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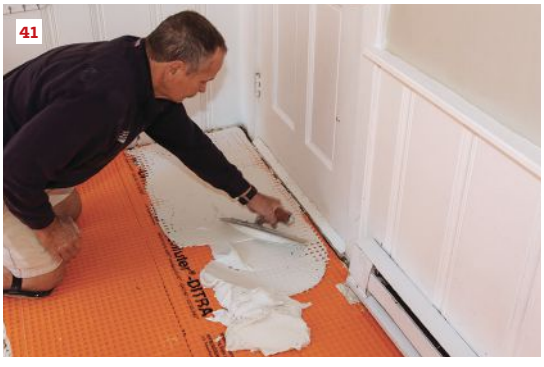

On the cover: Tom Meehan, a tile specialist from Harwich, Mass., installs large-format tile made to look like wooden planks. Read about details and requirements for installing large-format tile on page 41. Photo by Roe Osborn.

FEATURES

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"GET YOURSELF A BLOWER DOOR RIG. JUST DO IT."

Jeffrey Fagan, of Janus Associates Construction Management, Chamblee, Ga.: I just read "Air Conditioning for Humid Climates" (by Curt Kinder, July/17). I am a GC in Atlanta and would give an eyetooth to have an HVAC contractor who works like Curt Kinder. I am going to copy this article and give it to all my managers to read.

I was most impressed with the idea of doing a blower-door test prior to drywall. Here in Atlanta, energy audits are completely separated from the HVAC contractor's scope and are considered part of the energy auditor's work. But I love the idea of connecting the dots between energy use (the equipment's demand) and user comfort. Doing this work prior to drywall while the insulation contractor is doing his work makes so much sense.

I would love your perspective on insulation at fireplace cavities and chases with masonry fireplaces (thinking Isokern here), especially with supertight construction. Combustion air is a concern, and also when you slam the front door, ashes blow out on the floor. Heck, now I want to go buy a blower-door unit so we can do this ourselves.

Curt Kinder responds: Thank you for the kind words. I'd give an eyetooth or two for a few more building-science-appreciative residential and light-commercial GCs here in Jacksonville, Fla.!

The trouble with many energy auditors and blower-door folks is that they are keyboard warriors only. They can't all lift the hood, and they are only as good as their software, which in turn is only as good as its inputs. Upon short reflection, one realizes it is simply ludicrous to delay infiltration testing until after batts and drywall are up. At that point, the leaks are long buried but still able to wreak havoc.

Get yourself a blower-door rig. Just do it. I like The Energy Conservatory (TEC) blower doors, but Retrotec gear will also do the job. Mine cost $3,000 in 2009. When it's delivered, take it home, grab a beer, and test your own house. I can promise, based on hundreds of blower-door tests, that nothing engages a homeowner more than being led by the hand to personally experience the myriad air leaks that afflict the typical home.

The process is also a real eye opener for any trade or craft that purports to build airtight. After you're done trying it out, recruit a couple of lanky high-school or college kids to learn to set up and run your blower-door rig. The skinny, agile young adults can swing from the rafters and bird-dog the air leaks. Give them neon spray-paint cans and pay them to tag away. Every now and then, we run across spray-foam contractors who confidently assume that the mere presence of them and their miracle product guarantees an airtight outcome. Cue our taggers: Showing the foam guys the air leaks in their work that whistle, and can part their hair, quickly changes their attitudes.

"I can promise, based on hundreds of blower-door tests, that nothing engages a homeowner more than being led by the hand to personally experience the myriad air leaks that afflict the typical home."

Big leaks matter. Everyone initially focuses on the obvious (but typically small) leaks around windows and doors, but they can miss much bigger, unseen gaps: chases down from the attic, missing drywall behind a master bathtub, the myriad holes in the ceiling under the hot, unconditioned attic, sink drainpipe penetrations—the list goes on.

Also, I'm a dedicated student of dew point. I have an app (NWS Now) that I check every summer morning for the day's dew-point forecast. In North Florida, it runs in the low to mid 70s, 24/7 from May through September. Lately, I've noticed a slow creep in dew point from the low 70s to the mid 70s. So what, you might say—what's a couple degrees? One of the absolute worst things to happen to a building assembly (wall, attic, ceiling, crawlspace, whatever) is for the HVAC system to cool it below the dew point of ambient air. Water vapor condenses [on the cooler surfaces] to liquid, and, if allowed to persist, mold ensues.

As for fireplaces, Isokern and others: Two building-science problems arise, and you've touched on both. Every Isokern I've come across is a massive open fireplace, which can't help but demand boatloads of combustion air to burn the wood and establish a draft in order to keep smoke out of the rooms. That requirement is completely at odds with the performance of a home verified substantially airtight.

The little, 4-inch flex duct from the Isokern box to outdoors that may have been provided to keep the inspector happy isn't going to cut it. Making the fireplace draft during initial ignition will require cracking a window or an exterior door, which better stay open while the fire decays into a bed of coals. At that point, the fireplace is emitting boatloads of carbon monoxide, creating a potentially lethal indoor environment.

The second issue is sealing around the flue where it leaves the pressure envelope. The natural instinct is to foam the heck out of it. But this runs afoul of requirements to maintain clearances. I doubt that the cementitious construction of an Isokern box ever warms anywhere near enough to decompose any insulation. That said, at some point many Isokern installations transition to double-wall metal pipe, and the rules for air-sealing around that must be respected. I learned this the hard way: Foam on my own fireplace's flue pipe decomposed sufficiently to set off a smoke detector. I'm glad I had the detector installed in my storage attic.

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HUMIDITY CONTROL DURING SWING SEASONS

North Carolina builder Tom Dugan: I have just finished reading "Air Conditioning for Humid Climates." As a builder of hurricane-resistant homes in coastal North Carolina, I am quite familiar with the cooling challenges you described. But I would like to add one more issue to your list. Humidity control during winter and swing months (not just during the summer air-conditioning months) is a problem here.

My homes typically give a blower-door number of 1.2 to 1.3 ACH50. This tightness can create humidity issues year round. Our swing months are from mid-March to mid-May and September through October. My own home is on the Cape Fear River in Southport, N.C. To supplement my three-zone Samsung mini-split system, I installed an inline dehumidifier into a recirculating trunk that runs from the peak of my top-floor living room down to the first-floor stairwell. I had installed this trunk to help with stack effect on my three-story house. This unit runs on its own humidistat set to about 47% RH. Our interior RH now stays within 2 points of that setting year round.

I am certainly not advocating this solution for everyone, but I am hoping that the newer high-end systems with humidity settings will help out with this problem. I still am concerned with the months that the air conditioner is not running. We generate gallons of water within the home that can no longer escape via exfiltration through leaky walls when it is cooler outside. I would love to read any thoughts or experience that you might have.

Curt Kinder responds: I recognize and share your concern with humidity control during shoulder and winter seasons. We in Jacksonville, Fla., have shoulder seasons, and sometimes a brief whiff of winter, defined as "needing to turn the heat on." It lasts about six weeks somewhere between November 15 and March 1. The intervals on either side are our shoulder seasons.

While I agree that very tight houses such as you describe (let's say tighter than 2 ACH50) won't automatically dry outward much during cool, dry weather, there is a simple solution: Open a few windows. Whenever the dew point or the nightly low temperature gets below 60, the outdoor air is quite suitable for keeping the indoors comfortable without active HVAC.

I try to give our own home's HVAC a month off in late fall and early spring via "window management." In my high-thermal-mass ICF house, I can hold interior temps between 70°F and 75°F as long as the overnight low is 60-ish, even if the afternoon high is 85°F. It's simple—open a few windows after dark, close them mid-morning. A neat thing about giving the mechanical system a month's vacation is that month's electricity bill has no HVAC component, which provides good information as to the cost of operation of the rest of the home. All that said, I never try to impose our lifestyle onto others, especially paying clients: "We inform, you decide."

Of course, some folks can't open windows owing to poor outdoor air quality or noise or more specific issues such as pollen sensitivity or asthma. Sometimes it's a matter of security; no one dares leave windows open in certain neighborhoods.

Humidity-sensitive owners of light-frame houses, tight or loose, will often respond to high humidity by driving HVAC thermostat settings down, particularly at night. Combine that with other typical fails, such as leaky walls and oversized AC systems with no provision for humidity controls, and you have a recipe for disaster in the form of extensive mold formation, typically behind drywall.

We design for and recommend air-conditioning thermostat settings no lower than 75°F (72°F as an absolute minimum). Anything below that risks condensation within wall assemblies. I've come across homes operated as low as 64°F on summer nights—black drywall mold factories.

There's a time-honored myth that ventilation is the answer to humidity control, but that's only true when outdoor absolute humidity is below that of the space or assembly being ventilated. If the ventilation system lacks the smarts to discern high-humidity (enthalpy) outside air, it can cause more harm than good.

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BY GREG AND SUE BURNET

Running Baseboard

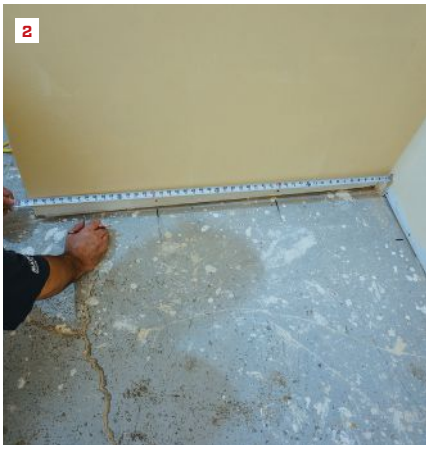
Baseboard is often the last trim element installed in a house. It provides a visual transition between the floor and the wall. If the floors are flat, installing baseboard is usually straightforward; aspiring carpenters commonly learn about cut lists, coping, mitering, splicing, and other trade basics doing this task. This article is a brief glimpse at baseboard installation. A detailed discussion about the associated tasks is too involved to present here, but more details can be found online, at jlconline.com/training-the-trades/running-baseboard.

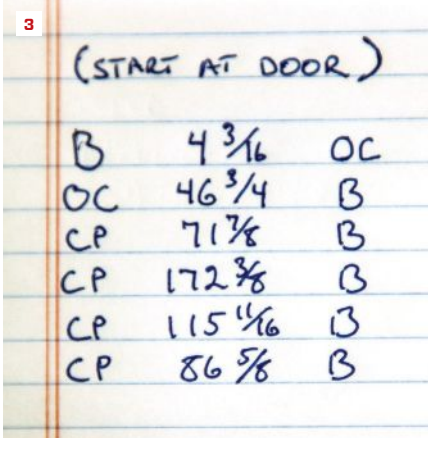
Decide where to start. Before I measure or cut anything, I look at the room and find a starting point, usually at a cased door opening. Being right-handed, I find it easiest to work from left to right (clockwise) around a room. For profiled moldings, I keep the coped ends to the left where they meet at inside corners. Once you have established a starting point and a direction, stick with them to maintain efficiency.

Make a cut list. No other area of trim installation benefits more from having a cut list than baseboard. If you work off a list, you need to be on your hands and knees only twice: once for measuring and once to install the pieces after they're cut. Without a list, you would need to do the baseboard a length at a time, constantly getting up and down, which is slow and tiring. In addition, depending on the house layout, it's not uncommon to have the miter-saw station several rooms away. Long lengths can be difficult to maneuver through an average house, and having a cut list minimizes trips to and from the saw.

Trust your measurements. Over time, the experience of using a cut list will help to give you confidence in making and recording your measurements. Mistakes will become obvious, but remember: A piece of base cut to the wrong length can be used elsewhere on a project. Also, baseboard is at floor level, which is often more visually forgiving than other trim areas.

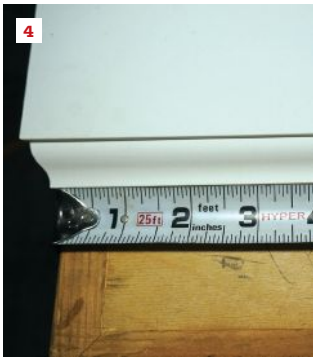
Greg and Sue Burnet are co-owners of Toolbelt Productions (toolbeltproductions.com), an education and training firm for the building industry.





Photos by Sue Burnet

The first step in installing baseboard is marking the stud locations on the floor so that the pieces can be anchored securely to the framing **(1)**. Working in one direction around the room, measure each length **(2)** and write the measurement on a cut list **(3)**. On the cut list, indicate the cut for each end: B for butt cut; OC for outside corner; and CP for the coped side of an inside corner.



When measuring baseboard stock, align angled cuts with the work-table edge and pull the measurement from there **(4)**. Inside corners should always be coped **(5)** to create a tight joint **(6)**. See the entire process online at the website noted below. For long runs that exceed the length of your stock, use a 30-degree scarf joint to join two pieces **(7)**.

Install lengths in the order that you measured the room. Use blocks under baseboard runs to allow space for finish flooring **(8)**. Overcut lengths slightly and "spring" them into place for tight inside corners **(9)**. Apply glue to both sides of a scarf joint on long lengths, nailing in the first piece before applying glue **(10)**. Also apply glue to both sides of outside corners **(11)**. Pins hold the corner together until the glue sets **(12)**.

For a more detailed discussion on running baseboard, go to **www.jlconline.com/training-the-trades/running-baseboard**.

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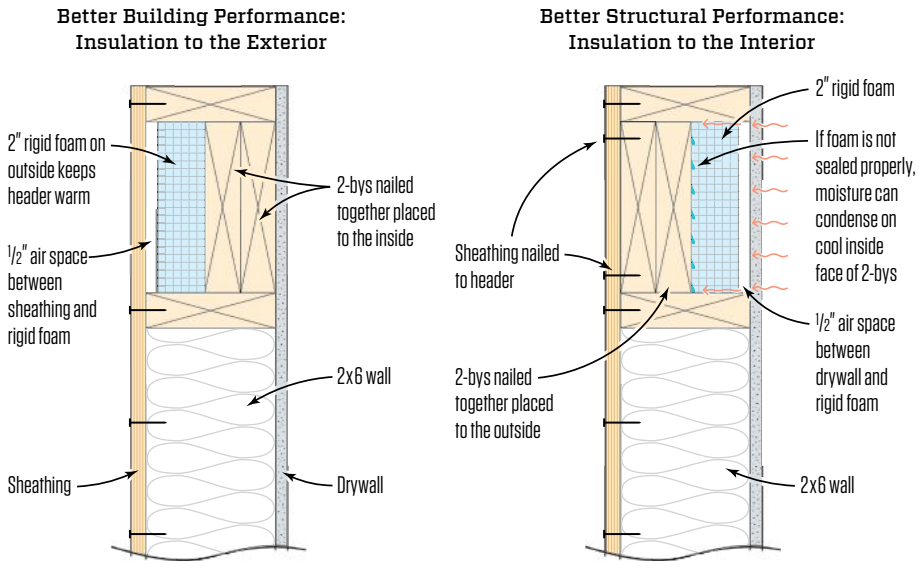
Q When I'm building an insulated header, should I place the insulation on the inside or the outside of the assembly?

A Steven Baczek, a residential architect from Reading, Mass., who specializes in designing durable, low-energy homes, responds: As with many questions regarding building techniques, the answer to this one is, it depends. Before we talk about insulation, we must acknowledge that a header's primary duty—transferring loads around window and door openings—is structural. Without that structural factor, the header is pretty useless no matter where you place the insulation. But we should also acknowledge that in many situations, headers aren't a necessary structural ingredient in the wall framing. That's a topic worthy of its own discussion.

For the sake of this discussion, however, let's say that we're building a header for a 2x6 wall—so we're working with 5½ inches of width. Also, let's say that we're using dimensional lumber to make a header for a 3-0 door opening. For the structure of the header, we need two 2-bys, nailed together on a code-approved schedule from both sides. A horizontal 2x6 is also needed under the header for nailing the sheathing outside and the drywall inside. The double 2-by header leaves a 2½-inch space for insulation, and most builders use 2-inch rigid foam and leave a ½-inch air space. But here is where the strategies vary.

For the best building performance, placing the insulation on the outside keeps the header warm and puts the thermal break on the outside of the header (see illustration, below). Note that in this scenario, the sheathing cannot be nailed directly

Insulating Site-Built Headers



Insulating a header in cold climates. Placing the insulation on the outside of the 2-bys (near right) keeps the header warm and puts the thermal break on the outside. With the insulation on the inside of the 2-bys (far right), moisture from inside air can condense on cool 2-bys if the insulation isn't sealed properly, possibly leading to rot.

Illustration: Tim Healey

to the header. Alternatively, the typical treatment of placing a layer of 2-inch rigid foam on the *inside* of the 2-bys also provides a thermal break for the header. However, when using this method in cold climates, it's important to seal the edges of the foam; otherwise, condensation may form on the cold, outer face of the insulation (against the 2-bys) and, over time, lead to rot.

When we use a double 2-by header on the high-performance houses that we build in high-wind areas, we always put our structure to the outside, which allows us to nail the sheathing directly to the structural header. The insulation installers can fill the space on the inside of the header with the same cavity insulation that they use in the stud bays. With this configuration, we usually provide air-sealing for the entire wall at the sheathing.

Q Should electrical receptacles be installed with the ground facing up or down?

A Ben Giles, licensed electrician and owner of South Shore Electrical Contractors, in Wakefield, R.I., responds: The electrical code does not address the direction that receptacles should be installed. You can put them in with the ground facing up, down, or sideways. Much more important is making sure the receptacles are wired and installed properly (see "Wiring Receptacles and Switches," Sep/17).

Orienting receptacles a certain way seems like one of those things that folks get in the habit of doing just because their boss told them to do it that way. I've heard of electricians who install receptacles with the ground up (upside down in my book) so that if a plug isn't fully engaged in the receptacle and something made of metal falls on the exposed male blades, the metal will hit the ground instead of bridging across the hot and neutral blades. That scenario seems highly unlikely to me. Similarly, I have heard of electricians orienting receptacles with the ground up when they are to be fitted with metal cover plates. The reasoning is that if something is plugged in loosely and the plate comes loose and falls, then it will land on the ground blade and not the hot. Again, the odds of that happening are pretty slim.

Even if the above events were more likely, with the properly-sized arc-fault breakers that we currently install in the main panels, the circuits trip so easily that the chances of harm or damage from occurrences like those are negligible at most. And finally, it should be noted that 90% of home appliances, as well as most lamps, vacuum cleaners, and the like, have two-prong male plugs. The orientation of the ground in the receptacle would make no difference for any appliance with this type of plug.

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Upgrading a Rear-Entry Landing

BY EMANUEL SILVA

On rare occasions, I work on homes with grand entries, such as the one written about in the August 2017 issue ("Refinishing a Brownstone Stoop"). But most of my work is on more humble homes, like the one I was recently asked to re-side the back wall of. When I was looking at the job, I noticed that the landing for the rear entry—a tiny concrete platform—was horribly inadequate. There was no room to stand when you were opening the storm door, and the step down from the door was uncomfortably high. The client agreed that the landing needed to be updated.

One option was to break up the old landing and pour a new one, but the old concrete was extremely hard and removing it would have been difficult and messy. Pouring a new full-height stair would have also meant having the top of the concrete above the top of the foundation—a situation I wanted to avoid. Instead, we decided on a hybrid landing a step down from the door. We would encase the old landing with a new poured-concrete platform and top it off with mahogany decking. We would also pour a step below the landing.

TWO POURS FOR THE CONCRETE BASE

The brick-paver patio was three steps down from the door, so the rise for each step would be a third of the total height from the patio to the threshold. I poured the landing and the bottom step in separate pours.

I wanted the concrete below the decking to drain properly, so I sloped the surface of the landing at about 1/4 inch per foot. The highest edge of the concrete was along the wall adjacent to the back door. After forming a weather lip along that edge, I sloped the concrete down from there. The height of this step didn't need to be exact because I would make up for any difference when I installed the sleepers and decking.

I drilled and epoxied 1/2-inch rebar into the original concrete to tie it to the new concrete work, and then I formed the upper step with 1-by material **(1)**. I poured that step and let it cure completely so that I could strip the forms before forming and pouring the lower step.

To add a decorative touch, I curved the outer corner of the lower step **(2)**. To create the curved form, I cut

kerfs across a strip of 3/4-inch plywood, with the saw blade cutting through to the last ply. The plywood then bent easily into the shape I wanted.

TAPERED SLEEPERS FOR THE DECK

Once the concrete was cured and the forms were stripped, I could build the wood "deck" on top. Because the top surface of the concrete sloped for drainage, I was able to make the wood deck above it level, which I did by installing the decking on tapered pressure-treated 2-by sleepers that I made from a site-built template. To put the step down to the deck at the proper height, I added 3/4 inch to the rise measurement to allow for the decking, which then gave me the height the sleepers needed to be.

I had been careful with the pour, so the tapered template fit closely for all the sleeper positions across the step. To cut the tapers, I made a simple jig by screwing one 2x4 to a second 2x4 at the angle of the taper **(3)**. The overhang of the angled 2x4, plus the width of my saw table gave me a rip for the right height for the sleeper. After making the tapered cut, I cut a straight rip out of the remaining piece, giving me two sleepers from a single board.

I made the sleepers long enough to overhang the edge of the landing by 1/2 inch for anchoring the PVC trim; I also notched the end of each sleeper to fit over the weather lip. Once I had made all the cuts, I gave the freshly exposed wood a generous coating of Woodlife preservative.

To support the decking, I laid out the sleepers on 12-inch centers **(4)**. I set the sleepers in place and numbered the ends to keep them organized. I first leveled across the tops of the sleepers to make sure there were no high spots **(5)**. Next, I drilled counter-bore holes in the sleepers to accommodate the heads of the GRK concrete anchors. Again, I brushed preservative into all the holes.

As I set each sleeper in place, I leveled down its length, adding treated shims to fill any voids below the fasteners **(6)**. Then I drilled out the concrete **(7)** and drove in the fasteners to secure the sleepers in place **(8)**. Before adding the decking, I added a layer of flashing tape. I tucked the tape under the threshold flashing below the door, letting it extend out over the first sleeper.

On the adjacent wall, I tacked the WRB up on the wall temporarily and installed "L" flashing that I'd fashioned out of aluminum stock **(9)**. I attached the aluminum to the wall with flashing tape and used pieces of flashing tape to isolate the flashing from the treated sleepers. With the flashing in place, I let the WRB back down and fastened it over the flashing system.

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DECKING AND TRIM

Before installing the deck boards, I sealed the sides and edges with a coat of Penofin decking stain and let them dry overnight. I started installing the boards at the outer edge of the landing **(10)**, letting the edge of the first board extend 1 1/2 inches over the ends of the sleepers—3/4 inch for the trim plus a 3/4-inch overhang.

To fasten the decking boards, I applied two 1/2-inch-diameter dots of 3M 5200 marine adhesive sealant at each sleeper. After setting a board in place (leaving a 1/8-inch gap between boards), I drove two 2-inch stainless steel finish nails at each sleeper to hold the boards tight until the sealant had dried. The holes from the finish nails are hardly noticeable in the stained boards, and once dry, the marine adhesive holds tenaciously. I left the decking boards long and cut them to length with a track saw after they were all installed.

To dress up the landing, I wrapped the riser of the top step in 1-by PVC trim. To allow clear drainage from the concrete surface under the decking, I stepped the trim out from the concrete using 1/2-inch spacers **(11)**. The spacers glued to the back of the 1-by on 12-inch centers, reflecting the same layout as the sleepers.

Before attaching the trim, I countersunk holes at each of the sleeper locations and then directly below at each spacer. Stainless steel screws through the top holes secured the trim to the sleepers; I drilled holes in the concrete and drove concrete anchor screws into the lower holes **(12)**. I finished up by filling the holes in the trim with PVC plugs that I make myself.

A frequent contributor to JLC, *Emanuel Silva owns Silva Lightning Builders, in North Andover, Mass.*

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Laying Out a Curved Walk

BY JOHN CARROLL

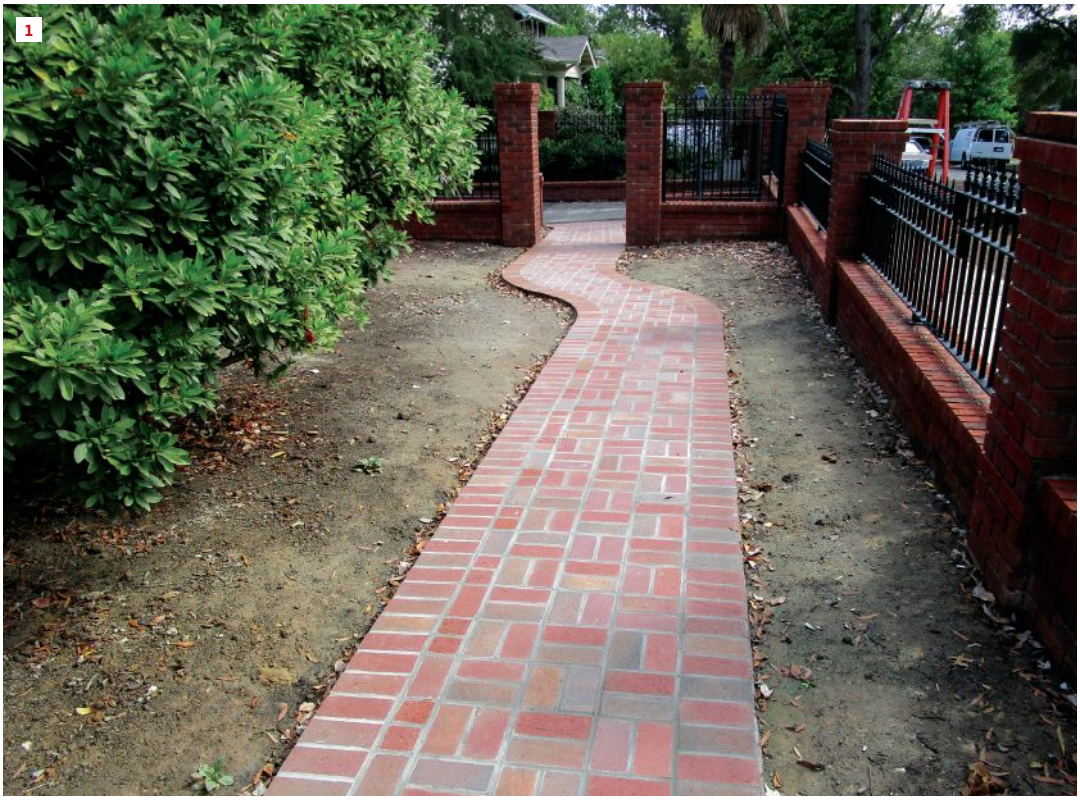
In the August issue, I wrote an article called "Durable Brick Walkways," in which I discussed the details for building a brick walkway to the entry of a home near Duke University, in North Carolina. That walk was one of two that I built at the house. The second walk began between two brick pillars and traveled along the side of the house. And while it may not have been as grand as the walk leading up to the main entry, this other walk presented some unique and fun challenges. Unlike the main entry, this "side" walk had to jog around some mature shrubbery next to the house **(1)**.

An angled jog would have made this mason's life much easier. But straight lines can be boring and, as in this case, awkward looking as well. Instead, I decided to use an S curve to shift the location of the walk. This gave me the chance to use one of my favorite under-appreciated tools—the lowly beam compass.

START WITH A DRAWING

A beam compass is essentially a large version of the dividers that most carpenters carry; I used my dividers to make a scaled drawing at the beginning of the project. The gateway was 44 inches wide, which set the brickwork at an even 5 1/2 units wide (7 5/8-inch brick + 3/8-inch grout joint). The transition would happen over a distance of 100 inches, and the two sections of the walk would be offset by 44 inches (the width of the walk). I also wanted the width of the transition area to be fairly consistent.

I started by drawing the transition between the two sidewalk sections as straight



This brick walk, along the side of the house, needed to shift position from the existing brick-pillar entry to run safely around mature shrubs growing next to the house. The author chose an S curve to transition between the two sections of sidewalk.

Photos: 1–4, 6–7, John Carroll; 5, Brett Arnold

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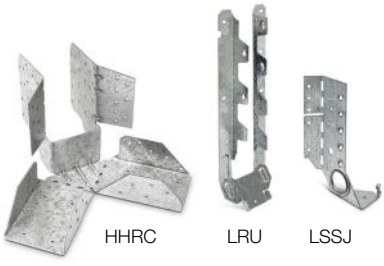

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diagonals (see Laying Out an S Curve, right). For the transition section to be the proper width, the starting point of the bottom diagonal had to be 8 inches farther along than the starting point of the top diagonal. I divided each diagonal line into two equal lengths of 54 1/2 inches, which gave me three points on each diagonal: A, B, and C on the top diagonal and D, E, and F on the bottom diagonal.

FINDING THE RADIUS

Each side of the transition section was to be an S curve with a double arc, so I needed to find a radius for the arc that looked right and that would work with the brick layout. In true Goldilocks fashion, I started with a 50-inch radius, but that gave me an arc that was too deep. A 100-inch radius produced an arc that was too shallow. I settled on 70 inches, which seemed just right.

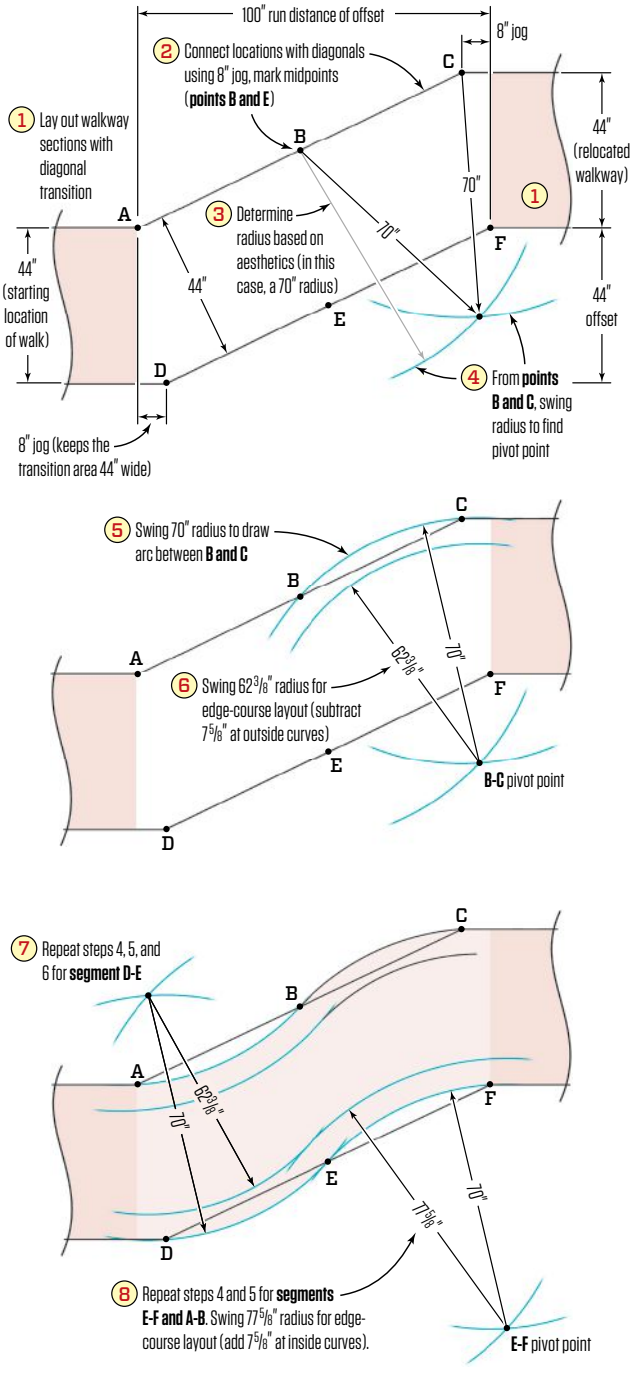
To create the arc in my drawing, I scaled my dividers to 70 inches. I swung an arc from point B and did the same from point C; the intersection of the two arcs marked the pivot point for drawing the B-C arc. I repeated the process for the other three line segments and I had my matching S curves.

PLYWOOD TEMPLATES

The next step was to draw the arcs full scale. There were two arcs to the S curve: a concave curve and a convex curve. I set the points on my beam compass to 70 inches and used it to make plywood templates for both shapes to the dimensions on the drawing. As I swung the arcs for the template, I established the beginning and end of each curve, as well as the correct arcs for the curves **(2)**.

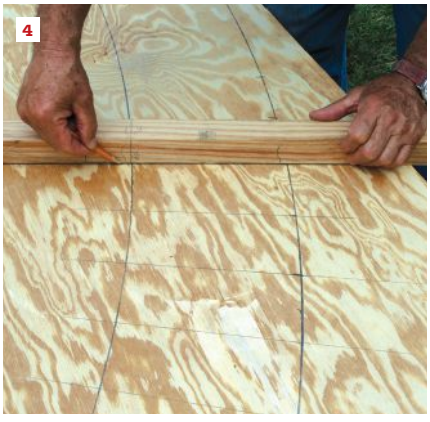
A crucial part of the templates was laying out the inside and outside curves of the border bricks and the positions and shapes of all those bricks. For the convex arc, I subtracted the length of a brick (7 5/8 inches) from the 70-inch radius and set the beam compass point to 62 3/8 inches. I swung an arc at that measurement from the same pivot point to find the inside edge of the bricks for the convex part of the S curve. For the concave arc, I *added* 7 5/8 inches to find the inside edge of the border bricks, setting my beam compass to 77 5/8 inches.

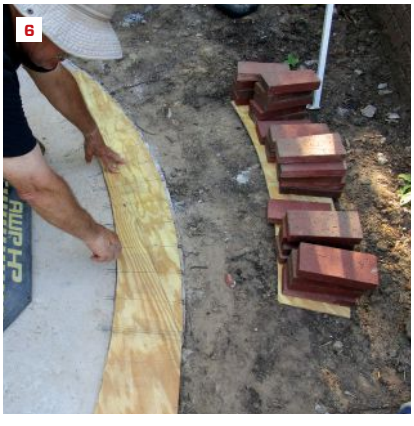
Laying Out an S Curve



The author first drew the transition as diagonal lines. After dividing those lines into two sections, he swung arcs for the concave and convex parts of the S curve and then swung arcs for the border bricks.

Illustration: Tim Healey





To lay out the curves full size, the author swung an arc using a beam compass **(2)**. For the convex curve shown here, he subtracted the length of the brick and swung a second arc. Then he marked out the positions of the bricks **(3)** and used the side of the beam compass to mark for each brick **(4)**. He cut out the templates and used them to position the forms for the slab under the walkway **(5)**. When the slab was done, he set the template on the concrete and marked out the positions of the bricks **(6)**. He used the template to taper-cut the bricks and then installed them leap-frog style to keep them perfectly in plane **(7)**.

Having established the beginning and end points of the arcs, I was able to lay out the positions of the bricks along the outside edges of each arc **(3)**. Then it was just a matter of pivoting the beam compass to each layout point and drawing a line along the side of the beam to create the tapered shapes of the bricks **(4)**.

PUTTING THE PLAN INTO ACTION

As with the main walkway, I needed to pour a concrete slab to support the bricks, but for this walkway, I had the curved sections as well as the straight ones. I used the templates to rough out the forms for the slab. I wasn't too concerned with accuracy at this point; any concrete that extended past the outer edges of the brick would be covered with soil. I formed the S curve with bending plywood **(5)**.

After I had stripped the forms from the slab, I used the template to lay out the curves and brick positions directly on the slab **(6)**. I taper-cut all the bricks, custom-cutting the ones where one curve transitioned to the other and where the curves transitioned to the straight sections of the walk. I squared lines across the slab to establish a starting point for the border bricks. Then I used the same leap-frog installation technique that I used with the main walkway to install the border bricks through the curved section **(7)**. Once the border was complete, I just continued the herringbone field pattern from the main walk right through the S curves.

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

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BY MELANIE HODGDON

Strategic Bookkeeping

So much information, so little time. Most accounting software can spit out a ton of reports, but the challenge is to figure out what's useful and what's not. No contractor in business today can waste time looking at a bunch of irrelevant clutter. At the same time, there are some key bookkeeping activities that need to be performed each month. Delaying those activities will only make tracking your finances more difficult—and you'll end up wasting even more time straightening out your books just to meet payroll, pay taxes, and figure out what jobs actually cost so you can price them accurately.

FOCUS ON WHAT'S USEFUL

It took one of my clients four days each month to "close" the previous month. The owner was frustrated that he had to wait until a week into the following month before he could look at a report that his staff considered accurate. In addition, some time-consuming practices weren't even yielding useful results. I requested a list of month-end activities, which the owner, office staff, and I reviewed to determine what needed to be done, what could be streamlined, and what could be eliminated. The following activities are from that list; included are comments about their usefulness to this particular company, along with the decisions reached by this company.

Reconcile bank statements. Do as soon as the statement arrives to keep your cash balance accurate and to identify transactions that don't belong to you.

Reconcile credit-card statements. Do as soon as the statement arrives to verify that all costs have been captured.

Reconcile lines of credit. Do as soon as the statement arrives. It's a good idea to review your balance. If you have an arrangement with the bank to automatically transfer monies between your credit line and bank accounts, it's critical to correctly track those auto transfers.

Reconcile loans. Make a single adjusting entry at year end. If you have an amortization schedule and record the split between principal and interest for each payment, then the principal balance should be accurate at year end and not require reconciling. But many companies don't have easy access to the breakdown for each payment; in that case, most simply record payments as 100% principal and make a single adjustment at year end to account for interest. It's important to know that this strategy results in understated interest expense on the profit and loss and an artificially low loan balance on the balance sheet until the adjustment has been made. So you need to take that into account when deciding whether or not it's worth the extra effort for your company to reconcile to exact balances each month.

Record depreciation. Automate because depreciation figures are the same each month. But any new capital purchases will require the monthly amount to be modified. For some companies, that's an automated process; if it needs to be manually calculated and entered, most companies wait until year end and get the figures from their accountant. If you do wait until the end of the year to make an adjustment, you will be "missing" depreciation expense on the profit and loss all year, and the value of your fixed assets will be overstated on the balance sheet. How critical that is depends on how big a chunk depreciation is of your overhead.

Review accounts receivable. Do at month end. Your A/R should be current; that is, if you have payments that are more than 30 days overdue, you shouldn't still be working on those projects! It's easy to lose track of who owes you what when the focus is on production. Review your aging accounts receivable at least monthly and chase down late payers. This is the simplest way to keep your cash flow healthy.

Review accounts payable. Do at month end. If you want good service from your subs and suppliers, you need to keep them happy by paying promptly. And if they offer a prompt-pay discount, you're putting money in your pocket every time you get that discount, so pay attention.

If you have credits with a vendor that you don't intend to purchase from in the near future, ask for a refund check; that's more cash in your pocket.

Review open purchase orders. Do regularly each month, but not necessarily at the end of the month. If you use POs, check them to get a sense of what additional costs can be expected for each job.

Be sure payroll liabilities are paid up. Do following each pay period and be sure you pay the correct amount each period. You don't need to have the federal or state government mad at you; penalties for failure to pay and for paying late are stiff. When faced with a choice of paying the government or paying their electrical sub, many companies make the mistake of paying the sub and letting the payroll stuff slide. This will come back and bite you. Pay the payroll taxes even if you have to draw on your line of credit; penalties on late tax payments will almost always exceed interest on credit lines.

Don't print reports. Discontinue printed reports and replace them with memorized groups of custom reports for each interested party to access. Printed reports are static; that is, you can look at a number but can't get behind it to see what's there. If something looks funny, you need to either go back into the software and run the report yourself, or ask office staff to research it. Both are time-consuming.

The same drawback is true for emailed reports (which are also static), though at least some software, such as the 2017 desktop version of QuickBooks (disclosure: I'm a QuickBooks ProAdvisor), allows you to schedule sets of reports to be automatically emailed to designated recipients.

The most efficient approach by far is to generate a list of useful reports and then have owners or CFOs open and review the reports live in the software.

Finally, there's no point in creating reports that won't be looked at. The bookkeeping staff and owner or CFO should agree on what reports will be reviewed each month or quarter, and in what form the reports should be shared or transmitted.

Review subcontractor insurance expirations. Do regularly each month but not necessarily at the end of the month. The Contractor version of QuickBooks will warn you when a sub's insurance has expired, but it's more valuable to look ahead so you can be sure to get copies of the renewed certificates in good time. Create a report that will list upcoming expiration dates and monitor it each month to stay on top of things.

Review financial reports, including the profit and loss and the balance sheet. Include as part of the set of reports for review; agree on a date by which reports are deemed to be complete. It's only useful to view these reports when the information is current. Look at achieved margins and compare the current month with the year-to-date figures, or the equivalent month last year. Look for trends.

Review job-cost reports. Review weekly if practical. For ongoing jobs, these should probably be reviewed weekly, as long as costs are being entered promptly. Again, there's no point in looking at a report with incomplete data, because any conclusions you draw will be inaccurate. On the other hand, waiting too long between reviews may prevent you from spotting something amiss or knowing about a change order.

Review jobs in progress and close when appropriate. Review briefly each week to determine which projects are nearing completion. The company should establish processes for starting jobs and closing jobs. Criteria should be set up to define exactly when a job is truly done: When the guys leave the site? When the last bill is paid? When payroll has been processed for the last punch-list activity? When the final payment is received?

Once the criteria are established, jobs should be reviewed and, if they meet the criteria, they should be closed. The closing process may vary from company to company, but simple things such as making the job inactive so your list of projects isn't cluttered by old work, confirming that contract price jobs have been invoiced in full, and checking achieved gross margin for the calculation of profit sharing are all potential activities.

MAKING THIS WORK

The key is to not waste time doing anything that fails to contribute to useful information. If nobody cares about a particular report, generating, printing, and distributing it are a waste of time (and paper).

While many of these activities occur at monthly intervals, not all must occur at month's end. For example, your bank account statement may end on the last day of the month, but your credit card statement may run from the 15th to the 14th. Reconciling should occur immediately after you receive a statement. You may want to review subcontractors' insurance expirations on the 20th of the month instead of waiting for month end, so you don't end up doing a whole bunch of once-a-month tasks on the last day of the month. You should always confirm your payroll liability payments are correct every time you make them.

Consider putting together a list of tasks to be completed on a daily, weekly, monthly, quarterly, and annual basis so you don't miss stuff or fall behind. Create and stick to a plan that lists required tasks (like paying taxes); critical tasks (like reviewing financials and job-cost reports); and efficient tasks (such as getting a jump on soon-to-expire insurance certificates). This way you can spread the load out to manageable levels, avoid wasting time viewing distracting information, focus on key information, and hopefully reduce your stress considerably.

Melanie Hodgdon, president of Business Systems Management, provides management consulting and coaching for contractors.

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Flood-Hardy Wall Construction
Can we build homes that stand up to frequent flooding?

BY TED CUSHMAN

When Hurricane Harvey dumped a record-shattering 50-plus inches of rain on Houston at the end of August, many homes in the low-lying Houston neighborhood of Meyerland were flooded for the third time in just three years.

Homeowners in Meyerland are experienced hands now, and they know the drill: Rip out the drywall, rip out the insulation, rip out the wood floors or the carpet, dump it all at the curb with your ruined furniture, your clothes, and your other belongings, and get ready to file another flood insurance claim.

A few homeowners in Meyerland, however, were fortunate enough to escape flood number three. Meyerland resident Drew Shefman is one: As Harvey approached, Shefman and his family made the news by managing to get their home lifted up 4 feet and set on cribbing barely a week before the storm arrived. Floodwaters fell short of flooding the Shefman home by a scant 6 inches; since then, contractor Arkitektura has come back to lift the house another 6 feet. Today, the house sits 10 feet above grade.

But even elevating a house turned out not to be a fail-safe strategy in Meyerland. According to the *Houston Chronicle*, a nearby home belonging to Jeffrey Tarrand had been elevated 42 inches after tropical storm Allison flooded the area in 2001. Harvey displaced Allison in the record books; Harvey also submerged Jeffrey Tarrand's elevated first floor under 22 inches of water.

ASSESSING THE RISK

Harvey was an epic storm. It wandered aimlessly around the Texas coast for days after landfall, dropping 40 to 60 inches of rain. And while Harvey flooded many homes that had been flooded repeatedly in the past, it also flooded homes that had never experienced flooding before. An estimated 80% of the flooded area fell outside the boundaries of the government's official flood plain. Harvey's story highlights one of the uncomfortable realities about flood: It's unpredictable.

Based on rainfall alone, Harvey qualifies as a "500-year flood"—meaning that in theory, a similar event would be expected to happen at that location once every 500 years, on average. The official flood-plain maps of the Federal Emergency Management Agency (FEMA) are based on a higher likelihood: a 1% chance of flooding in any given year (the so-called "100-year flood"). But neither term really means what it sounds like it means. Hundred-year floods happen every year, somewhere in the country. And even 500-year floods aren't necessarily all that rare. "By some calculations," researchers Nicholas Pinter, Nicholas Santos, and Rui Hui, of the Center for Watershed Sciences at the University of California-Davis, wrote after Hurricane Harvey, "the current flooding represents the third '500-year' flood in the Houston area in the past three years."

No matter how advanced the mapping technology, no flood plain map can ever be perfect. "The flood plain moves," says Louisiana State University Professor Claudette Reichel.

When severe flooding hit Nashville, Tenn., in May 2010, the event was described as a "1,000-year flood." And in 2016, rains that brought devastating floods to Baton Rouge, La., and vicinity also got the "1,000-year" label from the National Weather Service office in Slidell, La.

Climate scientists predict an increasing incidence of heavy rainfall and serious flooding as the earth's atmosphere continues to warm in coming decades. But climate change or no climate change, the sad truth is this: We know it's going to flood. What we don't know is exactly where, exactly when, or exactly how deep.

THE INSURANCE PROBLEM

The unpredictable nature of flooding is a major challenge for the federally-backed National Flood Insurance Program (NFIP), which is run by FEMA. The agency is midway through a complex and technically difficult reworking of the NFIP's Flood Insurance Rate Maps, or FIRMs, which define the official boundaries of the "flood hazard zone"—the locations where NFIP flood insurance is required for homes carrying federally-backed mortgages. Huge parts of the country still have outdated flood-zone maps that date back to the 1980s and earlier. And even the agency's state-of-the-art new maps, where they have come into force, represent only a best guess, despite the application of advanced ground elevation measurement technology and sophisticated computer modeling.

And no matter how advanced the mapping technology, no map can ever be perfect—because as Claudette Reichel, a professor at the Louisiana State University Agricultural Extension, points out, the flood plain itself is a moving target: Flood risks change from year to year in response to natural and man-made changes in rainfall and flow patterns. When record-setting rainfall soaked Reichel's own region in the summer of 2016, 80% or better of the flooded properties were outside the official flood plain—just like in Houston in the summer of 2017. And just like in Houston, most of the flooded property owners in Louisiana didn't have any flood insurance.

PRACTICAL PREPAREDNESS

Ideally, says Claudette Reichel, homes in places where flood is a serious risk should be built above the anticipated flood level. But even for new construction, that's an expensive proposition. For an existing house, dollars can be a deal-breaker. The cost of raising an existing home to get it above the flood line is prohibitive for most people, especially if the house is built on a slab foundation.

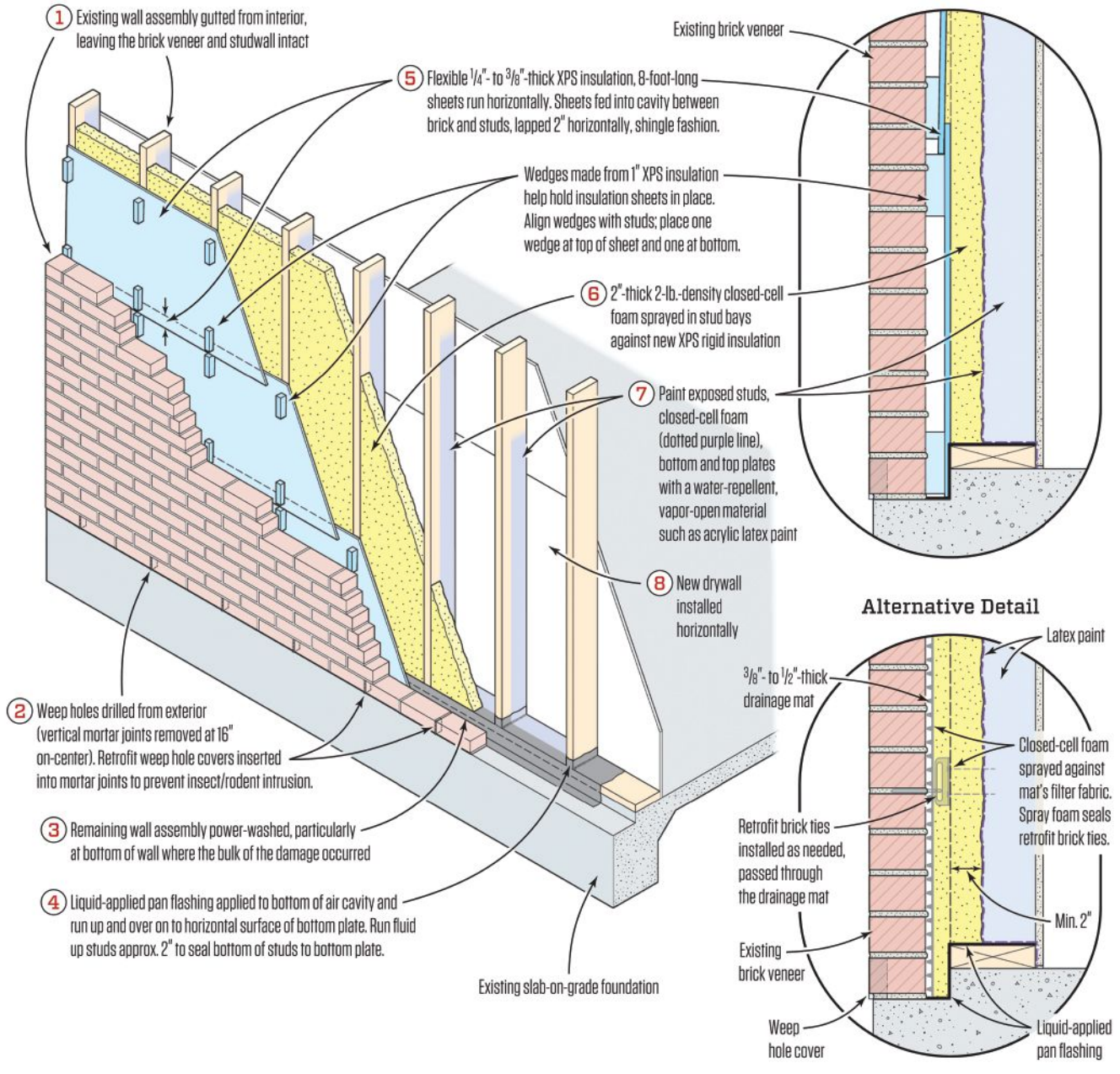
But if the money's not there to raise the house, Reichel says, homeowners still have choices. After Hurricane Katrina flooded New Orleans in 2005, building scientist Joe Lstiburek developed a set of recommended details for rebuilding walls in flood-damaged wood-frame houses that can't be readily elevated (see illustration, page 37), as well as suggestions for flood-tolerant masonry cavity-wall and mass-wall construction (see illustrations, pages 38 and 39).

Lstiburek's post-Katrina rebuilding recommendations focused on typical southern Louisiana construction methods, with modifications intended to make the buildings more tolerant of standing water and easier to open up, clean, dry, and put back into service after a flood. Reichel, who describes the idea as "drainable, dryable, flood-hardy restoration," popularized the details on the LSU Ag Center's website, and continues to educate Louisiana property owners on the concept. And after *JLC*'s *Coastal Contractor* magazine published a drawing of Lstiburek's suggestion for wood-frame walls in 2006, the illustration found its way into FEMA guidance for homeowners repairing their properties after a flood.

Following Hurricane Harvey, Lstiburek has evolved similar guidance tailored to the construction style that's typical of the Houston market, where many homes are built on slabs and clad with brick (see illustration, facing page). In this go-round, Lstiburek is moving away from the idea of saving any interior wall covering. Floodwater tends to be "filthy," Lstiburek observes, and interior wallboard is likely to be ruined every time the property floods—and probably has to come off in any case to allow thorough cleaning and disinfecting of the wall cavity.

Illustrations by Tim Healey

Flood-Tolerant Wall Reconstruction



In the aftermath of Hurricane Harvey, building scientist Joe Lstiburek has proposed the method shown here for remediating flood-damaged houses in the Houston market, where brick veneer exteriors and slab foundations are common. In theory, the details should reduce water damage and make cleanup and repair easier the next time the building is hit by a flood. The centermost insulation layer is watertight and impermeable, while materials toward the inside and outside faces of the wall allow drying by diffusion.

In this latest incarnation of flood hardy, Lstiburek is assuming that the home's sheathing will also have to come out, leaving the exterior brick cladding exposed from the back. All of the framing as well as the brick has to be washed, scrubbed, rinsed, and disinfected, he says, with particular attention to the base of the wall where dirt and sediment may have collected. Then it has to be dried.

When the wall is ready to be reconstructed, Lstiburek suggests two possible ways to establish an air barrier and drainage plane on the interior side of the brick cladding. One way would be to slide rigid closed-cell extruded polystyrene (XPS) insulation into the cavity between the brick and the studs, jamming the insulation into place with small pieces of XPS to hold it temporarily, and then applying closed-cell spray foam against the XPS and between the studs. This would create an effective air barrier and also achieve some lateral stiffening of the wall structure.

Lstiburek's other suggestion is to place a fabric-faced open-weave drainage plane material such as Benjamin Obdyke Home Slicker against the brick, then apply the spray foam against the fabric for insulation and air-sealing.

Either method would create a drainage and drying gap behind the brick, outboard of the insulated wall. But first, says Lstiburek, the base of the wall should be coated with fluid-applied flashing to make a drain pan at the bottom of the wall. And weep holes should be cut at vertical joints in the bottom course of brick to allow water to exit the cavity.

SAVING HISTORY

Louisiana building-science consultant Paul LaGrange has been working with the LSU Ag Center since the days of Katrina, helping to design and develop the center's LaHouse high-performance home demonstration project. After Katrina, LaGrange found himself working on flood restoration of old balloon-framed New Orleans buildings. Many of the structures were uninsulated, with board siding applied directly to the wood studs.

"Some of these were listed as historic properties, and some weren't," says LaGrange. "But either way, in many cases we weren't able to remove the existing board siding. But we still had to improve the air barrier, the drainage plane, and the thermal barrier. And the way you do that with a historic house is very different from the way you would with a modern-construction home that was platform framed with structural panel or gypsum-board sheathing and interior drywall."

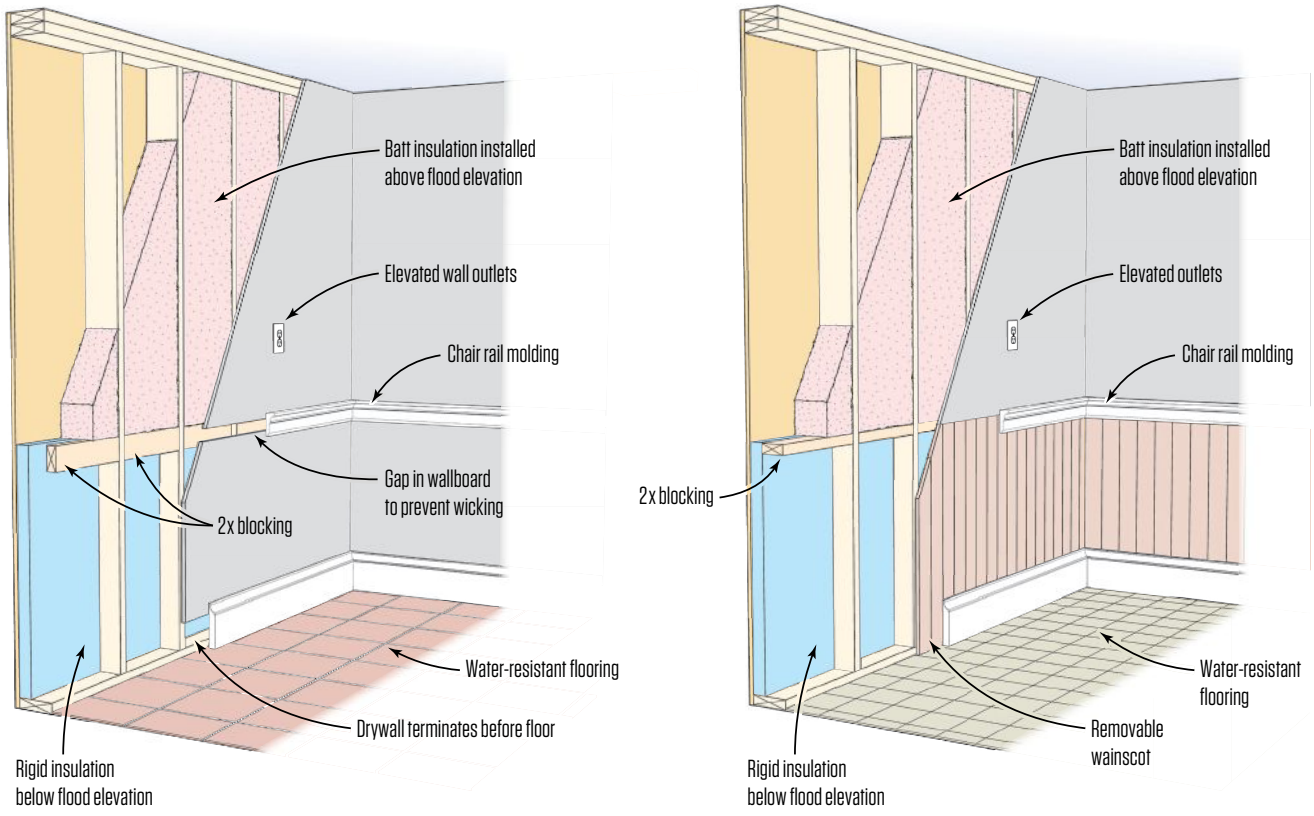
For those older buildings, LaGrange had to work from the interior. The methods he came up with (see photos, right) resemble Joe Lstiburek's recommendations for brick-clad Houston homes: LaGrange placed Home Slicker against the board siding, cut and fit sheets of XPS to hold the drainage fabric in place, and applied closed-cell spray polyurethane to air-seal the wall and lock the components together.

Like Lstiburek's recommendations for Houston, and like the drainable, dryable wall shown on the facing page, LaGrange's solution for balloon-framed houses should make the houses easier to fix in the event that they flood again. But so far, none of the buildings LaGrange worked on have been flooded a second time.

In historic New Orleans buildings where old board siding could not be removed **(1)**, consultant Paul LaGrange opted to place open-weave drain fabric against the wall, set rigid polystyrene insulation board against the drainage material **(2)**, and seal the cavities with closed-cell high-density spray foam insulation **(3)**.

Photos: Paul LaGrange

Drainable, Dryable Wall Repair



The drawing above illustrates the "wash-and-wear wall" concept for flood repair on existing homes advocated by Professor Claudette Reichel, director of the Lousiana State University (LSU) Ag Center's "LaHouse" project, and included by FEMA as a suggestion in the agency's advice for repairing flooded homes. Upper portions of the wall are left as is, while lower portions receive flood-tolerant materials. If flood recurs, lower portions of the wall will be easier to clean, dry, and put back into service.

"WASH-AND-WEAR" RECONSTRUCTION

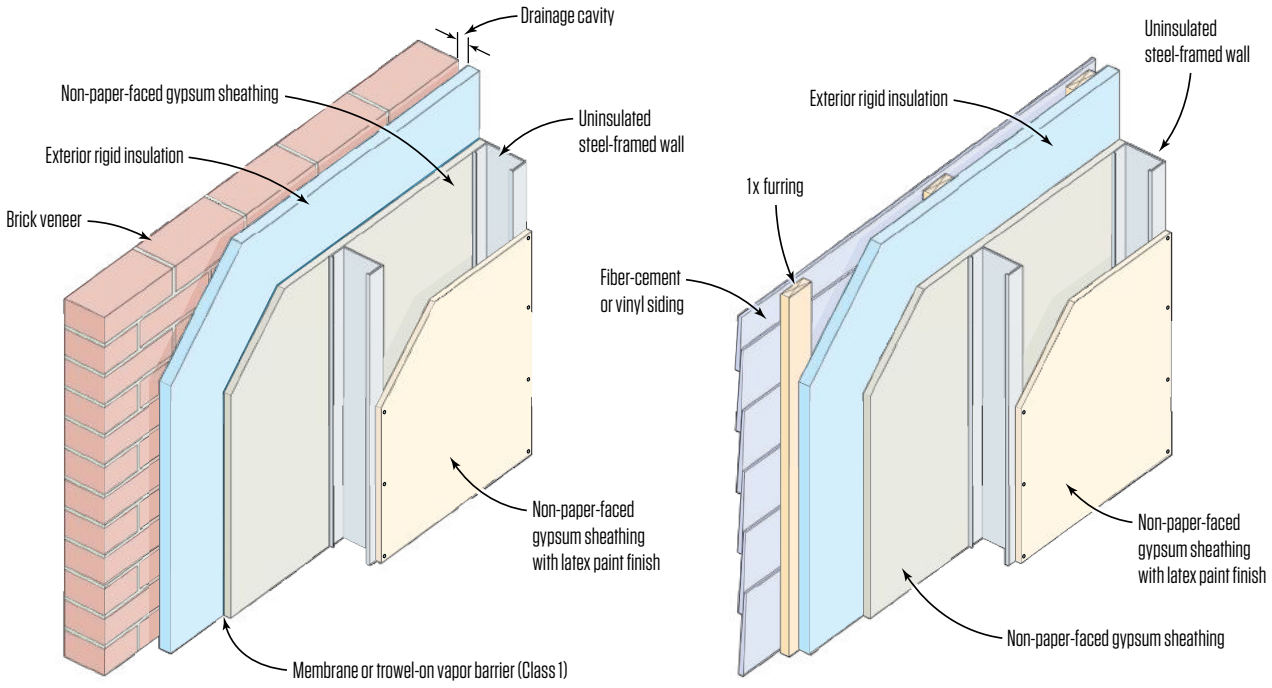
In any flood, the extent of the damage, and the demolition required, will vary depending on how deep the floodwater is, how dirty it is, and how long it sits in the house. In some cases, the interior wallboard may have to be completely stripped out. In others, just the lower wall may need gutting. In a best-case scenario, homeowners might be able to just remove strips of material and flush out the walls. But in any case, says Claudette Reichel, applying flood-hardy methods like the details shown above could save homeowners from months of displacement from their houses.

And unlike elevating the house, "wet floodproofing" (the FEMA term for the technique) isn't an all-or-nothing proposition. Homeowners can apply as much of the approach as they have time or resources for. Says Reichel: "Anything you do reduces your damage next time. You could elevate your water heater and your air conditioner compressor, but maybe not your refrigerator. Or for example, a lot of people in our area went back with floorings that were more resilient—interlocking vinyl flooring was flying off the shelves at the home center—but they didn't necessarily do the drainable dryable wall part."

But any measures taken this time around will pay off in the next flood, says Reichel. "The more wet floodproofing techniques they use, the less the ordeal. They would not be homeless for a year. They would not be competing with everyone else for new materials. All they have to do is clean and dehumidify to speed-dry, and they're back in."

"If they don't elevate their outlets and their switches, and those get underwater, those need to be replaced," cautions Reichel. "But at least the home is still livable. And if it's fresh water, not salt water, you don't have to replace the wiring—just the receptacles."

Cavity-Wall Assemblies



Above is a rendering of two drainable and dryable cavity-wall assemblies proposed by building-science expert Joe Lstiburek after Hurricane Katrina. The wall designs share several key characteristics: No water-sensitive materials are used in the construction; exterior cavities are drainable and vented to the exterior; and interior cavities can be opened to allow passive or fan-forced drying in the event of a flood, by removing strips of wall material at top and bottom. Lstiburek cautions, however, that floodwaters are usually "filthy," requiring the interior side of the wall to be opened up, scrubbed, rinsed, and disinfected.

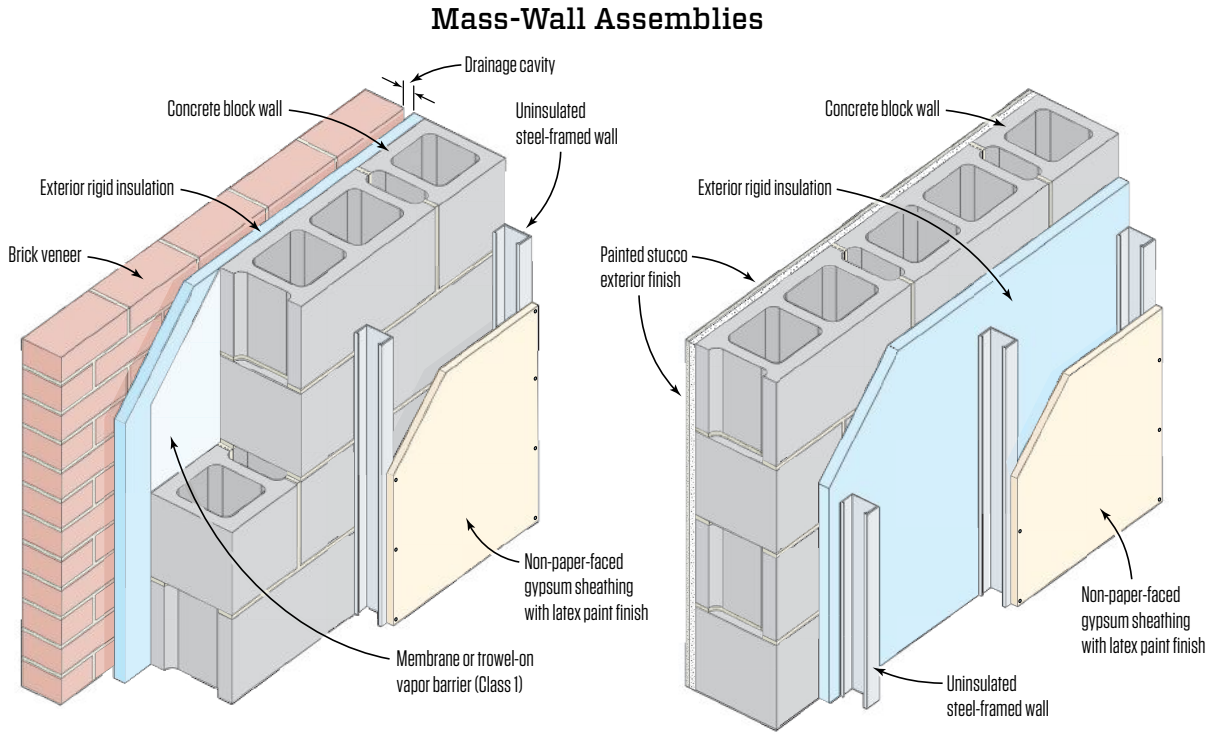
CLEANING AND GUTTING

As *JLC* goes to press this month, Houston is not ready for reconstruction. Thousands of volunteers have flocked to Houston to help, but for now, the job is demolition. "They are focusing on gutting and drying," says Paul LaGrange, "and they are actually drying it right. They are taking that four to eight weeks, depending on how long the water sat, and what products got wet, to dry those facilities. And of course they are sanitizing to prevent organic growth."

In the 2016 Louisiana flood, LaGrange says, some homeowners were in too big a hurry. "They were not drying their homes thoroughly enough, to a 15% moisture content or less, before they started re-insulating and hanging drywall." One common mistake is to measure moisture content at the surface of the wood, says LaGrange: "They weren't inserting the pins of the moisture meter into the center of the wood framing to gather accurate measurements. So you still had moisture that was emerging from the center of that wood, and people were hanging drywall way before their homes were completely dry."

Builder and *JLC* author Matt Risinger, who is based in Austin, Texas, has traveled to the Houston area with volunteers from his church to help gut several homes. At first, says Risinger, it was discouraging. "One of the houses I went to, the water was just absolutely disgusting," he says. "The open-cell insulation was like a sponge. You could push on it and water would spurt out on you."

"But by the end of the day," says Risinger, "once we ripped out all the drywall and the foam, I felt like, 'Okay, this house is salvageable. We're back to a situation as if it was in framing and had gotten wet.' And you know, houses get wet in framing all the time. We can deal with that, if it's dryable."



Masonry mass-wall assemblies proposed by Joe Lstiburek after Hurricane Katrina are reminiscent of traditional wall structures seen in historic buildings in New Orleans, some of which survived historic floods. Unlike the historic techniques, however, these insulated walls are adapted to modern space-conditioning and energy-efficiency expectations. The materials are chosen to be tolerant of water, and the least moisture-permeable material (the extruded polystyrene insulation board) is located at the center of the wall profile, so that moisture can diffuse out of the walls in two directions from the center.

THE LIVING LABORATORY

Joe Lstiburek's, Claudette Reichel's, and Paul LaGrange's advice is based on sound building-science principles and backed by a wealth of experience. But so far, the advice is mostly theoretical. A few houses in Louisiana have been given the flood-hardy treatment, but most have not. In the 2016 floods, says Paul LaGrange, "the vast majority of these folks did not have flood insurance because they were not in the flood plain. They were looking to get back their homes as quickly and inexpensively as possible." Many who couldn't afford even basic repairs sold out at a loss, and their homes were converted into rental housing.

But neighborhoods like Houston's Meyerland may serve as a proving ground. After his first flood, Drew Shefman says, he just wanted to get back into his house; his remodel included carpeting, which was ruined six weeks later when the second flood hit.

After the second flood, Shefman says, he started to think; on some exterior walls, he used plywood paneling attached with screws instead of using drywall, and he replaced his ruined carpet with vinyl flooring. But those ideas were not tested by the third flood, because Shefman lifted his house in the nick of time.

The rest of Meyerland has some decisions to make. "Two of my neighbors are selling," says Shefman. "One is going to rebuild. One is going to lift. A couple are still trying to figure out what they're going to do." Whatever they decide, those homeowners, their community, and the broader building and remodeling community will get the chance to learn something from their choices—because as uncertain as weather can be, one prediction seems reasonable: Houston is absolutely certain to see floodwater again.

Ted Cushman is a senior editor at JLC.

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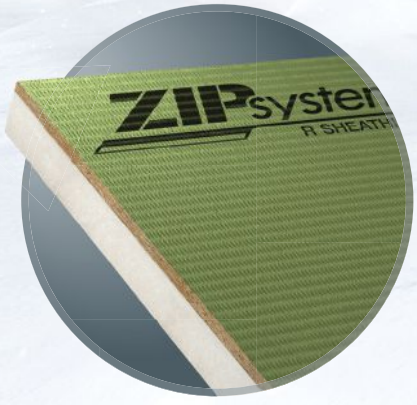

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FROM THE CREATORS OF AdvanTech

Working With Large-Format Floor Tile

The size poses challenges that require a different approach

BY TOM MEEHAN

Recently, our most common floor installations have consisted of large tile that looks a lot like wood planks. More than once, we've gotten funny looks from people who were sure that they were looking at a wood floor. At almost 3 feet long and close to 6 inches wide, these tiles have the same basic shape as a board. But this shape brings with it the challenges of installing large-format tile. The Tile Council of North America defines large format as having any edge 15 inches or longer. Because of the size, the chances of lippage (uneven tile edges) or cracking after installation are much greater. For this reason, the TCNA has put out guidelines specific to installing large-format tile.

A FLAT SUBFLOOR IS A MUST

For a successful installation of large-format floor tile, the most important factor is the flatness of the subfloor. In addition to its strict rules about deflection, the TCNA recommends that the subfloor have no more than 1/8-inch variation in 10 feet—tight tolerances for any subfloor. For this project, I made sure the plywood subfloor was within the TCNA tolerances before I installed a Ditra Mat uncoupling membrane over it.

If the surface of the subfloor had varied by more than 1/8 inch, I would have considered using a poured floor leveler on the worst areas—or on the entire floor—before installing the uncoupling membrane. The only area of this subfloor that was slightly out of level was in a hallway off the main floor. Because the hallway was relatively small (less than 10 square feet), I opted to use a mechanical "leveling" system there, which I describe later in the article. After installing the membrane, I rechecked the floor for flatness by trying to slide a silver dollar (which is just under 1/8 inch thick) under an 8-foot straightedge **(1)**.

Photos by Roe Osborn

Installing large-format tile requires a subfloor that is almost perfectly flat. The author checks the floor by trying to insert a silver dollar (or other 1/8-inch-thick spacer) under an 8-foot straightedge **(1)**. Slight warpage is inevitable with large tile and can cause excessive lippage where the edge of a tile sticks up above an adjacent one **(2)**. For this project and this type of tile, the author installed four courses at a time. To lay out each section, he set four tiles in place and measured across them **(3)**. That measurement then guided his layout line for installing each four-course section across the floor **(4)**.

A flat subfloor is crucial because large-format tiles are seldom perfectly flat. During firing and glazing of a long, narrow strip of clay, some minor distortion can be expected. If two tiles with a 1/16-inch bend are installed side by side, the middle of one tile can be 1/8 inch higher than the end of the other—the lippage that was mentioned earlier **(2)**. An out-of-level floor will compound the problem. As I unpack the boxes, I randomly check the tiles for any major discrepancies, setting aside the worst tiles to be cut for shorter pieces.

GETTING STARTED

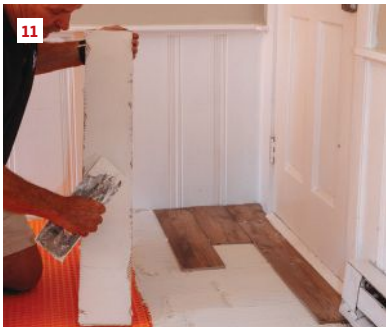
Before I mix any thinset, I scan the room to determine which sides are the most visible. That's where I'll begin my layout. In this case, I decided to start at the front wall of the house and the wall adjacent to the front door. To keep the installation neat and easy to handle, I always put down just a few courses at a time. To minimize lippage, I stagger the ends; for this floor, I started with a quarter of a tile, then a half tile, then a three-quarter tile, and finally, a full tile. With four starter pieces, I worked four courses at a time.

To determine the layout, I set four tiles side by side, leaving 1/8-inch gaps between them for grout lines **(3)**. I measured 23 1/2 inches across the tiles; that measurement would guide my layout lines as the courses progressed across the floor.

The TCNA recommends leaving a 1/4-inch gap around the perimeter of the tile floor for expansion, so for the first section, I measured out 23 7/8 inches from the wall. Using a laser tool, I projected a straight line across the room and drew a line with a waterproof marker **(4)**. Then I was ready to install the tile.

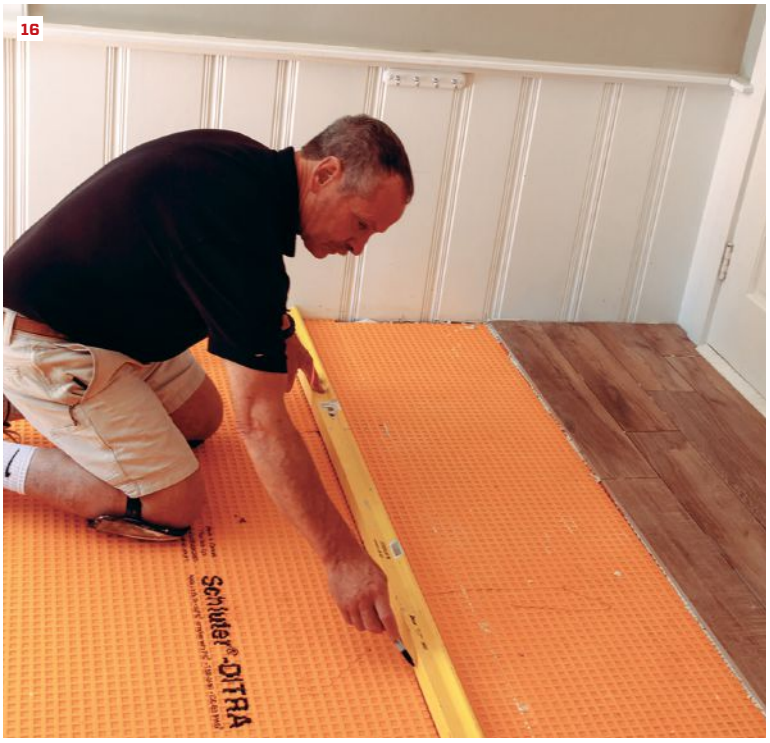
Tom Meehan, co-author of Working with Tile, *is a second-generation tile installer who lives and works in Harwich, Mass.*

Tiles for the first course had to be scribed around the threshold of the door **(5)**. Starting the first course with a quarter-size tile in the corner, the author put a full tile over the most trafficked area of the threshold, which helped to minimize the chance for cracking. Avoiding a grout line in the doorway also looked much better. The author marked the end scribe on the full tile and then flipped the tile over to mark the strip he needed to remove along one edge **(6)**. Next, he carefully cut the strip lengthwise in a tile saw **(7)**, flipped the tile over, and finished the cuts from the back **(8)**.

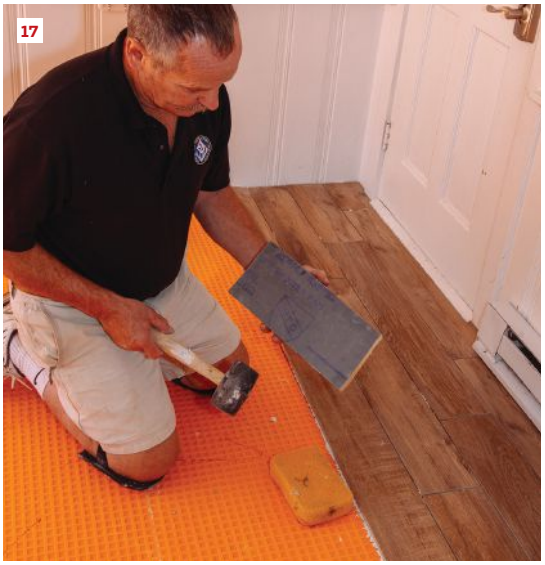


Installation of tile over this uncoupling membrane required two passes of dry-set mortar—thinset that needs to be used over the membrane. The first pass with the flat edge of the trowel forced thinset into the cavities of the membrane **(9)**. The second pass with a 3/8-inch-by-3/8-inch square-notched trowel combed the thinset perpendicular to the long edge of the tile **(10)**. The author applied a skim coat of thinset to each tile **(11)** before pressing it into place **(12)**.

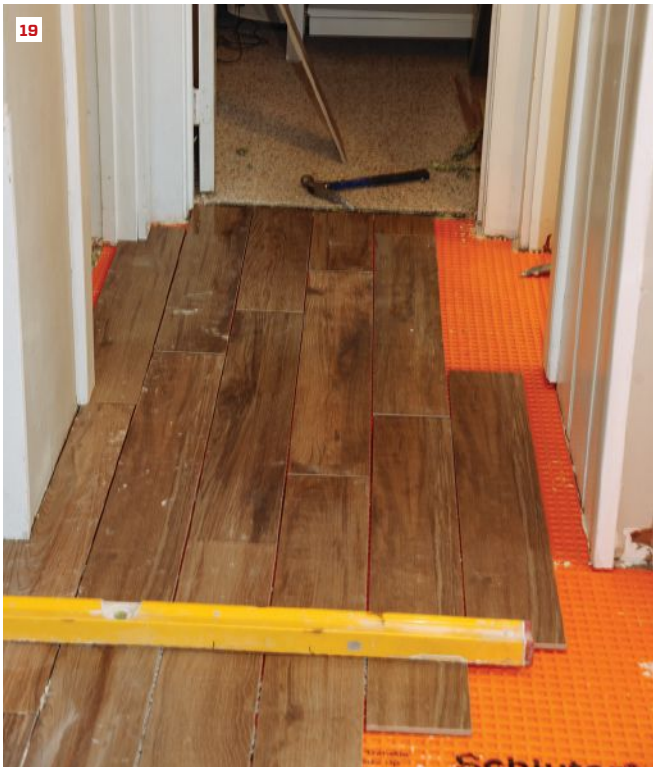
As the author pressed each tile into place, he pushed it side to side about 1/2 inch **(13)**. The perpendicular direction of the trowel lines allows air to escape along the long side of the tile as it beds into the thinset. Every few courses, it's a good idea to lift up a tile and check the coverage of the thinset **(14)**. For large-format tile, the coverage should be at least 85% for interior applications and 90% for exterior ones.

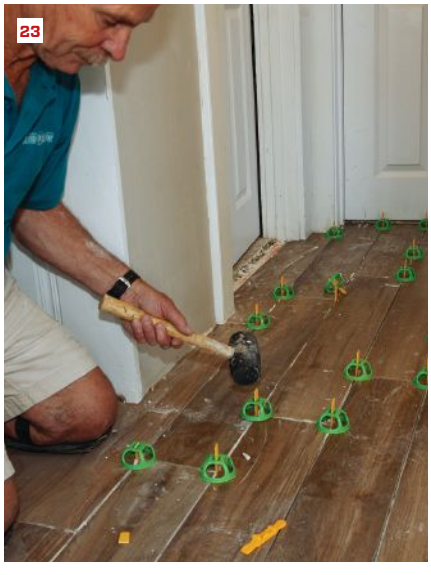


To finish each four-course section, the author marked the lengths of the last tiles in place before cutting and installing them **(15)**, making sure to leave a 1/4-inch expansion space near the wall. The second four-course section was laid out like the first, with a wall-to-wall guideline **(16)** using the measurement from the initial dry layout (see photo 3).



After completing each section, the author tapped down the ends of the tiles to minimize lippage. A short length of 2x6 with a scrap of flexible shower-pan membrane glued to it served as a beating block **(17)**. He tapped the ends of all the tiles with the block and a rubber mallet until their edges were even **(18)**.





The floor of an adjacent hallway was slightly out of level, and for this small area, the author opted to use a mechanical "Lippage Tuning" system from Miracle Sealants. First, he cut and dry-fit all the tile for the hallway space **(19)**. Then, as he bedded each tile into the thinset, he inserted a flat, 1/8-inch spacer at each grout-line intersection **(20)**. After all the tiles were in place, he pushed plastic caps down over the protruding tabs **(21)** and then used a proprietary tool to "ratchet" the caps onto the tabs, aligning the intersecting tile surfaces **(22)**. Each spacer has a breakaway point; once the thinset had cured, a gentle tap with a mallet broke off the tab below the grout line **(23)**.

Before grouting the floor, the author cleaned and prepped the tile. He used a utility knife to scrape out the excess dried thinset from the grout joints **(24)**, and a vacuum to pull the loosened pieces out of the grout lines **(25)**. He then went over the whole floor with a wet sponge to loosen and remove any dried thinset stuck on the surface of the tile. A final wipe with the sponge ensured the floor was ready for grout **(26)**.

The author applied the grout initially with a rubber-edge grout trowel in sweeping diagonal strokes **(27)**. After letting the grout set up for a half hour or so, he went over the surface with a sponge and clean water, rinsing the sponge frequently; this left a light haze on the surface **(28)**. When the haze dried, he went over the tile again with a clean, damp sponge, this time moving only in a direction parallel to the tile planks **(29)**. He made only a single pass with each side of the sponge before rinsing it in clean water. Two days later, he returned and cleaned the floor with a stone and tile cleaner.

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Rehab From Above

A complex roof gets a building-science makeover

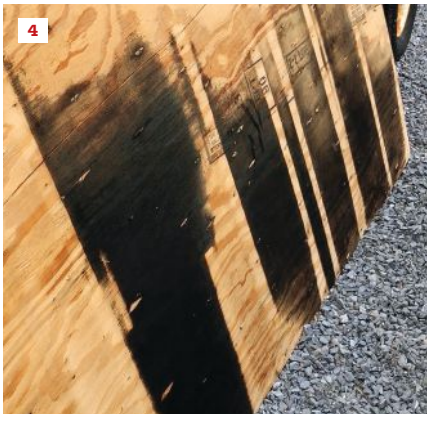
BY JIM BRADLEY

When it comes to constructing an architecturally complicated roof design, many builders are highly skilled in the framing that's involved, without being quite as well versed in the building science required to make the roof perform properly. While builders always think about how to fit the lumber in and make the cuts and joints to assemble the hips and valleys and create the elevations, they don't always fully understand things from the standpoint of thermal insulation, air-sealing, and moisture.

That can be a problem. If we don't correctly address those building performance concerns—if we don't couple our good structural framing with good building-science details—the framing and sheathing may be fine on the day the roof is built. But that might be the roof's best day, and the structure and envelope might deteriorate from that day on, degraded by mold, rot, insects, and vermin.

The house I write about in this story is a case in point. It was well framed to achieve structural strength and a pleasing appearance. But over the years, the roof was damaged by moisture and mold. When my company encountered the roof, its sheathing was softened by condensation and decay, shingles had worn out prematurely, and it was leaking. The homeowner also told us that some rooms inside were uncomfortable, in both summer and winter.

Photos by Jim Bradley and Tim Healey



Originally a simple raised ranch, this home had been remodeled with complex architectural details **(1, 2)**, which made adding to the roof's thickness impractical. The shingle roof needed replacement, and there was mold and rot in some areas of roof sheathing **(3, 4)**. Existing fiberglass insulation **(5)** was compromised by installation gaps and voids, as well as mouse tunnels.

WET BASEMENT, WET ROOF

When we first arrived at this house in 2016, it wasn't to fix the roof. It was to fix the basement, where, many years earlier, the homeowner had installed a finished wood floor. He had followed an accepted and typical practice for that time: He coated the floor with a bituminous tar, applied 2x4 sleepers using concrete nails, and then put down subflooring, underlayment, and linoleum. But over the years, water leaking near the brick chimney and through the foundation wall on the uphill side of the home seeped in and spread along the slab. By the time we were called in, the sleepers, subflooring, and underlayment were all damaged by rot.

After pulling out the ruined floor, we installed our fix. We applied a 20-mil rubberized fiber-reinforced membrane to the floor (lapping up and sealed to the wall), attached new sleepers with Tapcon fasteners, and laid down a new subfloor and underlayment.

To address the problem of roof runoff soaking the soil near the foundation, we also decided to put large commercial gutters on the roof. When the gutter contractor leaned his ladder against the roof, however, we saw that the sheathing at the roof edge was soft, indicating rot in the roof system. On further inspection, we found more soft spots on the roof. The more we learned, the more the homeowners came to see that their roof needed repair.

Most of the home's interior was in pretty good condition, and the owners didn't want the additional expense or the disruption that it would cause for us to approach this problem from inside. Also, the shingle roof had deteriorated prematurely and was due to be completely replaced. So the owners elected to have us open up the roof from above, and accomplish the proper air-sealing, thorough insulation, and effective venting that the roof should have gotten when it was first built. That's the work we're showing here.

Existing fiberglass batts in the rafter bays were exposed to wind-washing at the eaves **(6)**. Complicated existing framing around the chimney, an older original roof that had been left in place, and the later belvedere addition had created a maze of interconnected air bypasses **(7, 8, 9)**. For this rehab, the existing ceiling **(10)** was left in place, and the roof upgraded from above.

A PRACTICAL REPAIR

Our first idea for making this roof system work was to create a built-up ventilated assembly above the existing roof plane. In an ideal world, we might have applied a method we've used in other cases with good results. That is, we could completely fill the 2x10 rafter cavities with insulation, install a few inches of rigid Roxul mineral-wool insulation over the top of the rafters, install a vapor-open, watertight weather-resistive barrier membrane as a drainage plane above the rigid insulation, strap over the membrane with 2-by strapping, and finally sheathe over the strapping with plywood, leaving an ample, 1.5-inch airflow space for venting. This solution would have increased the R-value of the existing roof, while also creating a vapor-open system that could dry readily to the outside.

But that full-on treatment would have been costly, and not just because of the materials cost. If we raised the roof plane in that way, we would have to rework the roof intersections at the hips and the valley, not to mention the joints where the belvedere connected to the roof.

In addition, the existing window-sill height for the belvedere windows, as well as for the windows above several other roof-to-wall intersections, was too low to accommodate the added height of the rigid insulation and strapping. If we had rebuilt the roof that way, we would have had to modify the windows also (a complicated, disruptive, and costly process).

Instead, the owners opted for a more workable solution. We would open up the roof, insulate it with Roxul mineral-wool batts, and then create a venting air space within the rafter bays using lauan plywood. We would resheathe the roof with new plywood, then apply underlayment and roofing in the conventional way.

Because the home needed new roofing shingles, and because some sheathing was damaged and needed replacing, the owners decided to repair the system from outside **(11)**. But some spaces were also accessible from inside. A small attic space was insulated from inside **(12)**. That ceiling got a smart vapor-control membrane **(13)**, and the crew sealed a bath fan **(14)**.

AIR CONTROL LAYER

When we assessed this roof system, we found a wide variety of deficiencies in the assembly's air control layer. Some of the air leaks were relatively minor, but many were large, and some were huge. There were small holes in the drywall (made by the owners, who had installed drywall anchors in several places). There were recessed lights in some of the ceilings, which leaked into the roof cavities. Unsealed bath fans also penetrated the ceiling, allowing air leaks.

The really big air bypasses were things like the framed chase around the home's masonry chimney. Big enough for a person to crawl through, that chase extended all the way from an unconditioned attic down to lower floors and allowed heat and moisture to flow up into the upper parts of the roof. Also, the floor of the belvedere was unblocked and uninsulated, allowing drafts, and an uninsulated storage attic was built into the new roof system over part of the house, without an effective air barrier between that space and the occupied space below.

ATTIC UPGRADE

We approached the problem of the cold, leaky attic by defining the home's air control layer at the underside of the roof rafters rather than at the attic floor—the same condition that already prevailed in the cathedral-roof portion of the house. In the cathedral-roof areas, however, we could access the insulated cavities only from above, whereas for the small attic portion, we were able to approach from the inside of the house as well. That access allowed us to apply a more sophisticated air and vapor control layer from underneath, using Intello membrane with Tescon tape at the seams, a big improvement over poly.

Working from outside, the crew removed the existing sheathing **(15)**, filled gaps between the ceiling and the rafters **(16)**, nailed cleats to the sides of the rafters **(17)**, and insulated the cavities with Roxul mineral wool **(18)**. They protected the insulation with lauan plywood **(19)**, also creating an air space to help cool and dry the roof system.

REBUILDING FROM ABOVE

We took apart and reconstructed most of the roof system from the top side. In the photos above, you can see our crew working on one portion of the cathedral roof. Starting at the bottom, they began by removing the existing plywood and stripping out the existing fiberglass insulation. The condition of the insulation varied from place to place—some portions were OK, but in many places, the insulation was dirty and full of mice and bats. The plywood also was in mixed condition; some pieces were sound, but in some rafter bays, there was blackening and deterioration all the way from the eaves to the ridge.

Next, the carpenters filled the gaps between the rafters and the existing ceiling drywall, using one-component gun foam. This eliminated a convective pathway between the rafters, tightening up the system by isolating the framing cavities from each other.

The crew then applied cleats to the sides of the rafters, to support the lauan-plywood vent channel material they planned to install. Then they insulated the rafter cavities using Roxul mineral wool batts, cutting and fitting the batts carefully to the framing.

The choice of Roxul was driven by several practical considerations. At R-4 per inch, it doesn't have quite the insulating value of high-density spray foam; but our clients had environmental and health reservations about spray foam. Installing the Roxul ourselves let us open up, insulate, and seal just a portion of the roof at a time, rather than open the whole area up and schedule a spray-foam contractor. That was a safer way to work in our unpredictable, typically stormy summer weather. We also considered using dense-blown cellulose, but that would have introduced the risk of blowing drywall off the ceiling from the pressure of the insulation (a chance I didn't want to take). The Roxul is a reasonable compromise;

Where roofs abutted walls, the crew installed Cor-A-Vent Roof-2-Wall vent to allow air in the rafter vent channels to exit the system **(20, 21)**. Ridge vents (using Owens Corning VentSure; not shown) were also installed where feasible. The solution chosen allowed the repair to take place without any disruption to the existing windows.

it provides a well-insulated assembly, especially considering the careful air-sealing details we implemented, and it's practical for our crew to install on our own schedule.

Ventilation is just as important as insulation and air-sealing. Over the Roxul, the crew constructed vent channels by nailing cleats into the rafter sides, cutting sheets of lauan plywood to fit between the rafters, and fastening the lauan onto the cleats over a bead of caulk. We preferred lauan to synthetic manufactured vent channel products for several reasons. It's stiff enough not to flex or collapse from the pressure of insulation; we can readily cut it to the required width for various sizes of rafter cavity; and it's somewhat vapor-permeable, so that it allows some degree of drying to the outside in case the insulation somehow gets damp.

The layer of lauan effectively sealed the Roxul into an airtight cavity, keeping it safe from wind-washing and providing some deterrence to rodents and bats. We installed ridge vents, where feasible, and roof-to-wall vents at the top of the rafter runs to allow airflow through the cavities.

A PRACTICAL CHOICE

This repair was a building-performance project. It wasn't designed primarily for energy efficiency; it was intended mainly to correct moisture, durability, and comfort concerns. Our clients plan on selling the house at some point. So they made the responsible choice to correct the home's known problems, rather than to pass them on to the next owner. We were happy to be able to help them implement that wise decision.

Jim Bradley is a BPI-certified home-performance contractor, builder, and remodeler based in Vermont.

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18. I certify that all information furnished on this form is true and complete. Signature and title of Editor, Publisher, Business Manager, or Owner – Rick Strachan, Publisher, 9/22/17

Products

BY KATHLEEN BROWN

1. High-Performance Windows and Doors
Revolution XL by Deceuninck is a line of high-performance windows and doors that maximize sunlight while minimizing bulk. Revolution XL Tilt & Turn Windows have a multifunctional sash that tilts, swings, and locks with one hand, the company says, while doors are available in three models: tilt and slide, terrace, and lift and slide. Engineered for thermal performance (R-7 and above), sound mitigation, and durability, Revolution XL windows and doors have interior, exterior, and internal seals to prevent air and water infiltration. Pricing varies according to configuration, color, and finish. deceuninckna.com

2. A Matte Countertop Finish
Cambria recently introduced Cambria Matte, a low-sheen alternative to the company's standard high-gloss quartz-countertop finishes, which resemble natural stone slabs. According to the company, the new matte finish is low-maintenance—requiring no sealing or polishing—and is scratch- and chip-resistant, nonporous, and nonabsorbent. Cambria Matte finish is available for all 140 of Cambria's designs. Cambria quartz countertops are priced around $85 per square foot, on average. cambriausa.com

3. Instant, Filtered Hot Water Faucets
InSinkErator's new Iris (shown) and Melea instant-hot-water dispensers offer users on-demand access to near-boiling, filtered water. The faucets are compatible with InSinkErator's hot-water tank and filtration system, which is designed to remove impurities. Other features include single-hole installation and a 360-degree swivel spout. Faucet prices range from $300 to $560, depending on finish. insinkerator.com

4. A Low-Profile Solar System
The GAF DecoTech Roof-Integrated Solar System is a low-profile alternative to standard rack-mounted solar panels. A black gloss finish and hidden wiring help blend panels into the roof. Counterflashing and step flashing form a protective shield against leaks, debris, and animal infestation. The DecoTech Roof-Integrated Solar System is sold nationwide through GAF-certified contractors, so pricing varies. gaf.com

5. Sliding-Barn-Door Hardware

DesignGlide Barn Door Hardware by Jeld-Wen can be installed in any standard-sized interior door frame in just a few steps to convert a standard door into a barn door—with no reframing or custom doors required. DesignGlide features a soft close and includes accent rails that attach to the top and bottom of a standard interior door. Prices start at $200 and vary by location. jeld-wen.com

6. Noncombustible Insulation

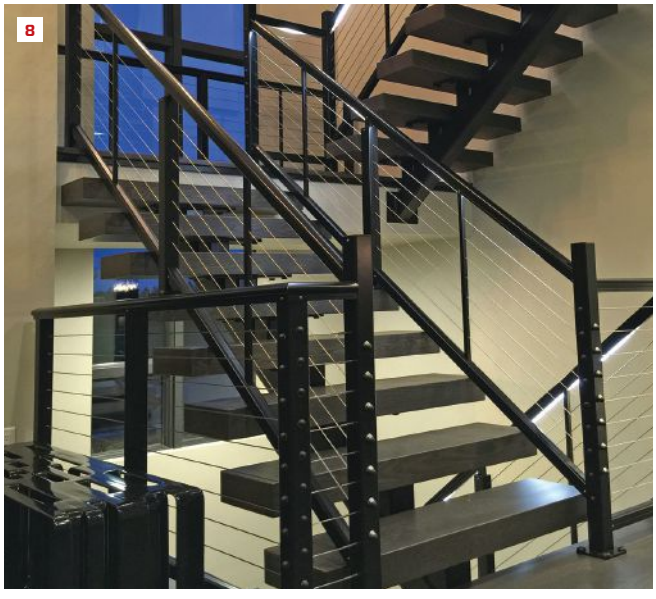
The JM CladStone Water & Fire Block Insulation from Johns Manville is a noncombustible mineral-wool product that offers continuous insulation and moisture management for cavity wall and rain-screen applications. According to the company, JM CladStone facilitates water drainage while providing thermal efficiency, fire resistance, and acoustical performance. The basalt-based insulation also repels moisture and is mildew- and corrosion-proof, says the company. It can be installed with a variety of exterior claddings and fasteners. Pricing is determined on a per-project basis. jm.com

7. An Eco-Friendly Flooring Underlayment

DriTac's new Impact and Double Impact flooring underlayments promote indoor air quality by protecting from subfloor emissions. Hypoallergenic and nontoxic, the underlayment resists mold, mildew, and bacteria growth and is designed for resilient flooring, wood, and laminate. DriTac says its "Safeguard Seaming System" creates a vapor barrier between two pieces of underlayment, while its "Total Sound Reduction System" provides strong footfall performance. Prices range from $0.50 to $0.75 per square foot. dritac.com

8. Predrilled Stair Posts

Feeney's new predrilled stair posts and pickets allow for faster installation by eliminating the need to drill holes in the field. Slotted holes minimize the size of openings while allowing for angle flexibility. The posts are compatible with all Feeney Design-Rail Aluminum Railing systems that use 1/8-inch CableRail infill. Extra material on the top and bottom of the posts facilitates trimming once post locations are determined. Three angle ranges and railing heights are offered, with custom options available. Prices range from $70 to $115. feeneyinc.com



9. A Wi-Fi Connected Thermostat

Bosch Thermotechnology's new programmable Connected Control Thermostat allows homeowners to monitor and control temperature settings remotely from a smartphone app. The full-color, 5-inch, touchscreen thermostat is compatible with most HVAC systems, the company says. Homeowners can create temperature presets and schedules, access local weather data, and set a "vacation mode" to automatically control heating and cooling functions while away. The Connected Control Thermostat is available for $170. bosch-climate.us

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10. A Clean Trim Finish

The QuickTrim System by Trim Solutions is an exterior PVC trim with a hidden-fastening system, allowing for a clean finish and fast installation—with no face-nailing, caulking, or painting necessary. The PVC flat board stock is fitted standard with a nailing flange and starter strip and can be used for corners, sub rakes, mantels, frieze boards, casings, and sills. An optional J-channel is available for added protection from water. A 5/4x4 board costs between $4 and $4.50 per lineal foot. trimsolutions.net

10

11. A Nonadhesive Floor Runner

Pro Tect says its Runner Floor Protection works like a gym sneaker, with soft rubber backing that keeps it in place when pressure is applied. Made from Eco-Fi, a polyester fiber derived from recycled plastic bottles, Runner Floor Protection offers heavy-duty impact protection for floors and countertops in high-traffic areas. The nonporous floor runner can be used with hardwood floors, tile, marble, and linoleum. Rolls come in 24-, 36-, or 48-inch widths, with 50-, 100-, and 150-foot length options. Prices range from $63 to $360, depending on size selection. pro-tect.com

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12. A Dual-Purpose Corner Seal

Georgia-Pacific's newest addition to its ForceField line is a corner seal, for both inside and outside corners, that bends along a center channel. The semi-rigid polypropylene strip is 4 inches wide and 0.03 inch thick, providing coverage for an area that is notoriously difficult to seal, GP says. ForceField Corner Seal is designed for use with ForceField sheathing panels and can be installed directly onto those panels to form an air and water barrier. The corner seal is sold in 200-foot rolls and is available nationwide through building materials dealers. buildgp.com/gp-forcefield

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November Advertising Index

BY TIM UHLER

Stabila Layout Station

Accurate layout is one of the most important elements in almost all construction tasks, including forming foundations, framing walls, hanging cabinets, setting tile ... the list goes on. I believe you should first master layout with a tape measure and construction calculator, but once you acquire and understand those traditional skills, there are faster ways to create a perfect layout. These days, laser levels make the tasks of finding level, plumb, square, and point-to-point alignment as simple as pressing a button.

There are a lot of laser level units on the market now that shoot plumb, level, and square lines and dots. But the square function typically only works on level surfaces. To shoot square with most laser units in an exterior setting, you need to use a receiver. That requires moving the unit in small increments until the laser beam hits the detector dead center, which can be time consuming—in fact, sometimes pulling tapes is faster. However, the auto-alignment feature on the Stabila LA180L is the easiest option we've found yet for doing layout.

KEY FEATURES AND FUNCTIONALITY

This goofy-looking laser shoots three plumb lines and one level line. Two of the plumb lines fan vertically 180 degrees from each other, and the third plumb line is perpendicular to them. There is also a plumb dot that shoots down and up, which helps align the laser when you're shooting square. Each of the lines pulse, so they can be used with any detector up to 328 feet away. But the LA180L also comes with a special REC410 Line RF (radio frequency) receiver—and this is where this product gets interesting.

As with other layout lasers, you can adjust the unit until the receiver beeps, showing that you're aligned. The adjustable knob on the laser makes micro-adjustments easy. The standout feature with the RF receiver, though, is that when you press the receiver's cross-hairs button, the beam starts moving until it finds the receiver. This works very well—we checked it against a PLS, tape measures, and math, and found it to be perfectly accurate.

The range on the radio frequency is 150 feet. Beyond 150 feet, the receiver will still pick up the beams' pulse mode as long as you manually adjust the laser between 150 and 328 feet. I can manually adjust this

Many lines, many functions. The LA180L self-levels within 5 degrees, includes a 5/8-11 tripod mount, and can be affixed to a specialized saddle-type foundation bracket (sold separately for $150). A control knob under the handle offers micro-adjustments for shooting square, but the unit can be auto-aligned with the REC410 Line RF receiver (included with the kit).

Photo: Tim Uhler

A smart receiver and many lines. The REC410 Line RF receiver (near right) communicates with the LA180L via radio frequency to auto-align it for square. A groove below the level vial shows the marking position. The unit projects plumb dots, two vertical plumb lines 180 degrees from each other, a third vertical plumb line for shooting square, and a level line. The lines all pulse to work with any receiver.

laser faster than the auto-alignment function can because I'm typically dealing with distances less than 60 feet on my jobsites. However, because the alignment feature is automatic, I can start the alignment process with the receiver, then go snap some other lines, roll out tools, and double-check numbers on the blueprints while the unit does its work. And with this unit, I don't need anyone's help setting up or establishing layout.

Once it's aligned, I can also use the up/down arrows on the receiver to move the laser. This is helpful when we are compensating for out-of-square conditions and want to quickly know how much an adjustment of one leg will affect the other. Here's an example: Sometimes, we have to adjust one side of the mudsill so that it will hang over the foundation wall. Ordinarily, we'd then have to re-square to find out how much this affects the other leg. At that point, we might find the other leg is too far out. But with this laser, I can check quickly without all the tapes, and so on; all I have to do is walk over and check each leg with the detector. There is no re-squaring, because the unit is always square and it instantly adjusts.

This laser also makes it easy to establish layout in basements with stepped walls. In addition, if we are framing partition walls, we don't need to snap lines; we can position the laser and instantly have layout on the ceiling that directly matches the floor—without getting on a ladder.

As the general contractor, we always site in the footprint of the house after the lot is cleared so the excavator can dig the hole. This means we need two guys running three 300-foot-long tapes and one guy reading plans, calling numbers, and calculating square (and usually a boss, too, who makes the final decisions). Once we stake out the corners of the house, we nearly always make adjustments to how it is sited in, which means more measuring and running with tapes. With this laser, though, we can instantly get our largest square without running all three legs of a triangle. This means a process that is faster and less open to errors, with less aggravation. Because the laser will shoot level too, we can get rough ideas for elevation differences.

There are a couple of things about this laser that I found a little clunky. One is that while the shape of the laser makes it easier to fit into corners, it also makes the unit a bit cumbersome and awkward to place in some scenarios. It works best on a level surface plenty large enough for the base and is sometimes precarious on the edge of a stem wall foundation. Stabila does make brackets ($150 each) for that application, but they add expense. The second quibble is that because of the shape of the unit, it's awkward to handle when you're replacing batteries (it takes D Alkaline; a rechargeable battery kit is sold separately for $100). It's easy to change them, but doing so puts the unit off balance, so you have to set it down gently.

Stabila has designed this unit for "long range layout," and the accuracy is excellent. Like most laser levels, it self-levels if it is within 5 degrees. Level accuracy is stated at 3/32 inch at 100 feet; line straightness at 1/8 inch at 100 feet (meaning there is little to no warping in the line); and plumb accuracy at 3/32 inch at 100 feet.

THE BOTTOM LINE

This kit sells on Amazon for $1,500 (not including the foundation bracket or the rechargeable battery kit). If all I did was framing, I wouldn't bother, because I can lay out mudsills and partition walls quickly enough with other, less expensive units. But as a general contractor involved with the site layout, foundation forming, and all the framing, including multilevel decks, I can easily justify the purchase. For any company that does a lot of layout, I would recommend buying this laser.

Tim Uhler is a lead carpenter for Pioneer Builders in Port Orchard, Wash. Follow him on Instagram @awesomeframers.

Photo at top left by Tim Uhler

Milwaukee Airsnake

BY CHRIS ERMIDES

New cordless drain-cleaning options available as of this month from Milwaukee include an 18V drum-style snake mounted as a backpack and a 12V porcelain auger system. The most interesting new offering, however, is a cordless drain cleaner that uses compressed air to blow out a drain clog. The concept of using compressed air for this task isn't new, but Milwaukee's is the first "air gun" on the market that's powered with batteries. The 12V Airsnake runs on one M12 compact battery and has an onboard compressor that blasts a burst of air up to 50 psi into the drain line once you pull the trigger. The company says that the air gun can reach clogs up to 35 feet away and works on drain lines ranging in diameter from 1 to 4 inches. It reportedly maintains pressure when blowing by a vent stack, as well.

At a media event, Milwaukee demonstrated the Airsnake on a clogged sink without removing the P-trap, which was mildly impressive (although you might want to evaluate the condition of other P-traps). This simple demo underscored the fact that there's no snake to get hung up in plumbing bends. The air gun can be equipped with plug-type attachments for use directly on the drain pipe, a sink attachment (so you don't have to remove the trap), and a toilet attachment. A 10-inch extension arm increases the working range of the gun up to 20 inches (the unit itself is 20 inches long), and a 15-degree offset adapter helps for tough-to-reach pipe access. Pressure can be dialed in, so you can fine-tune the power for more delicate pipe systems. The M12 Airsnake is available in two kits. The 2572A-21 kit ($330) includes three drain-plug attachments (1 inch, 2 to 3 inches, and 3 to 4 inches), drain shroud for use in sinks, 15-degree offset connector, one 2.0-Ah battery, charger, and carrying case; the 2572B-21 kit ($400) includes all that and adds a 10-inch extension arm and toilet-seal attachment. milwaukeetool.com

Chris Ermides is a senior editor at JLC *and editor of* Tools of the Trade.

Klein Wire Stripper

Klein's K12055 Heavy Duty Wire Stripper is a cross between lineman's pliers and typical wire strippers. Most electricians carry both tools with them at all times, but this solution offers a nice alternative. Fewer tools in your pouch means less weight and less time putting one tool down to reach for another. The jaws have a wide face and deep knurls that are more common on traditional lineman's pliers. These make for a strong grip when grabbing and twisting wires, and they're wide enough to grab and twist up to three wires at a time. Unlike traditional lineman's pliers, the jaws taper slightly at the tip so you can loop wires with them, as well.

These pliers are made of a forged steel that Klein claims is four times stronger than that used in traditional strippers. You can feel that when gripping them—they're very stout. The blades are assembled with a hot-riveted joint that opens and closes smoothly. The stripping holes and cutting knives are induction-hardened, which is a noncontact method of electromagnetic heating that leaves the edges harder than the rest of the tool.

The pliers can cut and strip 10-18 AWG solid and 12-20 AWG stranded wire, as well as shear 6-32 and 8-32 screws. The cushion-grip handles lock and are spring-loaded, so you can keep them in whichever position you prefer (many electricians like them to always stay opened). The tool is manufactured in the U.S. and costs $30. kleintools.com —*C.E.*

BY CLAYTON DEKORNE

1

2

3

Ensō It Is

"Ensō"—a circle drawn with a single, broad brushstroke **(1)**—served as Eric Manigian's initial design for a "conversation table" **(2)** gifted to the Zen Peacemakers. Using spalted maple, Manigian joined five wood slabs **(3)** with pinned, locking scarf joints that allow the massive tabletop to be disassembled, transported, and reassembled as needed.

A large tabletop made with slabs of spalted maple is one of the recent works by Eric Manigian that embody the woodworker's life practice.

I'm reluctant to call this a "spiritual" practice, as "spirit" can be a limiting word if misread as something separate from physical and historical forms. Indeed, every aspect of Eric's circuitous life path seems reflected in this work: The intricate housed joints that keep the tabletop together stem from his early training as a timber-framer and from his travels to Japan, where he fell in love with traditional temple architecture. He learned how to use the tools he built the table with from Toshio Odate, with whom he studied sculpture at Pratt Institute. Odate later wrote the seminal book *Japanese Woodworking Tools: Their Tradition, Spirit and Use*, which was the first exposure to Japanese woodworking tools for many Western carpenters.

Eric also credits Odate with teaching him that trees have a life force, and that it is a craftsman's responsibility to work with integrity and sincerity out of respect for the tree. A craftsman has an obligation to direct his full attention into the work so as to put that life force to good use. It's this practice of coming at your work with integrity but without pretension, of concentrating without overthinking or overdoing it, that is really the practice. It's represented in Zen history by "ensō"—the practice of drawing a circle in one bold stroke. Ensō captures the essence of Zen action and serves as the basis for the table's design.

Eric was inspired to build *Ensō Table* by the work of Bernie Glassman, an American Zen master who is known for his international peace-building initiatives. Glassman's organization, the Zen Peacemakers, frequently relies on "council practice," for which this table is perfectly suited. In a circle, no person sits in a more prominent position than another; all are equal.

Clayton DeKorne is the editor of JLC.

Photos courtesy Eric Manigian Studio

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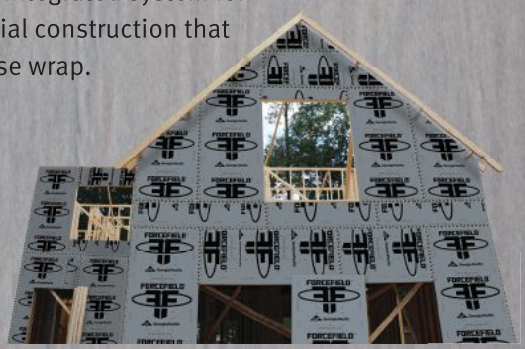

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