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On the cover: Workers for LG Squared, in Atlanta, apply critical slab-edge insulation and termite protection to a high-performance foundation slab. See the story on page 31. Photo by Chris Laumer-Giddens.

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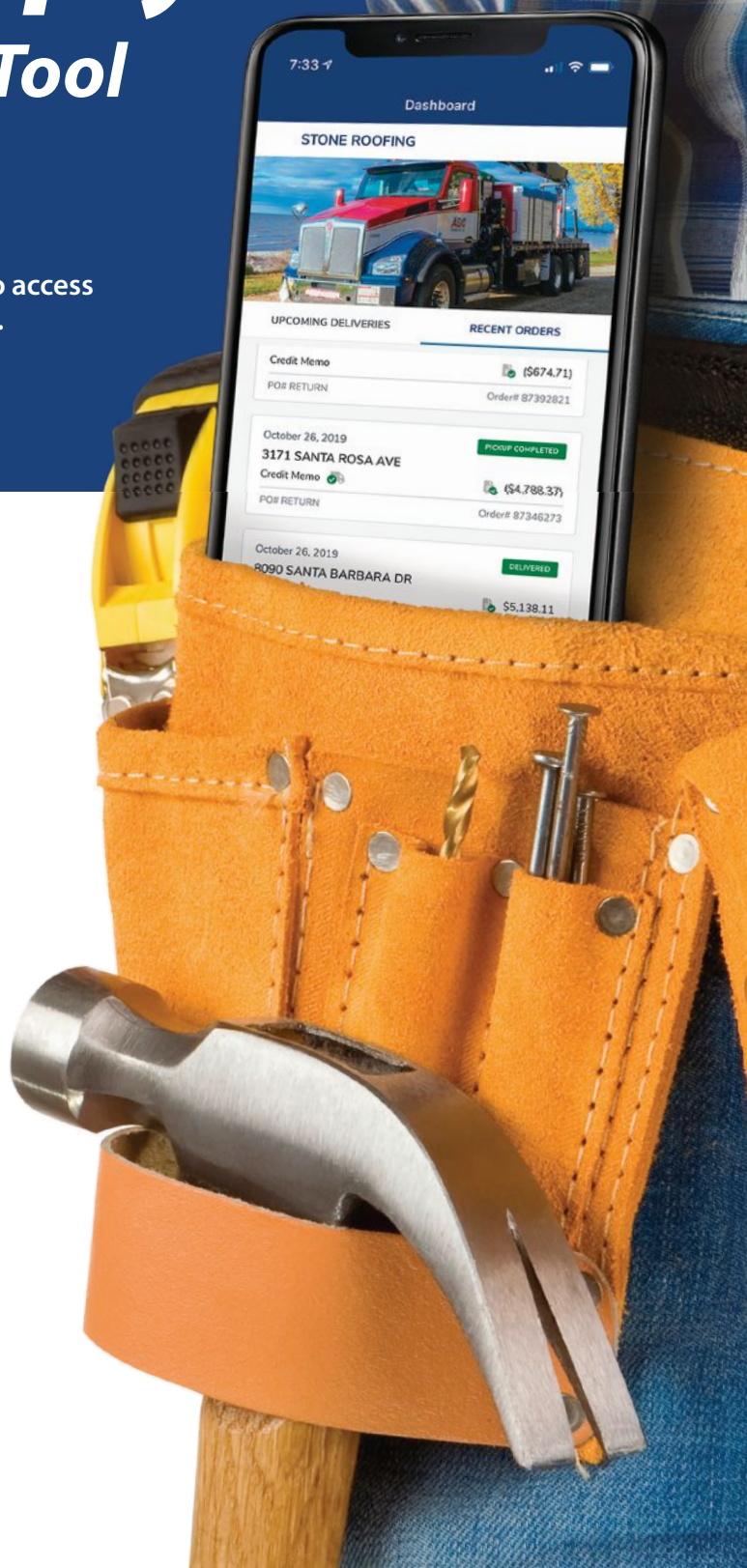

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BY ROE OSBORN

Working Out Eaves Details

One of the last tasks in framing a house is installing the exterior trim—in particular, the eaves trim. In most cases, this trim—the soffit and fascia—must be installed before the roofing goes on to make the building weathertight. Roofing is usually a payment milestone for the framing crew, as well.

Begin at the design phase. Determining the configuration of the eaves typically occurs at the design phase of construction. Designers work out the overhang, or the distance from the exterior wall of the house to the edge of the eaves trim or fascia. (They also figure out rakes and returns that may also include soffit overhangs.)

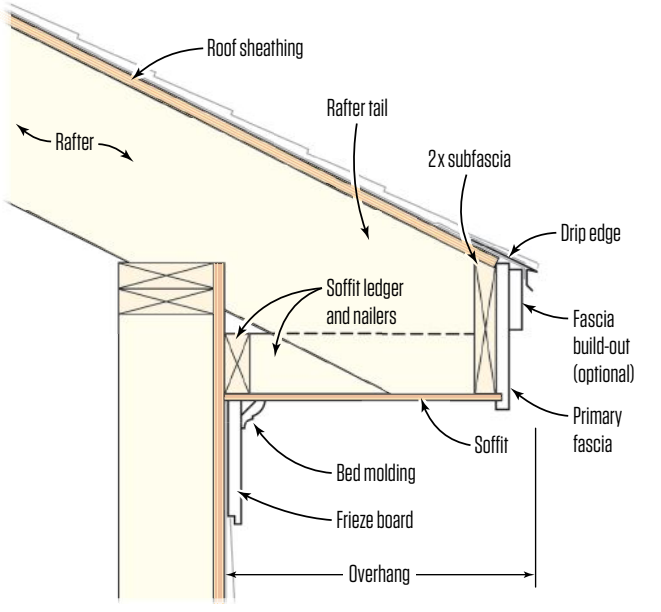
In the most general terms, wide overhangs (16 inches or more) tend to work better visually with shallow-pitched roofs and more contemporary designs. Wider overhangs also do a better job of keeping roof runoff away from siding and can offer shading for windows to help reduce a home's solar gain.

Narrow overhangs (12 inches or less) generally look better with steeper-pitch roofs and more classic designs. Narrow overhangs don't offer much shading, and they do not offer nearly as much protection against rain. Where I live in New England, most narrow eaves are equipped with gutters to collect roof runoff **(1)**.

Designers have to properly proportion the size of the fascia (the vertical part of the eaves) to the width of the soffit (the horizontal part of the eaves) (see Eaves Terminology, right). A skinny fascia can accentuate the width of an overhang, while a tall fascia can make eaves look clunky. The vertical distance of the fascia beyond the soffit material (the reveal) creates a shadow line, which can be crucial to the overall aesthetics of the eaves. Details such as the frieze board on the wall below the soffit, additional fascia boards, or crown molding are some of the nuances that a skilled designer can incorporate into the design of the eaves to achieve a desired effect. Framers rarely have input into the design of the eaves, but because the rafter tails are an intricate part of that design, it's important to have these details worked out completely ahead of time.

Make a full-scale drawing. Once the design is completed and put on the blueprints, most framers I know make a full-scale drawing of the eaves detail on the end of a straight piece of rafter stock or piece of sheathing **(2)**. They begin by drawing the birdsmouth, or the rafter cut out that fits over the wall plate (see "Cutting Common Rafters," Mar/17). From there, they mark out the total overhang as taken from the plans. Working back from the overhang, they mark the width of the fascia and any secondary fascia trim that might be called for. Next is the subfascia, which is usually made from 2-by stock that is nailed to the rafter tails.

Eaves Terminology



Narrow overhangs rely on gutters to help keep water off the siding **(1)**. To lay out and install the parts of eaves, framers must be able to visualize the details and how those details relate to the wall and roof framing (illustration, above).

Photos: 1, 5, Roe Osborn; 2–4, Justin Cline. Illustrations: Tim Healey

Visualizing the details of eaves is easier with a full-scale drawing. For this complex eaves with crown molding, the builder uses a section of the molding along with a piece of 1-by stock to ensure a proper layout **(2)**.

Going back to the fascia board on the drawing, framers mark the height of the board as determined by the design and by stock widths. (For 1x8 fascia, they would mark 7 1/2 inches down from the top). Then they mark the reveal along with the thickness of the soffit material. The top of the soffit material and the inside edge of the subfascia help define the cut lines for the rafter tails.

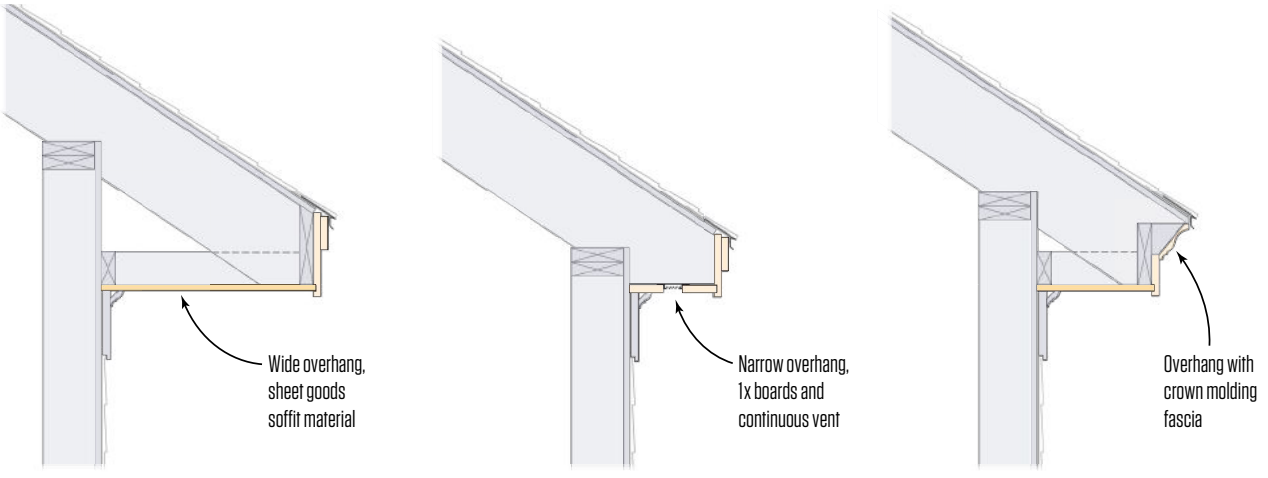
A full-scale drawing is particularly important when the plans call for a cornice with crown molding (see "Building a Cornice," Apr/17). Because crown-molding angles can vary, it's helpful to have a sample of the material you plan to use on hand as you make your drawing. Some builders make their full-scale drawings and mock-ups on a sheet of plywood and work out the cornice returns as well.

Eaves with narrow overhangs. Regardless of the overhang dimensions, fascia is most often made from 1-by stock. The material for the fascia can range from preprimed wood to a wide variety of rot-resistant synthetic materials. On the other hand, materials for the soffit can vary greatly.

For narrow overhangs, the rafter tails may provide all the nailing needed when they're spaced 16 inches on-center (see Basic Eaves Configurations, below). One-by material works well for the soffit, and the continuous nailing provided by the subfascia isn't necessary. In this case, the level part of the rafter tail usually ends close the wall, so no additional nailing surface is needed along the house wall.

For narrow eaves, the outer piece of soffit material goes on first, nailed to the level underside of rafter tails with the outer edge of

Basic Eaves Configurations



Here are three of the most common residential eaves configurations; each of these can vary greatly according to the wishes of the designer or client. Wide overhangs offer greater protection from runoff (left). Narrow overhangs usually don't require additional nailing surface (center). Crown molding can add a distinctive flare to the look of the fascia (right).

Seen from below, blocking between the subfascia and the wall adds plenty of nailing surface for attaching a wider soffit **(3)**.

To join the fascia to the soffit, this crew member runs the 1-by fascia material through a table saw to create a dado groove **(4)**.

A frieze board **(5)** captures the top edge of the siding while closing the joint between the soffit and the wall.

the soffit flush with the outer edge of the tail. If you are including continuous strip vent (see "Three Ways to Vent a Soffit," Jan/13), the flange for the vent slips between the soffit strip and the rafter tail, and the inside soffit strip captures the other side of the vent.

If enough care has been taken during installation to line up the rafter tails perfectly, the fascia can butt against the soffit and nail directly to the plumb cuts of the rafter tails to give you a nice straight eaves detail. Sighting down the rafter tails will give you a quick indication of whether extra straightening work is needed. With 1-by soffit material, the fascia can be nailed directly to the soffit as well.

Eaves with wide overhangs. Most wide soffits are made from sheet goods ripped to the proper width. We used to make those soffits from 3/8-inch AC plywood. Wide soffits require some sort of nailer in the form of a cleat or blocking along the wall of the house. Wide soffits may also benefit from blocking that runs between the wall ledger and the subfascia **(3)**. That blocking is typically nailed to the sides of rafter tails.

Methods for attaching the soffit to the fascia vary depending on the material. For thin plywood soffits, the preferred method is cutting a dado or groove along the reverse side of the fascia. The fascia dado for 1/4- or 3/8-inch plywood can be made with a couple of quick, shallow passes on a table saw **(4)**. When you're attaching the soffit to the nailers, the outer edge extends past the subfascia by 3/8 inch or so. The dado in the fascia then slips over the protruding soffit and captures the edge of the material. The dado groove also provides some leeway to adjust the straightness of the fascia. If thicker soffit material, such as 1-by stock, is used, a wider dado can be cut, or the soffit can be joined to the fascia with a simple butt joint.

Where the soffit meets the wall. When measuring the width of the soffit, most framers I know give themselves a little leeway to compensate for any waviness or irregularities in the wall. Any small gaps (up to 3/4 inch wide) can then be covered with a frieze board. Not only does the frieze board disguise the joint between the soffit and the wall, it is also part of classic entablature (see "A Look at Traditional Trim Designs," Aug/15) that completes the aesthetics of the eaves **(5)**.

Most frieze boards are 1-by material with a rabbet cut along one edge. The frieze board goes over a band of tar paper or weather-resistive barrier attached to the wall just below the soffit, and the top edge of the board slides up against the soffit with the rabbet facing the house. The top siding course then slips into the rabbet. Bed molding can then cover the frieze/soffit intersection if desired.

A quicker (but perhaps less attractive) method is to skip the frieze altogether and run the siding up to the soffit. Instead of trying to create a perfect joint between the soffit and siding, butt a narrow strip of 1-by material against the soffit and nail it to the siding. The strip will be cocked to the angle of the siding, but that angle puts a corner of the strip against the soffit for a crisp and tight line.

Roe Osborn, author of Framing a House *and* Finishing a House, *is a senior editor at* JLC.

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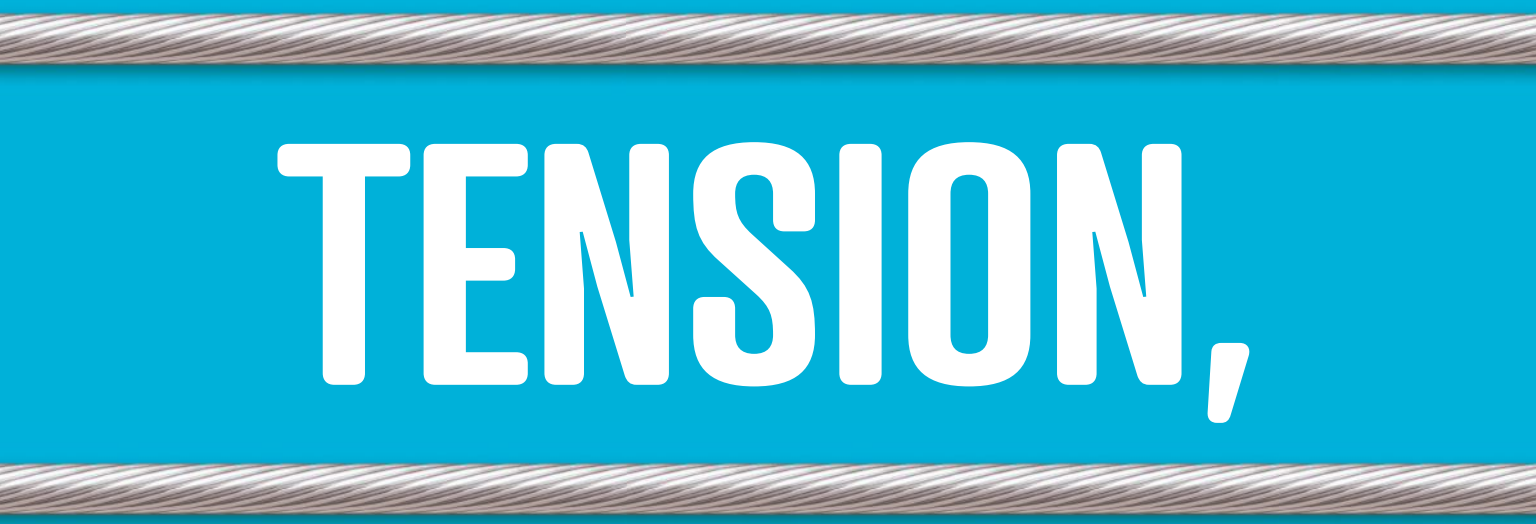

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Q Does the bottom of a niche in a tiled shower have to be a single piece, or can I use multiple tiles?

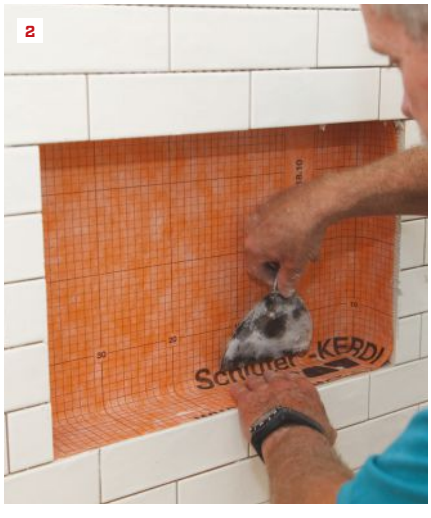
A Tom Meehan, a second-generation tile installer and co-author of *Working with Tile* who lives and works in Harwich, Mass., responds: Either option is acceptable if you have waterproofed the inside of the niche completely and carefully. That waterproofing can come in a few forms.

One way to create a waterproof niche is by using a preformed manufactured niche pan or insert. Most of these products fit within standard 16-inch stud spacing and the depth of 2x4 walls. The materials that these niches are made of can vary tremendously, but most are a type of plastic or composite material. These factory-made units come in a variety of configurations—many with integral shelves. Many companies, including Laticrete and Schluter, that make tile installation materials also offer choices in preformed niches.

Factory-made niches come with attachment flanges around the perimeter of the openings. These flanges go over or are let into the wallboard of the shower and must be integrated with the system for waterproofing the wallboard. One caution when installing a preformed niche is to make sure that the flange does not cause the tile around the opening to flare out. Schluter makes preformed niches from Kerdi board, its own waterproof wallboard. The flange (made out of the same wallboard) installs flush with the walls of the shower, making it easy to integrate the niche without a significant raised area around the perimeter.

Although I have installed manufactured niches, I most often custom-make niches to fit in specific places in a shower. In the project I wrote about in "Tiling a Walk-In Shower" (Nov/19), we lined up a niche below the window in the shower. I first lined the inside of the niche with waterproof Johns Manville GoBoard backerboard (the same board that we installed in the rest of the shower), bedding it in modified thinset **(1)**. Then I cut and installed a layer of Schluter's Kerdi waterproofing membrane **(2)**. At that point, the niche was essentially waterproof, so it didn't matter that I used two pieces of stone tile to cover the bottom of the niche **(3)**.

That said, there are a few key points that I always try to address when installing shower niches. First, I encourage clients to locate the niche on a wall that receives a minimal amount of direct water from the shower. After waterproofing the niche, I install the bottom pieces with a slight pitch so that the water runs out and doesn't pool in the niche. Also, if using porous tile (such as the limestone for this niche), I make sure that the tile is sealed properly before the clients use the shower.



Photos by Roe Osborn

To waterproof a tiled niche, apply waterproof backerboard to the inside surfaces of the niche **(1)**. (The back wall of this niche was in two pieces to facilitate installation.) Next, apply waterproof membrane, bedding it in unmodified thinset **(2)**. With the waterproofing complete, install the tile starting with the bottom of the niche, which should have a slight pitch for drainage **(3)**.

JLC INTEL

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TROUBLE-FREE METAL ROOFS

Careful fastening and a good underlayment will ensure that the roof stays dry for decades

Architectural metal roofs have a lot going for them. They look great, are suitable for relatively low pitches, and can last 60 to 100 years. However, they need to be properly installed.

As with all roofing, keeping moisture out comes down to material choice and proper detailing. Using the manufacturer-supplied flashing and trim are obviously important, but here are some other things to consider:

STANDING SEAM IS WORTH THE COST

Roof panels come in exposed fastener and standing seam types.

Exposed fastener roofs can have 70 screws per square—a lot of potential leaks. The weak points are the neoprene gaskets, which can begin leaking in as little as 15 or 20 years. And if installers drive the screws at an angle or don't tighten them enough, the gaskets won't make a proper seal to begin with.

By contrast, standing seam roofs have no exposed fasteners. Panels are fastened along the vertical seams, using clips or an integral flange, which is then covered by the next panel. Standing seam costs more but has a better shot at a trouble-free life.

BE CAREFUL WITH ADD-ONS

Even on standing seam roofs, some installers fasten solar panels, satellite dishes or snow guards with exposed screws. A better choice is to use S5 brackets, which clamp to the vertical seams and are held in place with round-point screws that don't penetrate the metal.

UNDERLAYMENT IS CRUCIAL

If any water does get behind the panels (whether from installation errors or leaks caused by falling branches), it can work its way into the sheathing around those screw penetrations.

That's where high quality, peel-and-stick underlayment membrane earns its keep. It provides a backup watershed and also self-seals around screws.

Some installers only extend the membrane 36 inches up from the exterior wall line, as required by code, then lay roofing felt above that. This protects the roof edge against leaks caused by ice dams, but if water gets behind the metal on the upper part of the roof, remember that felt has no sealing ability.

UNDERLAYMENTS AREN'T EQUAL

Although you can use a standard peel-and-stick membrane, some builders and architects want more protection. The issue is heat: underlayment beneath a metal roof will get hotter in the sun than under asphalt shingles.

"We make a membrane for metal roofs called Ice & Water Shield HT. It's a 40 mil rubberized asphalt that has been tweaked to give it better thermal stability," says Brandon Wulf, a Sales Manager at GCP Applied Technologies. "The HT product is formulated slightly differently to achieve a higher thermal stability."

Some roofs get even hotter. That's the case with copper panels, which absorb more sunlight than steel, and in extreme climates like Arizona. "In those cases, we recommend Grace Ultra," says Wulf. "It's 100 percent butyl rubber with a thermal stability up to 300 degrees."

Bottom line: careful fastening and the right underlayment go a long way toward keeping a standing seam roof trouble-free for its entire service life.

To get more tips on proper metal roof installation, visit **www.gcpat.com**.

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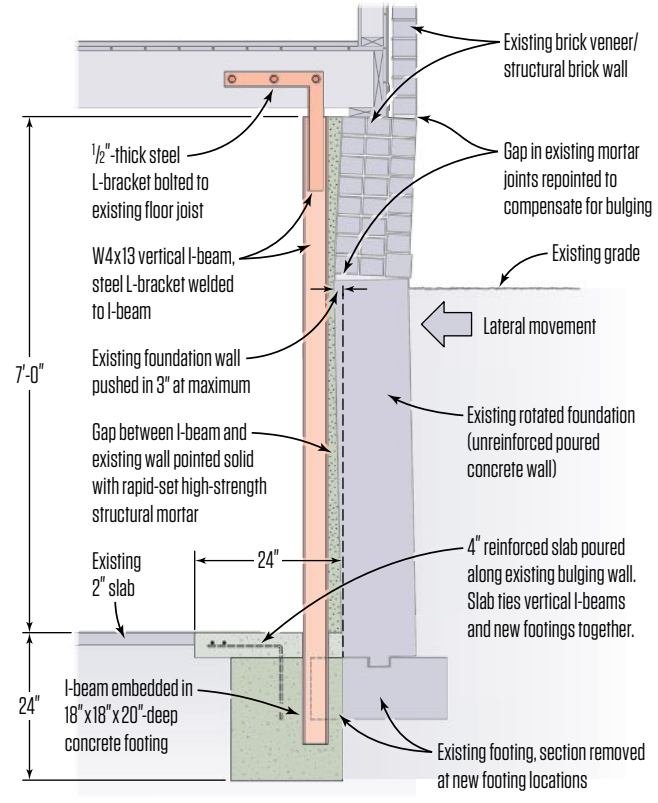
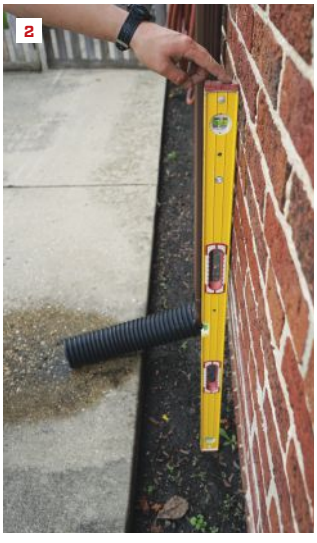
Reinforcing a Bulging Foundation





Photos by Jake Lewandowski; illustration by Tim Healey

A Cure for a Bulging Foundation

BY JAKE LEWANDOWSKI

Working for my company, Great Lakes Builders, is never boring. We are called in to do just about any kind of structural repair you can imagine, and foundation problems are common among the projects we do.

Recently, we were called in to reinforce the foundation on a home built in the middle of the last century—before soil analysis, concrete reinforcement, and engineering became commonplace. The foundation on this home was unreinforced poured concrete from grade down to a footing below the basement floor. Above grade, a brick masonry wall extended up more than 2 feet to support the framing for the first floor.

The poured foundation was solid, but over time, one wall had rotated inward more than 3 inches at its maximum **(1, 2)**. In plan, the foundation was plumb at the corners and bowed in at the middle. To stabilize the foundation wall, we installed six vertical I-beams, anchored in concrete footings at the base and bolted to the first-floor framing above (see Reinforcing a Bulging Foundation, left, and photos on pages 14 and 15). After securing the I-beams in place, we filled the tapered gaps between them and the existing wall with high-strength structural mortar.

Structurally, we needed only five vertical beams. But adding one more beam and changing the spacing kept the beams away from the basement windows. In addition to calling for the vertical structural members, the engineer specified that we install a 24-inch-wide by 4-inch-thick steel-reinforced concrete slab along the entire length of the bulging foundation wall.

Jake Lewandowski is a construction manager with his family's business, Great Lakes Builders (greatlakesbuildersinc.com), specializing in structural repairs in Elk Grove Village, Ill.

This foundation had rotated inward considerably, and the resulting bulge was visible from both the interior **(1)** and the exterior **(2)**. The solution, shown in the illustration, was to install a series of six vertical steel I-beams—anchored in concrete below and attached to the floor framing above—to resist any further lateral movement.

The crew laid out the positions of the vertical beams on the basement walls **(3)**. After snapping a line across the slab and scoring it with a saw, they removed rectangular sections of the existing slab and dug holes for the beam footings. They then ground the paint off the foundation wall at each beam location **(4)**. The beam footing holes were 24 inches deep and extended 18 inches from the foundation wall **(5)**.

Next, the crew placed each beam in its footing hole on a temporary block that set the beam 6 inches from the bottom of the hole. They rough-plumbed the beam with one flange touching the bulging wall. A flat L-bracket had been welded at the top of each beam with 3/4-inch holes as specified by the engineer. They drilled through the joists and drove high-strength 3/4-inch bolts at each hole location **(6)**. After removing the 6-inch block and leaving the beam temporarily suspended from the joist, they poured concrete to within 4 inches of the top of the slab **(7)** and gave each beam a final check for plumb **(8)**.

Before filling in the tapered gaps between the beams and the foundation wall, the crew sprayed liquid bonding agent on the bare concrete to help maximize adhesion **(9)**. They then packed structural mortar into the gaps, making sure to fill them completely **(10)**.

When all the beams were set and the concrete cured, the crew removed the rest of the slab between the wall and the line they scored earlier with a saw **(11)**. They added #5 rebar along the excavated trench and attached it to pieces of rebar that they had bent over and embedded in the concrete anchors **(12)**. To complete the project, the crew poured concrete in the trench flush with the rest of the basement floor **(13)**. Anchored at the base and tied into the floor framing above, the vertical beams will stabilize the foundation and resist any further inward movement.

Problem-Solving Deck Framing Details

BY EMANUEL SILVA

Unlike the framing in a house, which remains largely protected from water and temperature extremes, deck framing is exposed 24/7 to all the elements that nature can throw at it: rain, snow, organic debris, wind, and UV rays from the sun. So when building or repairing decks, I like to use details that help protect the framing and avoid problems like rot and corrosion that can eventually lead to structural failure. Some of these details are mandated by building codes, but most I've developed based on my 15 years of experience of seeing what works and what doesn't.

START WITH THE BASICS

If I didn't request that my local lumberyard carry wood preservative for treating end cuts and notches in the PT framing lumber that I (and the majority of other deck builders) use to frame decks, I doubt that they would even stock it on their shelves. That's because they tell me that I'm one of their only customers who buys and uses the stuff.

Sure, it takes a few moments to brush on the preservative, and it eventually ends up getting all over my hands and tools. But it's not just a good idea; it's a code requirement. According to the IRC, all cuts and holes made in pressure-treated wood need to be treated with a wood preservative, preferably one with a copper-naphthenate or oxine-copper (also known as copper 8 quinolinolate) base, whether the material is treated southern yellow pine or any of the incised western species **(1–3)**.

Another simple tactic I use to increase the longevity of my decks is to make self-adhering flashing (SAF) membranes an important part of my deck-building toolkit. For example, I always completely cover the sheathing with a flashing membrane prior to deck ledger installation, taking care to install it shingle-style with no reverse laps that can collect water **(4)**.

I also use peel-and-stick flashing to separate the deck framing from any structural metal hardware **(5)**. Many deck builders began using this approach when wood treaters stopped using the less reactive chromated copper arsenate (CCA) to produce their preservative-treated lumber and switched to more corrosive preservative formulas such as alkaline copper quaternary (ACQ) and copper azole (CA). These new preservatives contain two to three times as much copper as CCA in a more chemically active form, and builders began noticing that standard G-90 galvanized hardware was corroding at an accelerated—and alarming—pace.

Hardware manufacturers responded to this problem by introducing metal connectors with thicker, G-185 galvanized coatings and by expanding their stainless steel offerings, and preservative manufacturers continued to tweak their formulations and treatment levels to be less corrosive. Meanwhile, builders learned that using self-adhesive membrane as a barrier wherever metal connectors and PT framing come in contact was an effective way to minimize corrosion; I continue to use this approach today.

SAF membranes are particularly handy wherever I want to direct water away from a tricky framing detail, such as over a doubled beam or at a joist-to-post intersection **(6)**.

Photos by Emanuel Silva

When modifying PT deck framing, follow cutting, notching, and drilling guidelines to avoid weakening the framing **(1)**, and always treat end cuts and notches with an approved preservative **(2)** to avoid compromising the wood's rot resistance. The author uses 6x6 posts, which can be notched, to support all of his deck framing **(3)**. Before installing a deck ledger, the author removes the siding and protects the sheathing with a layer of peel-and-stick flashing membrane **(4)**.

The author applies strips of flashing membrane to PT framing before installing joist hangers and other hardware **(5)**. Self-adhering flashing protects the top edge of doubled beams **(6)**, while shims create drainage gaps between trim and framing, or between some framing members **(7)**. Blocking strengthens the connection between guard posts and the framing **(8)**.

There are other tactics for managing water when framing decks. For example, it's sometimes possible to create drainage gaps between framing members with PT plywood or PVC spacers **(7)**. To promote drainage, I also like to space the ledger away from the SAF-covered sheathing with strips of 1/2-inch PT plywood. Another option is to fasten Deck2Wall spacers, which are code-approved discs made of glass-filled polypropylene, to the back of a ledger to allow for drainage.

In addition, I like to use shims to separate PVC and wood fascia trim from rim joists. Not only does this provide a drainage gap and prevent moisture from being trapped in this vulnerable area, but it also allows me to correct for framing that has dips and curves.

BLOCKING

Modern decks and porches require a large amount of blocking. I use different sizes and types of PT blocking to reinforce the connections between the framing and the guard posts, configuring the blocking so that the posts will be strong enough to satisfy my inspector **(8)**.

When I install the blocking with flat-headed Simpson Strong-Tie SDS screws, I predrill the holes to prevent splitting. Because these screws install flush with the framing, the heads don't interfere with

To help true up guard posts and lock them into position during installation, the author uses composite shims **(9)**. Then he wraps the posts with garbage bags, which help prevent the posts from warping and twisting by protecting them from exposure to moisture and UV rays **(10)**. Taping the bags tightly around the posts helps them to last until it's time to finish the railing system.

joist-hanger installation or exterior trim details, such as fascia.

To ensure that the posts are as close to plumb as possible, I install them carefully using a spirit level and Nelson composite shims to true them up. These shims are waterproof and won't split, crack, or compress like standard cedar shims, so the posts don't loosen up **(9)**.

After post installation, I'm often not sure how long it will be until I have a chance to come back and install the composite or PVC sleeves or other details needed to complete the balustrade. To protect the posts from exposure to sunlight and rain, which can cause them to twist, warp, and curve, I like to simply wrap them with heavy-duty garbage bags, taping up the bags to prevent them from flapping in the wind and blowing away **(10)**.

One of the last items on my framing checklist before installing the decking is to make sure there is adequate backing for any inlays, picture-frame borders, or other decorative decking details. To avoid creating a collection point for water, I either cut kerfs in the blocking to allow for drainage, or carefully cover the blocking with a flashing membrane.

STRAIGHT AND FLAT

On decks that will have 5/4x6 or larger PT (or cedar) decking, small variations in the dimensions of the deck joists aren't a big deal. But with composite or PVC decking, those variations will result in a wavy deck surface, because the decking is flexible enough to conform to the uneven plane created by irregular joists. So, prior to installation, I make sure to check the joists and correct them as necessary so that excessive crown is eliminated and the joists are uniform in width. In some cases, a few passes with a power planer takes care of it; in extreme cases, it means ripping almost every joist on a table saw.

Emanuel Silva, a frequent contributor to JLC*, owns Silva Lightning Builders in North Andover, Mass. Follow him on Instagram @emanuel.a.silva1996.*

Tin Veneer on a New Tray Ceiling

BY NATE PLASHA

Last fall, a previous client asked me to repair a water-damaged ceiling in a old Victorian home. The damage was the result of ice damming and was confined to the kitchen under the roof-to-wall juncture at an 8-foot-wide one-story bump-out addition. Rather than reinstalling a flat ceiling, similar to the existing one, the homeowner wondered if it was possible to do something more interesting. After a few discussions, we decided to investigate upgrading to a tray ceiling with a tin panel finish—a finish more in keeping with the home's Victorian style.

Working with a friend, Karl Lukhaup, we began by isolating the affected 8-foot-wide area of the kitchen with plastic. We demoed the ceiling down to the framing and began to envision the layout of the tray. The kitchen had a collision of other elements besides the ceiling framing to contend with, such as multiple ceiling planes, wall cabinets, crown-molding detailing, and a large island countertop located in close proximity to our planned tray.

Sizing the hole. Ultimately, we related the length of the new tray's framed opening to the island unit, extending it 16 inches beyond either end to roughly 11 feet long. We framed its depth to the underside of the roof's collar ties, which conveniently worked out to be 12 inches and matched a ceiling plane in the kitchen area beyond. We were somewhat limited on the tray's width. We made the opening 3 feet wide and centered it over the kitchen "galley" below; a tangential goal was to supply generous task lighting to this work area.

With the tray framed in, we repaired the roof area above, flashing the questionable roof-to-wall juncture to prevent leaking from recurring. The wiring was roughed-in and the insulation subcontractor blew in cellulose. Then we installed a 1/2-inch plywood nailable substrate on the top and sides of the tray and drywalled everything. We painted with latex paint for our vapor barrier and then installed the tin panel finish.

Tin ceiling. The homeowner opted for tin ceiling panels with crown and picture-frame molding by American Tin (americantinceilings.com). Ornamental tin panels typically are 2x2-foot squares and can have heavy, pronounced patterns. Since we did not have room for a 4-foot-wide tray, we decided to go with a more subdued repeating pattern, which allowed us "tin off" the non-modular opening and locate task lighting easier and in a more visually pleasing manner. We cut holes for the dimmable 2-inch-diameter LED lights in place, avoiding lapped tin seams.

Nate Plasha owns and operates Black Locust Craftsmen, a small artisan construction company, located in Burlington, Vt.

Photos by Tim Healey, Nate Plasha, and Daria Bishop

After removing the water-damaged kitchen ceiling, the author framed the structure for the tray ceiling **(1)**. To hold the blown-in insulation in the cramped "attic" above the tray, the insulation sub attached netting to the underside of the frame **(2)**. After installing plywood to the top and sides of the tray for attaching the tin veneer, the crew drywalled and taped off the ceiling **(3)**.

The tin veneer for this ceiling came in 2-foot-square sheets with a narrow flange around the perimeter for attachment. Tin ceiling veneer is typically embossed with a pattern—in this case, within 6-inch squares, so the author based the framing and underlayment of the tray ceiling to accommodate that 6-inch layout. This particular tin had one face with a finish called Artisans Silver Wash White. Tin is usually cut from the back of the veneer; basic tools for cutting tin include a framing square, tin snips, and a felt pen **(4)**. The panels were centered in the ceiling, trimmed to accommodate a non-modular tray size **(5)**.

The author had laid out and built the vertical perimeter of the tray ceiling to fit a half-sheet of veneer. He cut the sheets in half and then trimmed the flange off to fit the space exactly **(6)**. Again, the length of the tray worked out perfectly for the embossed 6-inch pattern of the veneer. To attach the veneer, the author started with an 18-gauge brad nailer, driving 1-inch brads at regular spacing along the nailing flange **(7)**. Where needed, he supplemented the attachment with hand-driven brads, taking extra care not to damage the embossing or finish with the hammer **(8)**.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The author used tin crown embossed with an egg-and-dart pattern as an accent between the tray field and the perimeter **(9)**. Because the molding was flexible, he used a combination square to set the height **(10)**. Corners were coped much like wood molding, with snips cutting the curve of the cope **(11)**, to create seamless inside corners **(12)**.


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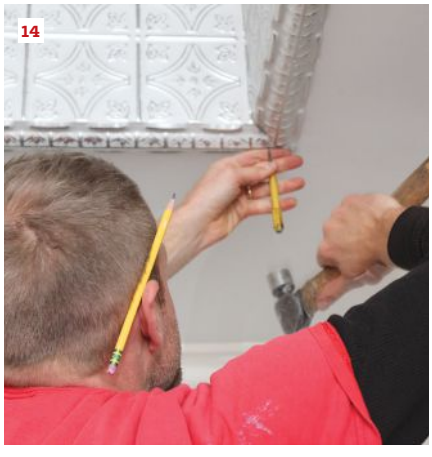
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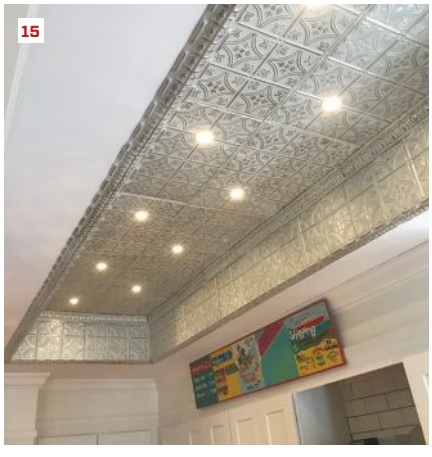
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To finish the bottom edge of the tray ceiling where it returned onto the main ceiling, the author installed embossed picture-frame molding, making sure that the fasteners hit solid nailing **(13)**. He used a nail set to drive all the fasteners to a proper depth without denting the tin **(14)**. After finishing the tin installation, lighting was installed to complete the tray ceiling **(15)**.

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BY IAN SCHWANDT

Building a Worker-Centered Crew

Part 4: The Tools

In the previous three articles in this series, I discussed how a lead carpenter can work from within the triangle (composed of clients, employer, and crew) of obligation and influence to produce the foundation, framework, and rough-in necessary to build a worker-centered crew. Here in the final article, I will focus on the tools that we as lead carpenters need in order to fulfill our obligations to the labor force, the client, and the company over our working days. While we can physically grasp tools of our trade such as saws, fasteners, and personal protective equipment, the tools I reference here are more abstract; however, like physical tools, they still function as essential means to get the job done.

CLEAR GOALS AND OBJECTIVES

A lead carpenter's weekly time in the field with the crew is limited—not just by the work he or she is expected to complete in a 40-hour week but by pressures imposed by clients and the employer. Many of us put in extra time when we can to increase our workday efficiency; picking up materials, reviewing drawings, or doing paperwork outside of the workweek is common in our industry. But there are many tasks that can be done only in the field, especially when it comes to training young workers.

"You can figure that out in the field" is an answer that many a lead carpenter has received after asking for clarification of a design or scope of work. Sure, we can "figure it out in the field," but doing so comes with a cost that can throw our triangle of obligations out of balance. Every hour a lead carpenter spends doing on-site design work or managing the unrealistic expectations of a client is an hour not spent in production where the crew members can be trained. Clear project goals and objectives—provided by sales, design, and estimating professionals—are crucial tools that enable a lead carpenter not only to run the job in a profitable manner but also to teach skills, basic and advanced, to the crew of the future.

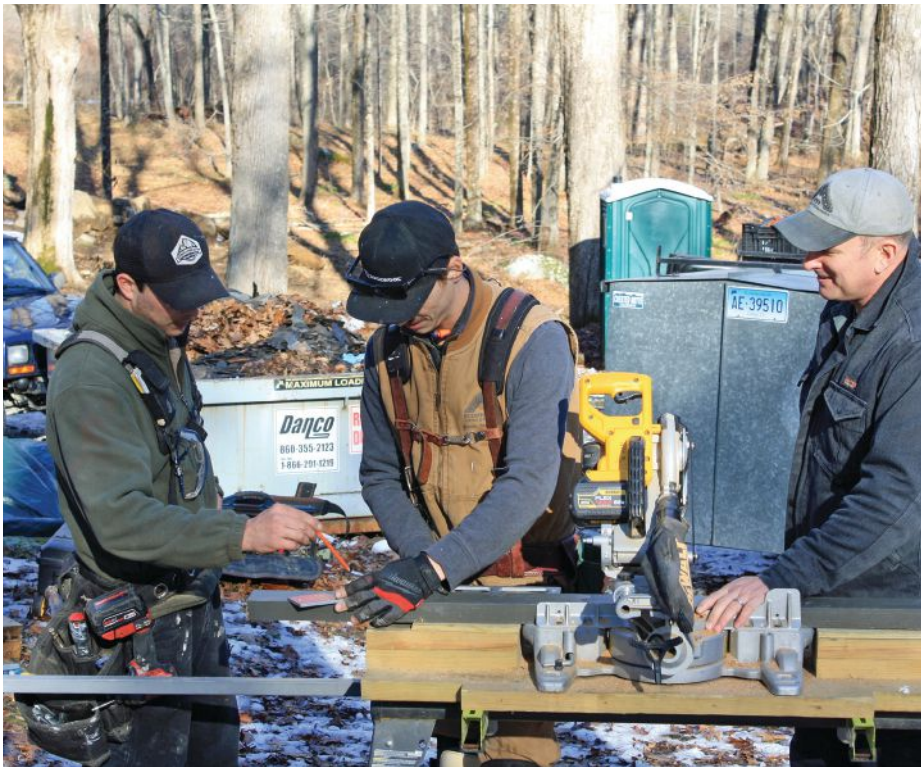

Photo: Sara Lukasiewicz

TRUST YOUR LEADS

"The way to make people trustworthy is to trust them." Hemingway was not writing about the relationship between the lead carpenter and the employer, but this concept of trust provides a foundation for the lead carpenter's success nonetheless. Lead carpenters have a hand in nearly every important company system. Companies that put their full trust in their leads to produce, train, manage subs and clients, and understand the financial side of a project (sometimes through a "trust but verify" approach) create the environment in which a lead carpenter can be successful both on today's projects and in the future. The importance of the future is often overlooked when thinking about a lead carpenter's job. Cultivating long-term relationships with clients, subcontractors, suppliers, and crew members is vital to the long-term career of a lead carpenter. The road to

Clear project goals and objectives—provided by sales, design, and estimating professionals—are crucial tools that enable a lead carpenter not only to run the job in a profitable manner but also to teach skills, basic and advanced, to the crew of the future.

this future is paved with trust.

Even the most inexperienced workers are tuned into the level of trust the owner or manager of a company has in their immediate supervisors. I believe that those at the bottom of the company ladder often have a clearer view of those above them than the owners and managers at the top have of those below. The lead carpenter occupies a rung of the ladder near the middle, and when trusted and respected, provides an important link between the top and bottom of the ladder. A company culture in which a crew sees that the lead has the full trust and respect of the company owner is the tool that builds the foundation for the worker-centered crew.

THE MOST IMPORTANT TOOL OF ALL

Without workers, there is no crew. And without the labors of the crew, the job does not get done. Whether you subcontract every aspect of a job, have an in-house crew, or have a mix of the two, workers are the tool that produces the labor that completes the job. The demand for workers in the construction trades is at historic levels. To compete in this marketplace, many companies have begun to look inward at their culture to create structures and systems that make the work experience more fulfilling. And it's not always just about higher salaries. Benefits, alternative or flexible work hours, company events that foster comradery, a sense of purpose, and community building all contribute to making a company a desirable place to work and build a career. These strategies are no longer optional "nice to haves" but are increasingly "must haves" for attracting and retaining people who will commit to putting in the time and concentration needed to learn the job.

A NOTE TO YOUNG WORKERS

If you are a young person—or someone contemplating a career change—reading this magazine, please know that this industry needs you. Our trades need you. You can build a career from learning a craft. Carpentry, painting, masonry, plumbing, electrical: Any of these can provide opportunities to own a business, serve your country, provide for a family, and even travel the world. But first, you have to learn. The learning will be difficult, but in the right mindset, the learning will be enjoyable, and before long, you will develop valuable skills.

Trade skills—like those discussed in the previous article in this series—will unlock your ability to execute the work. The skills are what define a tradesperson and not his or her ability to execute the work. Keeping this in mind will help you focus throughout your early years when you may not be performing tasks that seem relevant. It is during this time that it is important to be earnest and take full advantage of opportunities to work alongside the veterans of your industry—ask questions during break, show up early, help out on a side job, or offer your help on one of the many projects that nearly all tradespeople have going on in their own homes.

The internet has become a vast encyclopedia of knowledge and there is no shortage of websites, magazines, podcasts, blogs, newsletters, social media posts, and more out there waiting for you discover them. While you will find a tremendous amount of learning on your employer's jobsites, taking advantage of the wealth of information in books and on the internet to fill in the gaps will set you apart from your peers.

It's not just about higher salaries. Benefits, flexible work hours, company events that foster comradery, a sense of purpose, and community building all contribute to making a company a desirable place to work and build a career. These strategies are no longer optional "nice to haves" but are increasingly "must haves" for attracting and retaining committed people.

You will never learn it all. No one does. Understanding and accepting this will put you on a path of lifelong learning where you will become part of the continuum of the building trades. You will stand on the shoulders of those who came before you. And on your shoulders will stand the workers of the future.

Ian Schwandt is a lead carpenter from central Wisconsin with experience leading commercial and residential projects in the Midwest and Northeast. Follow him on Instagram @ijswoodworking.

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BY TED CUSHMAN

Fighting Climate Change With Straw Panels

Buildings are a major source of carbon dioxide pollution on planet Earth. Recognizing that fact, some builders are working to lower the energy use, and thus the carbon output, of the homes they build. But there's a wrinkle: The CO_2 and other greenhouse gases emitted in the construction of a high-performance building can exceed the carbon footprint of the home's operation (especially in the near term).

However, that depends on the materials and methods used to construct the house. By using materials that capture and store carbon, builders can actually remove CO_2 from the atmosphere and sequester it in the home for the lifetime of the building. That's the approach Vermont-based New Frameworks Natural Design Build took for a recent project in Leyden, Mass. The company made the home's walls with an innovative structural insulated panel composed mostly of straw. The straw absorbs carbon dioxide from the atmosphere as it grows; when it's harvested and buried in a building, that carbon is locked up.

Every project uses energy to build, whatever the materials, and each project has to be evaluated individually, says New Frameworks founder Ace McArleton. But he says, "The calculations that have been done on a general basis about straw being used in the walls of a building is that it sinks so much carbon and stores so much carbon that the net offset gives us a huge leg up—more than any other material that we have out there."

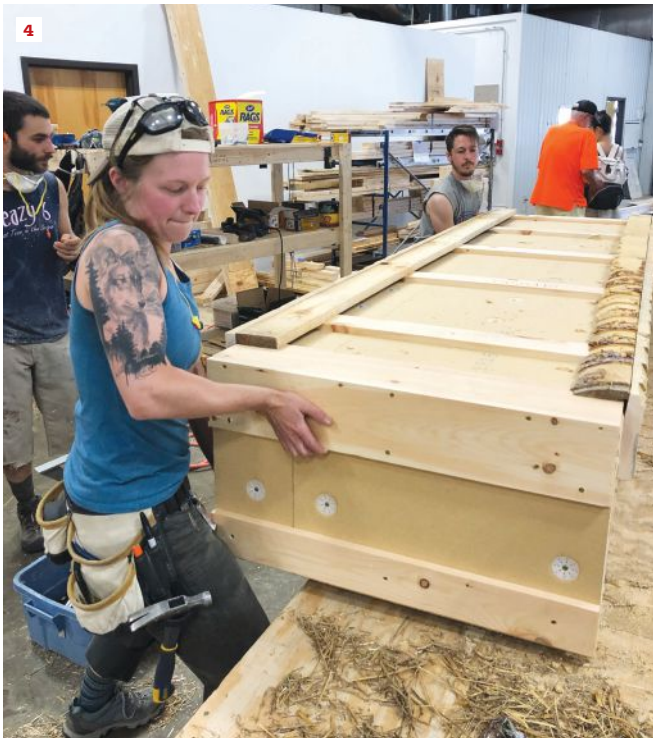
New Frameworks is experienced in building straw-bale homes on site. But now the company is pioneering a different approach: integrating straw bales into a panelized system that the crew can fabricate in the shop, then set in a day or two on site. The method is inspired by European firms EcoCocon and ModCell. McArleton says, "As usual, the Europeans are ahead of the curve from us on these things: They're doing beautiful commercial buildings and giant office parks with straw-bale panels."

New Frameworks also learned from the work of Chris Magwood and his Ontario, Canada-based organization, the Endeavour Centre. Magwood, author of *Essential Pre-Fab Straw Bale Construction, The Complete Step-by-Step Guide*, brought New Frameworks some essential methods gleaned from a Canadian straw-bale-panel company started by one of his Endeavour Centre students. Armed with that knowledge, New Frameworks invested in basic equipment and started to build panels.

Jackson Mills, project lead for the Leyden house, explains the process. "It started with individual cut sheets for each panel from the design office," he says, "so every panel had its own design page. And we precut all the lumber and sheathing, and we had

The crew sets straw panels on site **(1)** in Leyden, Mass. In the shop, panels are assembled in a steel frame and packed with straw bales **(2)**, then moved onto another work table **(3)** for installation of Gutex insulation and Intello vapor barrier.

Photos courtesy New Frameworks



Panel assembly takes place on tables at a convenient working height **(4)**. This panel has Gutex fiberboard insulation, rainscreen strapping, and corner protection applied. Above, a closeup of the panel in cross section **(5)**.

two assembly tables. One of those tables had a machined template, a kind of little cage that we built the frame inside of, to make sure that there was as little variation as possible. When we built the frame inside of that, it made sure that the frame was exact. After we built the frame, we installed the bales. Then we pulled out that panel [and moved it] onto the second assembly table. We trimmed the straw to make sure that it was exactly flush with the framing, and then installed the sheathing; and on the same table on top of the sheathing, we installed the Gutex fiberboard (we used Gutex Multitherm 60). And then it was strapping for the rainscreen on top of that, corner protection, and then we flipped it, shaved the bales down again flush with the framing, and then attached the Intello, which we used as the air barrier. And then corner protection on top of that."

Including the Gutex fiberboard, each panel weighed about 500 pounds, says Mills. In the shop, the crew was able to roll the panels around on the assembly tables, and move and stack them using a rented forklift. On site, the crew set the panels using a telehandler.

Panels have a clear-wall R-value of about R-40, says Mills. To create a continuous air and vapor control layer, the crew taped the Intello smart vapor retarder on the inside face of each panel to the adjacent panel on site when they set it. On the outboard face of the panels, the Gutex fiberboard forms the building's drainage plane, and strapping outboard of that creates the air space for a rainscreen siding application.

Although New Frameworks is a design-build general contractor in Vermont, handling jobs from concept to completion, for this Massachusetts job its only function was to deliver and set the wall panels. The builder then set trusses for the roof and installed windows and doors to dry in the building. "They were able to roll up onto the site and say, 'Whoa, there wasn't a house here two days ago, and now there is,'" says McArleton, "'and I just put the roof on, and now all I have to do is side on the outside and put the windows and doors in, and then do the inside finishes.'" Intello on the underside of the trusses was taped to the Intello coming up the walls to create a continuous air control layer. The attic was insulated with blown cellulose.

Wiring on the inside of the house runs in a service cavity built with 2x2s, says Mills. Penetrations, where needed, are cut with a hole saw. "We entertained the idea of pre-installing conduit for all penetrations, but that would really require knowing down to the

Panels are set on site using telehandler forklifts. Above, a corner has been assembled from two panels on site **(6)**. The completed walls of the house sit ready for roof trusses **(7)**.

inch where the plumber or electrician or whoever was going to put the penetrations, so we decided against doing it ahead of time," says Mills. "But when they do have the penetrations mapped out, they'll hole-saw it and install the conduit, and gasket and tape to the Intello on the interior, and prime and flash tape to the Gutex on the exterior."

Although this project is not a certified Passive House, the air-tightness goal is the Passive House standard of 0.6 ACH50.

The house is unusual, but McArleton says there was no difficulty with the local building department. "We have a fair amount of experience working with building inspectors in different municipalities because of the straw bales that we build with anyway on site," he says. "And what we've found is that because straw is in the International Building Code and has fire testing—there's an ASTM fire rating for it—we've moved out of the time where it's this super wacky thing. It's more acceptable to building inspectors overall. Really, it is cellulose insulation in a different form. So it's not actually much of a big deal, we find, to most inspectors. And we are able to provide the ASTM testing if needed and also the IBC if needed, but we haven't had an issue with that."

One challenge on site, says Mills, is the need for a dead-level sill plate. "We built the panels to such exacting standards that the transitions and connections between them are really tight," he says, "so if your sill plate is out of level, then the connections won't be tight. They would be off kilter to each other. It's a double sill plate, meaning one to the interior and one to the exterior, because of the thickness of the wall. And they have to be level in both directions. We had to do some work to level the sills."

With one house under its belt, New Frameworks is ready for more. "We're a full design-build company," says McArleton, "so as we're working with owners and clients looking at potential projects, we now have this as an option to offer. Our goal as a company is to try to do at least one to two a year if we can for the next few years, just to get ourselves feeling like we've worked out the kinks. And then it's a question for us of how much volume we would be interested in doing, and what that would mean for us to scale up to a larger production facility. That is still an open question for us. But we feel so dedicated to this idea taking off in the marketplace that we are excited to do it for our own projects, and then beyond that, help others to take this idea and run with it."

Ted Cushman is a senior editor at JLC.

Constructing a High-Performance Slab

For durability and performance, isolate the slab from the earth

BY CHRIS LAUMER-GIDDENS

Photos by Chris Laumer-Giddens; illustration by Tim Healey

Concrete is one of the most durable materials we can build with. That makes it ideal for foundation slabs. But it's also one of the most thermally conductive materials we have. In this story, I'll explain how we detailed the slab foundation for an off-grid project in the North Carolina mountains. Our goal was to build the five slabs for the compound so that they would last virtually forever, and to integrate them into buildings designed to be self-sufficient for energy. Our strategy was to isolate each slab from ground moisture with a vapor barrier and to thermally isolate it from the ground with insulation—essentially, keeping the slab within the conditioned building enclosure.

Treated this way, and with concrete specified and placed according to known quality standards, there's no reason each slab shouldn't last for many generations beyond the lifetimes of the original owners. And especially by insulating the critical slab edge, where the greatest potential for heat loss occurs, we could meet the project's goals for energy self-sufficiency.

PREPARING THE SOIL

A durable slab begins with a solid soil base. In western North Carolina where this project was constructed, there's a lot of good, red clay soil that you don't have to worry about much. But on parts of our site, there was softer material that had washed

The author had to borrow red clay from off site **(1)** to create a strong sub-base for the slab. Trenches for the turndown portion of the slab were dug around the perimeter, then the foundation crew started by running 2-foot-high exterior forms around the perimeter **(2, 3)**. Gravel was placed in the bottom of the trench and leveled **(4)**.

down from the mountain over the years. We had to remove that material and replace it with other soil from the site.

In addition, a part of our chosen home site sloped down at about a 15% grade, and our owners wanted a nice flat, level pad for their home. So we ended up bringing in about 100 truckloads of soil from off site to create the elevation that we needed for the house and outbuildings. We placed this soil in lifts of 2 to 4 inches and compacted it to between 98% and 99.5% compaction with heavy equipment (a sheepsfoot roller compactor).

FORMING UP

Once we had the building pad constructed and compacted, we excavated trenches for the turndown perimeters of the slabs, which were designed as continuous grade beams. Our foundation crew set 2-foot-high plywood forms for the slab edges, screwing the forms together and bracing them against the soil outside the trenches. They placed 4 inches of gravel in the trench, leveling it with a small vibrating plate compactor. (There is no requirement to compact the gravel, but we wanted a nice flat surface for placing the insulation.) Next, the crew placed 4 inches of expanded polystyrene (EPS) foam insulation in the bottom of the trenches. Then they placed mineral-wool insulation on the inside vertical face of the trenches. Once the slab was poured and the forms were stripped, we would insulate the outside face of the footings with 6 inches of the same mineral-wool insulation, for an R-value of R-24 (code requires R-10).

Why did we use mineral wool for the sides of the trench and the under-slab area and use polystyrene for under the footings? The reason has to do with the compressive strength of the two materials. EPS foam, like extruded polystyrene (XPS) foam, comes in various types. In this case, we used R-Tech IV foam from Insulfoam, which has a compressive strength of 25 pounds per square inch (psi).

The crew set R-Tech Type IV polystyrene insulation in the bottom of the footing trenches on top of the gravel **(5, 6)**. They placed Rockwool Toprock DD insulation on the inside face of the trench **(7)**, placed gravel in the sub-slab area, and braced the Toprock DD back using small pieces of polystyrene **(8)**. Finally, they filled in the interior of the slab with Toprock DD **(9)**.

That works out to 3,600 pounds per square foot (psf), which is stronger than the assumed strength of our soil (2,000 psf).

Mineral wool, on the other hand, has a compressive strength in the range of 11 to 15 psi. That's closer to 1,600 psf, too low to support the weight of the building. However, the mineral wool we used (Toprock DD from Rockwool) is sufficient to support the weight of a concrete slab. So we used that material everywhere except in the base of the footings.

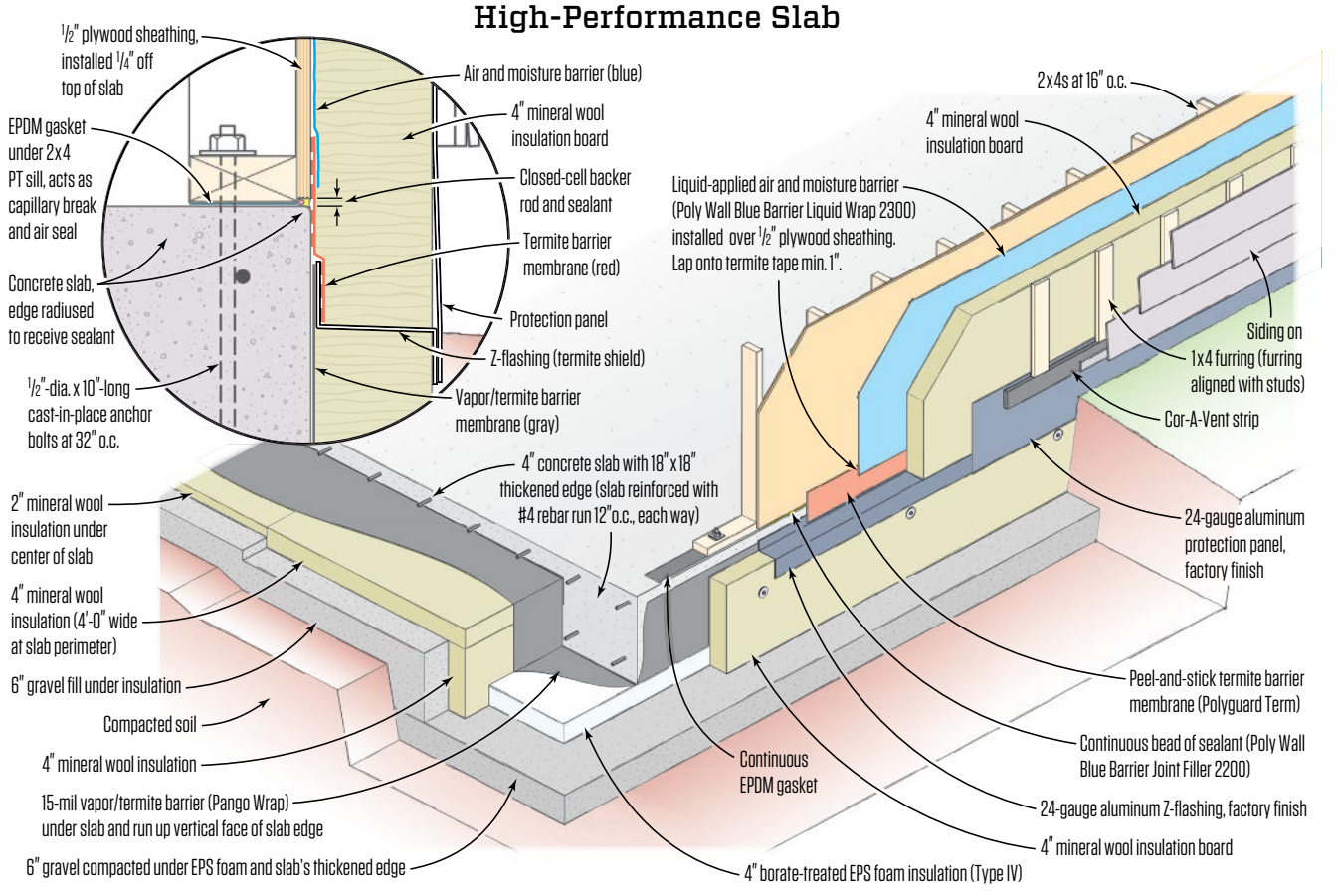
In its product literature, by the way, Rockwool North America recommends its Comfortboard product, not Toprock, for under-slab applications. Toprock DD is used primarily for low-slope ("flat") roof applications and is denser with a higher compressive strength (15 psi at 25% compression for Toprock DD versus 10 psi at 25% compression for Comfortboard 110), primarily so that it can support the foot traffic.

Comfortboard is what the manufacturer recommends for under-slab use because it is adequate for that application. The manufacturer doesn't recommend against using Toprock; it's just that it's not necessary. But it turned out that Toprock cost slightly less than Comfortboard. So it was a win-win for us to use the Toprock DD throughout the foundation.

PREPARING THE SUB-SLAB AREA

The next step was to place gravel for the slab sub-base. This gravel did not need to be compacted. Once it was spread and leveled, I called my plumbing and electricals subcontractor in to run their rough-ins.

Once the rough-ins were done and backfilled, we placed 4 inches of mineral wool around the interior perimeter of the footing forms, then placed 2 inches of mineral wool across the whole remaining area of the slab base, for an R-value of R-8 (code requires no insulation at this location).



Above is a version of the author's slab detail from a wood-framed house in Marietta, Ga. Here, the author has used a bent metal termite-control flashing integrated into a sub-slab Pango Wrap termite-control vapor barrier membrane. The slab and the wood structure are all contained within the conditioned envelope of the building.

INSTALLING THE VAPOR BARRIER

A thorough vapor barrier is one of the keys to a high-performance house. So the next thing we did was install a 15-mil vapor barrier on top of the insulation, covering the entire portion under the slab and around the entire turndown and up the edge to the top of where the slab would be. For most of our projects, we use Stego Wrap, a multilayer polyolefin sheet, for the vapor barrier. In this case, we used an equivalent product, Perminator from WR Meadows, because of availability to the installing contractor.

We overlapped the seams 12 inches and sealed the seams carefully with a tape that has been tested with that vapor barrier to ensure a tight seal. Any penetrations through that vapor barrier, such as plumbing pipe or electrical conduit, we also wrapped in the vapor barrier material and then sealed with the tape.

Around vertical pipes and conduit, we wrapped a band of sill sealer material and taped it at the planned height of the top of the concrete. Later, when the concrete was poured and set, we would dig out the sill sealer and pour in a seal of liquid-applied flashing (either Prosoco or Polywall will work for this). This provided an additional air seal around the pipes and a barrier to insect intrusion. On later jobs, however, we learned that wrapping the pipes with sill sealer wasn't necessary; during the finishing process, you can run a trowel around the pipes and make a suitable groove for the liquid flashing.

PLACING CONCRETE

Quality control for concrete can be tricky, and it's a whole topic of its own. In our case, we hired a local consultant, named Roy Keck, to specify our concrete mix based on the weather conditions, the location, and the end use. We planned to use the concrete slab as the finish floor, so it would be polished and sealed

The crew placed a 15-mil polyolefin vapor barrier (Perminator from WR Meadows) across the slab and down into and up out of the footing trench **(11)**. They wrapped the conduit and pipe that penetrated the poly with more poly, tape, and sill sealer **(12–15)**. Later, they would remove the sill sealer and seal the gap using liquid-applied flashing.

after it was cured and after the rest of the house was framed. We had warm weather and we were almost an hour's drive from the concrete plant, so those factors needed to be considered as well. Roy phoned our order in to the plant, and we poured starting in the early morning.

This large project consisted of three small residential buildings, which we placed in two separate pours. We decided to pour the slabs on different days to simplify things. Each pour began in the early morning and was done before noon, so we had plenty of time.

I had a few main concerns. One was that the compressive strength of the concrete was adequate—I made sure that the mix was designed for at least 3,000 psi. Another was the slump—throughout the pour, I checked the concrete from each truck using a standard cone slump test to make sure that the slump was as specified. (For more information about measuring concrete slump, see "Concrete Basics," Jun/00.) The specification was for a 4-inch slump, plus or minus one inch. We kept the slump between 4 and 5 inches.

Once the concrete was placed and struck off, the placing crew left and the finishing crew arrived. But finishing couldn't start until the slab was ready—that is, until the standing bleed water was gone. Some finishers make the error of troweling that bleed water back into the concrete, but that is a big mistake—it leads to surface defects, such as flaking and scaling, in the concrete.

You can pull some water off the slab with a bull float, but basically, you need to wait. In this situation, the sub-slab vapor barrier prevented water from bleeding out of the bottom of the slab, so the only way for the water to exit was through the top surface. That significantly extended the drying time. When the bleed water had finally evaporated, the finishers power-troweled the slab and moved on.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The author specified a 3,000-psi mix placed at a slump of 4 to 5 inches **(16)**. Bleed water had to evaporate completely before the slab could be power-troweled **(17)**. After finishing, the crew applied protective plastic over the slab to maintain good curing conditions **(18)**. On a later project, the author specified a termite shield over the mineral-wool insulation **(19)**.

CURING CONCRETE

In the presence of moisture, concrete continues to harden for months or even years. As soon as the finishing crew was done, we covered the slab with a recyclable plastic protection membrane called KleenRunner to hold in the moisture and keep the concrete from drying out. While the concrete was dry to the touch when we placed the plastic, moisture began to bead up on the underside of the plastic as soon as we applied it.

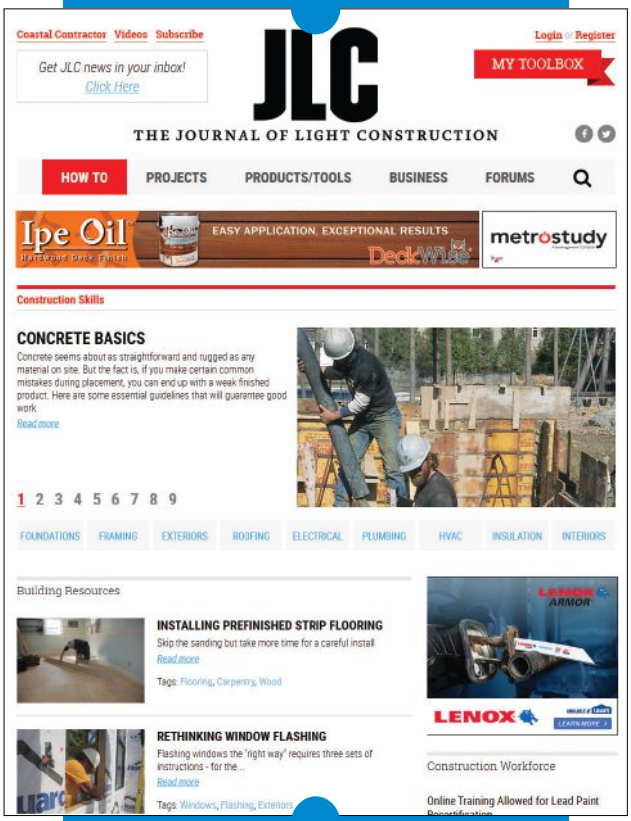
Although there is a perforated version of KleenRunner, which is designed for protecting wood floors during construction, we use the nonperforated version of the material for this application. The idea is to leave the plastic in place as we frame the house, and cut it out around the wall plates later on. That way, the concrete will have months of ideal curing conditions, it will be protected against muddy footprints and staining, and the plastic will be left as a capillary break under the wall plates for the long run.

TERMITE CONTROL

Where subterranean termites are a problem, codes require pretreatment of the ground below a slab foundation. The off-grid project shown here was framed and sided with steel and sheathed with gypsum, so we could justify omitting the soil treatment because there was no wood in the structure. But in a wood-framed project we did later, in Marietta, Ga., we took termite control a step further. Instead of the basic vapor barrier membrane, we used a newer product (Pango Wrap from Stego Industries) that is a termite barrier as well as a vapor barrier. We installed a termite shield of bent metal on top of the slab edge insulation, taping the metal to the wall membrane to integrate it into the building. This also protected the insulation from foot traffic during construction.

Architect and builder Chris Laumer-Giddens is a principal of LG Squared Inc., in Atlanta.

JLC



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Installing Glass Block

Proven methods for a time-honored architectural element

BY TOM MEEHAN

Ten or 15 years ago, interior glass block was all the rage. I installed it regularly in bathrooms and kitchens and often as a design element in entries and living rooms. Glass block both lets in light and obscures visibility—all in the texture of a block wall. While glass-block installations here in the Northeast have become rarer, they are still common on the West Coast and in Florida.

I recently installed a freestanding glass-block partition as part of a walk-in shower. The glass-block wall helps keep an adjacent vanity dry while offering a modicum of privacy to the person in the shower. The installation methods I use haven't changed much since my first glass-block projects. As with most projects like this one, proper preparation is the key to success.

The glass-block wall in this shower is nonstructural. It sits on the tile floor, attaches along one wall, and stops a couple of feet shy of the ceiling. We opted to cap the exposed edges of the block with limestone tile.

The most important thing to remember when installing glass block is to keep the courses plumb, level (both across the block and across the courses), and in plane. Also, always use the proper mortar and reinforcement, and don't try to install too much in one stint.

Tom Meehan, co-author of Working with Tile, *is a second-generation tile installer who lives and works in Harwich, Mass.*

Photos by Ryan Meehan

The author lays out the glass block on the floor **(1)** and scarifies the floor tile with an abrasive wheel on an electric grinder **(2)**. After extending the layout up the wall and scarifying the wall tile, he cuts and removes enough tile **(3)** to expose the wall framing for attaching reinforcement **(4)**. He spreads a layer of modified thinset over the tile **(5)** and quickly checks the floor for level **(6)**.


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Because glass block is nonporous and does not absorb moisture, the author uses a premixed mortar that contains lime and sand and is specially formulated for installing glass block **(7)**. After spreading the mortar on the floor tile, he butters the 8x8 block on two sides **(8)**. To keep the mortar from sliding off, the author holds the block at an angle **(9)** and then rolls it into place **(10)**, pressing it into the mortar on the floor and on the wall. As he places each block, he gives it a tap with a rubber mallet to insure complete adhesion **(11)**. Glass block is quite heavy, so the author installs only a few courses at a time and allows the mortar to set up overnight before starting additional courses. When scheduling glass-block projects, he tries to coordinate them with projects nearby that he can jump to while the mortar cures.

The author continues the installation of the glass block for the first course, buttering each block and tapping it into place. When the course is finished, he checks to make sure the block is in plane and on the layout lines on the floor **(12)**. Next, he checks to make sure the course is level along its length, tapping it down if necessary **(13)**. The third and final check for each course is leveling across the block; again, he taps the block into line if necessary **(14)**.

The author spreads a layer of the glass-block mortar on top of the first course and inserts plastic spacers that adjust to the width of the block—in this case, 4 inches **(15)**. These spacers keep the horizontal and vertical joints at the recommended 1/4-inch width. (The square plastic guides come off after each section cures.) He then installs the glass blocks for the next course, setting the blocks tight onto the spacers **(16)** and tapping the last block over to take out any slack from between the blocks **(17)**.


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After installing two courses, the author installs a stainless steel panel anchor (which comes in 16-inch lengths) to tie the glass block to the bathroom wall framing. He bends one end of the anchor, inserts the end into the pocket cut out earlier, and screws it directly to the wall framing, with the rest of the anchor resting on the block **(18)**. He then inserts spacers for the next course **(19)**.


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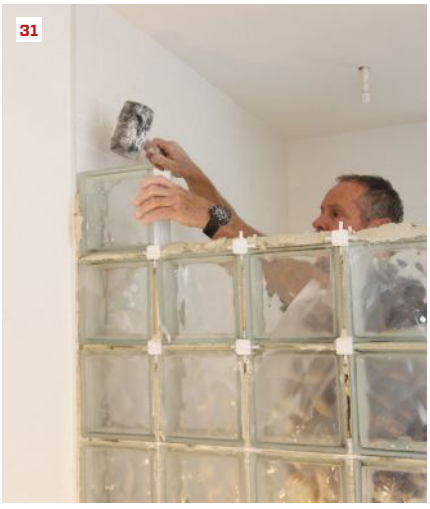
After installing the third and fourth courses **(20)**, the author rechecks the glass block for level **(21)**. He also checks the wall for plumb, making sure the block is also level across its width **(22)**, as well as in plane **(23)**. At this point, he scrapes the excess mortar out of the joints and lets the wall sit overnight to allow the mortar to cure.

The next day, the author begins by attaching another panel anchor to the bathroom wall for reinforcement **(24)**. He adds mortar **(25)** and then spacers for the next course **(26)**. With four courses of the block wall completely solid, he continues installing the next few courses **(27)**.

The author continues to check the glass-block wall every two or three courses for level **(28)** and plumb **(29)**, as well as checking the end of the wall for straightness and plumb **(30)**. He also adds panel anchors every two courses for the entire wall.



On the third day, the author installs the last few courses **(31)**. Spreading the installation out over three days lets the mortar for each section fully cure before continuing the installation. After letting the final courses cure for 24 hours, he coats the edges of the glass-block wall with a layer of modified thinset as a base for the limestone cap that will finish the wall **(32)**. For the cap, he rips 4-inch-wide strips of limestone from 12-inch limestone tile and rounds over the edges of the strips with an abrasive wheel on an electric grinder.

After the thinset coating on the edge of the glass-block wall has fully cured, the author spreads a second layer of modified thinset to install the stone cap tile **(33)**. He then butters the back of the stone tile **(34)** and presses it into the fresh thinset **(35)**. Starting with a partial tile at the bottom lets him use a full tile at the top, and using plastic wedges helps to maintain even grout lines between the tiles **(36)**. He continues installing the stone strips across the top of the wall to finish wrapping the edges of the glass block **(37)**.

After letting the mortar cure for 24 hours, the author spreads sanded grout on the glass block using a rubber-edged grout float **(38)**. Diagonal strokes ensure that the joints are filled completely. He lets the grout sit for 15 minutes or so and tests it with his finger before beginning the cleanup **(39)**. He gives the block an initial wipe with a clean sponge, rinsing the sponge often in clean water **(40)**, and then wipes down the wall a second time with the sponge and fresh water **(41)**. Next, he wipes down the wall with highly absorbent paper towel to remove the grout haze **(42)**. A final wipe down with a paper towel finishes the job **(43)**.

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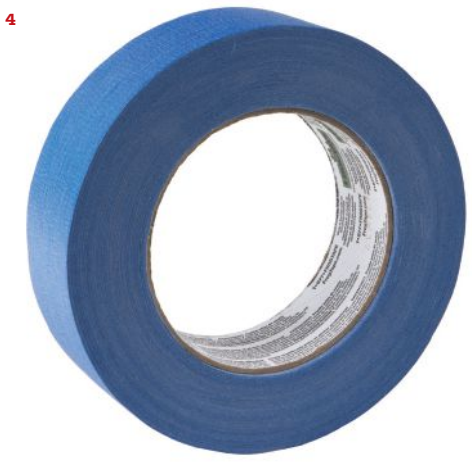
BY SYMONE GARVETT



1. Aluminum Window and Door Collection

Kolbe Windows & Doors has expanded its Vista-Luxe Collection to include a full selection of thermally broken all-aluminum windows and doors. The VistaLuxe AL Line offers tilt-turns and hoppers, casements and awnings, direct sets, swinging doors, pivot doors, folding doors, multi-slide doors, lift and slide doors, and Hi-Finity multi-slide doors. The all-aluminum line offers a choice of popular colors with powder-coated or anodized finishes. Contact a local distributor for pricing. kolbewindows.com

2. Two-Piece Toilet

The Kohler Betello two-piece toilet is equipped with the manufacturer's Revolution 360 flushing technology, which rinses the entire bowl surface, and ContinuousClean, which dispenses a small amount of toilet bowl tab cleaner during each flush. Kohler says the CleanCoat surface treatment repels water and dirt and prevents the formation of bacteria, mildew, and mineral deposits. The toilet is WaterSense labeled and has a separate skirted trapway that enables the same installation process as a non-skirted toilet. Pricing starts around $530. kohler.com

3. Heavy-Duty Construction Adhesive

Dap has reformulated its DynaGrip Heavy Duty construction adhesive to provide stronger and more durable bonds than previous versions of the product, as well as 50% more instant grab, according to the manufacturer. This allows the adhesive to hold vertical projects in place without the need for braces or clamps. The new formula is low odor, complies with VOC regulations, and provides adhesion on common building materials. It is available in 5-, 9-, and 28-ounce containers. Pricing starts around $4.60. dap.com

4. No-Bleed Painter's Tape

FrogTape has developed a new high-performance alternative to the standard blue painter's tape. The new Pro Grade Painter's Tape is made with the manufacturer's patented PaintBlock feature, which has a super-absorbent polymer that reacts with the water in latex paint and instantly gels to form a microbarrier. This barrier seals the edges of the tape, preventing paint bleed and creating clean, crisp lines, according to the manufacturer. Pricing for a four-pack starts at $20. frogtape.com

5. Colorful Entry Doors

ProVia has announced a new range of entry-door colors called "Trending Colors." Composed of 11 hues—avocado, blueberry, burnt orange, cabernet, clover, deep blue, goldenrod, hibiscus, moss, plum (shown), and robin egg—these fresh new shades are inspired by the latest design trends. Trending Colors will be added to ProVia's 17 standard colors for Embarq Fiberglass, Signet Fiberglass, Legacy Steel, and Heritage Fiberglass entry doors and Aeris and Endure windows and patio doors. Contact a local distributor for pricing. provia.com

6. Built-in Wall Ovens

Thor Kitchen is introducing its first built-in wall ovens in 2020, including a 24-inch Combi Steam Oven (shown) and 30-inch Electric Single Wall Oven. The Combi Steam Oven has a 2.16-cubic-foot interior and four cooking modes: Gourmet Recipe, Steam Assist Cook, Guided Cooking, and True Convection. The Electric Single Wall Oven has four standard cooking modes, as well as a Keep Warm mode, self-clean, and a delay start timer. Both ovens are available in a stainless steel finish. Pricing is to be determined. thorkitchen.com

7. Self-Latching Mortise Lock

The Inox PD96 self-latching mortise lock for sliding doors is the latest addition to the PD9000 series. It features a bolt actuator on the strike plate and a solid brass push button on the lock face. When the door closes, a one-inch, brass bolt automatically latches the door. The PD96 is available in three metallic finishes—satin stainless steel, bright polished stainless steel, and oil-rubbed bronze on stainless steel—as well as the full line of CeraMax Rainbeaux finishes. Pricing for the PD96 starts at $650. unisonhardware.com

8. New Heating and Cooling Line

Trane has introduced a new line of ducted heating and cooling products, RunTru by Trane, designed to provide dependable performance at an affordable price point. As of launch, RunTru by Trane includes a full line of split and packaged units, including air conditioners up to 14 SEER, heat pumps, furnaces, coils, and air handlers. New products in the RunTru line include the A4AC Air Conditioners, available in a full array of cooling capacities, and the A4HP4 Heat Pump, designed to keep homes in milder climates comfortable throughout the year. Contact a local distributor for pricing. runtruhvac.com

9. Elegant Plumbing Fixtures

The Hansgrohe Joleena collection of bathroom faucets, accessories, shower components, and kitchen faucets draws on a transitional design theme. It is the first Hansgrohe collection to offer a matte black finish, available alongside chrome, brushed nickel, and polished nickel. Bathroom options include a single-hole faucet, available in two sizes for undermount and vessel sink installations, and a widespread faucet. Prices for items in the collection range from $26 for a hook to $525 for a tub set. hansgrohe-usa.com

10. Composite Corner Bead

ClarkDietrich has announced the launch of Strait-Flex Gold, a new paper-faced composite corner bead featuring a memory-free hinge that adjusts to any angle. The product replaces the previous Mid-Flex 250 corner bead and provides durability and impact resistance, while the heavy-weight, diamond-punched paper provides maximum adhesion for an even lay-down, according to the manufacturer. The paper surface is pretreated to accept paint, and finishing compound is not required over the laminated area. It is packaged in 100-foot rolls and can be cut to minimize scrap loss. Contact a local distributor for pricing. clarkdietrich.com

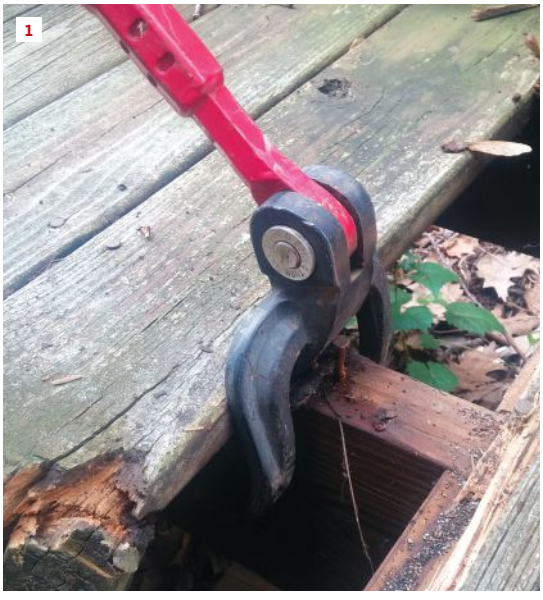
11. Panelized Stone Veneer

Cultured Stone has launched a panelized version of its Drystack Ledgestone profile in three color options: rubicon, Melrose (shown), and high plains. Rubicon presents a blend of deep grays and carbon-inspired tones, Melrose incorporates an assortment of light-gray hues, and high plains showcases an earthy color with tan undertones. The panels provide the same textural variations present in the non-panelized profile and typically range in price from $6 to $8 per square foot. culturedstone.com

12. Superior Kitchen Ventilation

Broan has improved its under-cabinet kitchen ventilation system to remove heat, smoke, and moisture with the launch of Captur. According to Broan, the new blower wheel and motor assembly are designed to move more air with greater efficiency, while unique filters capture effectively without restricting airflow. Several new hood shapes, including the sleek-shaped Corteo series (shown), provide coverage over all burners while providing quieter operation and less energy use. Contact a local distributor for pricing. broan.com

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



The angle of the Crescent Bull Bar's **(1)** jaws can be adjusted by depressing the pin on the head and rotating the handle. When the pin is released, the jaws are locked in their new position.

The head on the Deck Demon **(2)** is fixed, with nail-puller slots on the tip of each prong. The tool is designed to "pop" deck boards loose from the framing, and can be used with decking that was installed with nails, screws, or hidden fasteners.

Wrecking Bar Roundup

Anyone who builds new decks for a living knows that demolishing an existing deck is often part of the job. This is tough work, and because no two decks are perfectly alike, it helps to have a variety of deconstruction tools at your disposal. Here are some of the specialized wrecking bars that the pros keep in their arsenals of digging irons and pry bars to make this job go more efficiently. *[Editor's note: These reviews originally appeared in* Professional Deck Builder.*]*

CRESCENT BULL BAR

Crescent Tool's Bull Bar **(1)** is heavier than a few of the other tools that we own, and it has an indexing head that rotates 180 degrees, allowing the user to select the best angle for maximum leverage and access. In the open position, the head can generate leverage to pop large planks from joists, while the closed position provides for shorter pulls and faster action when you're working in confined spaces.

The gap between the double forks is wide enough to straddle a pair of 2-by joists, and at the center of the jaw is a built-in nail puller, which comes in handy for initially working over a deck before pulling up any boards.

The tool's greatest drawback might be its shorter, 44-inch-long handle—but in tight spaces, that short handle is also a tremendous advantage, especially when coupled with the adjustable head.

Price: $50. crescenttool.com

Matthew Breyer, CGR, owns Breyer Construction and Landscape, in Reading, Pa. breyerconstruction.com

DECK DEMON

The Deck Demon **(2)** features all-steel composition—including the handle—akin to a traditional crowbar, except for the welds that attach the head to the shaft. As a result, the shaft applies 100% of the power and leverage to the task at hand, instead of flexing. Barring a weld snapping, the Deck Demon seems nearly indestructible and should last a long time even under heavy use.

The tool has nail-puller slots on the tip of each prong, presumably for removing straggling nails and screws from joists. This feature works but is awkward to use because the handle is offset from the prying point. For this phase of the job, we have another tool that works faster.

Operation is simple: Rest the head of the tool on a single or double joist and apply pressure upward directly under the deck board's connection to the joist. The effort required to "pop" the board off depends on the type of decking being removed, its thickness, and the fasteners used to install it.

During our testing, some in my crew wished that the handle were longer. An extra foot would let the user remain more upright and gain even more leverage when popping boards. It is not a deal breaker, but a similar tool we use for de-boarding that has a longer handle is definitely more comfortable. On the other hand, the longer handle can make that tool tough to use in tight spaces.

The head on the Deck Demon is rigid, so prying can be done in only one direction. This means the operator is usually standing on joists filled with

Photos: 1, Matthew Breyer; 2, Greg DiBernardo

bent nails or screws, which isn't as fast or safe as working from existing deck boards. Sometimes, if the boards are easy to pop off the joists, we can work the tool backward and remain standing on the deck, but it's difficult to get significant leverage that way. Still, the Deck Demon works as advertised and is well-built, earning it a place in our arsenal.

Price: $70. angelguardproducts.com

Greg DiBernardo owns Peachtree Decks & Porches in Alpharetta, Ga.

GUTSTER

The Gutster **(3, 4)** has been through several design incarnations since its initial release. The original was extremely durable; we've demoed hundreds of decks with our first Gutster, though it's now beat-looking and bent. Then the manufacturer switched to an oval-tubed design, which wasn't nearly as reliable. We had a couple of them, and the head welds cracked after one or two jobs. The manufacturer has since gone back to a 48-inch-long round handle, which seems to have fixed the problem.

This tool provides excellent leverage for prying apart framing and removing the first couple of deck boards. It fits over single or double joists and has two pointed "fangs" you can jam into cracks and joints to gain purchase. The tool is ergonomic but heavy enough to split a 5/4x6 cedar deck board in half if used in a downward stabbing motion. It also has nail-pulling slots—much like those on a roof shovel—that are useful for quickly de-nailing joists during resurfacing projects. Since the design of the tool requires that the user stand on the joists while prying up deck boards, we don't like to use it for board removal—but we use it for everything else. Sometimes we even dig with it.

Price: $100. gutstertools.com —*G.D.*

DUCKBILL DECK WRECKER

To remove deck boards, we rely mainly on the Duckbill Deck Wrecker **(5, 6)**. That's all it's designed to do—and without a doubt, it's one of the fastest ways to get this job done. The long handle provides plenty of prying power, and the head spans the joists and presses up from below in such a way that the user can stand on the deck while levering off boards with amazing speed.

The tool works on boards that are nailed or screwed. Although I've never timed it, I would guess that a two-man crew can de-board a 250-square-foot nailed-down deck in about 15 minutes. The boards come off so quickly that a helper can stay busy clearing and stacking deck boards as they're removed.

We like that we can reverse the head by pulling a pin and flipping it around, because where there isn't enough room for the handle to be levered, we can still get into tight spaces. It's a highly specialized tool that is worth every penny.

Price: $85. duckbilldeckwrecker.com —*G.D.*

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With two 1 1/4-inch-wide sharpened steel plates separated by a 2-inch gap, the Gutster **(3, 4)** can be used to slide behind siding, roofing, flooring, and drywall as well as decking.

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The Duckbill Deck Wrecker **(5, 6)** has a long rubber-gripped handle for maximum leverage and a reversible head for forward or backward decking removal.

The Demo-Dek **(7)** has a beefy laminated bamboo handle and an alloy steel jaw design that allows the tool to remove deck boards without relying on a joist or a beam for leverage.

The jaws of the Mayhew Tweaker **(8)** and the Stanley FuBar **(9)** are designed to grip the edge of 2-by framing so that twisted joists can be easily leveraged into position with one hand.

GREENTEK DEMO-DEK

Another quick deck removal tool is the Demo-Dek **(7)**, a hybrid design consisting of an alloy steel 5140 jaw and an ultra-durable laminated bamboo handle. While other deck-board removal tools use the underlying deck joist for prying leverage, the Demo-Dek uses the deck board itself. I was skeptical when I first heard the claims of inventor Ben Weinreich, who is a licensed contractor in Maryland, but putting it into action made me a believer—quickly.

The U-shaped jaw of the standard Demo-Dek, which is the one we tested, is fixed and can accommodate standard 5/4 and 2-by decking. The Demo-Dek can be used at any point on the decking—we didn't have to locate the head of the tool over a joist as with most other decking removal tools we've tried. This feature makes an even bigger difference on decks with doubled joists or wider framing members that can hamper tools—to the point of making them useless—that rely on a joist for leverage.

The Demo-Dek generates a large amount of prying torque. We used the tool on both nailed and screwed pressure-treated 5/4 and 2-by decking, and it didn't slow down a bit. To prevent soft or rotted boards from splitting lengthwise between the fasteners, we found that it was cleaner to work down the length of the board and pry incrementally, even though the tool provided so much torque that we were tempted to break the board free in one big pull. We used this approach more often on 5/4 boards than on 2-bys.

In addition to appreciating the power the Demo-Dek provides, we liked the way the tool can capture a deck board in its jaw. This allowed us to hold onto a removed board and move it around, on or off the deck. Other tools break the board free, but then the user has to bend down to grab the board or kick it to move it out of the way. Being able to swing the removed board to wherever it made sense and flick it out of the jaw without missing a beat was a huge time-saver. And for any fasteners left behind, the Demo-Dek has a built-in nail puller.

Price: $120. greentektools.com —*G.D.*

A PAIR OF JOIST TAMERS

I frame decks with southern yellow pine, which tends to go a little wild at times, especially when left sitting in an unrestrained pile. Straightening out twisted joists during installation used to be a pain until I happened upon a couple of specialty pry bars.

Mayhew Tweaker. The business end of the Tweaker **(8)** has a C-shaped jaw that grips the edge of a joist. The in-line foot-long handle gives plenty of leverage to "right" an errant joist end. After I secure one end of the joist in a hanger, or with a few more nails than usual, I use the Tweaker to adjust the opposite end upright—then nail it.

Price: $30. mayhew.com

Stanley FuBar. The F-shaped head of Stanley's multipurpose 30-inch Fatmax FuBar utility bar **(9)** grips around joists the same way as the Tweaker, and an offset design gives you a little more leverage. The back of the "F" has a striking face for pounding, and the handle end is a pry bar with nail-pulling slots—making it a good all-around tool for demolition and construction. Stanley manufactures shorter versions of this tool, and other manufacturers offer similar variations that can be used the same way.

Price: $70. stanleytools.com

Mike Guertin is a builder and remodeler in East Greenwich, R.I., and a siding, roofing, and deck specialist at JLC Live and Remodeling/Deck Expo shows.

Photos: 7, Greg DiBernardo; 9, Mike Guertin

Classifieds

February Advertising Index

BY CLAYTON DEKORNE

Shortage of Skilled Labor? We've Been Here Before

While researching the history of the U.S. building trades, I stumbled on a fascinating wage study completed for the Department of Labor in 1928, which tracks the wages paid to workers in the building trades from the earliest periods of Colonial America up to 1928 (available free from Google books; search "History of Wages in the United States from Colonial Times to 1928"). While it doesn't bring wage data up to the present, this slice of early Colonial history has proved to be a keystone to understanding the experience of trade workers in Colonial America.

Why do I care so much about the past? The status of builders at the time our country was founded has, I believe, enormous symbolic significance to the building trades that might help restore pride in the trades and reverse some of the negative characterizations of our profession. (For more on this thesis, see my article "How Will Construction Solve the Skilled Labor Crisis," Sep/19.) As an industry, we need to change the narrative to show the trades as lucrative and challenging careers. The 1928 wage study is fascinating to me because it paints a picture of what life in the trades was like for many workers and reveals some of the social conditions that have stayed with the profession through time.

At the founding of our country, skilled labor was extremely scarce in the Colonies, and builders were paid three to four times what workers with similar skills were paid in Europe. Those high wages were an enticement to recruit more immigrants to the colonies. Gabriel Thomas, who wrote a history of Pennsylvania in 1698 for the purpose of recruiting workers in England to emigrate, asserts that "the encouragements are very greate and inviting." Of course, the money paid for skilled labor was also a sore point for many. As the wages study notes, "Governor Winthrop, of the Massachusetts Bay Colony, declared in 1630 that the 'scarcity of workers caused them to raise their wages to an excessive rate.'" It details that "letters and reports from agents of the British companies engaged in colonial settlement, and from the early colonial governors, express consternation amounting to distress over the 'exhorbitant demands' of craftsmen and laborers."

A glance at the excerpt below of rates paid to workers shows this condition existing in the colonies for almost a century, and it's hard to think of these rates as very great or inviting. The study notes the 1928 dollar equivalent in parentheses, and in today's dollars, it is still very low as a day rate (a 1928 dollar translates to about $15 in today's dollars). Yet details in the wage study give us rich insight into the life of Colonial tradesmen that must be considered when comparing their status to a modern context. The quality of life in the Colonies was not what we think of today. Homes were heated with fireplaces; churches were entirely unheated. Nothing in the way of china, glassware, or carpets existed, to say nothing of lighting, indoor plumbing, appliances, or cars. In other words, there were few commodities to buy. What constituted wealth was land, and owning land afforded political rights and prestige in the Colonies. At a rate of about $2 an acre, land was accessible to trade workers in ways it never was available to commoners in Europe, making the building trades an attractive way to make a living in the nascent United States.

Rates continued to soar in Massachusetts until 1750, when "lawful money" was established. After that, workmen on public construction were paid at the following rates and subsistence, which remained fairly constant up to the Revolution:[36]

	Per day
Bricklayers	6s. ($1. 00)
Bricklayers' helpers	4s. 8d. ($0. 78)
Laborers	4s. ($0. 667)
Carpenters	4s. ($0. 667)
Laborers	2s. ($0. 333)

Building-trades' rates in Pennsylvania from 1750 to 1775 were: Bricklayers, 5s. 6d. and 6s. (72.6 and 80 cents); bricklayers' helpers, 3s. 6d. to 5s. (46 to 66.7 cents); carpenters, 5s. to 6s. (66.7 to 80 cents); painters, 6s. (80 cents); and unskilled labor, 2s. 6d. to 3s. (32.6 to 40 cents) a day.

The figures in parentheses show dollar equivalents in 1928 (the time of this study). A 1928 dollar equals about $15 today. These wages seem low, but there wasn't much to spend money on—except land. Though the details around landownership and indentured labor were sometimes complicated, salable land was plentiful and, at around $2 an acre, affordable to many trade workers.

U.S. Department of Labor

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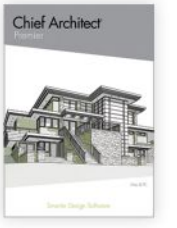

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