high and 30 feet wide, and design pressure (DP) ratings for select sizes of up to 70 to meet requirements for high velocity hurricane zones. (DP ratings determine a product's ability to withstand wind pressure.) Equipped with T-lock design, the doors achieve Missile D level of impact resistance. Bypass, pocket, and bi-part configurations are available. simonton.com

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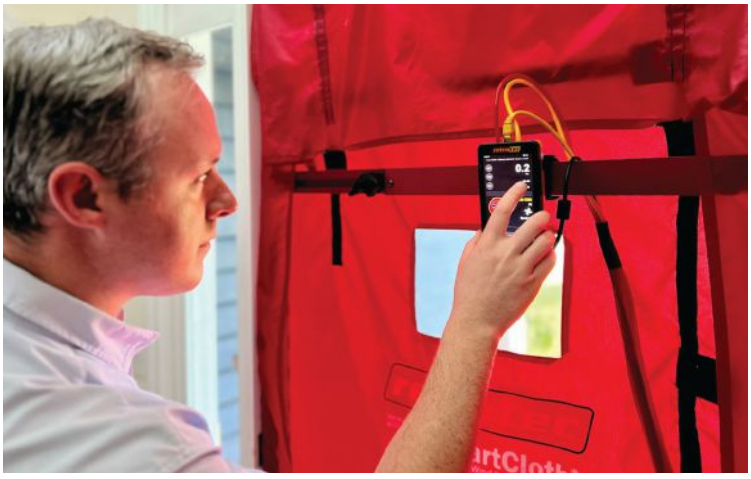
9. Termite Protection Barrier
Installed in crawlspaces or below concrete slabs, Pango Wrap creates a physical, nontoxic barrier against subterranean termites and moisture vapor. The manufacturer says the 15-mil, multilayer material has the flexibility and strength of extruded high-performance polyolefin film, making it easy to install, and can resist deterioration when exposed to pesticides. A 14-by-75-foot roll retails for $1,080 online. stegoindustries.com

10. Four Control Layers in One Panel
Henry's Blueskin VPTech combines a weather-resistive barrier (WRB) with continuous insulation and seam sealing in a single, integrated panel. The WRB is the manufacturer's self-sealing, drainable, and vapor-permeable Blueskin VP100, and the insulation is Type II R5 graphite polystyrene (GPS) rigid foam. Self-adhesive tabs on the WRB are used to seal each 4-by-8-foot panel against adjacent ones, creating a uniform, continuous air barrier. henry.com

11. Clean Design Kitchen Faucet
The Tenon kitchen faucet collection from Moen combines Scandinavian design with Japanese textures. All styles—pull-down faucet, smart faucet with motion control, and pull-down bar faucet—include an integrated, multifunction pull-down spray wand that nests inside the spout. Faucets come with a finish-matching handle and a teak handle for the option to mix textures. Moen says the faucets provide 50% more spray power than other Moen faucets. A stainless steel pull-down faucet retails for $1,000. moen.com

12. Three-Layer Anchor Sheet
SwiftAnchor from Westlake Royal Building Products is a high-performance and mechanically fastened base or anchor sheet designed for adhesion to the manufacturer's Royal TileSeal HT and Royal MetalSeal HT underlayments. The sheet has three layers: A top engineered coating provides adhesion, walkability, and a gasketing moisture barrier; a second layer offers tear-resistance; and a third layer provides grip to the deck and another gasketing moisture barrier. Available in 40-inch-by-300-foot rolls, the sheet can be left exposed for up to 60 days, according to the manufacturer. westlakeroyalroofing.com



USING BLOWER DOORS FOR QUALITY CONTROL

Improvements in wireless platforms simplifies testing and improves accuracy

An airtight envelope has many key benefits including better comfort, lower energy use, cleaner indoor air, and better humidity control. Not only does this allow the house to perform better, it also makes it last longer. To ensure the home will be properly sealed, builders are now using the blower door test as a method of quality control throughout the build. A blower door consists of a calibrated fan, door panel, and a high-resolution manometer to bring the whole house to a desired test pressure. Houses are typically tested to 50 Pa of pressure. This can be positive or negative depending on which way the fan is facing. Most testers choose to test to -50 Pa to keep dampers from blowing open on bath and kitchen exhaust fans.

For new builds, multiple tests can be conducted from the framing stage to final. This helps ensure the air barrier remains intact as various trades make holes in the envelope and seal behind themselves. It is much easier and cost effective to repair the air barrier by sealing gaps, cracks, and other penetrations at earlier stages of the project instead of waiting until the end.

Keeping track of blower door test results is critical to maintaining the air tightness throughout the project. Once the house reaches the desired level of tightness, the goal is to maintain that blower door test result as the project continues. A process that automatically saves and organizes test results makes this easy. Back in 2013, Retrotec invented the first wireless touchscreen manometer for airtightness testing and named it the DM32. A few years later, they developed rCloud to work with it. rCloud is an app for smartphones and tablets that allows testers to run air tightness tests from their wireless device. Testers simply follow the prompts to conduct a test. This also helps prevent testers from forgetting certain parts of the process, such as the baseline reading. Once the test is complete, rCloud automatically generates a report that is saved to the cloud. All aspects of the test including the outdoor weather conditions and baseline readings are logged and saved. Multiple tests can be saved under one address so they can easily be referenced later.

Below are two reports from the same house. The first report is the first test at the framing stage. The second one is the next test after the envelope was sealed more once leaks were located. The goal was to get the house under 1 ACH50. We can see this was achieved when it was tested the second time. In this scenario, the builder would want to test a couple of more times to make sure they are still under 1 ACH50 as the build continues. A good time to test is after all mechanical, electrical, and plumbing penetrations are made and once again at the final stage of construction.

Visit Retrotec.com to learn more about blower doors for quality control.

Produced by Zonda Media, a Delaware corporation
marketing.zondahome.com

Festool CXS 18 Compact Drill

BY JOHN CARROLL

Back in 2011, Festool developed the 10.8-volt CXS drill, which was smaller and lighter than any other cordless drill/driver then on the market. Festool has since updated it with the CXS 12, which continues to use a 10.8-volt battery but offers several innovative features. The company's new CXS 18 drill is similar to the CXS 12 but uses Festool's 18-volt battery and delivers about 30% more torque than the CXS 12.

Although the CXS 18 is considerably more robust than the CXS 12, it's still a light, compact drill that measures a mere 8 1/4 inches tall and 6 1/4 inches long and weighs in at just 1.54 pounds. Despite its diminutive size, however, it has plenty of power. It doesn't have an impact action, but it drives 3 1/8-inch construction screws into framing lumber with ease, and it's rated to drill 1 3/8-inch-diameter holes in wood. The brushless motor runs smoothly and, in use, it's well-balanced and feels good in the hand.

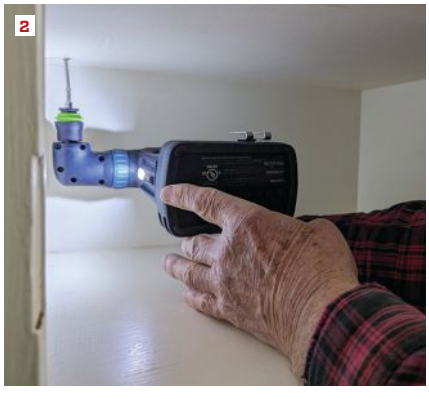
In addition to its smooth and powerful drilling and driving operations, the CXS 18 comes with an array of clever and useful features. One of my favorites is the LED light. In the remodeling work that I do, I often find myself driving screws in dark, confined spaces, such as inside cabinets or in bays between joists, rafters, or studs. In these situations, the LED light really helps. It can be adjusted for both brightness and duration via the Festool Work App (which is actuated through Bluetooth). Because the light can be set to stay on for up to 15 minutes, you can use the drill as a makeshift flashlight.

Other Work App functions include changing the trigger to accommodate left-handed users, checking the status of the battery, and ordering repairs. In the area around the light are three magnetized slots about 1/4 inch deep that hold spare bits securely. The drill also comes with a belt clip.

The basic CXS 18 drill comes with a Centrotec tool chuck, which allows you to quickly change hexagonal Centrotec bits without tools. Although standard 1/4-inch drive bits don't lock into the Centrotec chuck, Festool includes an adapter with a strong magnet that enables their use.

In addition to the Centrotec chuck, Festool offers a variety of interchangeable chucks that can be installed via its "FastFix Interface." The HPC 4,0 I-Set that I tested includes two of these chucks (along with the Centrotec): an AN-XS right-angle bit holder and a keyless 3/8-inch drill bit chuck. Both click securely in place by hand. The right-angle bit holder can be rotated clockwise to fine-tune its orientation to the drill body, which helps fit the drill in tight spaces.

The CXS 18 HPC 4,0 I-Set includes a CXS 18 drill, two 18-volt batteries, a charger, the three chucks described here, and the belt clip mentioned above. All the components are neatly arranged in



Measuring just over 6 inches long, Festool's CXS 18 fits easily between joists and has the power to drive large-diameter structural screws **(1)**. The drill has an adjustable LED work light, handy when you're working in dimly lit spaces **(2)**, and can be fitted with different chucks, including the AN-XS right-angle adapter and FastFix 3/8-inch keyless chuck **(3)**.

Photos by Matthew Narvey

Weigh In!
Want to test a new tool or share a tool-related testimonial, gripe, or technique? Contact us at jlctools@zondahome.com.

a custom Festool Systainer 3 toolbox and held in place by a hard plastic lining that's molded to fit them.

Festool's Systainer system is modular. In addition to stacking neatly with other Systainer boxes, this one houses clear bit cases that clip into the lid. Inside the cases, the drill and driver bits clip into magnetized slots. The cases fit precisely in compartments that are molded in the lid and covered by a clear lid. The result is that 40 or so bits can be neatly and securely arranged and clearly visible on the lid of the Systainer.

All this superb design and engineering comes at a price. The CXS 18 HPC 4,0 I-Set costs $500. Is it worth it? To me, it is. This set saves time and makes difficult jobs less difficult. And I find it enjoyable to work with such well-crafted tools. festoolusa.com

John Carroll, author of Working Alone, *is a builder who lives and works in Durham, N.C.*

The CXS 18 HPC 4,0 I-Set comes with a right-angle adapter, Centrotec magnetic bit holder and chuck, keyless chuck, rapid battery charger, and two 4.0 Ah batteries packed in a Systainer 3 toolbox **(4, 5)**.

Makita ML010G XGT LED Area Light

BY TIM UHLER


Photo by Tim Uhler

For us, jobsite lighting is a must. In 2005, we invested in the first of a series of plug-in metal halide Wobble Lights, switched to battery-powered lights in 2016, and then graduated to the hugely expensive but really good Milwaukee MX Rocket Tower Light last year. Because we have a lot of Makita XGT tools and batteries, I was interested in trying out the company's 40V XGT LED area light (model ML010G). It has a no-tip design similar to a Wobble Light's—a feature we came to appreciate—but can be operated without a cord, doesn't get hot, and doesn't require a dedicated AC circuit.

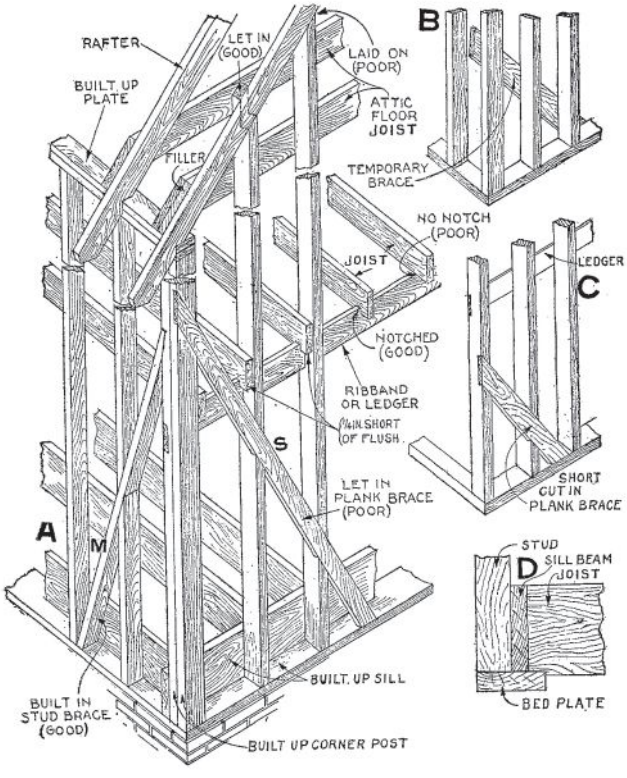
Specs. The LED lighting in this unit has three modes: high (5,500 lumens), medium (3,000 lumens), and low (1,500 lumens). It's IP54 rated (protected against dust and water spray) and can throw light at 360° and 180° (either left or right). The light weighs about 38 pounds when fitted with two batteries, though it operates from only one battery at a time. Either 40V XGT or 18V LXT batteries can be used, and they can be mixed and matched, with power drawn from the battery with the least capacity first.

We get about four hours out of a fully charged 5.0 Ah LXT battery, so two batteries give us a day of illumination at full power. This may not sound like a lot, but we are always rotating out our batteries anyway, so we never outrun the charging. Makita says that two 4.0 Ah XGT batteries will provide up to 27 hours at low power. Note: When you buy cordless tools, take advantage of any deals that throw in batteries; you can never have too many. Price: $700 (without batteries and chargers). makitatools.com

Tim Uhler is a lead carpenter for Pioneer Builders in Port Orchard, Wash., and a contributing editor to JLC *and* Tools of the Trade. *Follow him on Instagram at @awesomeframers, subscribe to his YouTube channel, or visit his website: awesomeframers.com.*

Makita's ML010G area light (above) can be powered by either XGT or LXT batteries to provide 360 degrees of lighting at three levels of illumination.

BY DEJAH LEGER



Why Do We Say Joists and Rafters?

Carpentry has its own specialized vocabulary. The words we use often need to be translated when we're talking to homeowners and non-carpenters. True to the English language, carpentry terms have a variety of roots, ranging from ancient Rome to Scandinavia. And because of their niche nature and the broadly unchanged manner of building homes, many terms are stuck in time, having been used for centuries. But why do we use the words we do?

We use all sorts of weird terms while we're building a house. From furring strips to pony walls, from cripples to jacks, carpentry words can raise a serious eyebrow (ridge) on non-carpenters. But each of these terms is a doorway that opens into the history of building, deepening our understanding of our trade. (Not to mention the cool points you'll earn on a jobsite when you talk about the etymology of the word "stud." Trust me.)

In this article, I'll start at the ground floor and move up—literally. If you've ever waltzed across newly framed floor joists as if one misstep wouldn't make for a very bad day, then you're already familiar with the chunky timbers that form the horizontal framework within houses.

JOISTS

English-speaking carpenters have been using the word "joist" for at least the past 650 years (before that, a joist was probably just called a "beam"). It came to English from the Old French word "geiste," which meant to "lie down." (Thanks to the Norman Conquest, English contains an immense number of French words.) The term makes sense. Joists are always horizontal. They are the bed for flooring to lie down upon.

We also have "sleepers," which are boards laid over concrete to provide a nailing substrate for flooring. While there is no linguistic connection between "joist" and "sleepers," the gist is the same. (Coincidentally, the word "gist" has the same root as "joist," as in, to lay down a point.)

RAFTERS

Another word with an interesting past is "rafter," which came into the carpentry lexicon via Old Norse (the language of the Vikings). The Old Scandinavian word for "log" was "raptr." At the time, "pt" was pronounced like an "f," essentially meaning that, despite a few spelling changes, carpenters in the western world have used "rafter" to describe the same building element for more than 1,300 years. While the word meant "log," it was recorded as specifically referring to roof rafters as we understand the term today. If you look at historical and ancient structures, you'll see that many utilized full-sized logs as roof support.

Also, if you were to bind up all your rafters ("logs") together and float them down the river, you would have made a raft, and you yourself would become a rafter. Not the highest recommendation for jobsite lumber use, but from a linguistic standpoint, you're covered. Timber rafting is still a viable means of log transportation.

Hopefully, the next time you're hauling lumber up to the roof, you'll think of the Viking carpenter who was doing the same thing 1,000 years ago, both of you muttering "uff da, these rafters." Or when the apprentice calls the studs "joists," you can lay down the law and explain exactly why "joists" are always horizontal.

Dejah Leger is a superintendent at Carlisle Classic Homes in Seattle and the genius behind languageofcarpentry.com. Do you have a carpentry term you'd like to know the origin of? Submit an inquiry to dejahleger@gmail.com.

Audels Carpenters and Builders Guide [1923]

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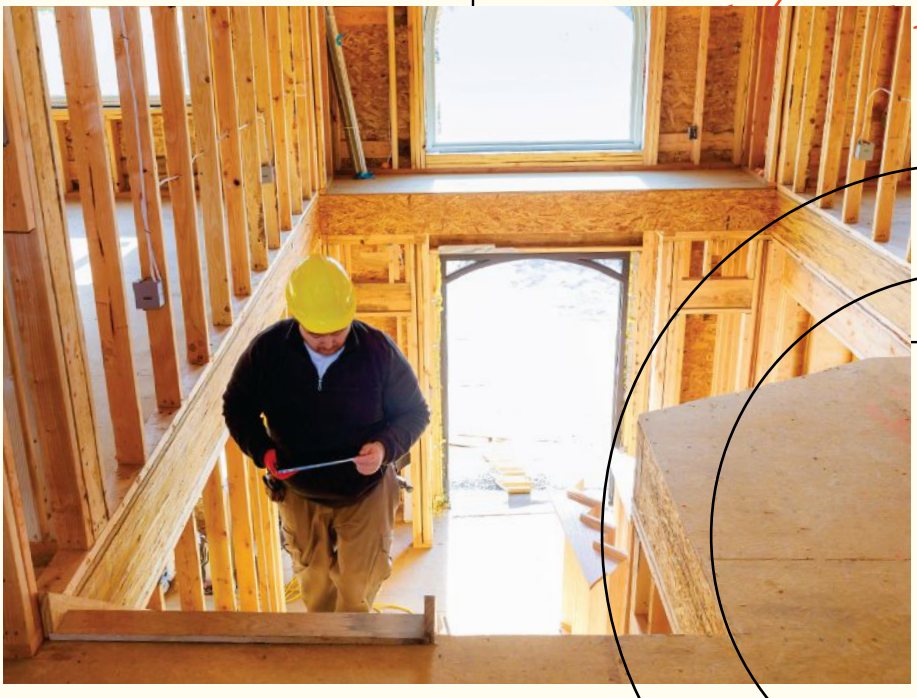

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A New Approach to Deck Framing

FastenMaster's Icon ScrewJoists are straight, light, and easy to install

by Raymond Degidio

PHOTOS COURTESY FASTENMASTER, EXCEPT WHERE NOTED

As a builder of high-end decks in southern Rhode Island, I have always been frustrated by the foundations for our decking never being perfectly straight or flat. Installing premium PVC or composite decking on standard pressure-treated framing never felt right, even after we carefully sized the joists, ripped or planed them as necessary, sometimes even shimmed them on the beam, and, in general, took the time to ensure the framing was flat. I knew that, even after all that work, the framing would eventually dry out, shrink, and create waves in the decking.

I'm always looking out for the next innovation in this industry. Usually, that's a new tool or software or railing system—not exterior deck framing. That's why I was eager to try out FastenMaster's Icon ScrewJoist deck substructure system when I was introduced to it last year. Using the same tools we always use for framing, we found that the Icon joists install faster than standard framing and require less hardware. And unlike steel framing, which has a different learning curve, framing with Icon joists is similar to framing with standard PT lumber.

An Icon joist has an open web with

Figure 1. Icon ScrewJoists are fabricated with 2x4 pressure-treated top and bottom chords connected with structural screw webs and are designed to be straight and flat (A). They weigh about half as much as a comparable 2x10 PT joist (B), making them easy to move around a jobsite (C). Instead of requiring a joist hanger, the end of an Icon joist goes over and under the ledger and is fastened to it with pairs of structural screws driven down through the top chord and up through the bottom chord and into the ledger (D). The joists can be ordered with or without waterproofing applied to the top chord.

2x4 KDAT (kiln dried after treatment) PT framing members on the top and bottom and structural screws on angles in the web. When I pick up a 16-foot 2x10 PT board, chances are it'll have a twist, a crown, or a bow; in contrast, a 16-foot Icon joist is straight and flat. The other thing I like about it is its weight: I can pick up a pair of 16-foot Icon joists—one in each hand—and carry them around. Try that with traditional framing (**Figure 1**).

A Learning Process

For the first deck we built with Icon joists, we pushed the design envelope a bit with a 50-foot-long structure varying in depth from 12 feet in one section, to 16 feet in another, and 21 feet in a third area. We started by submitting a plan view that we had drawn of the deck to my FastenMaster contact, Ernie Gasbarino, who sent back a preliminary plan to bring on site and review. After a few revisions and final approval of the plans, FastenMaster delivered a complete set of drawings for the project and a delivery date. Based on this information, we completed all the site work, installed the beams, and set the ledger per FastenMaster's specifications.

Ledger. We ripped the ledger down to $7\frac{3}{8}$ inches from 2x8 PT stock. When setting the ledger, we needed to keep in mind that Icon joists lap over and under the ledger by $1\frac{1}{2}$ inches for a total height at the ledger of $10\frac{3}{8}$ inches, or a tad stronger. After setting the ledger and securing it using FastenMaster LedgerLoks, we flashed it to the wall and laid out the joists based on the spacing and numbers on the drawing.

Icon joists are supported by a ledger and dropped carrying beams. As we installed the joists, we screwed down through the top chord into the ledger with two 3-inch FastenMaster MVP screws (our preferred screws for framing), then up through the bottom chord with two more screws. This engineered connection of four screws—two down and two up—avoids the need for joist hangers, saving time and allowing us to start laying decking sooner.

Figure 2. On this project, the Icon joists bear on a two-ply PT LVL dropped perimeter beam supported by PT 6x6 posts, with the top of the beam 1½ inches lower than the bottom of the ledger (A). Once a joist is positioned on the 16-inch-on-center layout, it's fastened to the beam with a pair of structural screws driven down through the bottom chord into the beam (B). Another intermediate dropped three-ply beam provides midspan support and carries point loads from the columns supporting the porch roof (C).

Carrying beams. We installed a two-ply LVL dropped beam at the front of the deck and a three-ply 2x10 dropped beam near the midpoint of the left side of the deck; the latter also carries loads from a porch roof. We set the beams so that the tops would be 1 1/2 inches lower than the bottom of the ledger to account for the design of the Icon joists. Both beams are supported by 6x6 posts bearing on concrete piers (**Figure 2**).

Connecting the joists to the beams couldn't be easier. Once we had positioned a joist on the 16-inch-on-center layout and screwed it to the ledger, we simply drove a pair of MVP screws—one on each side of the bottom chord—into the carrying beam. In most applications, securing the joist to the beam with these two screws avoids the need for tie-down hardware from joist to beam, saving time and hardware and eliminating another step in the installation process.

Alcove. The house has a small, 7-foot-7-inch-wide-by-5-foot-deep alcove, where the joist span increases to 21 feet. Here, we ran the 2x8 ledger straight across to a three-ply hanger fastened to the framing of the facing wall, then added two more 2x8s to the ledger to create a three-ply inset beam. In this area, the 16-foot joists are supported by the ledger and inset beam assembly, while shorter, 5-foot Icon joists fill in the gap between the longer joists and the wall of the alcove.

This detail illustrates that Icon joists don't have to be supported by a dropped beam; you can build an inset beam instead and set the joists as you would on a ledger. We recently used this detail on a project that had originally called for a two-ply drop beam. When we realized that the drop beam would limit the headroom underneath the elevated deck, we replaced it in the field with a two-ply beam set on posts at the same height as the ledger. Then we removed the front squash block on the Icon joists and installed them on the beam the same as on the ledger. Next, we ripped a 2x12 down to 10 1/2 inches so that it was the same overall height as the joists. We fastened this to the outside of the ends of the

Figure 3. Icon joists can be supported by inset beams as well as by dropped beams. Here, the author removed the squash blocks at the ends of the joists and replaced them with a two-ply 2x8 beam that spans across the support posts, followed by a third ply to strengthen the assembly (A). Inset beams can also be used to preserve clearance under an elevated deck when spans longer than 16 feet are called for (B). Blocking is required midspan and under bearing points but is easy to install because the open web of the joists (C) allows continuous blocking to be inserted from the side of the deck (D). Side rim boards that fit between the top and bottom chords of the edge joists can then be installed.

joists and the inset beam with structural screws to create a three-ply beam. This was an easy change for us (**Figure 3**).

Blocking. A deck framed with standard PT lumber requires a lot of blocking, which involves cutting the pieces to length, installing them between joists, and screwing each side of the blocks into the joists from inside the joist bay, which is a tight fit. Blocking a deck framed with Icon joists is a lot quicker. We rip as many 2x8s as are needed for the size of the deck (as determined by the supplied plans) to 7 3/8 inches, then simply slide the ripped 2x8s through the web of the joists from the side. Once the 2x8s are through all the joists and in position, we install screws through the top and bottom chords into the blocking, and we're finished.

We also use blocking to help us with stair landings if they come off the side of a deck. We install the blocking through the web of the joists in the first three or four bays, then slide the landing joists over the blocking.

We usually picture-frame decking, which on a traditional deck requires installing the end joist, installing a joist 5 1/2 inches in from that joist, installing

PHOTO 3A: RAYMOND DEGIDIO/JALEX BUILDERS

Figure 4. Blocking was also required for the surface-mounted 4x4 rail posts (A). The small landing for the flight of stairs at the end of the deck was conventionally framed and provides access to storage underneath the deck (A). A wider set of stairs at the other end of the deck leads to a poured-concrete patio and sitting area (B).

a 2x6 between them at the top, and screwing them off. With the Icon system, we simply install two Icon joists next to each other, giving us 7 inches of framing to work with. We add blocking where we need it for secure-mount posts or for top-mount aluminum railing systems (**Figure 4**). These areas are highlighted and marked out on the plans, along with any other blocking details.

Cost

A 20-foot-wide-by-16-foot-deep deck framed with PT lumber requires 18 2x10 joists, three 20-foot 2x10s for the ledger, rim, and blocking, three 2x6s for picture frame and rail blocking, several joist hangers and Simpson Strong-Tie H2.5 connectors along with short screws for both (long screws for joist-hanger sides), and FastenMaster LTS brackets. Based on current pricing at my local lumberyard, these materials amount to $1,356 (I rounded off and did not include tax). Icon ScrewJoists are sold as a system, not individually, with a cost of about $10 per square foot of framing. This project required 18 joists, two 2x8x20s for ledger and rim, and one 2x6x16 for rail blocking. I purchase Icon through my lumberyard, Arnold Lumber Company, as a flow-through product that is delivered directly to the jobsite. The total for the Icon system is $2,475. Now most of you will say it's double, but that's not actually true. Let's look at the time involved for a complete price.

To treat each system fairly, we'll agree that the ledger, the footings, and the drop beam are in place and ready to go, and the deck is 4 feet off the ground. For the pressure-treated deck, I conservatively figure three workers at six hours each to set the frame, all the hangers, and the blocking. Assuming that the cost per man hour of labor is $65, the total labor cost for this example would be $1,170, for a combined labor and materials cost of $2,526. You now have a deck frame that is not exactly flat, will move as it dries out, and carries a zero-year warranty for the materials.

After building several decks with the Icon system, I estimate that it will take three workers 1 1/2 hours each to install the framing, for a total labor cost of $293. This brings the materials and labor cost of the Icon deck to $2,768, a difference of less than $250. For that premium, we now have a deck frame that is flat and kiln-dried to reduce movement, and that comes with a 25-year warranty.

If my labor estimates seem low, consider this: We set the joists for our first deck (the one shown in this article), which was 50 feet wide with double beams and an inset beam for one section, in under two hours. We did a 20-foot-wide-by-12-foot-deep deck that was 8 feet off the ground with an inset beam in 28 minutes. We did a 34-by-12-foot deck that was 10 feet off the ground with a drop beam in 38 minutes. It's amazing how quickly the system installs once you are comfortable with it.

Everyone builds decks differently, and this system may not be for everyone (distribution is currently limited to New England and the mid-Atlantic states). We build 90% of our decks with TimberTech Azek decking and railing systems. The decking has a 50-year warranty, the railings have a 35-year warranty, and, now, the frame has a 25-year warranty. We found that the Icon joists install easily, come with a complete set of drawings, weigh less than standard PT lumber—helping prevent injury—and in the end, are a cost-effective solution to better decking. ❖

Raymond Degidio owns Decks By Jalex/Jalex Builders in Narragansett, R.I.

PHOTOS 4A AND B: PJ DOUGHERTY/JALEX BUILDERS

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Installing an Outdoor TV

Power drop-down and pop-up actuators add versatility to your mounting options

by Robert Viviano

As demand for outdoor living spaces expands, so does the list of features that our clients want to fill those spaces with. They want to bring the things they enjoy inside their homes to the outside—from full-blown kitchens, bars, and fireplaces to all types of furniture. Now you can add large, flat-screen TVs to the must-have list.

Having installed a number of outdoor TVs over the last few years, we've learned a few things that are necessary to consider for a successful installation, such as the best placement to avoid glare and provide a proper viewing angle, and the relationship of the furniture layout to the TV. Other factors include the type and size of the TV, power and other electronic connections, and types of mounts and—if needed—power actuators for motorized installations. Also, don't forget that an outdoor TV can be affected by weather conditions and wind direction.

Location

The first thing we consider in an outdoor TV installation is location, with the best one being under a permanent roof cover. If that's not possible, the TV will require a weatherproof cover, though waterproof TVs that can sit out in the elements are available if your client wants to spend more than $5,000 for the unit. We typically recommend the $300 to $500 Sam's/Costco TVs if the unit will be protected from weather conditions.

One mistake I often see is mounting a TV to a house wall. While this location is tempting because the installation is quick and easy, it creates two issues. First, deck furniture isn't typically situated to face the house; instead, it's generally oriented to look out over a backyard or garden or to take in lake or mountain views. Second, there's a greater chance that glare will be a problem during the later hours of the day when the sun is low, making the screen virtually impossible to see. Instead, locate an outdoor TV near the outer edge of a deck, toward which the furniture is already pointing.

When locating a TV, make it work with how the deck is used. Consider not only furniture orientation but also the location of the grill so that the cook can watch the game while cooking the steak

PHOTOS BY ROBERT VIVIANO

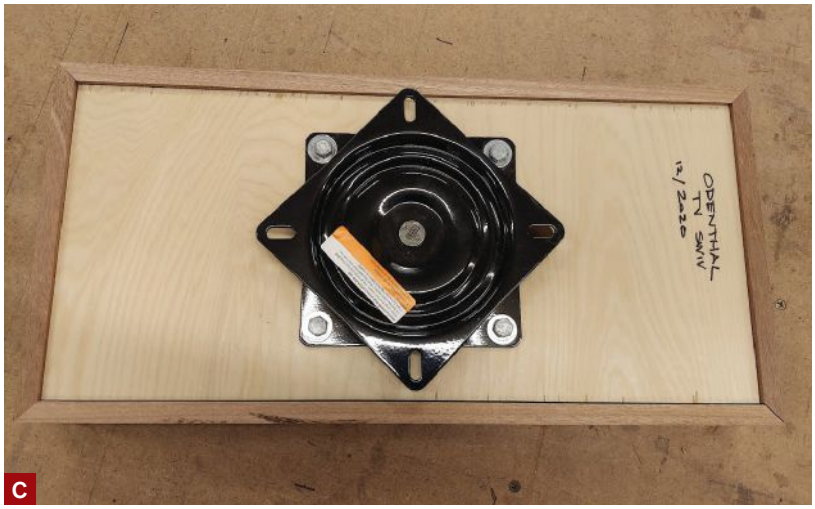

Figure 1. For a basic TV installation on flat and pitched ceilings, the author uses a motorized flip-down mount (A, B). On a flat ceiling, the mount can be fitted with a swivel bracket that allows the viewing angle to be adjusted (C). In a room with a higher ceiling, a TV can be mounted to a vertical drop-down power actuator that retracts the TV into the ceiling (if there is enough clearance above) or into an enclosure mounted on the wall (D).

or burgers. If there's a bar area with stools, is the TV viewable from it? In many cases, using a multidirectional mount rather than a fixed one can solve viewing problems.

TV size. Let's face it, bigger is better, but there are practical limits in an outdoor environment. The larger the TV, the more it tends to act like a sail, with the risk that wind will dislodge or damage it. Size might also be limited based on where it will be attached, such as over a fireplace. If the installation includes a motorized mount, you'll have to consider the movement and load that a large TV will place on the actuators. Bottom line? Make it as large as possible for the conditions.

Mounting Options

Our go-to method is to mount the TV to a ceiling with a motorized flip-down mount, such as Vivo's Vesa E-FD55 (less than $200 on Amazon). On flat ceilings, we often add a swivel base so that the viewing angle can be adjusted. We make the base out of scrap LVL clad to match the ceiling finish, and we mount it to an outdoor ball-bearing boat-seat swivel. This assembly blends in well with the ceiling. If the location is windy, we can add a stop pin to lock the swivel in place (**Figure 1**).

Another option is to mount the TV to a power drop-down actuator, operated by remote control, that retracts the TV completely into the ceiling or a wall enclosure. A lid can be fitted to the bottom of the TV hoist so that it closes off when the unit is retracted, but the lid needs to be sized precisely with about a 1/8-inch gap around the margin to fit into the opening. The drop-down mechanism we use has a bounce sensor (very important); when the wind picks up, the mechanism automatically retracts into the ceiling to protect the TV (and itself) from damage.

To mount a power drop-down to an under-deck dry system, we fabricate a

Figure 2. When you're installing an outdoor TV above a fireplace, the author recommends locating it close to a mantel that projects at least 10 inches to help divert heat away from the TV, with the mantel no higher than 5 feet above the floor to preserve viewing angles (A). Sometimes, an insulated flue runs behind the TV, so when building a recessed TV cabinet (B), the author will jog around the flue pipe and add fireproof rigid insulation about 2 inches thick for extra insurance (C).

bracket that mounts to the side of the beam and cantilevers out close to the ceiling. We make it out of stainless steel (I have a background in metal fabrication), matching the drop-down mount's bolt pattern to the bracket. A metal shop could fabricate a similar bracket out of mild steel and paint it.

Fireplace mount. Another common place to mount a TV is above an outdoor fireplace, which is usually well-protected from weather and located where it can be seen on a deck or patio. But heat from the fireplace needs to be taken into account, especially if the unit has a gas flame. Usually, these units don't have a flue, so all the heat comes out the front and can melt the TV. In fact, we won't install a TV above any fireplace that doesn't have a mantel to divert the heat, preferably one made of stone that projects at least 10 inches out from the face of the fireplace (**Figure 2**).

Another thing to keep in mind with a fireplace mount—especially if there is a mantel—is the height of the TV. If the TV is too high, it will be uncomfortable to watch, especially when the deck or patio is small. Our recommendation is to make sure the top of the mantel is no higher than 5 feet above the deck and keep the TV as close as possible to the mantel.

There are several mounting options, including simple wall mounts that just tilt and are mostly tucked tight to the wall (again, Amazon is a good source). There are also mounts that pull out away from the wall so the TV can be swiveled in different directions, but these mounts can get you into trouble. If they pull out too far, the wind can grab the TV and mangle it very quickly. To limit the risk, we recommend pull-out swivel mounts that project out only about 6 to 8 inches, with less rotation.

Sometimes, we mount a TV into a recessed box that is made to fit the TV's size. Sizing the box to be about 6 inches deep with a 2-inch margin around the TV provides a custom fit that protects the TV from side winds and blocks the back of the TV from view.

We build these boxes with poplar sides and 3/4-inch birch-plywood fronts and backs, sealing the wood with a coat of polyurethane varnish or a primer/sealer on the back to help keep the wood stable. I use a hidden magnetic push latch for the door so that hardware isn't visible. Inside the compartment is where outlets for A/C power and data/cable are mounted.

Figure 3. While manufactured outdoor TV cabinets are available, the author prefers to build custom units that he matches to the other finishes in the room and equips with a power pop-up actuator (A). These lifts (a good source is tvliftcabinet.com) allow the TV to drop down out of sight when not being viewed, with the cabinet lid closing over it automatically (B, C, D). If the TV needs to be able to rotate, the lift can be installed in a cabinet with a pull-out drawer mounted with heavy-duty slides that allow the whole assembly to extend out away from the wall (E, F, G).

In our TV boxes, we include a door at the bottom that allows wires to be dropped into the wall behind the TV. Boxes can also be used to house DVD players and other audio equipment, remotes for the TV, lights, fans, other accessories, and soundbars; be sure to consult with your customers about their specific plans when you're designing the box, since these devices will change its dimensions. We also recommend that the box be painted black, just like the TV that it surrounds, to keep the focus on the screen.

Cabinet Mount

TVs can also be mounted in a cabinet, either a stand-alone unit from a third-party supplier [like Cabinet Tronix] or a custom-made built-in unit. We prefer built-ins, and to make them more dramatic, we like to equip them with power pop-up actuators (**Figure 3**).

We build our cabinets using $^{3}/_{4}$-inch birch plywood for the back and sides, where the mechanicals get mounted, and 1-by poplar for the face frames.

Figure 4. To install a pop-up style of TV lift in an outdoor bar located along the edge of the area that is protected by a roof, the author devised a gutter system to channel water away from the assembly (A). When the TV is retracted and the lid is closed, water is prevented from getting into the enclosure, while the lid lifts up and out of the way when the mechanism raises the TV into viewing position (B).

Then we clad the cabinet box with PVC panels and top it with a PVC hinged flip lid that conceals the TV when it drops down into the cabinet. When the pop-up actuator moves the TV upward, it pushes the lid open. The lid needs to stay leaning against the lift shaft so that when the shaft retracts, the lid will close by itself when the TV is lowered into the cabinet.

Our cabinets aren't waterproof, but they stay stable because we install them where they aren't continually exposed to weather. Keeping in mind that anything mechanical will at one time or another need to be serviced or replaced, we make the front PVC cladding easy to remove to provide access to the equipment. With this PVC cover removed, we make it a point to inspect the actuator movement and make sure the wiring can flex without binding or snagging as the TV raises and lowers. We don't want the TV to unplug itself.

There are two types of pop-up actuators; one holds the TV in a fixed position, while the other can rotate when at the top of lift. When installing a rotating pop-up actuator, we plan for space behind the unit to allow the TV to swing. In tight situations where customers also want rotation, we have built units with a pull-out drawer. If you do that, make sure you get the heaviest stainless-steel ball-bearing slides you can buy. I've found that online marine suppliers are a good source for hardware used in outdoor applications. With a swivel-type TV mount, the rotating TV will push the lid over to lay flat, so keep in mind that the lid will have to be manually flipped back to the closed position when the TV retracts.

A creative yet challenging version of the pop-up style that we built was in the backsplash area of an outdoor bar. The countertop was made using custom concrete, the lid had to lift and retract with the TV, and the assembly had to be waterproof since it was located near the edge of the covered area.

To prevent water from getting inside the box, we added a gutter system on each side so that the lid would overlap the gutter and any water reaching the edge would channel out and away. The other thing I was concerned about was that the mechanism would eventually wear to the point that it wouldn't seat the lid exactly every time, or that outdoor dampness would affect the movement and cause damage to the concrete top. Our solution was to spring-load the cap to the mechanism so that when the top seated, it would rely on the springs to constantly adjust as needed (**Figure 4**).

Electronics

We leave the wiring and electronics to the pros. Many of our customers are already engaged with a contractor who installed their in-house media system, and we try to coordinate with the audio and TV guys during the planning process and before we close things up.

When planning outlets, for example, we need to account for all the equipment so not to be short on power sources for soundbars and amplifiers, as well as the TV. Speakers may need to be wired in and cut out. It's a lot cheaper to run wiring when all is open than it is to run even a simple wire to a specific location after the fact. To limit our liability, we want the audio/video guys to do a last-minute check that they have all their wires in place before we close things up.

For a cleaner look, we recommend using a streaming data connection rather than a hard-wired cable. This requires just one duplex outlet in the ceiling for the TV; multiple wires are more challenging to conceal. ❖

Robert Viviano owns Deck the Yards, in Pittsburgh, Pa.


A


B


C

Fence Made of Glass

By Ryan Lieuallen

Our customer, who lives on a tranquil river flowing through Washington's Spokane Valley, decided to remove a 6-foot-tall hedgerow that was blocking his river views and replace it with a retaining wall topped with a frameless glass railing system. A landscaper was contracted to build the retaining wall, while our job was to install the glass fence.

We considered pouring a continuous concrete footing to create a solid and level mounting surface for the brackets, or spigots, that support the 34-inch-high-by-1/2-inch-thick glass panels, but the narrow concrete top surface would be at increased risk of spalling from the anchor attachments. Instead, we decided to support the spigots with individual concrete footings, which would be easier to hide and require significantly less concrete and labor to form and pour.

Creating 44 individual footings that are perfectly level with each other on a sloping site was a challenge. While the landscapers were building the retaining wall, I worked with them to place compacted gravel in the line of the footings, then they backfilled to finish grade **(A)**. We dug each footing by hand to set the 44 12-inch-diameter cardboard footing forms 24 inches deep, relying heavily on a laser level as we took a full day setting, bracing, leveling, and double-checking the forms before pouring concrete **(B)**.

We mixed the concrete by hand and carefully shoveled each scoop of concrete into the forms so as not to disturb them. We used a concrete vibrator to eliminate air pockets, then rechecked with the laser before finishing the pour. Mixing concrete by hand sometimes creates slightly different slumps from batch to batch, so we let the footings set for two weeks in case there was uneven curing.

We used 1/2-inch-thick wood strips cut to the length of the panels to align the spigots, dry-setting the spigots on the footings to get our lines. Then we drilled holes for the anchor bolts and set the spigots, knowing they would probably need adjustment after we set all the glass loosely to check the fit.

I would like to say all the footings were perfectly level, but that was not the case. But they were within 1/8 inch of each other, so only needed a slight bit of shimming inside the spigot. We also started by setting the glass panels over the footings that were a little low, knowing that we could grind the concrete down a bit on the higher ones. Once the straight line was created, we also did minimal shimming of some of the spigots from front to back. The final process was getting each glass panel to flow level into the next, which required very fine shimming and minor adjustments for equal spacing **(C)**. ❖

Ryan Lieuallen owns Ridgeline Decks in Spokane, Wash.

PHOTOS BY RYAN LIEUALLEN