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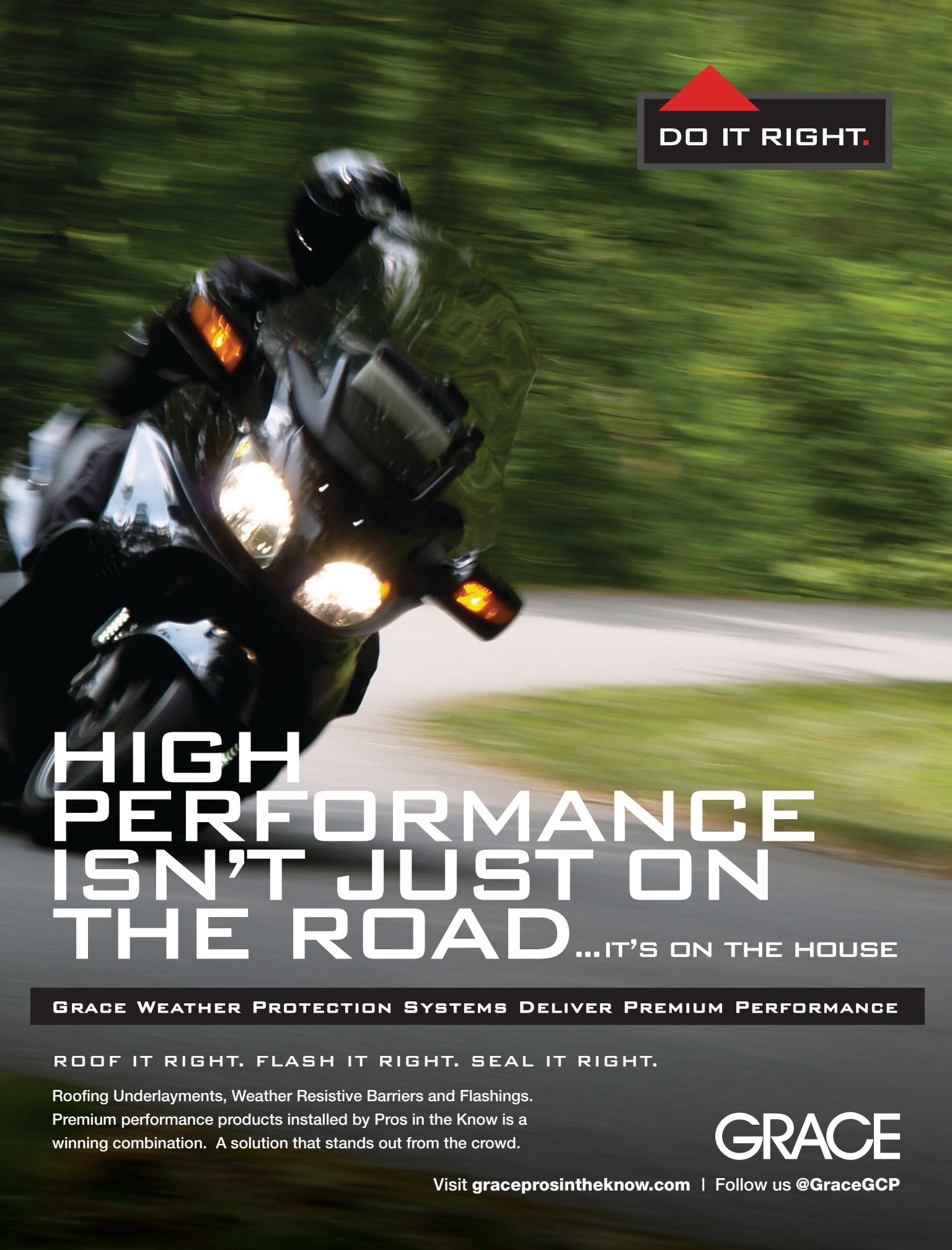
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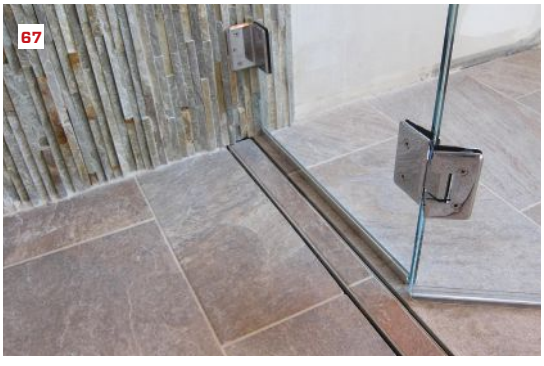

On the cover: Steven Amsler works on roof demo for a deep energy retrofit project under construction by Upright Frameworks (Portland, Maine). Photo by Ted Cushman.

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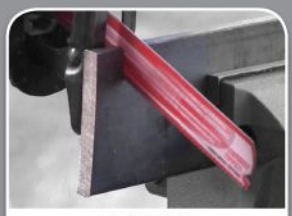
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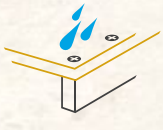

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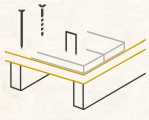

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"Q&A: Sawn vs. Plywood Shims," by Tim Garrison

Bryan Readling, Senior Engineer with the APA-The Engineered Wood Assoc. (online, 8/10/15): Preservative-treated shims will be needed to prevent decay in the case of a beam bearing on a masonry pier. Kiln-dried-after-treatment (KDAT) PT plywood is a good choice to minimize thickness shrinkage. Compression stress perpendicular to the face is assumed to be the same as for SYP, which is 565 psi. In actuality, the plywood shim will compress very little under load since it is already compressed a bit due to the pressure received during manufacture. The amount of deformation for a plywood shim supporting a wood beam with similar compression capacity is negligible.

Untreated plywood or OSB can be used instead if the wood is not in contact with concrete or masonry. OSB has similar characteristics to plywood since it is manufactured under pressure. The amount of compression within the connection will almost always crush the beam material perpendicular-to-grain before the wood structural panel will crush.

"Venting Vapor" (online, 8/14/15)

B Eli Fishpaw (online, 8/17/15): A solution to the problem of leaky ducts is to avoid ducts with direct delivered heat and cooling by using, for example, a mini-split heat pump.

I have heard of failures with open-cell foam on unvented attics in the winter when the vapor-permeable insulation blocks air but allows vapor to pass. When it meets up with a vapor barrier of roof shingles, cold temperatures result in condensation, and it can never dry. This is what the article is trying to address. Another approach is to use a vapor-impermeable insulation, such as closed-cell foam.

My preferred solution is to create a vented space above the insulation with furring strips. If site-applied open-cell foam is used, a furring strip above sheathing is needed to create space for ventilation. The source of air is from eave vents, not the building envelope. (Note, however, this flow of air would carry to the ridge vent the vapor from the building envelope.) A ventilation space also addresses the issue of intermittent water damage from wind-blown rain, providing a drain and a flow of air to help dry liquid water before it causes problems. Rather than an open-cell spray foam, however, my preference is to put vapor-permeable expanded polystyrene (EPS) above the roof and outside the wall sheathing. This maintains the structure at a constant humidity and temperature, reducing problems associated with expansion, contraction, and condensation. Furring strips and corrugated roofing create a drain/dry plane. Of course, with a system this tight, active ventilation is needed.

"Charging for the Estimate," by Brian Altmann (Jul/15)

Shawn McCadden (online, 8/2/15): Great article, Brian. This should be what professional contractors do without a second thought. You are right, though; one needs to practice this and refine the process so you have it down before charging a professional fee for it.

Mark Paskell (online, 8/2/15): Fantastic explanation of steps in the design-and-build sales process. Remodelers who follow these steps will experience better outcomes with their customers and more-profitable jobs. Now what do we need to do in the industry to help other remodelers so they don't go through 19 years of frustration giving free estimates?

Tom Henderson (online, 8/2/15): This business approach does many good things. It serves the homeowner and the contractor. I believe if more contractors were to implement this approach, this would raise the bar in better service and value to all parties involved.

"New York Trench Death Draws Manslaughter Charge," by Ted Cushman (online, 8/10/15)

Scott (online, 8/11/15): Owning a construction company in Atlanta, I personally know that my biggest asset is my employees. I don't understand why anyone would put their employees into a direct hazard or why an employee would risk his life in an deep trench. There are not too many near misses in a trench cave-in and not many live to tell their story.

"In the Near Future: Jobs vs. Machines," by Clayton DeKorne (online, 7/31/15)

Oliver McGraw (online, 8/2/15): Some of these technologies may actually empower the small business owner. Rather than having to hire and manage a huge crew to do a job, the small business owner just needs to buy a robot and maybe hire one helper. This means that a small company can compete with a large company that has the resources to manage a huge production crew. Hiring people and keeping them employed is also incredibly capital intensive.

B Thom Wright (online, 8/2/15): The real answer is to raise wages, making construction work attractive. Over the past 40 years, real wages in the construction industry have tanked. The work is hard, risky, and sporadic, and is conducted in a harsh environment. Young people with talent see other careers as more attractive. That will change with higher wages.

Higher wages will come with a shortage of workers. The market works by balancing supply with demand. The mechanism that makes that work is price. As the price of labor rises, the demand for that labor will decline so that the demand equals the supply. At the same time, as the price for labor rises, the supply of labor will increase because the job becomes more attractive. The labor shortage is a problem that is self-correcting if we will just let the free market do its job.

Don Alward (online, 8/2/15): I am a masonry contractor and read about this machine last year. The cost of the machine that I have seen is around $600,000 with a life expectancy of 10 years. The article I read states that the machine cannot build corners, or install flashing, insulation, or wall ties. It also is incapable of jointing the brick it lays. The promoted selling point is the machine frees up masons to do detail work.

My questions are: Are the material manufacturers going to produce a masonry unit that is precise enough for a machine to install? And do the tenders have to cull out defective materials? I live in North Carolina; the UDO (Unified Development Ordinance) does not allow long, straight, and simple designed walls that I think this machine would be financially viable to build. We have so many color changes in brick, mortar colors, and CMUs that the machine would have to adapt to, unless the material manufacturers are going to put in markers for the machine to recognize.

I am in agreement Thom Wright: Let's increase wages for workers to attract new craftsmen. I have been in masonry my entire life (my father was a mason, and my sons are masons), so if the machines take my job as a production mason, I will change my endeavors to perform more custom work, which is more gratifying anyway.

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Q I am putting a ground-level deck on a client's home that's located next to a busy road. Besides plantings, what is the best strategy for reducing the road noise on the deck?

A Dr. Bonnie Schnitta, president of Sound Sense, a company that specializes in acoustic engineering and consulting, responds: It takes roughly 200 feet of dense foliage to equal the sound reduction of an acoustic barrier that can be as thin as ⅛ inch. Plants don't stop sound, but they can help to diffuse it and prevent a fence or wall from becoming a reflective surface—particularly important on the client's side of the fence, because any noise that goes over the fence will hit the house, bounce back, and then reflect off the fence, amplifying the sound. So while plants themselves aren't great at reducing noise, they can help to make your solution work.

When you're building a barrier to reduce noise, whatever is built needs to have the right transmission loss in the frequencies (such as car exhaust noise) that are disturbing. For an outdoor wall or fence, I recommend a minimum sound transmission class (STC) of 30. (STC is the rating of an object's ability to block sound.) The next goal is to make certain that the barrier provides a level of reduction that is perceivable to the client.

A barrier or fence that's intended to reduce outdoor noise should be placed as close to the noise source (the road) or to the receiver (the client on the deck) as possible. Placing the fence close to the road would be preferable, but setback requirements might reduce the effectiveness of a roadside barrier. Having a barrier in both locations would provide even greater noise reduction, whereas a fence placed halfway between the deck and the road would be far less effective, if at all.

Taller fences provide greater noise reduction, but if you are building a fence next to the road, zoning requirements or visibility issues may restrict its height, making it less effective. To provide perceivable noise reduction, an acoustic fence placed next to the road would need to be at least 8 feet tall.

A wooden fence does not have sufficient STC by itself, so it should be lined with an acoustic barrier having an STC of at least 30. Typically, we use a mass-loaded vinyl barrier, such as the SoundSense NoiseOut2 or the equivalent. (If the barrier is not UV-resistant, be sure to keep direct sunlight off it.) A mass-loaded vinyl barrier works by providing a dense, resilient layer as well as a surface free of voids to block the sound. This approach lets the client and contractor choose the fence style they like and then line the fence with a vinyl barrier (usually black). In order to have sufficient transmission loss in the lower frequency of car exhaust, use a mass-loaded vinyl with a weight of 1½ pounds per square foot or greater. Most loaded vinyl products are lighter, so be sure to choose the heavier product (for more about this material, see "Retrofit Soundproofing," Jan/15).

If an 8-foot fence is not possible, then I'd locate the barrier beside the deck or on the deck. For a fence that doesn't block the light, use Plexiglas, laminated glass, or clear mass-loaded vinyl intended for outdoor applications, with an STC rating of 27 or greater. One strategy we've used is building a lattice planter with a clear acoustic material attached. The vines that grow in the planter and on the lattice prevent the acoustic barrier from becoming too reflective, while the transparent material allows dappled light through.

Finally, when a client voices concerns about noise in a finished product, we recommend that the contractor hire an acoustic engineer to review the situation and recommend a solution. An expert's opinion can be a reality check and adjust the client's expectations for whatever solution they decide to pursue.

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Q In a recent remodel, I needed to repaint a single wall. The client still had a half-gallon of good-quality paint in a can that had been opened and then resealed. The paint inside was still good, but very thick. Is there anything that can be added to latex paint to make it flow more easily after it's been open and stored?

A Scott Burt, owner of Topcoat Finishes, a high-end residential paint company in Jericho, Vt., responds: When paint has been left behind from a previous paint job and properly stored, verify that it is the exact batch that was mixed initially, so the paint color and sheen will match the other walls as closely as possible.

"Properly stored" means that the can of paint has been kept indoors and hasn't been frozen or exposed to excess moisture. It also means that the previous painter properly cleaned any excess paint out of the rim of the can and then tapped the lid down securely for a tight seal.

But even under the best circumstances, stored paint changes over time. Because the can is no longer full, air inside the container can cause evaporation of the driers from the leftover paint. (Driers, or drying agents, are the chemicals in all paint formulations that cause the paint to turn from liquid to solid on the wall.) These driers are part of the off-gassing that happens when paint is applied and left to dry. When the drying agents are compromised in the can through evaporation, the paint becomes a bit thicker and less fluid.

Before I open a stored can, even from my own shop inventory, I first inspect the rim to make sure it was cleaned for storage. A clean rim means that there is no dried paint or debris to fall into the paint when the lid is removed.

The second thing I check for is rust on the rim or the lid. Rust occurs naturally over time because of moisture present in waterborne/latex paint. If I do see any rust, I immediately strain all of the paint into another vessel. Any rust particle that makes its way to the roller tray will transfer to the wall and bleed through the paint on the wall endlessly.

After inspecting for paint debris and rust, I open the can and stir the contents thoroughly with a stir stick. I feel around the bottom of the can with the stick, looking for any solids that may have settled. I stir until the paint feels like it's as liquid as it can be. Then I slowly lift the stir stick out of the paint and watch how it flows off the stick back into the can. After storage, it's usually a bit on the slow side.

At this point, the best way to revive the paint is by adding small amounts of water. I stir in a few ounces at a time until the paint flows readily off the stick. Be careful not to add too much water. Thinning the paint excessively can compromise the color and the sheen. I also allow for more drying time than usual because of the reduced concentration of drier in the paint.

If there isn't enough paint in the can to complete the task at hand, tightly reseal it and take it to a paint store that sells the same brand of paint. The store can create a new batch and match it exactly to the old one.

I dealt with this issue recently with a batch of paint in a custom color from nine years ago. The particular line of paint had changed, and the color fans had also changed. I couldn't even count on the color codes being the same. If I had just called and ordered 3 gallons of the color and didn't get an exact match, I would still have needed to pay for it. If I'd used the unmatched paint, it would have taken more coats (labor and materials) to cover the walls. So, the time taken to get the right match is always time very well spent.

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BY GARY STRIEGLER


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Hiding a Bed in the Wall

Wall beds (also called Murphy beds) have always been a big hit with clients. They make a lot of sense, freeing up floor space and letting a room serve multiple functions.

Recently, a client decided that an office/guest bedroom would be a better use of space than the existing formal dining room, which was cramped at best. We started by putting French doors with a transom in the door opening. With a window on the opposite wall, one of the remaining walls in the room was long enough to fit a wall bed with a small bookcase on either side for office stuff. To leave enough space for the bookcases, we decided on a full-size (double) bed instead of stepping up to a queen.

START WITH THE MATTRESS

The wall beds I build have three basic components: an outer cabinet, an inner platform for the bed, and a hardware kit. In the past, I've had good luck with Hafele hardware, so I went with it again. It's a simple system to install and comes with good instructions (although I do wish that the measurements were in inches instead of metric units). And the finished bed always operates well.

To build the bed, start with the mattress size (width and length). I like to make the inside dimension of the bed platform 1 inch bigger than the mattress to allow room for bedding. For the standard full-size mattress I planned to use, I made the inside of the bed platform 55 inches by 76 inches.

THE OUTER CABINET

I usually build the platform first, but space was a little crowded on this job, so I started with the outer cabinet. To find the inside measurement for the cabinet, I added

Photos by Gary Striegler


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the combined thickness of the hardware (around 2⅝ inches for the Hafele system) to the total width of the platform. To match the height of the planned bookcases, I made the bed cabinet taller than it needed to be and then added horizontal trim at the end to make up the difference.

The cabinet was a three-sided box (a top and two sides) that I pocket-screwed together **(1)**. For racking strength, I added a piece of ¾-inch plywood for the upper back, and ripped a narrower width of ¾-inch plywood and installed it at the bottom. Then I stood the cabinet up, centered it on the wall, and screwed it into place **(2)**.

BUILDING THE BOX

The bed platform starts with a 6⅜-inch-deep plywood box. When building the box, I joined the sides to the head and foot to cover the plywood edges so the only time the edges are visible is when the bed is down **(3)**.

For strength, I built the box with a ¾-inch-plywood bottom, which I made in two-pieces. (A single piece of plywood can be used for a twin-size bed). The plywood pieces fit inside the sides and I pocket-screwed them in place **(4)**. (Later, I add a frame-and-panel detail to finish the bottom of the platform, as described on page 24. This covers the plywood edges, as well as the joint between the two back pieces of plywood.)

THE BED GROWS FEET

For the fold-down feet that support the bed, I used the Hafele system. The feet store out of sight when the bed is in the raised position, and the hardware for the feet hides inside the platform in a grid of slats that add rigidity to the platform.

To make this grid, I nailed 1½-inch by 1½-inch strips along the inside edges of the platform, and then I screwed the slats to the bottom between the edge strips on 10-inch centers **(5)**. The mattress actually sits above the slats on ⅜-inch plywood that screws to the slats and edge strips. But I waited to install this plywood so I had access to mount the handles used to pull the bed down.

To install the feet, I located and drilled holes in the outside end of the bed according to the manufacturer's instructions **(6)**. The hardware that holds the feet attaches to the bottom of the platform inside the box **(7)**.

Because the edges of the platform are exposed when the bed is folded down, I covered them with ¾-inch by ¾-inch-thick pieces of solid-wood trim **(8)**. I made a ⅛-inch rabbet along the edges of the trim to add interest and to avoid having to make a perfect joint between the plywood and the trim.

INSTALLING THE HARDWARE

With the main components built, I turned my attention to the hinge hardware. I don't always read instructions, but with folding-bed hardware, it's critical to do so. It's also important to use the paper template provided by the manufacturer as a guide for mounting the harware.

I started by drilling holes and attaching the bracket to the platform **(9)**. Then I

clamped the paper template to the sides of the cabinet **(10)**, and I drilled the holes, taking care not to blow out the plywood veneer on the outside. Because I was working by myself, I clamped temporary legs to the platform to support it while I lined up the bolts to join the platform to the cabinet **(11)**.

Next, I installed the pistons that help drop and lift the bed. This is really a two-person job. The pistons are held with a metal band in just the right position to fit on the bracket with the bed partially open. It helps to have one person hold the bed in position while the other attaches the pistons **(12)**. Once both pistons are attached, opening the bed slightly compresses the pistons so the bands can be removed. Don't discard the bands in case the pistons need to be removed for some reason in the future.

The pistons come in several strengths depending on the size of the bed and, in my case, how much extra weight I add with the trim. I usually buy the strongest ones. Once the bed was operational, I added a stop at the top of each side to keep the bed lined up with the cabinet when it's in the closed position.

Finishing it out. The final step was the trim. I always like to add frame-and-panel molding to the bottom of the platform, which will be exposed when the bed is folded up. I checked a couple of things before making my frame. First, the frame needs to be taller than the platform to hide the feet when the bed is closed, but if it's too tall the feet can't pivot to their down position. Second, the frame also needs to extend below the bottom of the platform, but if it's too low, it hits the floor as the bed opens. Keeping in mind the thickness of the finished floor, I screwed a test piece onto the platform and opened the bed to check the clearance. I also gave the frame ¼ inch of clearance along the sides.

I pre-assembled the frame using pocket-hole joinery and nailed it to the platform **(13)**. I added panel molding inside the frame for a decorative touch. A two-piece crown detail across the bed cabinet and the two flanking bookcases finished the top, and I added a filler piece between the top of the bed platform and the top of the cabinet.

Gary Striegler is the president of Craftsman Builders, in Fayetteville, Ark. craftsmanbuildersnwa.com


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Sewing in a New Pocket

BY JOHN CARROLL

Pocket doors can be challenging on any project, but when you're retrofitting a pocket door in a remodel—with minimal disturbance to the existing walls—the challenge is even greater. On the job shown here, the pocket door replaced a swinging door connecting a master bedroom and master bath. Inside the bathroom, there was plenty of wall space for the pocket door, but on the opposite side, a perpendicular wall between the bedroom and the kitchen ended about 5 inches inside the proposed pocket. In addition, there were base and wall cabinets on the kitchen side, and between the cabinets—in the area where the pocket was planned—was a ceramic-tile backsplash. To top things off, an electrical outlet needed to be moved.

The kitchen had been upgraded recently and was in pristine condition. Any thoughts of tearing into that side of the wall were out of the question. The pocket door would need to be installed entirely from the bathroom side. Fortunately, I had done this a couple of times before, so I was confident it was possible.

DELICATE DEMOLITION

After removing the existing door, I opened up the wall on the bathroom side and was pleasantly surprised to find that the wall cavity was a full 4 inches deep. Apparently, the bathroom was located in a space that had originally been a covered porch, and the wall I was working on had once been an exterior wall.

I removed the drywall an extra stud bay beyond what I'd need for the pocket, with the anticipation of relocating the kitchen outlet **(1)**. Then I began the nerve-racking task of removing the framing material from the pocket cavity without damaging drywall or finishes on the kitchen side of the wall. I caught a lucky break in that the cabinets hadn't been screwed to the frame in the pocket area, which was behind an inside-corner dead space for both the upper and lower cabinets.

On the down side, a lot of wood needed to be removed, including the jacks for the existing door and the framing that tied the perpendicular wall to the pocket-door wall. Farther down the wall was framing for a window that had been covered over when the porch was converted to a bathroom. To remove the framing without damaging the drywall on the other side, I first cut each 2-by into small pieces **(2)**. I made cuts as deep as I could with a circular saw, then finished them with a Bosch oscillating multi-tool. As I pulled out the pieces of 2-by framing, the drywall screws pulled through,

Photos by Frances Harris

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leaving the kitchen drywall—and more importantly, the backsplash tile on the drywall—intact. For once I was glad a drywall installer had used screws sparingly.

When I removed the original jacks, I was left with nails sticking out of the adjacent stud. I cut these off with a grinder fitted with a metal-cutting blade.

Removing the intersection stud left the edges of the drywall on both sides of the perpendicular wall unsupported, so I added a 5/4 by 6-inch backer board. I spread construction adhesive on the entire area **(3)** and screwed the board to the end stud of the perpendicular wall **(4)**.

Before installing the backer board, I beveled both edges so it would be less likely to interfere with the pocket door as it slid in and out of the pocket. The 4-inch-deep cavity meant we would have ¼ inch of clearance between the door and backer board inside the pocket. I also drilled a hole in the backer for the outlet wire, which I tied into the circuit via a temporary box to keep the kitchen functioning. The electrician would come in later and reroute the supply.

FRAMING IN A WIDE OPENING

The rough-opening width for a pocket door needs to be twice the width of the door plus 1 inch. Because the door I was installing was 30 inches wide, I framed the rough-opening width at 61 inches. To prevent damage to the tile floor or threshold in the bathroom, I figured out the exact location for the finished opening and located the rough opening to accommodate that layout. This foresight paid off when I finished the trim at the end of the project, and there was no need to repair the floor.

The rough-opening height for a pocket door must be at least 84 ½ inches above the finished floor, but I try to make the rough opening as tall as possible so that the framed header is well above the header/track for the pocket door and completely independent of it. This strategy prevents problems in the track should the header ever settle or deflect down. For this opening, I installed a double 2x8 header tight to the top plate of the wall, which made the rough opening several inches higher than the required minimum.

To fill the entire width of the 4-inch cavity, I first padded out the header with a piece of 5/4 material, leaving a gap to accommodate the vertical 5/4 backer board that I had installed earlier **(5)**. (I planned to install the pocket-door kit snug to the bathroom side of the wall cavity. This would allow that critical ¼ inch between the backer board and the door, described earlier.)

I made the header long enough for the 61-inch rough opening plus the double jack studs at both ends. Before installing the header, I put construction adhesive on the back of the drywall where the header would bear against it **(6)**. I also spread adhesive on the drywall before installing the jacks. When the opening was framed, I gave the pocket-door track a dry fit.

INSTALLING THE POCKET-DOOR KIT

The pocket-door kit I installed was made by Johnson. The header/track in the kit can be modified for doors of various widths. After reading the directions carefully, I made the necessary changes for a 30-inch door.

To position the track at the proper height, I drove 12d sinker nails into the jack studs at 80¾ inches up from the finished floor on both sides of the rough opening, and 1¾ inches in from the edge of the studs on the bathroom side. I left the nail heads about ⅛ inch proud of the surface. Slots in the end brackets of the header track slipped over these nails so I could set the track tight against the bathroom side of the cavity.

The header track for the pocket door is supported by special split studs—thin strips of wood lined with metal. After making sure that the header track fit properly over the nails, I laid out the positions of the two split studs, marking their positions on the header track and on the floor **(7)**. Then I attached the split studs for the far side of the opening to the header track.

Because this wall cavity was ½ inch wider than the normal 3½-inch cavity, we screwed strips of ½-inch plywood to the outer faces of the split studs. After slipping the floor-plate brackets onto the bottoms of the split studs, I held the assembly in place while my helper ran a bead of construction adhesive on the drywall behind each stud position **(8)**. We lifted the whole assembly and slid the brackets down over the positioning nails in

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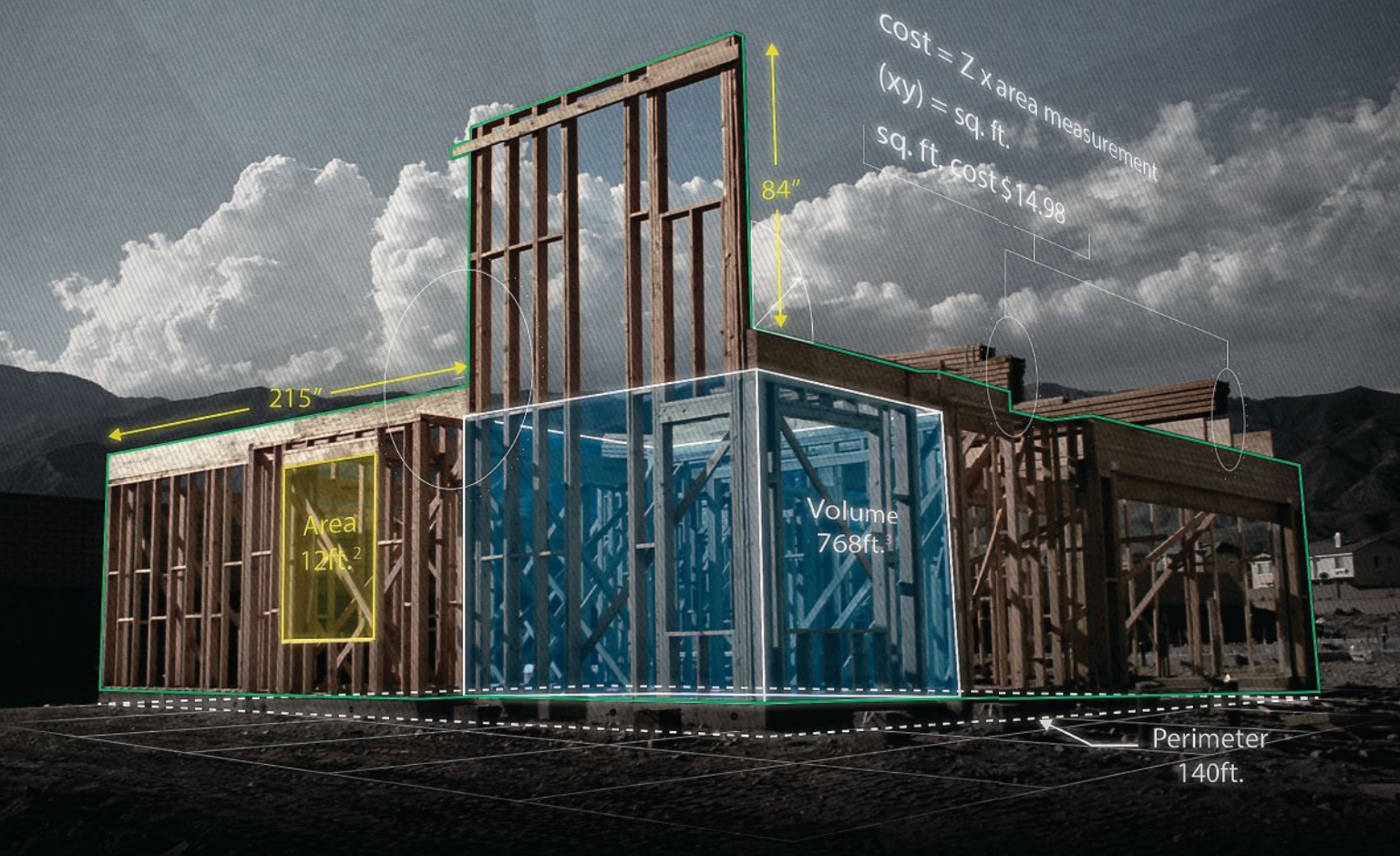

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the jack studs. When we were satisfied with the placement of the track and the split studs, we drove several pan-head screws through other holes in the end brackets to permanently attach the assembly in the pocket.

We then screwed the floor brackets into place. Finally, to install the other halves of the two split studs that faced the bathroom side of the pocket, we slipped the studs into the floor brackets, positioned them against the header, and drove two screws through each stud to anchor them in place **(9)**.

FINISHING THE INSTALL

With the pocket-door frame installed, the electrician rerouted the wires through the floor. We moved the outlet box to the bay next to the pocket **(10)**. With the new electrical box going through the tiled backsplash, I carefully cut the hole with a tiny diamond blade mounted on a Dremel tool, not trusting this delicate task to anyone else. We covered the hole left by the old outlet box with a blank plate screwed into a special bracket.

I was just about ready to hang drywall in the bathroom, but one very quick yet very important task remained—something I had regretted overlooking in the past: installing the small rubber bumper at the end of the pocket. This bumper keeps the door from banging into the end of the pocket, but more importantly, makes the door open flush with the finished door jamb. I screwed the bumper to the jack stud about 36 inches above the floor.

Then I hung the drywall on the bathroom side, attaching it to the split studs with 1-inch screws to make sure no sharp points penetrated into the door cavity and interfered with the smooth operation of the door, or worse, damaged the finish of the door. Because of my careful demolition work, I didn't need to touch the walls on the kitchen side of the pocket. I finished the new drywall in the bathroom in the normal manner and was now ready for the actual door.

Before hanging the door, I painted all four edges and the first few inches of both faces along the top and the side that would go into the pocket. These areas would be hard to reach after the door was trimmed out.


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When the paint was dry, I hung the door. I mounted the two supplied door plates on the top of the door, 2 inches from each end **(11)**. Then I set the wheeled hangers in the track **(12)**. These hangers have two wheels on one side and one wheel on the other, and you need to alternate the wheel positions as you slide them onto the track. To hang the door, I just snapped the hangers into the plates. Suspended on the track, the door rolled smoothly into and out of the pocket. Final adjustment would happen when I installed part of the trim around the door opening.

TRIMMING AROUND THE DOOR

The trim around a pocket door is a bit different from that around a standard door. The vertical jambs are installed first and extend up to the header/track. I started with the full-width jamb on the latch side of the door, which I made sure was absolutely plumb. Then, using a special wrench supplied with the hardware kit, I raised or lowered the hangers until the edge of the door fit perfectly against the jamb **(13)**.

The vertical jamb on the pocket side of the opening is split into two pieces, as is the horizontal jamb along the header. Because I had mounted the door off-center, one side of the split jamb was 1 ¾ inches wide, while the other (the bathroom side) was 1 ¼ inches wide.

As I had on the latch side, I cut and fit the split jambs next to the opening, letting them extend all the way up to the header/track. Then I screwed in the horizontal split-jamb pieces between the vertical jambs **(14)**. This trim configuration allows the head pieces to drop down easily if the door needs to be adjusted or removed in the future.

The directions recommend using screws just for attaching the horizontal jamb pieces, but I use them for the vertical split jambs as well. I leave these screws exposed so that the jambs can be removed in the future to access the door. The next person who has to remove that door will thank me.

FINAL STEPS

Casing the door opening, installing the baseboards, and installing door pulls were the final steps. To avoid penetrating the pocket, I installed the casing and baseboards with 18-gauge 1 ½-inch finish nails. These nails went through the trim and the drywall and bit into the split studs, with ¼ inch to spare. I didn't nail the casing to the split jambs, to make the jambs easy to remove **(15)**.

This door kit came with two types of pulls: finger pulls for the faces of the door and an edge pull. The edge pull required a 2-inch-deep mortise, so I made sure to keep it away from the finger pulls.

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

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BY MELANIE HODGDON

Projecting Markup, Margin, and Sales

In previous articles, we differentiated between production costs (classified in accounting as Cost of Goods Sold and often abbreviated COGS), considered profit as just another expense, and learned how to calculate gross margin and gross profit based on actual historical numbers. In this article, we'll put it all together and we'll see how you can apply simple formulas to give you "what if" scenarios for projections.

Let's look again at a simplified profit and loss and the formulas for gross margin and markup. We'll keep our gross profit fixed. You will always know what that is, because you've isolated your overhead and named your profit. Gross profit is the sum of these. But this time, we're going to learn the formulas required in order to perform a series of "what if'" scenarios.

DIFFERENT MARGINS YIELD DIFFERENT VOLUMES

If you know your gross profit and you experiment with various margins, you can see the theoretical sales volume required to meet your overhead and target profit.

	Example 1	Example 2	Example 3
Gross Profit	$40,000	$40,000	$40,000
Gross Margin	20%	25%	30%
Volume	$200,000	$160,000	$133,333

Gross Profit ÷ Gross Margin = Sales Volume

DIFFERENT MARKUPS YIELD DIFFERENT VOLUMES

If you know your gross profit and you experiment with various markups, you can see the theoretical sales volume required to meet your overhead and target profit.

	Example 1	Example 2	Example 3
Gross Profit	$40,000	$40,000	$40,000
Markup	15%	30%	45%
COGS	$266,667	$133,333	$88,889
Volume (Gross Profit + COGS)	$306,667	$173,333	$128,889

Gross Profit ÷ Markup=COGS
Gross Profit + COGS= Sales Volume (Income)

WHAT MARGIN DO YOU NEED TO MEET REALISTIC VOLUMES?

Now let's rein in the sales volume to get some realistic numbers for, in this example, a small volume remodeler. (You may be comfortable with a larger volume, but we're going to start off conservatively. You can grow from here.) If you know your gross profit and you experiment with various possible realistic sales-volume amounts, you'll see what margin would need to be achieved at each sales volume in order to meet your overhead and target profit figures.

	Example 1	Example 2	Example 3
Gross Profit	$40,000	$40,000	$40,000
Target Volume	$100,000	$200,000	$300,000
Margin	40%	20%	13.33%

Gross Profit ÷ Target Volume (Income) = Margin

WHAT MARKUP IS NEEDED TO MEET REALISTIC VOLUMES?

Taking these same realistic volume figures, you can calculate the markup you need to apply. Then, using the markups, you can price your jobs accordingly, secure in knowing that you will actually make a sustainable profit, provided you hit your sales volume target.

	Example 1	Example 2	Example 3
Gross Profit	$40,000	$40,000	$40,000
Target Volume	$100,000	$200,000	$300,000
COGS (Volume - Gross Profit)	$60,000	$160,000	$260,000
Markup	66.67%	20%	13.33%

Gross Profit ÷ COGS (Target Volume – Gross Profit) = Markup

Melanie Hodgdon is the owner of Business Systems Management (melaniehodgdon.com). For a summary of the essential pricing formulas used in this article, visit JLConline.com

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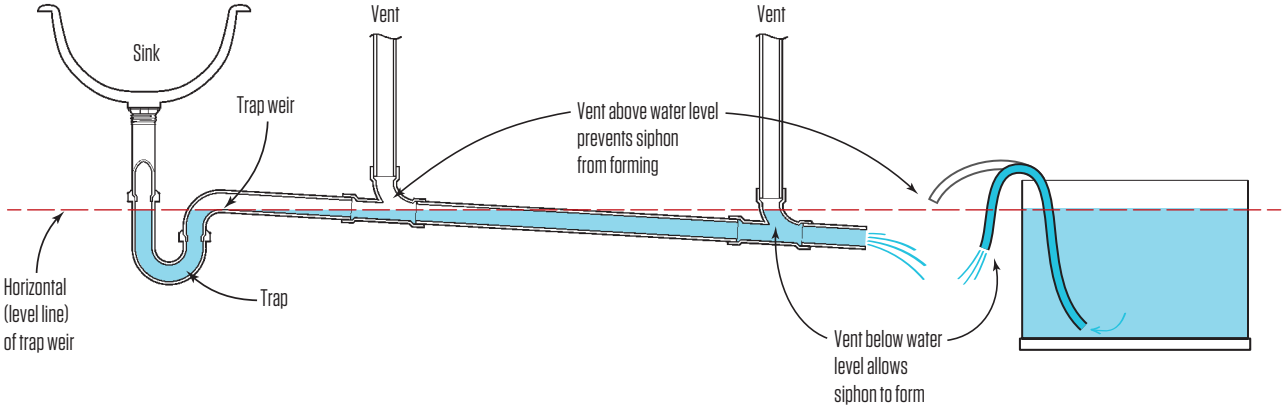
BY GLENN MATHEWSON

Maximum Length for Fixture Drains

How Siphons Are Created



The trap below a plumbing fixture is likely the most ancient plumbing feature that is still in use today. Basically, it's a simple cup of water that keeps sewer air from communicating with the air you breathe. The trap arm is the portion of a fixture drain between a trap weir and its protecting vent. The trap weir is the point at the bottom of the trap arm pipe where it connects to the trap. It's the height at which water will no longer flow from the trap via gravity—the rim of the cup, so to speak (see "How Siphons Are Created," above).

The flow of liquids has a lot of science to it, and anyone who has ever siphoned water from a fish tank or a swimming pool knows that a liquid can be drawn from a vessel without any power other than what appears to be magic. In a drain, one of the primary purposes of a fixture vent is to break the siphon. If the entire cross-section of a drain is able to fill with water downstream of the trap, a siphon can be created for a sufficient period of time to pull enough water out of the trap to render it ineffective. A vent is supposed to maintain air in the cross-section of the pipe to prevent a siphon from forming.

TROUBLE WITH TABLES

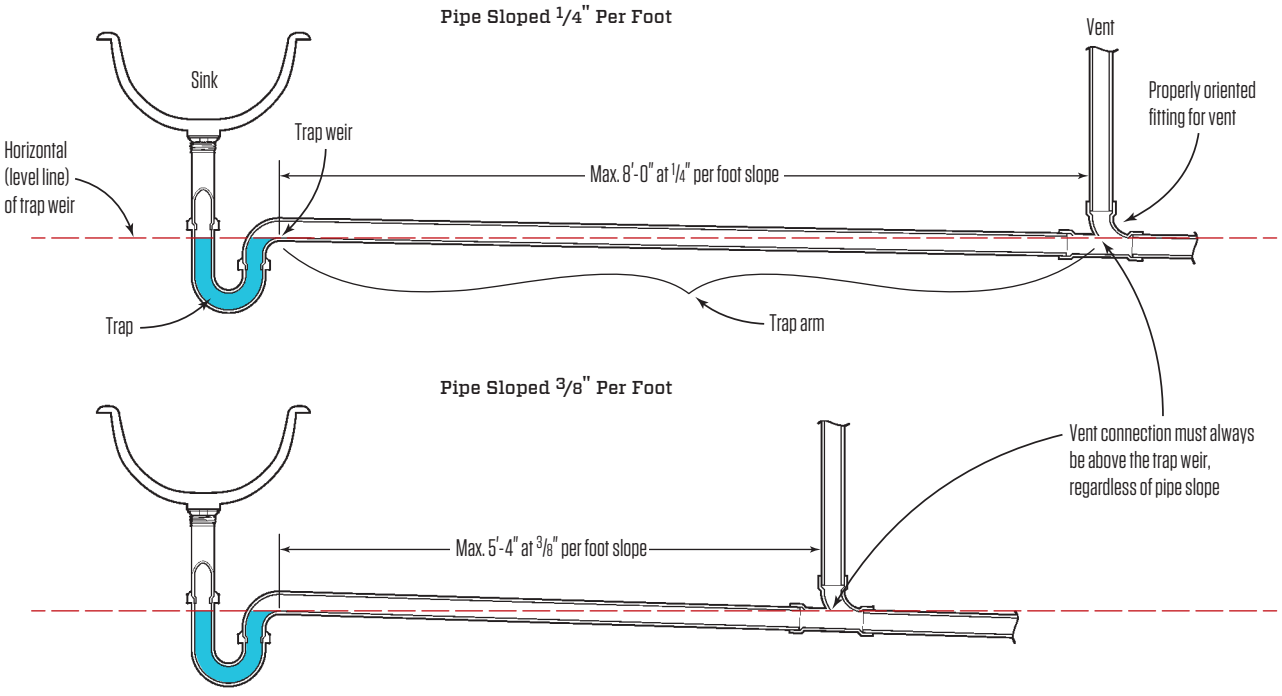
The section of the code that pertains to the maximum trap-arm (also called a "dirty arm") length has strict provisions designed to prevent a siphon from forming in a drain. For simplicity, the maximum distance between a trap and its protecting vent has been presented in the form of a table for decades.

However, this table was—and still is—accompanied by a very important statement: "The vent connection shall not be below the trap weir." Unfortunately, that statement is now much easier to overlook.

This basic scientific statement always trumps the simple length taken from a table and is the real key to preventing a situation where a siphon could form.

Illustrations by Tim Healey

Maximum Allowable Trap Arm Length



When builders look only at the table without reading the text, they find that a 2-inch-diameter drain can run a maximum distance of 8 feet to the vent. They may also see that the slope column references ¼ inch per foot, but they are likely to assume that it's just reiterating the minimum allowable slope for a 2-inch drain.

MORE THAN THE MINIMUM SLOPE

But the slope column is saying much more than that. It's stating that you can only use *up to* an 8-foot length if the pipe is run at the minimum allowable slope of ¼ inch per foot. But often, installers don't install pipe at the minimum slope, just as they wouldn't stand at the very edge of a cliff to enjoy the vista. (For many code applications, I use that analogy to encourage people to build beyond the minimum level that is allowed.)

The lengths in the table are just the result of simple math. A 2-inch-diameter pipe sloped at ¼ inch per foot results in a drop equal to the pipe's internal diameter over a distance of 8 feet: ¼ inch x 8 = 2 inches (see "Maximum Allowable Trap Arm Length," above).

But if the drain is sloped at ⅜ inch per foot, the maximum length is less than what someone might assume with just a quick glance at the table—it is actually 5.33 feet: ⅜ inch x 5.33 = 2 inches. So the additional slope of just ⅛ inch per foot reduces the allowable drain length between the trap and vent by a whopping 2.66 feet, or 33%.

KEEP THE VENT CONNECTION ABOVE THE TRAP WEIR

When I'm performing a plumbing inspection, I don't often bother with measuring the exact drain length, unless it seems to be unusually long or is clearly at a shallow slope.

With the siphon principle in mind, I first make sure that any drain less than 3 inches in diameter has at least a ¼-inch slope (⅛-inch slope for 3-inch diameter and greater), and then I simply measure from the floor (assuming that it is level) to the bottom of the drain at the trap connection (where the trap weir is located).

Next I measure to the top of the pipe at the vent connection, roughly accounting for the thickness of the pipe wall. If the difference is less than the diameter of the pipe, a siphon will not be able to form and the connection is approved—simple and effective with no code book table needed for reference.

Just make sure that the top of the drain where it connects to the vent is at or above the bottom of the drain at the trap connection, and you're golden.

Glenn Mathewson is a certified code professional and a building inspector for the City of Westminster, Colo., and a frequent presenter at JLC Live.

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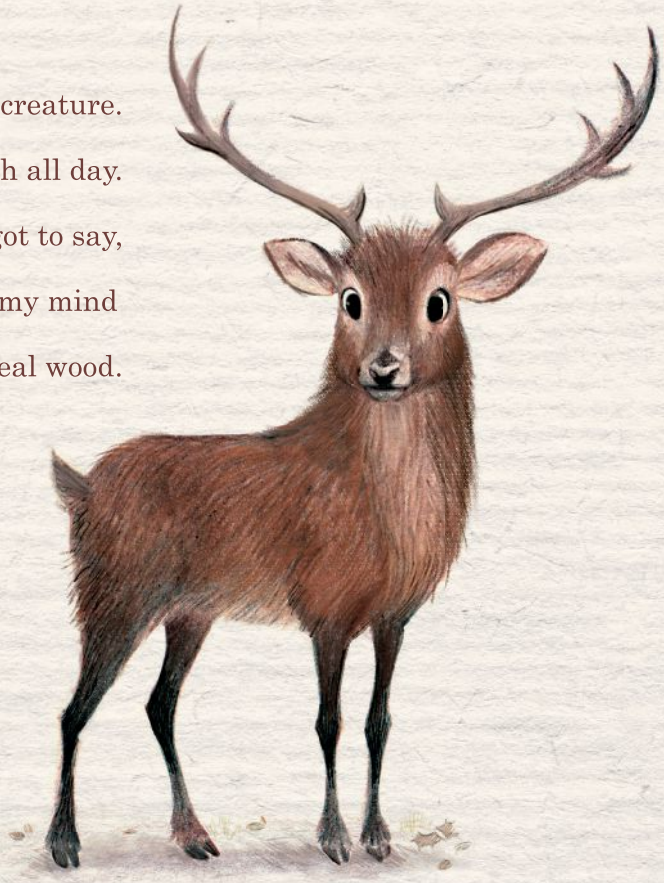

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BY TED CUSHMAN

OSB as an Air Barrier

Building codes are getting tougher about airtightness. In the 2012 International Energy Efficiency Code (IEEC), blower-door testing is required for new homes, and the limits have gotten stricter. While the 2009 code specified 7 ACH50 (7 air changes per hour at 50 pascals of pressure), the 2012 code calls for 5 ACH50 for southern homes and 3 ACH50 for homes in the northern U.S.

Many builders will have to change their ways to meet the 2012 code's requirements. But code-compliant airtightness is a piece of cake compared with the stringent specification for the voluntary Passive House standard. Passive House allows no more than 0.6 ACH50—five to eight times tighter than the 2012 code. These days, Passive House builders are routinely meeting that standard. But nobody is saying that it's easy.

One popular approach among the Passive House crowd is to rely on OSB sheathing, taped at the seams, as the air barrier (or "air control layer") for the house.

Photos: Michelle Sangster

Architect Richard Pedranti, HERS rater Pete Vargo, consultant Bryan Kehm, and builder Rob Ciervo tape plastic over the OSB sheathing during a blower-door test (top). At bottom, the plastic balloons out under air pressure.

That's the method architect Richard Pedranti chose for his first Passive House, in 2014 in Scranton, Pa. But to his dismay, Pedranti's house failed its first blower-door test. The reason? Under 50 pascals of pressure, the OSB leaked air—not at the taped seams, but all across the faces of the panels.

Pedranti's wall assembly was a 2x4 frame with taped OSB sheathing and wood I-joists applied over the outside face of the wall to create a 12-inch cavity for dense-blown cellulose insulation. The outside face of the I-joist wall was to be sheathed with vapor-open particleboard, then double-strapped for siding—essentially, the same wall system described in *JLC* by Maine Passive House builder Chris Corson ("An Affordable Passive House," May/12 and Jun/12).

"We never questioned using OSB as our vapor and airtight layer," Pedranti told *JLC*. "The industry accepted it." But with walls and roof framed and sheathed (but no I-joist layer yet), the building tested at 1.5 ACH50. "We spent hours and hours chasing leaks," said Pedranti, "but at the end of the day we were still at 1.1 ACH50." Then Pedranti's HERS rater, Pete Vargo, suggested reversing the blower-door fan, pressurizing the building, and taking a look at the outside. When the crew taped plastic over the OSB walls, Vargo's suspicions were confirmed: Air was leaking through the OSB.

Pedranti was demoralized and discouraged. "What was I going to do?" he said. "We didn't have anything close to a Passive House. I was feeling queasy." But reaching out to experienced colleagues helped. Passive House builders Adam Cohen, Dan Whitmore, and Chris Corson offered sympathy and advice, as did Passive House Institute US (PHIUS) co-director Mike Kernagis. Based on their input, Pedranti weighed his options for sealing up the OSB.

THE FIX

Pedranti was lucky to identify the problem before burying the OSB inside the multi-layered wall assembly. Now, he realized, he had a range of choices for making the wall airtight. He considered several fluid-applied membranes, including Dow Corning Defendair 200, BASF Enershield, and Prosoco Cat-5—all costly, but all known to be effective at air-sealing. "Prosoco is very expensive," said Pedranti. "The other

two wouldn't warranty their product for residential use. I couldn't go there—I was working for somebody else. I couldn't use a product if the manufacturer wouldn't stand behind it."

Also, Pedranti noted, he had already air-sealed the OSB joints with Siga Wigluv tape, which has a water-based adhesive. Solvents in the fluid membranes might attack the tape. So Pedranti decided to apply another Siga product to his building: Siga Majpell air-barrier fabric, sealed at the joints with Siga Majvest double-sided tape.

The fix cost more than $3,000, said Pedranti ("the tape is good, but it's expensive," he said). But it took just a few hours—and with a layer of Majpell over the OSB, the house was tighter than 0.3 ACH50.

Pedranti learned his lesson. He has just tested his second Passive House project—another simple box, but this time sheathed with Zip System coated OSB. "I can't tell you the number," Pedranti said. "It's so tight, I'm afraid it might be wrong. It's ridiculously low. I'm going to have my HERS rater check it before I tell anyone."

After a plumbing break flooded a newly built Passive House, an EcoCor crew cut open the OSB air barrier to remove damp insulation from the outer cavity (top), then patched the holes (bottom) with Zip sheathing, Pro Clima Uni Tape, and Prosoco R-Guard Cat5.

A WET MORNING IN MAINE

Since Maine builder Chris Corson helped Pedranti solve his Pennsylvania problem, Corson has had his own encounter with leaky OSB—in Corson's case, for a Passive House in Camden, Maine. Corson has built dozens of Passive Houses since 2012, panelizing his 2x4 stud and I-joist walls in a warehouse near Belfast, Maine. Corson has been comfortable with an OSB air barrier despite Pedranti's experience, and despite research showing wide variation in OSB air permeability. And until recently, Corson's field experience confirmed his confidence, with house after house handily beating Passive House criteria.

But in December, Corson's crew had the same experience Pedranti described. "We tested the house and got like 0.7 ACH50," Corson told *JLC*. "I said, 'What's going on?' And after running around chasing leaks all day, I said, 'Let's look at the OSB.' We taped plastic over the wall and cranked the blower door up to 150 pascals, and sure enough, the air was coming right through the OSB."

Corson's solution was to coat the inside face of the OSB sheathing between the wall studs with a fluid-applied Prosoco flashing membrane (the outside face of the OSB was already buried under I-joists and cellulose). After that, he told *JLC,* the house tested out at 0.28 ACH50. And like Pedranti, Corson made the decision to switch to using Zip System sheathing for his air barrier. "For [an extra] $600, it solves the problem," he said. "It's a no-brainer."

But there's a footnote to Corson's story. After the Camden house was dried in and sided, he handed the job off to the homeowners for painting and interior trim. In June, three weeks before their move-in date, the owners finished a day's work on trim, locked up the house, and went home. When they came back the next morning, they couldn't open the door—because the inside of the house was flooded with 2 feet of water. A fitting on the main water supply had burst. None of the water had leaked out—the house was watertight as well as airtight. Through the glass door, said Corson, "They could see their tools floating around in there. It was like an aquarium."

Ironically, said Corson, the field-expedient fix to the leaky OSB air-control layer "saved the house" when the flood occurred. "This could have been a complete and total tragedy," he said. Unprotected by the waterproof membrane, "that OSB could have wicked the water all the way up the whole first floor as if you had 8 feet of water in there." As it was, he said, the flood fix was simple. "I took my guys off other jobs and we came in and fixed it," he said. "It was a little painful—it was all plastered and painted. We cut 55 holes in the sheathing, pulled out all the wet insulation, dried the walls out, re-insulated, patched it all up, and sealed it." The polished concrete slab floor was undamaged.

After the repair, Corson tested the house again. "We were at 0.28 ACH50 pressurized, and 0.32 depressurized," he said. "That's it. We're done."

Ted Cushman is a senior editor at JLC.

Photos: George Reefer

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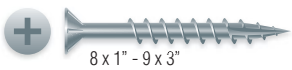

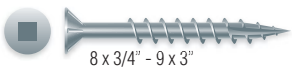

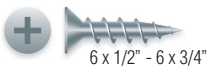

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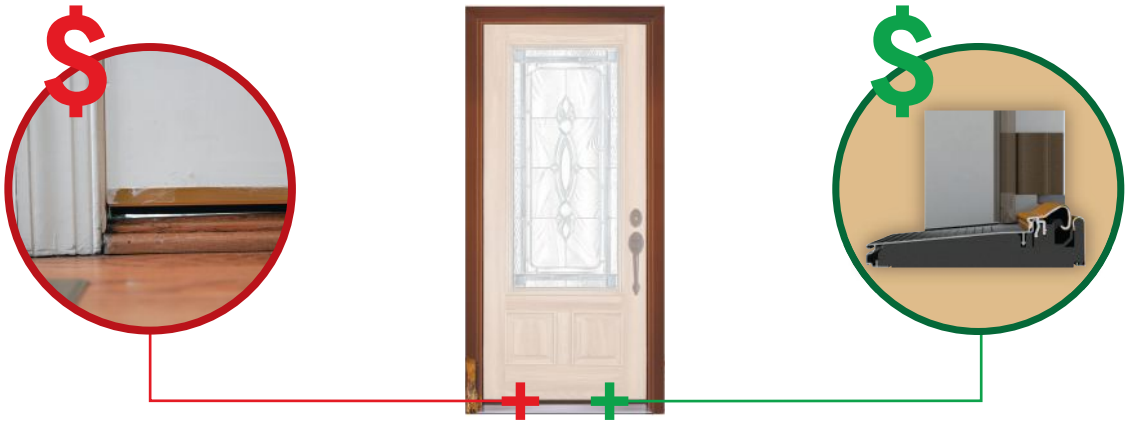

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Precast Walls Above Ground

Precast concrete panels offer speed, strength, and durability

BY TOM DUGAN

I am a builder in coastal North Carolina. I started my company more than 20 years ago, doing renovations, additions, and remodeling projects. Over the years, I've had to tear out and replace lots of work in existing stick-built homes because of issues involving the various layers and pieces needed to "tighten up" an enclosure against air and water intrusion.

I started to learn about precast concrete in 2010, when a client asked me to design and build his retirement home on a small, steep slope overlooking a beautiful creek near Wilmington, N.C. The house was to have two stories of living space, above a concrete basement.

After considering various basement options, including cast-in-place concrete and filled masonry block, we looked at the precast insulated concrete panel system from Superior Walls of America. When I met with Charles Hunter, the Superior Walls rep for our area, he proposed building all three stories of the building with Superior Walls. My client (an industrial builder himself) liked the idea of a concrete home because of the ever-present threat of hurricanes in our area. He opted to follow this path, and the resulting home, with its impact-resistant windows and standing-seam metal roofing, was the first home in our state to earn a Gold rating from the Insurance Institute for Business and Home Safety (IBHS)

Photos by Tom Dugan

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for hurricane-resistant construction.

The more I learned, the more advantages I saw. Reducing the size and number of the joints and cracks in the exterior walls simplified the building process and resulted in much stronger, more airtight, and more watertight homes. And as a bonus, the resulting houses turned out to be extremely energy-efficient. The example shown in this story is my own personal home and my third Superior Walls project, and I have two more in the planning stages. I continue to be more than satisfied with the system.

PLANNING AND COORDINATION

You need to plan carefully before you place an order with Superior Walls. Your plans have to be accurate, because when those trucks roll in with your concrete panels on board **(1, 2)**, the openings for windows and doors must be correct—you won't be able to easily make changes on the fly by simply ripping out some studs and moving them around during construction. A Superior Walls rep sits down with me to go over every detail of the plans. He helps me to not overlook important details, such as widths of openings, heights of door thresholds, and columns in the walls to support floor beams.

Building multistory homes also requires attention to ceiling heights and depths of the floors, because these combine with roof pitch to determine the total building height. Most jurisdictions around here have height limitations that can affect the design (a maximum height to the roof ridge of 35 feet is typical). With 9-foot ceilings being so popular these days, that can create a challenge.

Superior Walls panels come in standard heights of 4, 8, 9, 10, and 12 feet. Custom heights are a special order at an added cost (I have never needed to order a custom-height wall panel). Floor systems, as I'll explain later, sit on precast support shelves inboard of the continuous panel skins.

FOOTINGS AND FOUNDATION

Superior Walls delivers and places foundation and upper-story walls as a turnkey operation. But the builder is responsible for site work and for providing the footing. In most cases, we use a gravel footing **(3)**: a trench lined with drainable geotextile filter fabric, filled with crushed stone, and roughly leveled, with a perforated perimeter drainage pipe in a filter sock. If we build in a coastal V zone ("velocity zone"), where a hurricane storm surge might scour the soil and undermine the footing, we use deep-driven pilings and a grade beam foundation. But this house was only in the A zone, so a gravel footing was fine.

If I'm building in an area that is known to have soils with a bearing capacity greater than 2,500 pounds per square foot (psf), I can size my stone footing to a standard dimension from the code. But for this house, we were building near a river on silty sand with bearing strength of about 1,500 psf, so I had an engineer test the soil and specify the footing size.

The concrete base of a Superior Walls panel is 10 inches wide. With a gravel footing, the load-bearing capacity of the stone spreads outward and downward from the wall base at a 60-degree angle. The engineer specifies a footing depth that is sufficient to reach adequate bearing width for the soil conditions on the site. As the builder, I place the gravel according to the engineer's drawing and roughly grade it.

We use ½-inch crushed stone, called "78 stone," for our footings. Occasionally I've used ¾-inch "58 stone," but it's harder to spread and compact, and it doesn't add any significant strength.

When the Superior Walls crew arrive, they compact and level the stone bed to their satisfaction using a laser, grade stakes, and an aluminum straightedge.

SETTING WALLS

When they're happy with the footings, the Superior Walls crew start to lift panels off the trailer with the crane and swing them into place. I provide batter boards and strings to guide the placement. I'm always on site for the set, and it's impressive to see the crew swing those 8,000-pound panels down and just kiss that string with so much precision you'd think they were doing surgery.

They start by establishing one corner and making sure it's perfectly plumb **(4)**. That first corner pretty much determines the rest of the panel positions.

The joints between the panels are sealed with an industrial-grade urethane-based sealant. At wall corners, the panels are bolted together with through-bolts. At in-line connections, the panels connect with a preformed lap joint, which is fastened using a bolt and a steel fitting.

Setting the walls for one story **(5, 6, 7)** typically takes about half a day. The next step is to finish prepping the ground inside the wall system for the poured slab **(8)**. This slab is a key component: The concrete flows inside the wall cavities and locks the whole assembly together. All of the usual components—including the ground vapor barrier, steel reinforcement for the slab, interior footings, plumbing, and electrical—are required, just as with any other slab on grade.

Once the slab is poured, framers can then construct any load-bearing interior walls and columns, and frame the first-floor platform within the Superior Walls


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perimeter. This should take only a day or two. Meanwhile, the next level of walls that have been cast at the Superior Walls plant is en route to the site.

Upper-story walls require less preparation, since there isn't any groundwork involved. Three to four hours on site with the crane **(11, 12)**, and the Superior Walls crew is gone again. My framers are immediately back at work building the next level of interior walls, and building another floor frame or a roof.

FLOOR FRAMING

In traditional stick framing, the floor platform rests completely atop the wall and flush with the outside. This creates a lot of joints that you need to air-seal, connect for uplift, protect from the weather, and so on. By contrast, Superior Walls panels have a 3½-inch-deep "rim ledge" at the inside top of the wall **(9, 10)**, completely within the wall's exterior skin, wherever the floor system needs to bear at the exterior wall. A 2x4 on the flat is cast into that pocket as a nailer and bearing shelf. Wall panels for higher stories rest directly on the concrete top of the panel below, with only one joint to seal and with continuous bearing from the base to the top of the structure.

The height of the floor support pocket can be specified as needed to accommodate the chosen floor framing system, whether that's dimension lumber, trusses, or wood I-joists. (I prefer to use 12-inch wood I-joists whenever possible, as I did in this floor frame.)

WINDOWS AND PENETRATIONS

Superior Walls panels are delivered with the window openings built in. Each window opening is wrapped with treated 2x10 southern yellow pine (SYP), which is attached to the concrete panel with 20d galvanized spikes that get cast right into the panel when it is made in the factory.

Superior Walls are a great product, but people make mistakes. If a window opening should happen to be ½-inch too small, and I've already bought the window, I'm in trouble. These openings can be modified in the field, but that involves considerable time and expense. So I don't order any windows until my walls are on site. Then I measure the openings, and I custom-order the windows from Viwinco (viwinco.com) in Morgantown, Pa. This company is able to deliver a custom window with impact glazing at a competitive price, with just a 10-day lead time.

Other openings can also be preformed at the factory. This house, for example, needed flood vents in the first-story garage level (my base flood elevation at the site was 6 feet above the basement floor). The openings for those vents were cast into the wall at the factory using Styrofoam. On site, we cut the foam out with a recip saw and installed the vents.

But if you need a hole (say, for a dryer vent) and there isn't a preformed opening in the wall, you can knock a hole in the wall pretty easily with a diamond saw and a hammer drill. In this house, for example, there's a freestanding gas fireplace in a third-floor room, vented through the wall **(15)**. Between the concrete studs, the skin of the panel is just 1¾ inches thick. For that vent, the fireplace contractor just took a hammer drill, scored all around the opening that was needed, knocked the concrete out, and sealed a vent flange in.

ROOF CONNECTIONS

One of the key elements in building for hurricanes (and tornadoes) is providing a vertical load path to resist wind uplift. The building industry has only recently begun to understand and accept this requirement. Simple things like roof pitches and eave overhangs can have a tremendous effect on the amount of uplift that can result when wind speeds reach 90 mph and more. My engineers have told me to plan on at least 45 to 55 psf of uplift from the roof deck in the case of a strong Category 3 hurricane with winds greater than 130 mph. That is a serious load, considering that an inland roof without heavy snow loads may only be designed for a gravity load of 10 or 20 psf. I have chosen to engineer all of my homes for at least 150-mph winds, which means paying close attention to the connection between the walls and the roof.

To ensure the connection of the roof assembly onto the Superior Walls panel, which is part of the vertical uplift load path, we use double 2x10 SYP top plates, through-bolted at 2 feet on-center with ½-inch galvanized bolts onto the top of the concrete wall panels. Each bolt connection is rated at 1,200 pounds. The trusses or rafters are then attached to this double top plate using Simpson H10 hangers (or equivalent). These are rated at 1,340 pounds each when nailed onto SYP. This gives me a roof attachment that should easily meet an engineer's requirements for 150-mph winds with an 8/12 roof pitch.

It's important to keep in mind that lower-pitched roofs have greater uplift than steeper roofs. Studies have shown that a 3/12 pitch creates the greatest uplift of all pitches. Conversely, pitches steeper than 8/12 have greater downward forces and less uplift. If local height restrictions force you to use a lower-pitched roof, you may need to increase the capacity of the roof-to-wall connection.

For this project, the Superior Walls crew set my gable end panels on the same day as my upper-story wall panels. My framers then framed the roof using a system of girder trusses and purlins **(13, 14)**.


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I could have built the roof with a supported ridge and long rafters, but I probably would have needed to use 2x12 rafters because of the span. Instead, I made girder trusses out of 2x10 lumber and then ladder-framed between the trusses using 2x8 purlins. This allowed me to frame with less-expensive lumber, and it left me with 2 inches exposed on my girder trusses that I could wrap in finish trim.

This approach greatly simplified the framing. All we did was put hangers on the faces of the girder trusses, gang-cut the 2x8s, and drop them in.

I sheathed the roof with ⅝-inch plywood, installed standing-seam metal roofing, and insulated the underside of the sheathing with 3 inches of spray-applied closed-cell polyurethane **(15, 16)**, which helps glue the roof deck down to the structure at the same time as it makes the roof-to-wall joint airtight.

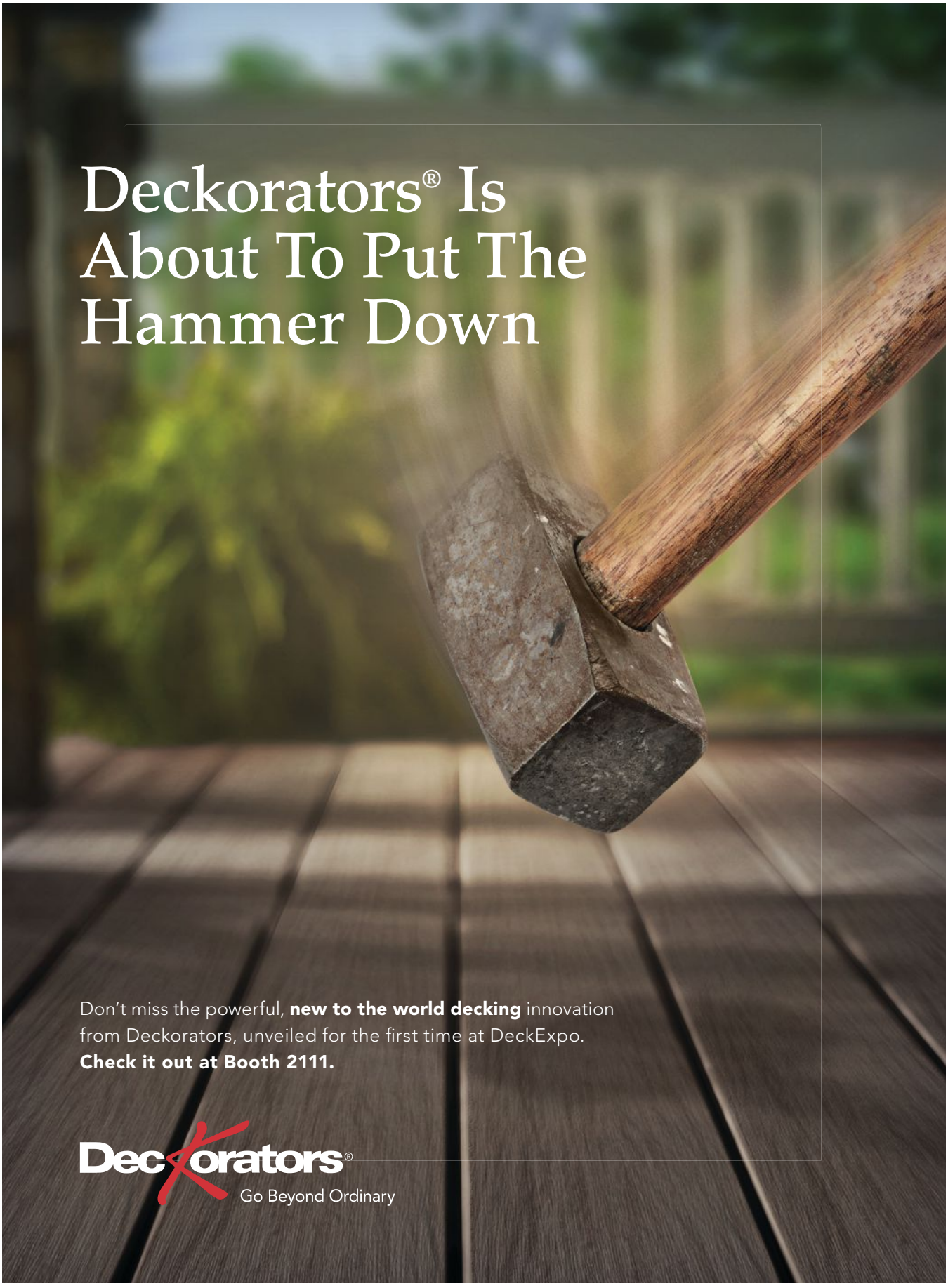
ENERGY AND HVAC

If I have three dollars to spend on energy efficiency, I like to spend a dollar on convection, a dollar on conduction, and a dollar on radiation. The airtight, continuously insulated concrete wall panels minimize convection and conduction. My radiation dollar, I spend on reflective metal roofing.

As I like to tell people, my homes are "small, tall, and tight." This creates an HVAC challenge: My houses need 30% to 50% less cooling than a conventional home. And because they're tall with small footprints, each story has a relatively small volume to condition. It's hard to meet those needs with conventional equipment, because the smallest air-conditioning units are too powerful for any one floor, and ductwork required for a multi-zone air handler serving all the stories takes up too much valuable space.

My solution for the home shown here was to install a Samsung minisplit heat pump with a single 3-ton outdoor unit, and three indoor air handlers that run off that single outdoor unit. The middle floor, where the bedrooms are, has a 1-ton indoor head, and the upper floor (which, because of the cathedral ceiling, is really a floor and a half) has a 1.5-ton indoor head. In addition, the glassed-in porch at the rear of the house has a 9,000-Btu wall unit for occasional use.

Tom Dugan is a builder in coastal North Carolina.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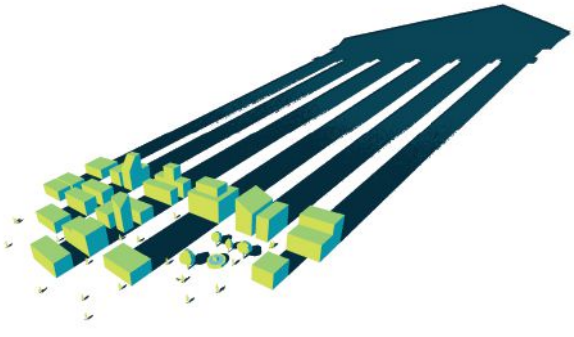

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Assembling Finish Trim: Craftsman-Style

How to get the visual details right and stay productive

BY GARY KATZ

Craftsman-style window and door casing is defined mostly by the entablature (the horizontal trim) above the jambs, which consists of three separate pieces of molding—the architrave bead, the frieze, and the crown. It may look challenging, but it's pretty simple because everything hinges on the length of the frieze.

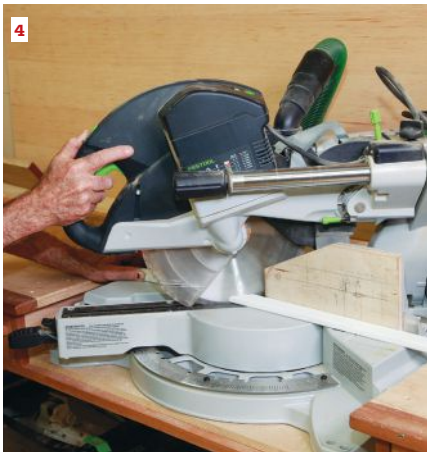
If you follow the flush-cut rule, where the ends of the frieze are flush with the outside edges of the casing (see "A Look at Traditional Trim Designs," Aug/15), the length of the frieze would then be equal to the outside dimensions (O.D.) of the casings below. If you want the frieze to go past the casings, then add a little more. But be careful: Adding small increments can have a huge visual impact.

Photos by Gary Katz

DO THE LAYOUT ON THE WALL

Like many carpenters, I'm challenged by simple arithmetic, so I usually do the layout right on a wall at a door or window opening. I start by pulling a tape measure over ¼ inch from the face of the jamb and marking the jamb reveal. Next I measure over the width of the casing, in this case 4¼ inches. I do the same thing on the opposite side of the jamb and then measure the O.D. of the casing.

For my home, I added ¾ inch to that measurement so that the frieze would cantilever ⅜ inch beyond both edges of the casing. This meant that for all of my doors and windows, I added 9¾ inches to the width of the opening to get the length of the frieze. So the



frieze for a typical 2/8 door would measure 41¾ inches.

The length of the architrave bead and the head cap or crown is easy to figure—just add for the cantilever on each end of the frieze. I usually make that cantilever ⅜ inch, making both pieces ¾ inch longer than the frieze. Measuring the architrave bead is easy, but measuring the crown can be a bit tricky. Be sure to measure from the long point of the miter where it passes through the bottom fillet (more on that later).

CUTTING THE PIECES

For stain-grade work, the frieze can be butt-cut, which exposes the end grain, a look that I like. For paint-grade work, the frieze can also be butt-cut and then sanded carefully. Alternatively, it can be cut with a self-return, which eliminates sanding and guarantees a smooth finish. But I was in somewhat of a hurry, so I butt-cut all of my frieze boards.

If you decided to self-return both ends of the frieze, remember to cut the little return caps first. Cutting them from a long piece of stock is much safer than working with a short scrap.

Once the frieze is cut, I move on to the architrave bead. I start by cutting the return cap. Because this piece is very small and weighs next to nothing, the wind from the miter-saw blade can suck the piece into the blade and ruin it. To keep this from happening, I slide the miter-saw fences on my Kapex saw in as close to the blade as possible. For other miter saws, use a zero-clearance fixture to cut the small self-return pieces.

After cutting the first return cap **(1)**, swing the saw and cut the miter in the opposite direction **(2)**. Then hook a tape on the long point of the miter and measure to the opposite long point for the overall length of the bead **(3)**. After cutting that miter **(4)**, flip the waste material over and cut a miter in the opposite direction. Finally, swing the saw to 90 degrees and slice off the other self-return cap **(5)**.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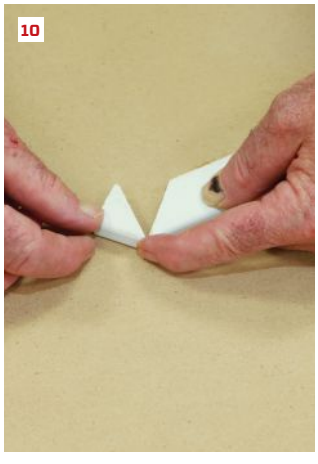
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I always cut crown molding upside down on my saw. Of course, if the material is too big to stand against the fence, I lay it down and cut it on the flat. But this crown is pretty small and can be cut easily in position. Because this profile has a solid back, it can be cut right-side up, but don't be tempted. One of the main reasons I cut the material upside down is so I can see the measurement marks, which are usually made on the bottom of crown molding and almost never on the top. With the molding positioned upside down, it's also easy to align the miter-saw blade with the measurement marks.

Like the architrave bead, I cut the first self-return cap **(6)**, then I swing the saw and cut an outside-corner miter. Next, I hook my tape measure where the long point cuts through the bottom fillet on the molding **(7)**. At the opposite end of the molding, I mark the measurement on the same part of the profile, where the miter will pass through the bottom fillet **(8)**. As before, I then make the final miter cut and cut the other return cap from the waste.

ASSEMBLE THE PIECES ON THE BENCH

Once all the pieces are cut, I start the assembly. For all the small self-returns—on the frieze (if I'm self-returning the ends), the crown, and the architrave bead—I use 2P10 cyanoacrylate glue because it sets immediately and no nails are required. Firing pins into tiny self-returns—right near your fingers—might provide job security for the folks at urgent-care clinics, but for finish carpenters, it can be dangerous and painful. This glue allows me to assemble small pieces and then, if it's necessary, reinforce the joinery with 23-gauge pins without having my fingers near the joint. I put the glue on the larger piece **(9)** and spray the smaller piece with activator. Then, because the glue sets so fast, I "hinge" the joint closed to align the miter perfectly **(10)**.

I use the same process with the crown and the architrave bead. As soon as the glue sets, I spray any squeeze-out, too, then peel it off with a sharp chisel.

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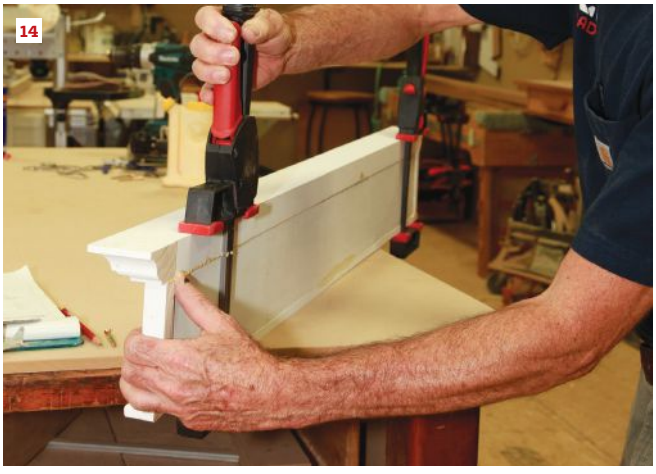

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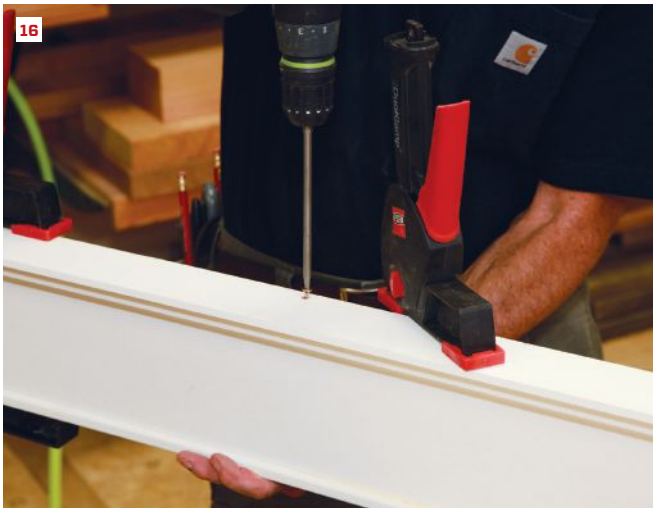


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The miters on the crown molding usually require some adjustment, so to assemble those pieces, I use yellow glue, which provides more wiggle room to get the joint perfect. Once I have the joint aligned, I secure the miter with a spring-loaded miter clamp, then fire 1-inch 23-gauge pins to secure the moldings **(11)**.

With all the self-returns assembled, I apply glue to the bottom of the frieze and fasten the architrave molding **(12)**, using my fingers to make it flush with the back of the frieze and make the cantilever equal at both ends. I secure that thin molding in place with 1-inch 23-gauge pins as well **(13)**.

Attaching the crown to the frieze board isn't quite as easy. I learned a long time ago that shooting long nails through the top of the crown and down into the frieze is risky. Too often, one of the nails will follow the grain and pop out through the face of the frieze. That can be tough to fix. Even if you fill and carefully sand the wound, a shiny spot can still show up in the finished trim work. Using clamps and screws is much safer, and the results are far more pleasing and predictable.

After applying a thin line of glue to the top of the frieze, I clamp the crown to the frieze, again using my fingers to be sure the crown is flush with the back of the frieze and proud an equal amount at each end **(14)**. Then I predrill clearance holes for the screws, using a bit that's slightly larger than the diameter of the screw threads. The screws don't bite into the crown, but draw the crown to the frieze board instead **(15)**. If the tops of the door and window heads can't be seen, I use regular square-drive screws to secure the crown; if the tops of the entablatures are visible, I use trim-head screws **(16)**.

WORKING FROM THE TOP DOWN

I prefinished all the trim in my home, and because the door and window jambs had all been sealed with Quad foam, I didn't depend on the casing to secure the jambs. So first I squeezed a small bead of PL Premium on the back of the trim and then I nailed all the moldings only to the walls using 18-gauge brads. To pull the casings tight to the jamb, I tacked them with 1-inch brads.

Though it might be easier to install the plinth blocks first, then the side casing, and finally the entablature—starting from the bottom and working up is usually a smart approach—on my home, I started at the top, installing the entablatures first, and then worked down **(17)**. (That habit probably stems from the method I use to install mitered casing). I centered the entablature above the opening and then tacked it to the wall with a ¼-inch reveal along the jamb.

Next I traced a line across the top of the plinth block on each side of the doors, and measured down from the head casing to the plinth-block line **(18)**. I cut the casing to fit a little snug and mortised the bottom of the casing and the top of the plinth block for two Festool Dominoes **(19)**. It wasn't necessary to install tenons in the top of the casing—the wall supported the entablature, and the casing legs lay pretty flat near the head. But at the bottom of the jamb, the plinth blocks rode on a narrow section of wall and tended to rock a little. The Dominoes prevented the plinth blocks from tipping and skewing the reveal at base of the casing.


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Plinth blocks are an essential element to a Craftsman-style doorway—without them, the casework isn't complete. I used plinth blocks on all the door jambs (except inside the closets)—paint-grade and stain-grade alike. The width of the casing varied from opening to opening: The casing on the entry door was mull casing (shared with the windows), so it was 4¼ inches wide; casing on the standard doors was all 3½ inches wide, while the casing on the stain-grade opening to the living room was 5½ inches wide. That meant that the plinth blocks also varied in size, each of them ¼ inch wider than the casing, for a ⅛-inch reveal on each side.

THE SILLS

Once the casings were installed, I tackled the windowsills; some needed to be scribed to fit where they lapped over the casing **(20)**. The sills were too wide to secure with nails, so I predrilled clearance holes, screwed in place, and plugged the holes **(21)**.

STAIN-GRADE TRIM

I love wood, particularly Douglas fir. But with the Douglas fir windows and doors, I knew I couldn't use Douglas fir casing around all the interior openings—that would be too much wood and the impact and beauty of the wood would be lost. Instead, I opted to install paint-grade trim around most of the windows and doors.

For the 12-foot doorway between the dining room and the living room, however, I used all stain-grade finish material. I milled the crown molding on my Woodmaster Planer/molder so that it would match the standard WindsorOne profile that I'd used throughout the house **(22)**. Then I assembled the entablature the same way I did for the paint-grade work **(23)**, using fasteners judiciously.

Gary Katz is a frequent contributor to JLC *and a presenter at JLC Live. He produces the Katz Roadshow and publishes THISisCarpentry.com.*

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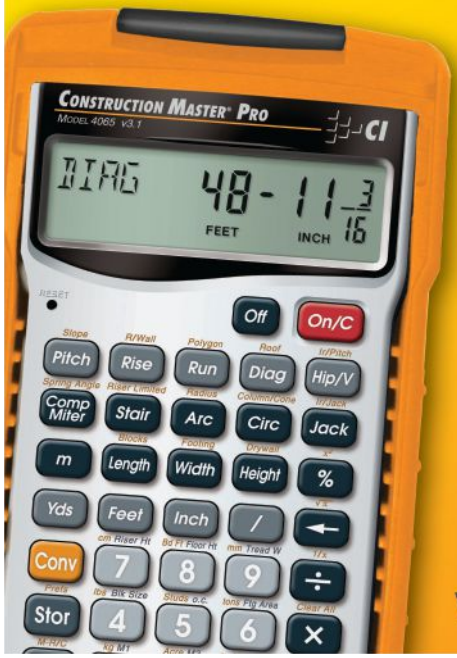

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Curbless Shower Retrofit

Providing drainage when you can't change the framing

BY DAVE HOLBROOK

Photos by Dave Holbrook

Last October, our company undertook a remodeling job in Provincetown, Mass., that included a complete makeover of the kitchen and two bathrooms. Part of this makeover involved installing new floor tile and integrating curbless, or barrier-free, showers in both bathrooms. The floor tile came flush with the hardwood flooring outside the bathroom doors, and the client wanted to maintain perfectly even floor planes. Somehow we had to find a way to establish a drainage slope in the showers without adding to the original floor thickness.

A curbless shower requires one of several possible designs for creating a ¼:12-inch drainage slope. It was clear we couldn't build up the subfloor, and we were reluctant to reconfigure the floor joists under the pan. This is fairly easy to do in new construction but much more complicated in an existing home, especially on this job: The floor was framed with 11⅞-inch-deep I-joists. There was no easy solution for cutting into those, so we knew we'd need to find an alternative.

THE THIRD OPTION

Best practice for a mud base calls for the bed to be not less than one inch thick at its thinnest edge. Both showers were 3 feet deep by 4 and 5-plus feet wide, respectively, and would have a monoslope

Curbless Shower

(Smaller Shower, Floor Framing Perpendicular to Drain)

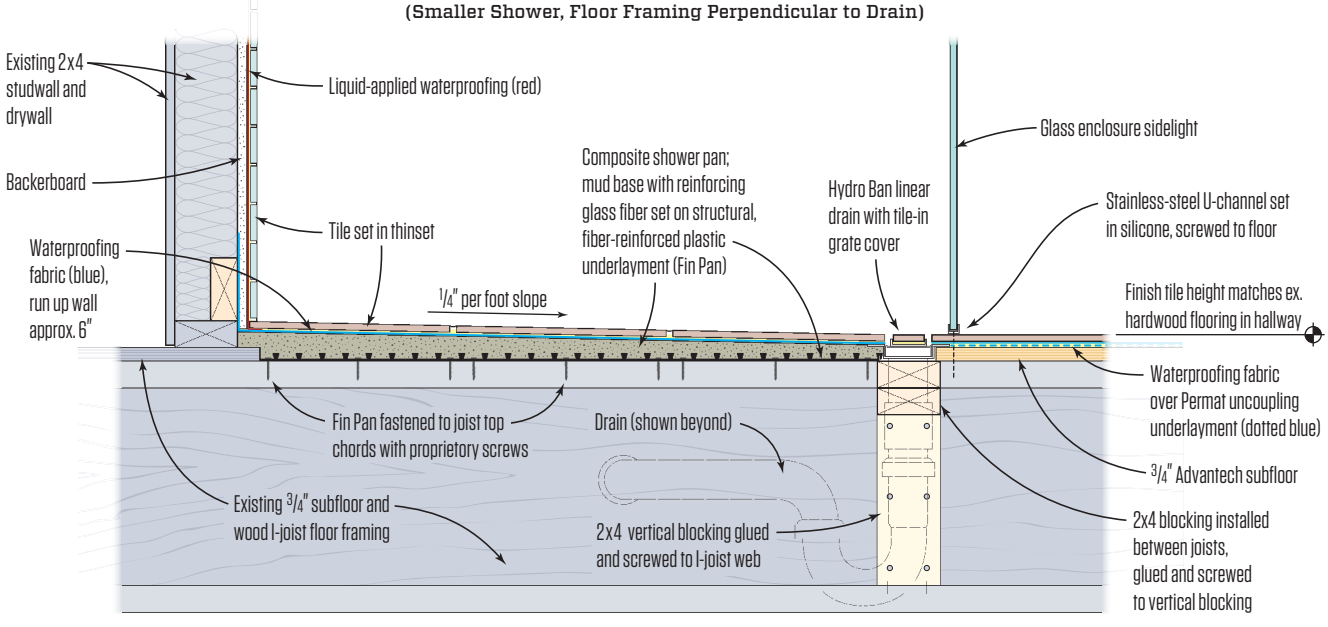

Illustration: Tim Healey

to the drain, adding ¾ inch to the bed's thicker edge. The drawings originally showed the drains at the back of the shower, which would mean sloping the bed front to back. While it's pretty intuitive to want to drain the shower away from the point of entry, it meant that we'd be restricted as to how much we could build up the floor to create a positive slope. Instead, we moved the drains to the front of the shower, just inside the door line, allowing the slope to build toward the rear at the incline we needed.

However, in order to match the oak-flooring thicknesses at the door and have a 1-inch-thick edge at the thinnest section at the drain, we would need to burrow down into the subfloor. We discussed blocking between joists in order to drop the subfloor between them in the pan area, but were concerned about the long-term stability of the framing and the possibility of movement that could crack the mud base and tile if we used that approach. Bottom line, we weren't going to start the job without first having a solid solution in hand.

We did some online research and found a product called TI-ProBoard, which is manufactured by Fin Pan (finpan.com). This is a structural, fiber-reinforced ribbed plastic panel designed to replace the subfloor in the shower area. It would allow us to pour a mud base almost directly on top of the joists. This product is designed for use with a proprietary central drain only, but working with a technical representative, we were able to adapt it for use with a linear drain.

ROUGHING IN THE DRAINS

There are plenty of linear drains to choose from (see "Lineup of Linear Drains," Nov/14). We picked the Hydro Ban linear drain by Laticrete (laticrete.com). Laticrete offers drains with either a finished grate or a ready-for-tile insert cap. They generally come in fixed stock lengths. For a front-draining installation where the drain must run fully wall-to-wall, the length predetermines the shower's rough opening dimension. (An important note when ordering: To figure the drain length, be sure to account for how much you build out the shower wall at each end. The drop-in drain cap must remain removable for occasional drain maintenance and cleaning.) For the smaller, 4-foot-wide shower, we could use a stock size. For the larger shower, however, we needed an in-between length. Fortunately, Laticrete was able to custom-cut a 62-inch-long drain for a reasonable upcharge and extra lead time.

Floor framing. We demolished the original floor tile and underlayment, then cut out the subfloor in the shower areas. In both showers, we were unable to fully cut the subfloor away without also undermining adjacent partitions, so we left an inch or two of subfloor at the back of one shower and at one end of the other. Since these strips were at the edge of the enclosure, well out of the impact zone where a bather would stand, we reasoned this wouldn't compromise the structural integrity of the base.

During the demo, we found that the joists in the smaller, 3x4 shower ran perpendicular to the linear drain **(1)**, while in the larger, 3x5 shower they ran parallel **(2)**. The TI-ProBoard has a structural


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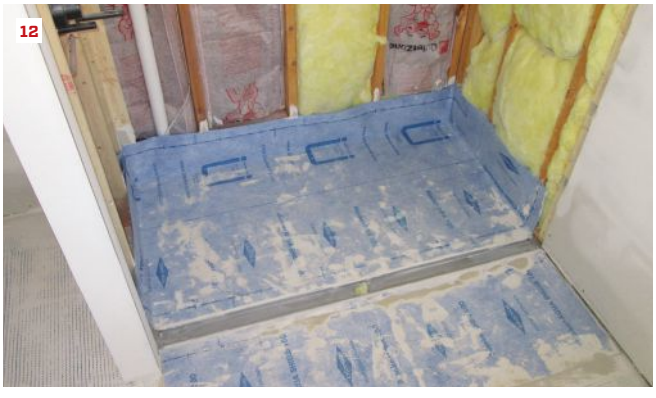
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ribbing and must be installed perpendicular to the framing. Its orientation to the drain is irrelevant, but in both showers, our plumber had to reconfigure the drain lines to connect the linear drains. The rough-in for the smaller shower was straightforward: Leaving the center bay open for the drain stub, we installed 2-by vertical blocking to the web of the joists of the outer bays. These verticals support horizontal blocks between the joist flanges **(3)**.

In the larger shower, where the linear drain runs parallel to the joists **(4)**, the installation was a little trickier. As luck would have it, one of the existing I-joists was centered smack-dab in the middle of the new drain location. With the subfloor removed, we were able to cut out the offending joist and fish in a new one from above. Luckily, there were accessible bearing partitions in the finished basement below to pick up either end of the new joist. Now the old joist (minus a center section) supported only the drain.

Integrating the Fin Pan. The Fin Pan TI-ProBoard structural underlayment is available in 8- and 12-foot lengths, each 12 inches wide. (It comes in a kit that includes the central drain, which we discarded.) The panels can be cut to length with any type of saw, though the Fin Pan technical reps recommended cutting it with a wet saw to limit the number of glass fibers released in the air **(5)**. The narrow panels have interlocking edges that slide together—they don't overlap. The strength of the panels comes from their ribbed profile **(6)**, which interlocks with the mud base.

To install, we cut the panels to length and trimmed the last panel to width, then slid the assembled pan base under the drain flange and fastened it to the joists **(7)**. Panels are fastened to the framing with proprietary screws, which are corrosion-resistant and have large, pan heads **(8)**.

Bathroom floor. Because we couldn't add thickness to the subfloor, our tile sub, Jean Marino, advocated for installing an uncoupling membrane called Permat, by Blanke Corp. (blankecorp.com), over the subfloor. She had reservations about tiling directly over the existing single layer of Advantech subfloor, and Permat is designed to add stiffness, reducing deflection that can crack a tile job. It's not a waterproofing membrane, but it's laid into a bed of thinset, and then its open mesh is filled and floated with more thinset **(9)**. It only adds about ⅛ inch to the thickness of the tile base, which would still allow her to match the new tile to the existing oak flooring **(10)**.

Mortar bed. Jean agreed to work with TI-ProBoard and the linear drain components, but only if she could add reinforcing glass-fiber to her mud base mix. I checked with the Fin Pan rep to see whether this would compromise the system in any way and was given the go-ahead. Jean taped off the linear drain and protected the adjacent floor with a tarp, then sealed the perimeter edge of the shower base with Laticrete 9235, a black, liquid-applied membrane (laticrete.com). Next, she made tapered screed sticks to establish the ¼-inch-per-foot drainage slope **(11)**. She made a stiff mix of fiber-rich mud, packing it in to interlock with the TI-ProBoard ribs. To finish off, she screeded the mud to the slope of the sticks, then pulled those out and filled in the gaps.

Shower waterproofing. For the shower-bed waterproofing, Jean used Aqua Shield membrane, also made by Blanke **(12)**. This


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system includes proprietary inside-corner pieces, which Jean installed before cutting the reinforcing fabric to include a 6-inch vertical leg up the side and back walls. For added moisture protection, we ran the Aqua Shield 24 inches out beyond the shower drain. I would have liked to have done the entire floor areas in both baths with Aqua Shield, but the budget didn't allow for it.

With each floor done, Jean installed Durock backerboard **(13)**, double-checking as she went to make sure the drop-in tiled drain cap still had proper clearance **(14)**. To complete the waterproofing in both showers, she applied an approved mesh at the seams with thinset, then began waterproofing the walls with the Laticrete 9235 **(15)**.

FINISH TILE AND GLASS DOORS

For the larger-shower walls, the client chose a rough, tessellated tile, which is geared more toward a decorative application than to a heavy-use area like a shower. This was a problematic choice, as it's impossible to grout or to clean, and its highly irregular surface provided a poor base for mounting the clamps and hinge plates for the glass door. Because we couldn't guarantee a proper seal at the valve escutcheon, we did persuade the client to use the same 12x24 tile being installed on the floor for the wet wall. For the small-shower walls, the client chose a glass mosaic tile, which looks beautiful but has a tendency to crack when drilled for hinge-plate screws—posing an added challenge for mounting the glass door they chose.

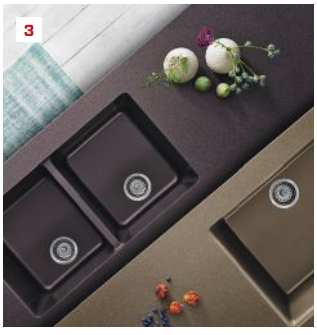
Drain cover. The drain cover comes in two styles, a standard metal top grate or a tile-in cap, and the client chose the latter. It's a stainless steel tray with fixed metal feet that stand passively in the drain channel, making it easy to remove for occasional cleaning. The cap tray has raised edges to contain the tile, which gets installed in thinset and grouted **(16)**. Outside the drain, it's critical to install the tile dead-flush, and eliminate small surface voids that would allow water to seep under the door sweep, which acts as a kind of "squeegee" that must seal tight against the tile.

Glass enclosure. With the tile work complete, our glazing sub, Orny Beltrame, of The Glass House, made laser-guided measurements of the two showers. From these, he cut two doors and side panels in ⅜-inch-thick glass, then shipped the pieces out for tempering. All told, this required about a four-week lead time.

On site, Orny and a helper started with the larger shower, first bedding a stainless steel U-channel in silicone and securing it with stainless steel screws to receive the sidelight at the floor **(17)**. He then secured each sidelight to the wall with two stainless steel mounting brackets from C.R. Laurence Co. (crlaurence.com). Orny managed to install the mounts plumb and level on the irregular tile with the help of epoxy filler, screwing into the 2-by blocking buried in the wall. Finally, he hung the glass doors on two heavy-duty stainless steel double-acting hinges, also from C.R. Laurence Co. **(18)**.

Dave Holbrook is an estimator and project manager for Deborah Paine Inc, in North Truro, Mass., and a JLC contributing editor.

BY LAUREN HUNTER



1. Garage Door Opportunities

Pella has added garage doors to its product lineup—in more than 300 styles, ranging from carriage house to traditional. The doors are available in the wood Architect Series; the Pella series (steel, aluminum, and vinyl); and the steel Encompass by Pella series (shown). Features include heavy-duty hardware and quiet-operating nylon rollers, energy-efficient insulation options, and SafeShield hinges and brackets. Starting prices for 8-by-7-foot doors with no windows range from $350 for Encompass by Pella to $3,000 for the Architect Series. pellagaragedoors.com

2. Thermostat to Sing About

To accommodate families' complicated scheduling, Honeywell has introduced the Lyric thermostat, which uses geofencing to connect with family members' smartphones. When all connected phones leave the sensing area, the thermostat enters energy-saving mode; it turns back to heating or cooling mode when a smartphone re-enters the geofence. A Fine Tune feature factors in indoor and outdoor temperatures, humidity, and weather. Users can also manually manage temperature settings. Pricing starts at $250. lyric.honeywell.com

3. Sanitary Sinks

Schock has enhanced its Cristadur and Cristalite+ sink collections with a new, non-porous finish. The patented ProHygenic 21 surface creates a barrier that's hostile to bacteria, making the granite composite food-safe and easier to clean. Prices range from $315 to $1,315. schockamerica.com

4. Filler Up

Two distinct styles make up American Standard's new collection of contemporary tub fillers. A sculptural square model complements the brand's Berwick and Times Square collections; and the more elegant, rounded model pairs with the Serin, Studio, Moments, and Green Tea collections. Both tub fillers feature a hand shower. Installers will appreciate the 360-degree rotation capability at the base, allowing the tub fillers to be positioned in any direction, even after rough plumbing is installed. An adjustable level feature allows installers to accurately level the unit even on an irregular mounting surface to ensure perfectly vertical installation. Pricing starts at $1,100. americanstandard.com

5. White Hardware

GRK Fasteners has introduced screws for white cabinets. The #8 screws—in lengths from 1 1/4- to 3 1/8-inch—have a dull finish that blends in with white cabinet frames and won't chip while being driven. Hex-drive heads help prevent stripping; W-Cut threads reduce friction and torque; and Zip Tips don't need to be predrilled. Pricing ranges from $7 to $13 for 100-count Handy Paks, or about $52 for higher-count Pro Paks. grkfasteners.com

6. Reworked Wall Assemblies

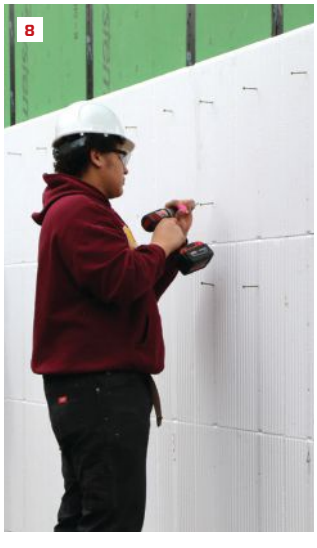
BASF combines building-envelope solutions to create its multilayered HP+ Wall Systems. Available assemblies use BASF products such as Walltite insulating air barrier, Neopor graphite-enhanced rigid foam insulation, and Enershield fluid-applied barrier. Each assembly is designed to have more than 135% greater design capacity than a wall with standard framing with OSB and full sheathing. Delivering up to R-34 in 2x4 construction, the HP+ Wall System can reduce lumber content by 25% and eliminate the use of plywood or OSB sheathing. basf.com

7. The Thick of It

The new Glenwood shingle from GAF is the industry's thickest triple-layer asphalt shingle, for a wood-shake look, but at a lower cost. The shingles carry a Class A fire rating, which wood shakes can't offer. StainGuard protection helps prevent algae from discoloring the roof, and DuraGrip Adhesive seals each shingle tightly, reducing the risk of blow-off. A lifetime limited transferable warranty offers non-prorated material and installation-labor coverage for the first 10 years. Pricing will vary. gaf.com

8. Continuous Insulation Panels

InSoFast EX 2.5 Continuous Insulation Panels integrate components of an insulated wall assembly into easy-to-install interlocking panels. Closed-cell, injection-molded EPS panels are co-molded with 16-inch-o.c. high-strength polypropylene stud framing that can be nailed, screwed, or glued and that reduce thermal bridging while providing solid attachment for drywall, and exterior finishes. The self-flashing seal requires no taping and won't dry out, crack, or change shape over time. Built-in drainage channels make the material suitable for below-grade installation. Panels measure 2 feet by 4 feet by 2 1/2 inches thick and feature horizontal and vertical channels for electrical or for installing over existing conduit. Volume pricing ranges from $1.84 to $2.99 per square foot. insofast.com



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9. Putting on Blinders

Therma-Tru's cordless internal blinds now allow for one-handed operation, and a new privacy bar covers the gap between the ends of the blind slats and the edge of the glass to block visibility into the home and reduce sun glare. Designers can also order the blinds with Low-E glass. Available in full- and half-lite styles, the Energy Star-qualified Low-E internal blinds can be added to Fiber-Classic mahogany and oak, Pulse, Smooth-Star, Profiles, and Traditions product lines for doors and sidelights. Pricing will vary, but an upgrade to internal blinds costs about $200. therma-tru.com

10. Weather Channel

Balancing breathability and water protection, Fortifiber's WeatherSmart Drainable weather-resistive barrier (WRB) has a perm rating of 15 and channels liquid away from the wall with better than 95% efficiency, says the maker. Use the WRB behind most claddings, including fiber cement, brick, vinyl, and wood siding. Made from spunbonded polypropylene fabric with a non-perforated, breathable polymer layer and embossing for drainage, the clothlike, nonwoven, UV-stable material resists tears, abrasions, and punctures, and also provides an air-infiltration barrier. WeatherSmart is priced in line with other premium housewraps. fortifiber.com

11. Panel Discussion

Identify the panels you need for your projects with help from Columbia Forest Products' new Plywood Panel Builder. Contractors can point and click to select from options including eight core types; 11 panel thicknesses; 100 species, six grades, and four cuts for face and back; four face matching choices; and four factory-applied finishes. The free tool doesn't take the place of a formal product order. columbiaforestproducts.com

12. Vertical Leap

CertainTeed's latest Board & Batten Vertical Siding is a 7-inch profile with a 5 ½-inch flat face. The siding emulates cedar boards and has a woodgrain finish, a 0.52-inch thickness, and the ability to withstand hurricane-force winds. Mix and match the low-maintenance profile with any horizontal vinyl panel combination and with CertainTeed's Decorative Trim and Vinyl Carpentry accessories. The 7-inch Board & Batten is available in 22 colors, including 10 new darker shades comprising a durable capstock with PermaColor technology. Pricing will vary by region. certainteed.com

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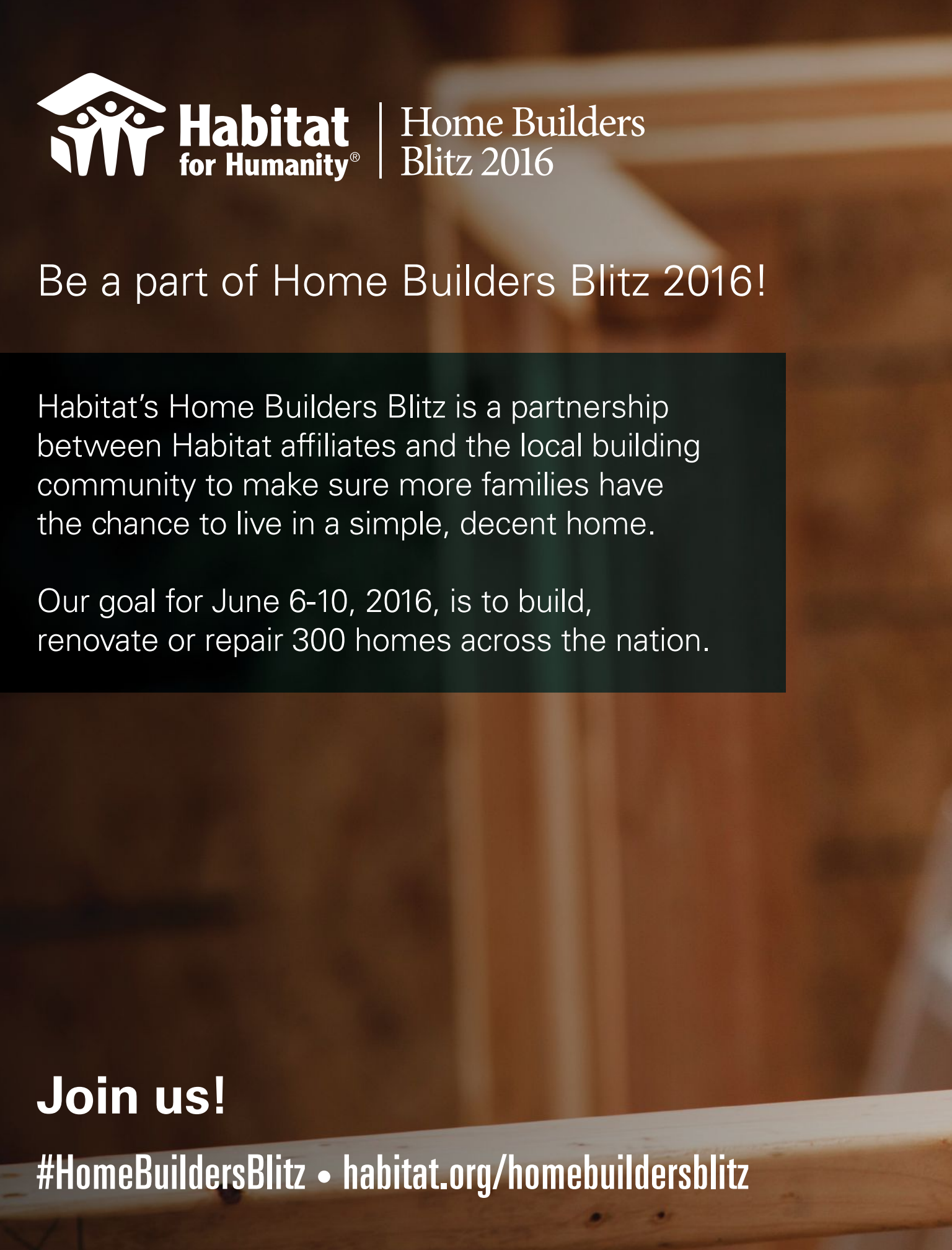
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BY TIM UHLER

Photos by Tim Uhler

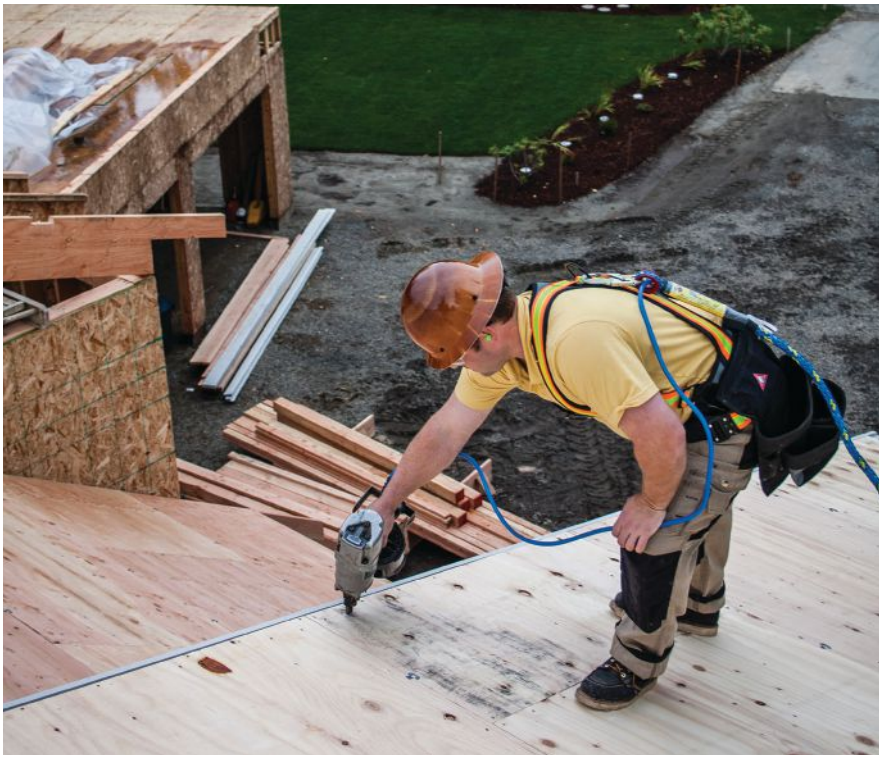
Practical Fall Protection

The company I work for has had no major accidents (beyond a few stitches here and there), and we are proud of that. That said, we didn't exactly go out of our way to use ropes and harnesses when they first became required.

Like other contractors who comply with OSHA fall protection standards, I've had to ask myself: How am I supposed to compete with crews that don't use fall protection? It's expensive to set up staging and time-consuming to rig nets, so we usually opt for lifelines and harnesses. Still, compliance has taken a lot of adjustment.

Over the last few years, I've read many articles about OSHA fall protection requirements, and I've taken an OSHA 10 class. I also work regularly as a volunteer on construction projects where many of the other volunteers do not work in the trades and have very little or no experience in construction. This has given me a fresh perspective on safety. And I find that as I'm getting older, I appreciate how quickly life can change for the worse.

All of this experience has done a lot to break down our resistance to fall protection requirements. But in addition, what's been key was finding comfortable equipment that works. To aid that endeavor, I contacted a few manufacturers to review some of their latest fall-protection products. Here's what I learned.



FALL-ARREST HARNESSES

There are a ton of choices, at many different price points. Here I'll review a few basic harnesses, as well as some of the more "deluxe" gear that works for us as framers. But I encourage everyone to scout out the market to find what works for his or her particular trade.

Super Anchor Deluxe. This harness has been designed to be comfortable and functional. It sports attached nail bags, which is nice, but the bags are pretty typical and not necessarily "framer specific." (I found them to be too deep, and it was difficult to put my tape back into its pouch, which slowed me down considerably.)

The shoulder and the back straps are extremely comfortable. They are padded, and the straps don't have any edges, as they do on the basic harnesses. In addition, the straps are designed not to absorb too much moisture—a big advantage in wet climates like ours or in hot climates where the harness could absorb sweat and begin to stink. All the connections are quick-connect, and replaceable webbing keepers hold the extra length of strap against the frame of the harness.

This harness has nice features to aid in inspection. It has tags that show where to inspect for wear and also a tag behind one of the straps where you can keep a record of the inspections.

I enjoyed wearing this harness. The only complaint I have (besides the nail bags) is that the chest strap can be adjusted only narrower or wider; it can't be adjusted up or down. After a couple of hours, I found that my nipples were sore (and as I complained, my crew laughed at me). If I could adjust the chest strap, I would use this rig and just replace the bags with the style of Occidental bags that I like.

Online, this rig sells for $360. This is a lot to spend, but look at it this way: It keeps you safe and doesn't wear out as fast as boots, so you will get quite a few years out of this rig. You can buy the ultra hi-vis version without the bags for $274.

Werner series. Werner is known for making ladders and scaffolding, but entered the fall-arrest-harness market a few years ago. They offer a whole line; at the lowest price point is the LiteFit harness, which can be purchased as part of a kit for about $120 or alone for about $50. The buckles are a slotted pass-through style that is virtually idiot-proof, and the harness has five adjustment points. I found this to be a very comfortable, light harness. Putting my own nail bags over this harness didn't cause me any problems.

A step up is the Blue Armor 1000, which has five-point adjustment, slotted pass-through buckles, and a pad under the back D-ring. The harness alone sells for about $70. This model also has what Werner calls "Web Alert" webbing. As it wears, it will reveal red fabric under the blue that indicates the level of wear or damage—a nice feature that makes the webbing easy to inspect. I enjoyed wearing this harness, too. It's easy to take on and off, and easy to adjust. I got used to wearing it pretty quickly.

The top of the line is the Blue Armor 2000. Like the 1000, this harness features the Web Alert webbing. It has a quick-connect chest strap and slotted-tongue connections at the leg straps. In addition, it has a back belt with two D-rings and a removable work belt that you can add nail bags to. The shoulder straps are padded, as well. The harness alone retails for $145. This rig is comfortable enough, but I didn't like the feel of the back belt because it is too tall for me.

Exofit Nex. This is the most feature-rich of all the harnesses we tried. The shoulder and leg straps are extremely well-padded. The shoulder pads have a protective covering, so the straps don't wear if you carry things on your shoulders. The leg straps are adjusted using quick-connect buckles that can be locked. The same style buckle connects the chest strap too.

The rear D-ring is spring-loaded so that it points "up" toward the head. This makes it easier to click in your lifeline, especially if you aren't very flexible, like me. The torso straps have "revolver"-style adjusters, where you twist a knurled knob to lengthen or shorten the strap, and then the adjuster locks the strap in place.

The webbing is water repellent and the shoulder pad has straps for storing the hook on certain styles of lanyards. This rig also

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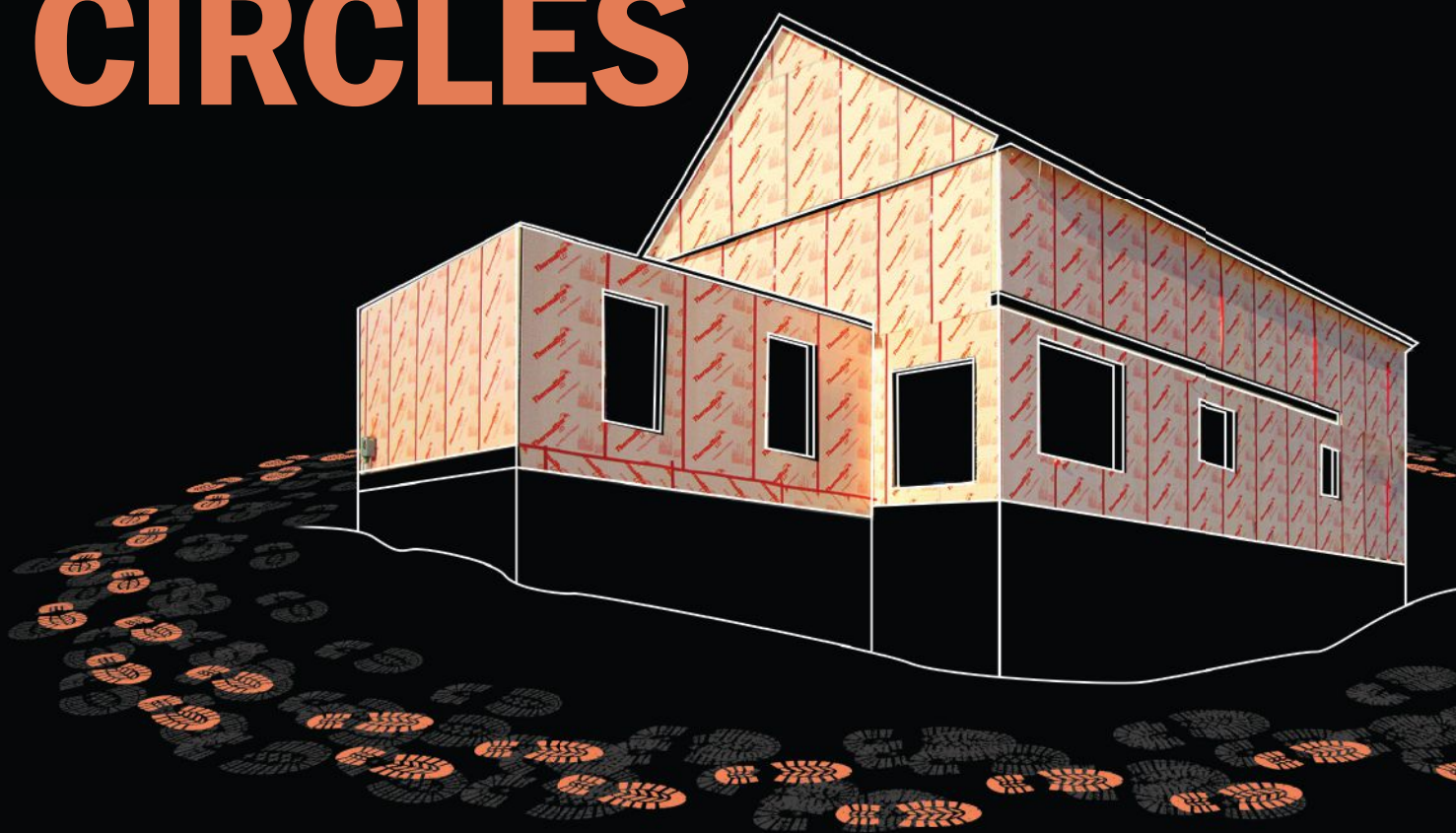

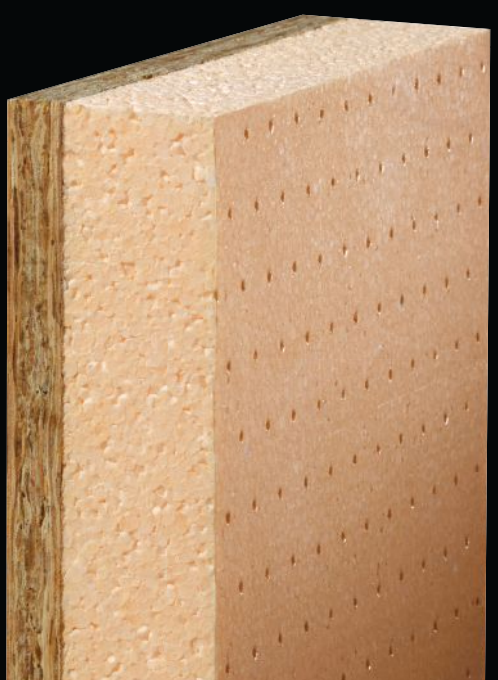

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has "trauma straps." If you do fall, you can put your foot into these straps and lift yourself up to relieve the pressure. This helps relieve circulation problems caused by dangling until help arrives.

To help keep track of inspections, this rig is fitted with an RFID device so that inspections, assignments (who has what harness), and inventory can be done on a computer.

With all of these features—and a hefty price tag ($360)—is this a harness worth buying? One guy on my crew really liked this rig and felt it was very comfortable. I loaned one out to a female friend of my mine who wore it roofing, but she had the same complaints I did: We both found that the fit was comfortable, but the trauma strap interfered with the nail bags. I didn't like the extra pockets on the shoulder straps. Overall, this rig felt big and obtrusive.

In my opinion, in order for a harness to be worn, it needs to be nearly invisible in use, or guys will just get bugged and not want to wear them.

DBI Sala Delta. This rig looks pretty basic, but it has a lot of features packed into it. The rear D-ring is spring-loaded—to make it point up and make it easier to clip a lanyard to—and the webbing is water-repellent with rig stitch indicators and DBI Sala's I-Safe identification tag (RFID). I like the tongue-buckle leg straps because they make it easy to put the harness on and take it off—even when I'm wearing gloves.

What I don't like about this rig are the vertical torso straps, which adjust by using a "Revolver" mechanism. Twist one way to tighten the straps and the other to loosen them. They work fine, but are a problem for me because I need to wear nail bags over the harness—and the bags make the Revolvers rub. I like everything else about this harness, and if I did not need to wear nail bags, I'd be happy to wear it every day. The Vest Style Harness is available in sizes from extra small to 3X-large and retails for about $100.

Protecta Pro. I have come to love simple harnesses and this is a very simple harness. All of the buckles are pass-through, so it is easy to use, and it is low profile. This is also a lightweight harness, because there are no bells and whistles. I found it online for about $50.

WHAT DO I BUY?

While I loved the Super Anchor Deluxe harness rig (with tool bags—like Occidental pouches—that are more to my liking), the chest strap couldn't be adjusted to fit my stature. Still, of all the harnesses, it is perhaps the most comfortable and simple to use. In addition to that rig, I recommend the Werner Blue Armor 1000. That harness was easy to put on and take off, comfortable, and brightly colored; in addition, wearing my Occidental framing bags over the harness gave me no problems at all.

KEY ELEMENTS

Complying with fall-protection rules can be difficult if you can't find a safe anchor point. In some situations, it's nearly impossible to properly rig a lifeline. This is particularly true for us when we're rolling trusses. Fortunately, I recently discovered a solution—Super Anchor's Safety Bar.

The Safety Bar is very easy to set up: Just slip it over the top chords of three trusses, pop in the detent pins, and then put a couple of nails through the ⅛-inch holes in the bar to keep it from sliding. As long as the trusses are braced, you now have a legal tie-off point for two workers (provided neither weighs more than 310 pounds). As a bonus, the bar holds trusses on layout, too. For our crew, I think we'll buy another bar or two the next time we frame a big house. I looked online and found them for sale for between $280 and $380. That's not cheap, but it's a whole lot less than the fine we face for framing without proper fall protection.

One final suggestion: Wear your harness over Duluth stretch work pants. They're comfortable and don't bind at all. Trust me, a harness is much more bearable with these pants.

Tim Uhler is lead framer for Pioneer Builders, in Port Orchard, Wash.

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BY JLC STAFF





A Blend of Old and New

"The house as a system" is a modern concept. But long before that phrase was coined, houses functioned as systems—or else they failed the test of time.

Husband-and-wife team Robert LaPorte (builder) and Paula Baker-LaPorte (architect) are bringing one such time-proven system into the 21st century, making modern homes using ancient systems—such as a wall assembly with natural clay and straw infill, mixed on site and packed into Larsen trusses wrapped around a timber frame. In scheduled workshops, the couple teaches the method to owner-builders and professional contractors alike (website: econesthomes.com).

Says Robert LaPorte: "Clay in a wall, being hygroscopic, can handle all the moisture without the need for a vapor barrier. The inclusion of clay is the best insurance I've discovered for preserving wood in buildings." Historically, says LaPorte, "Half-timber framed buildings right across Europe were infilled with a mixture of clay and straw. They're everywhere. It's a common formula."

Using Larsen trusses, says LaPorte, lets "any mainstream builder wrap his head around this with his existing tool set. We streamlined a way to quickly and efficiently create a 12-inch-thick wall that's natural, that's healthy, and that can be adopted by any builder with a day or two of training."

Photos: EcoNest

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