

JLC

The Journal of Light Construction

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ON THE COVER: Aron Jones of Big Dog Construction, in Grand Manan, NB, checks for square on an ICF monopour foundation before concrete is pumped in. Photo by Aron Jones. See story on page 35.

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Training the Trades

Choosing and Using Your First Specialty Tool

by **MARC FORGET**

When I started out in the trades the gulf between the tools I had and the tools I thought I needed was vast. Added to that was the fact I didn't make much money in a starting job. So, I needed to pick my spots in what tools to invest in with my limited resources. I divided my needs into categories: tools to measure and mark material, cut material, fasten that material, and finally, tools to take material apart. Once I had enough of those items to get by in the jobs I was tasked with, I was ready for the next category: tools to shape material. The first tool I bought to do this last task was a laminate trimmer, also called a palm router or trimming router.

My intent in this article is to share with new tradespeople how to assess their tool purchases as their skills and needs advance. I've kept in mind that budgets, unlike tools available, are limited. And I'm using the example of my first specialty tool, the laminate trimmer, and sharing some basic tips on what to look for and how to use it.

The categories of tools I just listed off could be applied loosely to any trade. In my case, I was starting out as an apprentice carpenter working on renovations and some custom homes. So it was in that environment that my choices for tools evolved. If you are working on a roofing crew or a crew that specializes in framing, then the some of the items you'll need will overlap (a tape measure for instance), but there will also be items that aren't as interchangeable (like an oversized circular saw). The idea is to let your purchases evolve organically with the work you are doing by choosing

tools that make the work better and/or easier. Investing in a biscuit joiner, no matter how neat it looks, is not going to help you in roofing or framing. As my grandmother used to say, "You can't have everything, where would you put it?"

With tool options (as with most things these days), we are overwhelmed with both choice and marketing messages, so the first piece of advice is to keep your choices practical. That way you won't be left with an under-used tool that represents stranded money. The next piece of advice, which is repeated often, is to buy the best tool you can afford. Here is where discipline is important. The \$300 hammer is the example I often come to. Yes, it's lighter and very cool, and in many ways the best offering for the tool. However, putting that much of your capital here to start may leave you short on all the other things you'll need. Ask yourself honest questions. Will this improve my work? Will I use it often enough to make me money? Will this make the work easier? If those answers are yes, then look at the price points and features of that category. Then choose the best you can within your budget.

Choosing My First Specialty Tool

In the case of the router, I was starting to do more door and hardware work. Cutting out hinges or finger pulls using hand tools took too long. I was also running into jobs where a consistent eased edge, sometimes with a bit of detail, was required for half-wall caps. Using the old abused company router was a stopgap but did not produce



Still going after 20 years, this router has never touched laminate but has machined countless doors. It's simple and it works (1).

great results. My skills had grown to where I could do this work, and now my tool library had to grow to allow me to do more of it and better.

I could have purchased a full-sized ½-inch router and had greater power and cutting bit options as well as the ability to do hinge recesses and the like. But my job was not growing in that direction. Also, my skills were not there yet. Investing in something that I was not ready to use to its fullest

PHOTOS BY MARC FORGET



Start small then build up as you need. A few bits will do most jobs (2). Setting the depth for the hinges? Just use the hinge as a guide (3). Be sure to do a test run before touching finish material.

could result in frustration and a poor outcome. I didn't want to spend more money on more tool than I needed for the foreseeable future, and the work I was doing was not in a shop with space for a lot of setup.

I needed something smaller and more portable, something more suited for onsite or in-place work. The laminate trimmer with its 1/4-inch collet, one-handed operation, and modest cost made more sense for what I was doing and what I would be doing going forward.

There were four or five different manufacturers that made this type of tool, so I began comparing features and prices. This isn't a tool review so I won't go into the specific details of each model, and the information would be out of date anyway. (This was 2002 and cordless routers were not even on the horizon then!) The general factors though were good balance, soft start (a must), a good view of the cutting area, power, and then price. It would have been nice to have a built-in light on offer, but again this was a while ago and therefore still the dark ages (pun intended).

Some of the options I looked at were

more focused on cutting for countertop laminate and weren't versatile enough. Others were too expensive, well north of \$200, and I had a hard budget of under \$200. This left me with a Bosch model or a Ridgid, and while I liked the Bosch a little bit more, option-wise the Ridgid was good enough and was cheaper. The point here is that I made a compromise. This is not a bad thing if whatever you end up buying does the task. The best tool you can afford, right? The tradespeople you admire online didn't start with the fanciest tools. They learned and earned to a point where they could have the latest and greatest. Even then, in many of their cases (I know because I talk to a lot of them), the simpler cheaper tool they bought long ago is still the go-to for their work.

What could I do with the router I bought? Not much until I got a set of bits. Keeping in mind what I would be doing with the router, I purchased a small selection of profile bits (roundover, chamfer, and ogee), along with a couple of straight cutting bits. The other more expensive profiles could wait until I needed them and knew what I was doing.

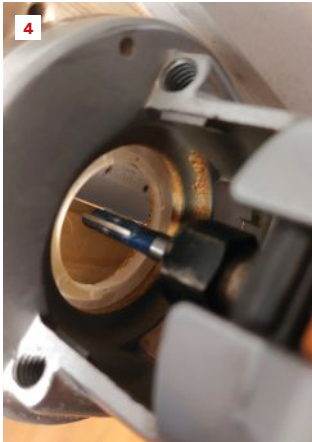
Using The Router

Since I'm using the palm router as an example of tool choice, I want to offer some tips for using it. First, the bit selected is placed into the tool and tightened into the collet (making sure nothing is plugged in or the battery is not in place at this time). Make sure this is tight—a loose bit will damage your work at best, or will fly off and damage *you* at worst.

Next, we set the depth. Let's take the case of recessing for a hinge. I take the hinge and set it flat on the router base and adjust the base until the amount of bit protruding equals the thickness of one hinge leaf. You can also do this with a sliding combination square, or in the case of a jamb or door that has a recess already, use that existing pocket to line up the tool to the depth needed for its new matching side. Note that I am still not connected to power.

Now we power up the tool and run a test on a piece of scrap, confirming with the hinge that the result will be flush. Safety glasses and ear protection are highly recommended. If you are doing a profile this same advice should apply. Test first, as a small change in depth will change the result

Training the Trades / Choosing and Using A First Specialty Tool



A good sight line of what you are boring is a must (4). Test runs and a sharp bit are vital. Otherwise, the profile is too deep or can burn (5). My more expensive kit rarely gets used, and it wasn't purchased until the old one gave me enough confidence and money (6).

a lot. When doing the test, and also when doing the actual work, make sure the cutting bit is not in contact with the workpiece when you turn on the power. The edge of the tool base can be held firmly on the work surface, but if the bit is touching at start-up you can get burning or the tool will jump back at you. The "hold firmly" suggestion is because, as the tool spins up, the torque it generates will want to twist the tool in your hand.

On your jamb or door you will have marked the outline of the hinges (after measuring where they need to be located). I do this using the hinge as

a template and marking it in pencil. I then go over this line with a knife to help prevent tear-out while routing. Take small passes, about half or less the width of the bit, and work up to the line you want. If you try to push the tool to take out full-bit-width swaths of material, you can bind the tool or overshoot your marks. Don't be afraid to check with your hinge as you go: If you started small you can still correct any depth issues and go back. Work in small passes left to right until you are done. The left to right is important, particularly if you are new to the tool, because of the direction of spin of the bit. Going *with*

the spin, right to left, can cause the bit to grab and pull itself along the material, potentially going further than you want and burning the wood. This goes for doing a profile on an edge too. Travel around the workpiece counterclockwise or the tool will want to pull you along.

Minor note: If I put the tool down or am away from it while I hang that door or install the workpiece, then I always double-check the depth setting before I start a new set. A bump, or just someone moving my kit out of their way, can change the setting. It's rare once everything is tightened down, but I have had it happen.

Once I got comfortable with this type of uncomplicated task with a simple tool, I was able to move on to more complex tasks, using rabbeting bits for shelves or boxes, V-groove bits for details, and flush bits with a bearing guide that follows along a template. The tool did not change, just the work I could do with it. But it started with keeping things simple and affordable. The work described here and the jobs that came after would not have been noticeably improved by a fancier tool. It was learning to use what I had that improved my skills and the outcome.

I understand the urge to get the best, the newest, and the tool you saw in the latest reel. However, I have never seen someone buy the latest thing and then turn into a master craftsman. If you talk to any one of the people who contribute to this magazine, I am 99.9% sure they will tell you the same. My 20-year-old router has made me more money than the \$110 it cost—many times over.

When you just are starting out, grow your tool kit to what is reasonable for the work you do, the pay you make, and the skills you have. Overpaying now or chasing hype will only leave you poorer and resentful of the trade you chose. So don't get hung up on what you have; work more on what you can do.

Marc Forget is an associate editor at JLC.

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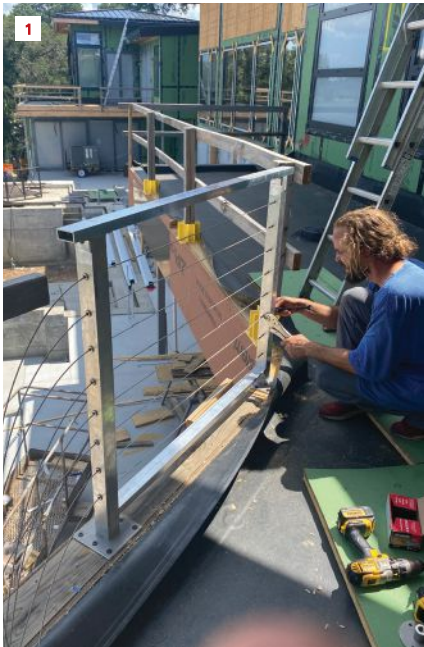
Durable Rooftop Decks

by RICK MILLS

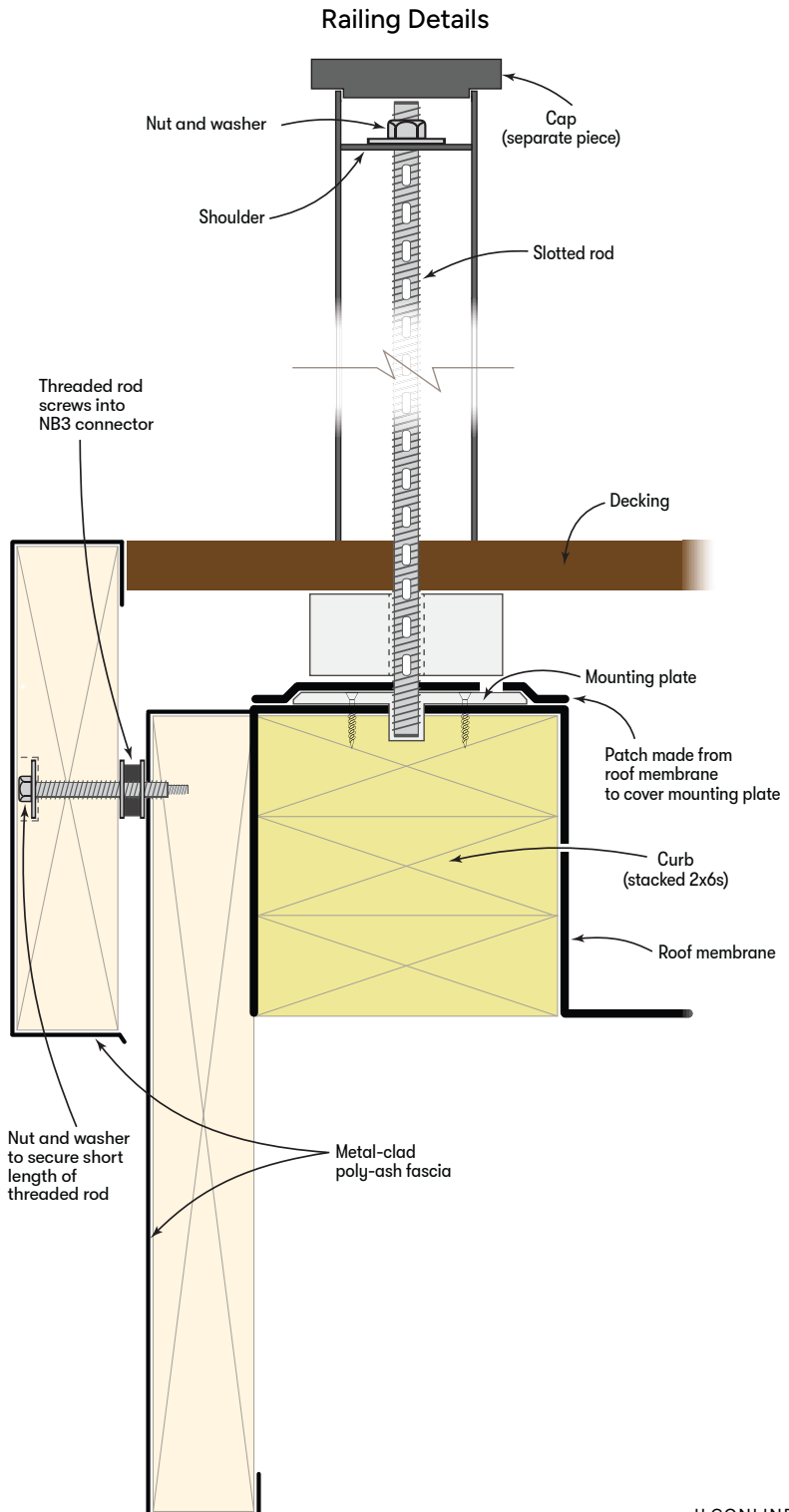
On a recent new construction project near Virginia Beach, the plans included three separate second-story porches located almost entirely over finished space.

During design development, the architect had originally specified glass railings that were sleek, aligned well with the home's modern aesthetic, and allowed for unobstructed views of the waterfront. However, after discussing with the clients the need to frequently clean the glass in a coastal environment, they chose cable railings instead.

The architect also called for a very clean fascia detail along the perimeter of the porches, which we had to decide how to approach. It's common in our area for decks over living spac-



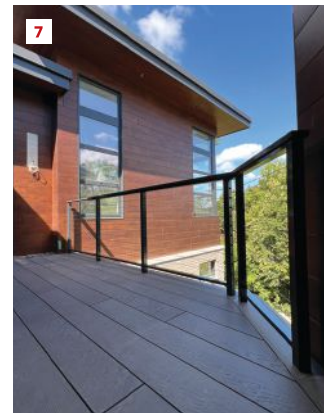
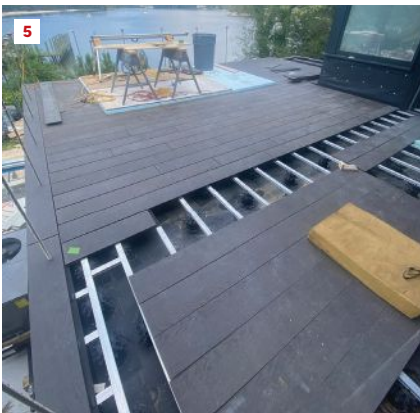
The railing specialist mocked up a section to test whether the fasteners from Nill Building Solutions would work as intended.



PHOTOS BY RICK MILLS; ILLUSTRATION BY OLA KWATKOWSKA



Code required a scupper in the curb opposite the center drain (2). The pedestals and rails are set so the decking will be flush at door openings (3). Note the cylindrical spacers (4) at the base of the post rods to support each post when the rods are tightened down.



Composite decking was installed over the guard post rods (5) before the railing contractor slid aluminum railing sections over the rods (6). Once the nut on each rod is tightened down, a graspable top rail and cable completes the guard rail (7).

es to have a pitched membrane roof sloping toward the outside with the deck on sleepers installed level and a small space behind the fascia to allow for water to flow out. However, we have seen on other projects with this drainage strategy that water constantly flowing over the side created a “crusty” buildup in that space from dirt and debris. This creates frequent maintenance issues that we wanted to avoid.

Knowing the high expectations for a project of this caliber, we collaborat-

ed with the architect and our roofer to design curbed roof areas for each porch. Water would flow to a center drain, eliminating the need for drainage along the porch edges.

Selecting a Railing System

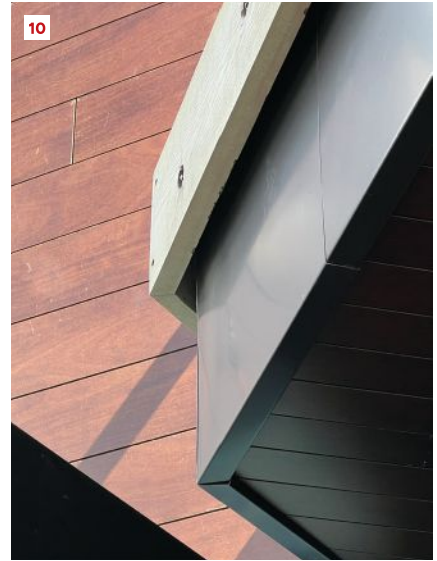
As I dove into the details for the available off-the-shelf cable railing systems and had some back and forth with the clients reviewing photos of different style installations, we quickly realized we needed help. We decided to bring in a local railing fabricator who we’ve

worked with for years to build the rails. His deep experience doing cable railing was a better fit than us trying to do this in-house.

One of the details that we wanted to avoid was having a visible mounting plate on the deck surface. Many systems have a standard “bolt down” baseplate attached to the bottom of their posts. The clients objected to photos of this style of railing; they were looking for a more refined look.

In the high-end building market, aesthetics is as important to clients as

On the Job / Durable Rooftop Decks



A crew member installs a piece of polyash for the first layer of fascia using (8). This piece was capped with aluminum before a second layer of polyash was installed (9) over spacers that separate each fascia layer (10) to provide drainage.

keeping water out of the building is for us. We had to find something with a clean, aesthetically pleasing attachment that we could also reliably flash to keep water out over the long term.

After a little research, I found Nill Building Solutions (nillbuildingsolutions.com), a company that offers a range of building components that provide robust methods for sealing out the elements. Specifically, they offer a guardrail mounting system that uses stainless-steel plates that connect to special stainless-steel threaded rods with slots to allow the cables to pass through them. When the rod is tightened with a nut, it creates a compression connection that stiffens each guard post, with minimal penetration through the roofing membrane.

Before committing to this system, we needed to make sure our fabricator was on board with installing it—he had expressed skepticism about how well the rods would work to create a safe and sturdy railing. Nill Building Solutions generously sent us some sample plates, connectors, and rods, which we used to create a mockup that

proved to be remarkably rigid. Feeling confident to move forward with this system, we finalized our post layouts and ordered the needed materials.

Guard Post Mounting System

The stainless-steel baseplates attach to the curb over the roof membrane (we were using EPDM, but the same would apply to TPO, bitumen, or the like). Before the roofing membrane and plates went down, however, we needed to mark out our guard-post layout and drill a 1 ¼-inch recess into the curb at each post location to allow space for a threaded connector that accepts the rod. After the membrane was installed over the curb, we then marked our post layouts prior to securing the baseplates with 2 ⅞-inch Headlok screws.

Once the baseplates were secured, the roofers came back to install a “patch” over each plate. We then cut a ¾-inch hole in the center of each baseplate into which we inserted the NB3TBD threaded “port”—the connector that the threaded rod screws into. It’s important to make

sure that sealant is applied around the port as each one is installed.

Decking System

The deck itself needed to be planned and executed in conjunction with the railing. We selected a system from Eurotech that uses pedestals to support an aluminum substructure that supports the decking. This system proved very easy to install. The pedestals allowed for lots of flexibility to accommodate the slope of the roof deck and the step up for the curb. The aluminum rails mate seamlessly with the pedestals and make for a dead-flat surface that feels exceptionally stiff.

One additional part we needed from Nill was a custom stainless bushing, or spacer, that we used to make up the difference between the curb height and the decking height. After we verified the desired elevation of the finished decking at the doors, we erected the Eurotech substructure. This substructure cantilevers over the curb and the bushing provides support beneath each guard post between the cantilevered decking and the top of the curb. Having this solid support ensures good



A view of one exterior porch shows the finished railing and clad fascia.

bearing for each post and allowed us to tighten the posts down without distorting the deck boards. With that solid base, we were able to get good compression when we tightened down the nut at the top of each threaded rod (where the stiffness of the posts comes from).

Once all of the rods were in place and the decking installed, our fabricator returned to take final measurements for each section of railing while also checking for any minor height discrepancies. Those slight inconsistencies were handled by adding or subtracting material at the bottom of each aluminum post to ensure that the bottom and top rails ended up aligned straight and level.

Finish Railing

The rails were designed in sections, with each section having a bottom rail

and a top subrail, which will be capped with a finished top rail. Each section was slipped over two posts and tightened down before the finished top rail was added. This finished rail was slightly wider than the posts and the subrail, providing a graspable surface that also tied each rail section together.

A big advantage of this system is it can be removed down the road to re-powder-coat the post wraps and railings. Building in a coastal environment, we're aware of how quickly metals corrode, and we're always looking for ways to restore these materials in the future. A powder-coated aluminum product is better than a lot of metals but it's not immune to corrosion. Eventually we'll have to address this for our client. It would be no small task to un-install the railings and re-string new cables but at least none of the decking would need to be touched.

Drainable Fascia

One thing we hadn't planned for is a code requirement that a deck or porch with a perimeter curb and center drain must have a scupper to allow water to escape should the drain ever become clogged. This serves as a backup, or fail-safe, to prevent water from entering the house. The bottom of our door rough openings are below the top of the decking to achieve a flush look, so flooding could occur if the drains clogged. Our plumbers brought this to our attention when they came to connect the internal drains. Luckily, we weren't too far into the process to come up with a solution. We were able to cut a recess in the curb near each drain, which

we lined with EPDM to create the required scupper.

The last piece of the puzzle was figuring out how to hide the scuppers, as no one wanted to see the openings or have a notched fascia. We solved this by creating a separation between two fascia layers that surrounded each porch. The wider, inner layer could be notched and the outer layer could remain solid and cover the notch while water drained away between them (and likely, the drains wouldn't clog often, so the crusty buildup wouldn't be an issue). I had learned from studying the Nill Building Solutions catalog that they offer a part that allowed us to create a watertight standoff between the two fascia layers.

This part (NB3) has a lag screw on one end with a circular plate around which you apply a bead of silicone before installing it to create a water-sealed connection. The face of the connector has a 1/2-inch threaded port. We connected short pieces of stainless-steel threaded rod into each port, added a nut to act as a spacer, and attached the outer fascia board with countersunk holes that we pre-drilled before applying.

For the fascia material, we opted to use TruExterior (formerly known as Boral), a poly-ash trim board. Since we would be wrapping each fascia in metal, we needed a substrate material for both that wouldn't react with aluminum the way treated lumber can, and we didn't want to use ordinary lumber in case water ever did infiltrate the aluminum wrap.

We installed the outer fascia flush with the top of the deck board to cover the edge of the deck boards (and eliminate the need for a solid-edge board). When viewed from the ground, this retained the look for the all-black fascia—an important architectural statement on this house.

Rick Mills is a senior project manager for Jackson Andrews Building + Design, in Virginia Beach, Va.

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Making a Brick Repair Disappear

by JOHN CARROLL

After nearly a half century of building things, I still get a sense of pride when people notice and comment on the craftsmanship of my work. When I'm trying to blend a repair into an existing surface, however, my hope is that they can't see the work I've done and, thus, don't have much to say about it. Installing brick in this space where there had been a window is a case in point.

Running Down Matching Bricks

The first step in making a brick repair disappear is finding materials that match. For this job, we were fortunate to have enough leftover bricks from the original construction of the house. There's a lesson to be learned here: If you use bricks on a new house, save the leftover bricks. At the very least, keep records of the bricks used. This includes the name of the manufacturer as well as the name and product number of the brick.

On a lot of the repairs that my son and I do, however, there are no leftover bricks and no records of the manufacturer. This is a common circumstance

on older structures. On these jobs, we take photos of the existing brickwork, then bring the pictures to our local brick supplier and compare the photos to the samples they have. In addition to 3x4-foot sample panels erected outside their showroom, they offer portable sample boards, which have actual 1/2-inch-thick slices of the faces of each style of brick glued to a Masonite panel about 14x14 inches. After narrowing down the selection to two or three candidates, we bring the portable panels to our jobsite where we can compare them directly with the existing brickwork. These physical samples are essential because, in addition to matching the color, we have to match the texture and finish of the existing bricks.

We also have to match the size of the existing bricks. Standard, modern bricks are 7 5/8 inches long by 2 1/4 inches high. Brickmakers also offer oversized bricks that are 2 3/4 inches high. In order to get the courses to line up, you have to match the height of the new bricks to that of the existing bricks.

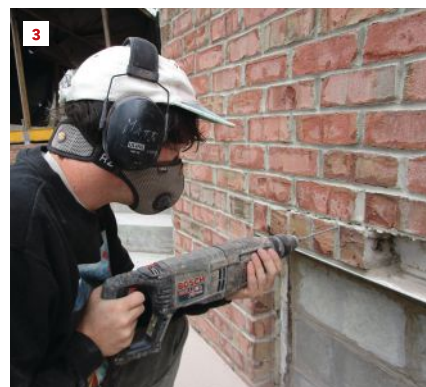
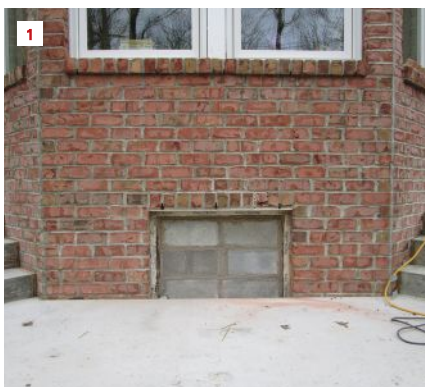
Matching the Mortar

Surprisingly, over 20% of the visible surface of a brick wall laid up with standard bricks consists of the mortar joints. The joints have a big impact on the appearance of the wall, and, for any repair, it's imperative to match the new mortar with the existing mortar.

The first challenge is to get the color of the mortar right. As with the bricks, it is very helpful to have a record of both the mortar manufacturer and the sand supplier used in the original construction.

If you don't have records, getting the mortar color right can be a tricky business. People sometimes dismiss this issue by saying, "Isn't all mortar just gray?" First of all, mortar is not always gray, and, secondly, there are numerous shades of gray (as any painter will attest).

Mortar can be dyed any color, but modern untinted mortar is usually some shade of gray. A lot of older mortars, on the other hand, tend toward a light tan hue. This hue has acquired the appellation "buff" and there are several manufacturers who offer buff mortars.



The contractor poured the porch and removed the window, and the author's job was to fill in the brick (1). Brick suppliers often have sample boards to help with selection (2). Using a rotary hammer drill to weaken the mortar (3) helps to remove the bricks with less effort.

On the Job / Making a Brick Repair Disappear



Removing the bricks resting on the lintel and at its edges allows for its removal (4, 5). The author finds no need to provide shoring if the opening is less than 5 feet and the mortar is sound. The brick is toothed out to allow the new brick to blend into the space (6).

Although my son and I usually use these buff mortars for repairs, they are sometimes specified for new houses by designers who like the soft tan hue.

My masonry supplier, Oldcastle APG of Durham, N.C., offers three different buff mortars which yield three different shades of light tan mortar. The shades of gray mortar also vary by manufacturer. A further refinement is that the manufacturers of masonry cement (the most common kind of mortar used), offer two types of mortar: Type S and Type N. Type S, which has twice as much Portland cement as Type N, makes mortar that is slightly darker than that made with Type N.

One of the difficult things about this process is the fact that you can't tell if the mortar you're using will match that in the wall until the mortar dries and cures. It takes several days for this to happen, and who has several days to wait for a mortar sample to cure? We don't; so, we keep samples of cured mortar in our shop. These include several samples of both buff and gray mortars. We also have a sample of mortar we made using one-half buff

and one-half gray masonry cement. To keep things simple, all our samples are made with the same light yellow masonry sand.

If you don't have the time or inclination to generate mortar samples, at the very least look carefully at the existing mortar and determine whether it's gray or buff, then buy accordingly. Gray versus buff is the great divide in mortar color. Get that choice right and you'll usually get an acceptable, if not perfect, mortar match.

Beginning Work: Removing Bricks

After running down the materials for this job, we needed to prep the area that we planned to repair. This required a surgical approach. We had to remove the lintel, then tooth out the brickwork on both sides of the opening. A wider opening might require shoring to support the brickwork above, but we knew from experience that no shoring would be needed for this 4-foot span.

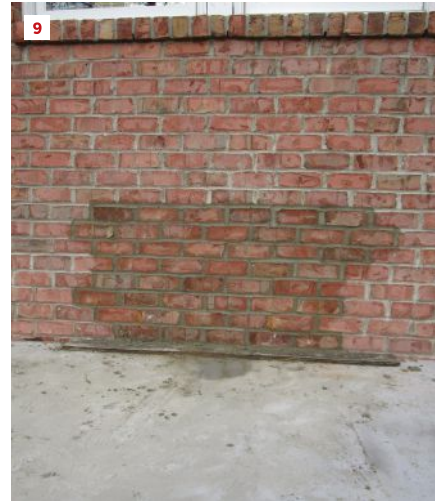
To get the lintel out, we removed the rillock course that rested on it, as well as a few bricks at each end. To avoid breaking neighboring bricks, we

used a rotary hammer fitted with a 1/4-inch bit. We drilled a series of holes to weaken the mortar joints and to break the bricks we wanted to remove. We've found that breaking the bricks into small chunks rather than trying to remove whole bricks reduces the chance of damaging adjacent bricks.

After removing the lintel, we toothed out the brickwork on both sides of the opening. Working from the top down, we continued to use the rotary hammer to honeycomb the joints and break the bricks we wanted to remove into smaller pieces. We used a handheld grinder and a cold chisel and a hammer to clean the final bits of mortar on both the underside of the horizontal course spanning the opening and in the toothed out areas.

Mixing Perfect Mud

For this job, we used Brixment Type S masonry cement mixed 3 parts sand to 1 part masonry cement. We had a cured sample of this mortar and it matched very well. We seldom mix a full bag of masonry cement because we rarely use that much within two hours, which is the time limit recom-



mended by the masonry industry. To get the right proportion of ingredients for this job, we filled a one-gallon bucket with sand three times and dumped it into our mixing tub. We mixed a half gallon of water into the sand, then mixed a gallon of Brixment masonry cement into the damp sand. This concoction produced a stiff mortar, which is what we wanted. Next, we added water a little at a time until the mud was just right (i.e., wet and mushy but with enough body to hold up the bricks as we laid them).

By making small batches with measured ingredients, we get mortar with optimal workability that dries to a consistent and predictable hue. We mix even these small, 3-gallon batches with a handheld mechanical mixer, the Collomix Xo6.

Laying the Bricks

After running down matching bricks and mortar, you have to install them correctly to make the repair disappear. Having mortar of the right consistency is essential, of course, but good troweling techniques are just as important. Because we have good habits of workmanship, my son and I don't smear mortar on the face of the bricks and we don't have to clean our brickwork after it dries. Rather than



While laying the brick the author makes sure to use a tuck pointer to pack the mortar joints solid, especially at the toothed areas and at the top course (7, 8). Until the mortar dries you cannot be sure the match is right (9). On this job the blending was invisible (10). This photo is not the author's job but an example of not following the steps he uses (11).

trying to use our trowels to fill joints where our brickwork meets the existing brickwork, we use tuck pointers. This way we can pack the joints full without slopping mortar on the face of the bricks.

After laying the bricks in straight, uniform courses that lined up with those on the wall and packing mud into the joints where necessary, we tooled the joints with a jointer that matched the joints on the rest of the wall. In this case, we used a concave jointer.

When we finished tooling the joints, we could see that our workmanship matched that on the wall. We had to wait several days, however, to see how well the cured mortar of our repair matched the rest of the wall. Fortunately, it turned out to be an excellent match. Our repair pretty much disappeared, which made us very proud.

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



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A Promising New Stucco Solution

by STEVE EASLEY

I recently learned about a new stucco substrate by HydroBlok (out of Draper, Utah) when Betsy Olson, a friend, neighbor, and owner of 3D Construction, LLC, here in Scottsdale, Ariz., used it when building her own home. Betsy noted that even the scratch coat—typically just a functional base layer—looked like a finished product. When exterior temps hit over 100°F, the interior remained at 72°F with no HVAC running, even with the garage door still open. The house became, in her words, “deafeningly quiet.” Having recently built my home in the same neighborhood using a drainable lath for the stucco assembly, I was immediately impressed by the speed of installation and by the incredibly flat, almost flawless execution of her stucco exterior.

Compared to conventional stucco systems, HydroBlok’s system affords faster installation and a smoother finish.

Product Details

Hydroblok’s website (hydroblok.com) describes the new product as: “A water-resistance exterior backer board designed as a cement board and EIFS alternative for stucco applications.” The manufacturer took its existing tile substrate, HydroBlok Shower Systems, and evolved that product into a substrate for exterior stucco that they’ve named HydroBlok One Backer CI. As the name implies, it also functions as exterior continuous insulation (CI). As a substrate, the product eliminates the need for a chicken-wire or metal lath, so it can be installed super flat, and just as important, makes it easier



Compared to conventional stucco systems, Hydroblok One Backer CI affords flatter installation and a smoother finish.

to achieve a uniform thickness. The cementitious coating on the panels essentially serves as a scratch coat on which a polymer-modified base coat can be applied directly, followed by a top coat with an acrylic stucco finish. It will soon be approved for use with veneer manufactured stone.

Backer CI combines four components into a single board: secondary WRB, continuous insulation, lath, and scratch coat. Fewer layers is always an advantage. Anytime you can eliminate layers, you eliminate potential mistakes and increase overall building performance.

The panels are made with a very dense extruded polystyrene foam insulation (available for CI applications in 1-, 1 ½-, and 2-inch thicknesses at R-5, R-7.5 and R-10, respectively) that resists impact (a big plus in our neighborhood, which faces a golf course) and avoids the use of water-absorbing EPS foam. The foam is faced on both sides with a fiberglass mesh embedded in a cementitious coating, which lends the board incredible strength and serves as the bonding coat. The panels are also light; a 1-inch-thick 4x8 sheet weighs 28 pounds.

A Growing Market

Backer CI targets a growing market. According to data from the Census Bureau's Survey of Construction, stucco overtook vinyl as the most common siding material on new, single-family U.S. homes in 2018 and peaked at 28% of the total U.S. siding market in 2021. Just last year vinyl siding nudged ahead by one percentage point, but stucco remains virtually neck-and-neck with vinyl. These numbers surprised me. I always knew stucco was super popular out here in the Southwest, but I was surprised that it is so common throughout the country.

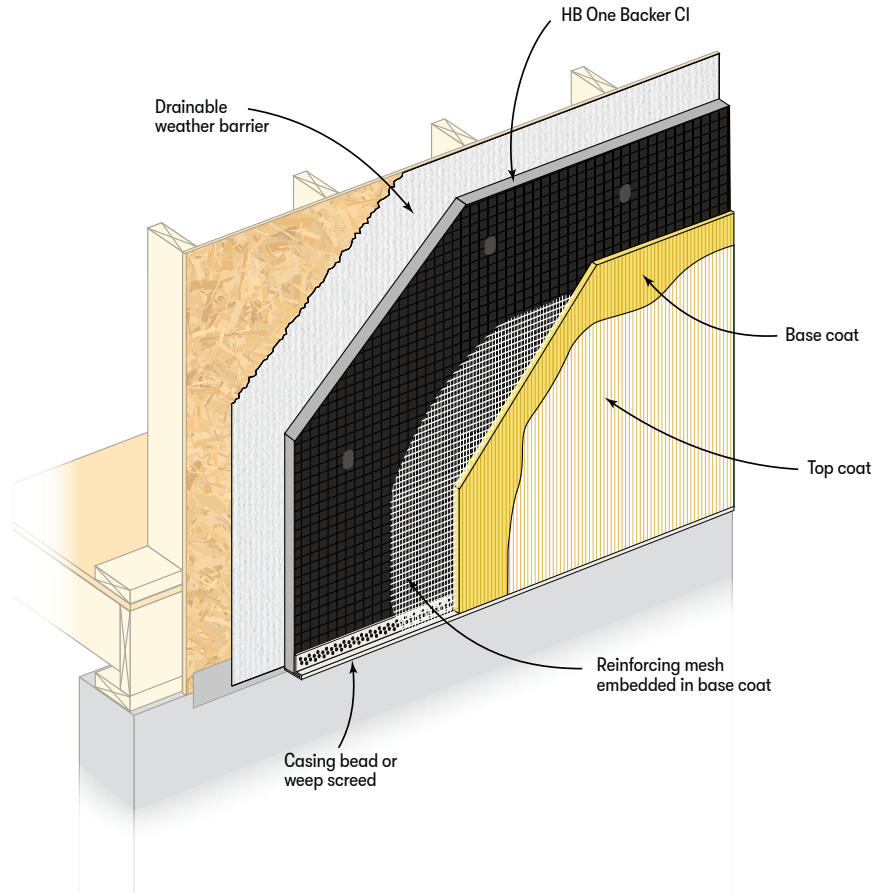
In large part, this growth is probably indicative of the biggest building markets, which for many recent years have been in the Western states and in the Southeast. According to Zonda's 2025 Local Leaders report, the top active markets for new-home construction (by new home starts and new construction share of listings) are in Texas, Arizona, Georgia, Florida, and Nevada—all states where stucco has been a common cladding material for decades. And, of course, there are regional differences. Stucco as a cladding material on homes leads in the Pacific (64%), Mountain (44%) and South Atlantic (33%) regions, whereas vinyl still dominates the siding market in New England (73%) and East North Central (69%) and Middle Atlantic (68%) regions.

Nevertheless, interest in stucco has slowly grown in regions where it wasn't common in the past, due in part to shifting interest in new architectural styles. Over the last decade, the popularity of modern and contemporary home styles, which favor monolithic and minimalist exteriors, has grown steadily in all regions.

Partly, I suspect, the growth is also due to the increased use of polymer-modified synthetic stuccos, which don't rely so heavily on a labor pool deeply rooted in the skills required for traditional three-coat stucco.

It's important not to confuse this

Backer CI With Synthetic Stucco Finish



system with an “exterior insulation finish system,” or EIFS, like those introduced to the North American market from Europe in the 1970s. That introduction resulted in wide-spread failures in the 1980s and 90s because knowledge of the water management details that ensure the success of EIFS cladding was slower to migrate here than were the materials themselves. This transition and the proper details have been well documented in *JLC* (see “Success with EIFS,” by Russell and Michael Kenney, 11/01). But as knowledge of proper detailing has spread, and as the fear of EIFS failures has receded into the past, use of

synthetic stucco has steadily grown. It remains a material that demands close attention to details to avoid failure, however, as evidenced by more recent *JLC* articles, such as “Synthetic Stucco Without Failures” (12/14) and “Trouble-Free EIFS” (11/22 and 12/22). Installing a synthetic stucco assembly with Backer CI requires many of the same details, such as drainage wrap, flashings, and proper water management.

Backer CI is not a structural sheathing. According to the ICC Evaluation Services Report (ESR), it must be installed over a minimum $1\frac{5}{32}$ -inch-thick Exposure-1-rated sheathing, or

ILLUSTRATION BY OLA KWATKOWSKA

a minimum 5/8-inch exterior gypsum sheathing. Panels must be fastened through the sheathing into framing with #8 galvanized screws a minimum 1 5/8 inch long (0.164 inch diameter) and 1/4-inch-diameter galvanized washers every 16 inches on-center along panel edges and in the field. The ESR for stucco applications (see illustration, facing page) also specifies installing the panels over a drainable housewrap and specifically references Tyvek StuccoWrap.

A Path to Code Compliance

The fact that this new product acts as a stucco substrate and an insulation layer could make it a real time- and cost-saver for builders. The industry has seen an increasing use of continuous exterior insulation, largely driven by building energy codes. While CI has long been a prescriptive option to meet code, the 2018 version of the International Energy Conservation Code mandated *only* CI options for climate zones 6, 7, and 8. Options without CI were added back into the 2021 and 2024 versions for these climate zones, but these most recent code versions now include CI options for *every* climate zone.

Currently 25 states have adopted the 2018, 2021, or 2024 energy code, though several of the states that have adopted these code versions have amended them to reduce the R-value requirements or to include wall assemblies that don't require CI. For example, New York State, which has adopted the 2018 edition of the model energy code, has amended the insulation requirements to allow R-23 wall cavity insulation without CI if the home also includes R-60 ceiling insulation; but if using R-49 ceiling insulation, builders must include CI (R-20+5 or R-13+10, where the first number reflects the cavity insulation R-value and the second number CI).

There are a wide variety of such amendments by states but the upshot is often the same: Use CI or go to greater lengths to achieve a higher R-value



The popularity of modern home styles, which favor monolithic and minimalist exteriors, has pushed the growth of stucco in all regions of the country over the last decade.

in cavity walls by using closed-cell spray foam, or, in the case of an R-30 wall, building a fat, double-stud wall. Increasingly, builders are recognizing that CI is often the most cost-effective solution.

Continuous insulation has a pretty dramatic effect on a wall's overall thermal performance. If you're building a 2x4 wall framed 16 inches on-center, for example, thermal bridging reduces the R-13 cavity insulation to R-11—about a 17% reduction. And if you're doing 2x6 walls, thermal bridging reduces the cavity insulation from R-21 or R-23 to around 17—about 18% less. The Backer CI panels provide 31% greater R-value than a comparably sized, R-3.8 EPS panel.

Condensation control in colder climates is another critical reason for using continuous insulation. Exterior CI keeps the interior surface of the sheathing warm, reducing the chances that condensation can form on that surface inside the wall cavity. It's important to emphasize that builders in climate zones 6 and above need to look at the vapor retarder requirements in Chap-

ter 7 of the IRC. When using a Class III vapor retarder (such as latex paint on the interior surface of exterior walls as most builders are doing) and installing continuous insulation over a 2x6 wall in climate zones 6, 7, or 8, then the R-value of the continuous insulation that's needed to control condensation is *higher* than the amount of insulation required to meet the prescriptive thermal insulation requirements.

Bottom Line

After researching this product, and watching crews install HydroBlok with synthetic stucco, my overall impression is that it requires fewer layers (and therefore less labor), allows a uniform thickness of the stucco and flatter walls, and provides a built-in path to meeting today's energy code. Those qualities make it worth consideration for the next iteration of a time-tested cladding.

Steve Easley is principal of Steve Easley Associates, a company based in Scottsdale, Ariz., that provides building-science consulting, training, and quality assurance for builders nationwide.

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How Simple Numbers Changed the Way I Lead

by IAN SCHWANDT

Like many remodelers, I was overly focused on revenue when I moved into the office after 15 years as a lead carpenter. I understood how to use the project estimate as a guide for running the project. I could tell you whether our trade partners were staying within their bids, if our material costs were in check, and if the crew was hitting their estimated hours. What I did not understand was the concept of return on invested capital as it applied to our in-house labor. This concept, taken from Greg Crabtree's *Simple Numbers* has become the link between the operational and financial parts of my role.

When I began studying the *Simple Numbers* book series and Greg Crabtree's financial framework, it didn't give me new facts or new data. It reorganized the data I already had and compelled me to see them differently. By isolating direct labor from subcontractors, materials, and other miscellaneous direct costs, and isolating management labor from operating expenses, I developed an understanding of how our company's labor affects gross and net profit.

The "True" Top Line

The first shift was deceptively simple: redefining the top line. In a traditional

P&L statement, revenue sits proudly at the top of the page and includes all money flowing into the company before any direct costs are subtracted. But Crabtree takes a different view by exploring the actual economic contribution a contractor makes to a project. He asks, "Should a subcontractor's labor or a supplier's material costs be included in the general contractor's contribution?" Crabtree says no, and I have come to agree wholeheartedly.

An example that I use frequently is a bathroom shower install with premium handmade tile versus a commodity subway tile. Each product will have wildly different contributions to the COGS (Cost of Goods Sold) of the project and neither choice influences how you run your company. You may think that you deserve to be rewarded with a higher gross profit for selling the higher cost tile, but do you want to stake your financial future on gross profit dollars that could evaporate if the client makes a last minute change from handmade Moroccan tile to big box store white subway tile?

This is why Crabtree advocates that you view your direct labor as your true economic contribution to a project and use your capacity to provide that labor as a driver of your gross profit

calculation. Looking at your revenue through this lens redefines your company's true top line as revenue less all non-labor direct costs.

In contractor language, that means if you are a \$10 million company but \$8 million of that is subcontractors and materials, you are running a \$2 million operation buoyed by \$8 million of pass-through costs.

That realization can be uncomfortable. Think about how often contractors define themselves by their revenue number: "I'm a \$10 million company" or "We are shooting for \$30 million this year" are common refrains heard at conferences.

At our company, roughly half of our top-line revenue is spent on non-labor COGS. When I reformatted our numbers using the Simple Numbers format, the scale of our economic output shrank instantly. Revenue isn't the machine. Labor is.

This reframing changed how I think about pricing. It made me far more cautious about taking on labor-heavy projects like decks and structural additions. Projects now must meet a labor efficiency threshold in addition to reaching a minimum gross-profit threshold. Blanket margin percentages stopped making sense. Even blanket gross profit per day targets became insufficient without a labor lens.

With the "true" top line defined, the next question becomes obvious: How efficiently is labor converting that top line to gross profit? Enter DLER.

DLER: Exposing the Blind Spot

Crabtree's Direct Labor Efficiency Ratio (DLER) is defined as:

If you are a \$10 million company but \$8 million of that is subcontractors and materials, you are running a \$2 million operation with \$8 million in pass-through costs.

When management labor is hidden inside overhead, inefficiency is hard to isolate.

(Revenue - Non-Labor Direct Costs) ÷ Direct Labor Wages

For example, before tracking DLER, I relied on estimate-versus-actual comparisons, schedule adherence, cost-to-complete accounting, and gut feel. Jobs that were busy and roughly on schedule felt successful. But when I calculated DLER across our portfolio of projects the picture changed.

Our labor was underperforming in terms of the money it returned to the company. This wasn't a morale issue. It was a structural issue. We were pricing and staffing in ways that didn't fully reflect the economic return required from each labor dollar. This was evident when reviewing the financial performance of direct labor-heavy projects. For these, a blanket margin added to labor without the additional costs of subcontractors and expensive material did not meet the minimum DLER metric.

I have been tracking our company's DLER since 2023 at both a project- and a company-wide level. This gave me the confidence to apply DLER to our 2026 budget and make it a metric that my team and I track. As for 2026, our company's DLER target, derived directly from our Simple Numbers budget format, is 3.52. That means every dollar of direct labor wage we spend must generate \$3.52 in gross profit. That target isn't arbitrary; it flows from our budget and net profit goals.

DLER has since become a pricing

guardrail. If a bread-and-butter remodeling estimate deviates significantly from our typical DLER range, something is usually wrong. Most often there isn't enough labor in the estimate. Occasionally, the opposite is true. Either way, it forces a deeper level of discipline.

DLER changed how I think about labor-heavy projects. Those can sometimes function as "flex jobs" that run alongside our core cycle. But they still must return gross profit in a way that supports our financial needs as a company. Meeting the minimum DLER on a labor-heavy project requires a higher than typical margin.

Separating Management Labor from Overhead

In the Simple Numbers format, non-billable management and administrative labor is separated from traditional operating expenses. It is treated as labor capital, not overhead.

The question we ask is straightforward: If we were doing zero work, who would still be employed?

For us, that is the owner, myself as operations manager, and our finance/HR manager. Everyone else represents direct job-costed labor. Additionally, all non-billable labor costs from anyone are grouped into management labor for purposes of this analysis. When we reformatted our financials this way, I clearly saw the impact of non-billable and management costs

on the entire company. Crabtree's Management Labor Efficiency Ratio puts this relationship into focus and gives you a number to manage to.

Management Labor Efficiency Ratio (MLER) measures:

$$\frac{\text{(Revenue - Non-Labor Direct Costs - Direct Labor Wages)}}{\text{÷ Mgmt and Admin Labor Wages}}$$

It answers a hard question: Is leadership labor generating an adequate return?

When management labor is hidden inside overhead, inefficiency is hard to isolate. When it stands alone your structure becomes visible. It clarifies whether management staffing levels are supporting growth or eroding margin.

A Different Way to Make Your Numbers Work

This framework doesn't replace a traditional P&L (as defined by generally accepted accounting principles). It reframes it. The P&L records history and compares it to a budget. The Simple Numbers format interprets the performance of our structure. For me, the biggest change wasn't the spreadsheet. It was in how I do my job.

Before, revenue growth felt like progress. Labor performance was judged by feel. Overhead decisions were intuitive. Now I understand exactly how efficiently our labor capital converts to dollars. I price jobs to hit DLER, not just a set margin. I see management labor as invested capital, not background noise. But most importantly, I can teach everyone at the company how the financial outcome of our individual work is interconnected.

Ian Schwandt is the production manager for TDS Design Build in Madison, Wis.

Health Savings Accounts for Retirement Planning

by **ROB CORBO**

In February of 2024, I reviewed health insurance options for employees and employers in the construction trades. In that article, titled “Health Insurance Basics” (11/24), I emphasized the importance of health insurance for construction professionals. Construction work is dangerous, to say the least, making insurance that much more important to the industry. The article reported that 24% of construction workers have no insurance, which is down from 33% in 2012, due to better access, affordability, and discounts from the passage of the Affordable Care Act (ACA). Unfortunately, as of now (May 2026), health insurance is less affordable than when I wrote that article, thanks in part to an important insurance subsidy expiring.

That subsidy was the ACA pandemic-enhanced premium tax credits, established in 2021 and available to consumers on the ACA marketplace. These credits were not funded during the government shutdown negotiations of October/November 2025, so they expired on December 31, 2025. As a result, health insurance premiums for more than 20 million Americans getting their insurance through the marketplace, many in the construction trades, have doubled.

During the government shutdown negotiations, health savings accounts (HSA) were offered as an alternative to the expiring enhanced ACA subsidies. The One Big Beautiful Bill Act made millions more ACA enrollees eligible for health savings accounts by making all Bronze and Catastrophic plans HSA-qualified. In late 2025, the administration proposed giving

money to people to pay for health costs via cash deposits in a health savings account in lieu of ACA-enhanced subsidies. This proposal failed to pass Congress by year-end. However, new rules for 2026 did allow more marketplace plans to be paired with HSAs.

What Exactly Is an HSA?

Health savings accounts were signed into law by President George W. Bush in 2003. They are personal savings accounts used to pay eligible health care expenses. They are tethered to high-deductible health insurance plans (HDHP). If you have a high-deductible plan identified as HSA-eligible, you can open a health savings account and make tax-free contributions as long as you are not covered by a family member’s plan, you are not covered by Medicare, or you are not claimed as a dependent on someone else’s tax return.

Once opened, you and basically anyone else can contribute to your health savings account, including family members, your employer, and friends. (That’s a good friend.) You can use your HSA to pay medical expenses for a spouse or other family members even if they are not covered by your HDHP. Contribution limits to a HSA for 2026 are \$4,400 for an individual and \$8,750 for a family. If you are over 55, you can make a catch-up contribution of \$1,000 each year.

HSAs can be used to pay for doctor’s visits, dental services, and drugstore purchases, including over-the-counter medications. They can be used for copays, coinsurance, vision services, family planning expenses, COBRA coverage, health insurance premiums

if unemployed, acupuncture, psychiatrists, alcohol and drug addiction treatment, and chiropractor services. If you change jobs, a health savings account travels with you.

HSAs offer some attractive tax benefits. Contributions are deducted from gross income via your paycheck or on your 1040 tax return, lowering your taxable income and total income tax due. If you can have contributions payroll-deducted, the amount deducted is free from both income taxes and FICA (Social Security and Medicare taxes). HSA contributions are allowed to be invested and grow tax-free. They are allowed to be withdrawn tax-free for eligible medical expenses. Taxes will never be due if the money is always used for qualified expenses. If withdrawn for nonmedical expenses before retirement, income taxes are due and a penalty applies; if withdrawn for nonmedical expenses after retirement, just income taxes are due. HSAs are considered triple tax advantaged: tax deductible contributions, tax-free growth, and tax-free withdrawals. They provide a greater tax shelter than traditional IRA accounts.

To qualify for a health savings account, you must be covered by a high-deductible health plan (HDHP). As long as you maintain an HDHP before retiring, you can continue making contributions to the HSA and can continue using it to pay medical expenses. However, the HSA cannot be used to pay the HDHP premium.

Once you retire and go on Medicare, you can keep your health savings account, but you can no longer make contributions. However, along with

paying qualified medical expenses, you can use HSA funds to pay for long-term-care insurance premiums and other long-term-care costs. You can also use it to pay Medicare premiums for Part B (doctor's visits), Part D (drugs), and Part C (Medicare Advantage) after retirement. For additional qualified expenses, see IRS *Publications 502 and 969*. And remember, if used for medical expenses, these withdrawals are still tax-free unlike tax-deferred traditional IRA withdrawals.

High-Deductible Health Plans

The U.S. Bureau of Labor Statistics reported in April of 2025 that 50% of private industry workers having insurance in 2024 had high-deductible health plans. A high-deductible health plan that is health-savings-account-eligible for 2026 is one with a deductible that is at least \$1,700 for an individual and at least \$3,400 for a family. Most plans have even higher deductibles.

An insurance deductible is the amount you pay out of pocket for medical expenses before coverage by the insurance company begins. Coverage, however, may be only 60% to 80% of the total due, leaving the rest as a co-pay for the insured. Total out-of-pocket costs for an HDHP in 2026 has been capped at \$8,500 for an individual and \$17,000 for a family. The advantage of an HDHP is that it comes with a lower premium than a low-deductible plan. These plans are best suited to people who are healthy and who hope to only pay the premium each year while maintaining a catastrophic plan just in case. A person in need of extensive medical services may find it less expensive in the long run to buy a lower-deductible, higher-premium plan, although such a plan would make them ineligible for a health savings account.

HSA Pros and Cons

Proponents of health savings accounts state that consumers will be more care-

ful with healthcare costs when paying part of their medical bills themselves: that they won't go to see a medical professional for minor issues and will be less wasteful. Critics argue that people will delay going to see medical professionals and will possibly lose valuable time against a condition more serious than expected, leading to higher costs later. Critics also warn that children of low-income families may suffer.

What's clear is that health savings accounts, established to benefit all Americans, are a luxury for those who need them most. Many of the 20 million Americans losing health insurance subsidies will no longer be able to afford a high-deductible plan, so for them, having an HSA becomes impossible. A health savings account combined with a high-deductible health plan works best for healthy people and high-income individuals. In a healthy year, you only pay the low premium. In a year with significant medical expenses, you could be liable to pay up to the total out-of-pocket maximum (again, capped at \$8,500 for an individual and \$17,000 by the IRS). A high-income individual or family can purchase an HDHP, open an HSA, maximize HSA tax-free contributions, pay all medical expenses for the year from out-of-pocket taxable funds, and let the health savings account funds compound year after year until retirement.

HSAs are a meaningful retirement vehicle for those who are healthy and have extra cash. Fidelity Investments estimates that the average retiree will need \$172,500 for health care ex-

penses in retirement, while a couple will need \$345,000. Those numbers do not include long-term assisted living expenses. For reasonably healthy individuals, an HSA becomes a retirement vehicle with tax-free dollars accumulating until retirement, at which time the funds can be withdrawn tax-free for medical expenses. For example, someone who contributes \$8,750 a year (\$729 a month) into an HSA for 30 years, invested in an S&P 500 exchange-traded fund returning 6% a year compounded semi-annually, will accumulate \$713,195 on \$262,440 of contributions.

Retirement withdrawals for non-medical expenses are subject to income taxes. (Pre-retirement withdrawals for nonqualifying expenses are taxable as income and subject to a 20% penalty.) Upon death, an HSA can be transferred to a spouse's account tax-free. Children inheriting an account will have to pay income taxes on the account's holdings.

HSAs are not a substitute for the ACA insurance premium subsidies that expired in 2025. If a significant number of American families, including construction professionals, lose health insurance, it once again puts the healthcare debate front and center. How do we care for our citizens? Until the debate is settled, those of us who can afford to benefit from health savings accounts should take advantage of this government program that incentivizes planning for present and future medical expenses.

Rob Corbo is a building contractor based in Elizabeth, N.J.

For reasonably healthy individuals, an HSA becomes a retirement vehicle with tax-free dollars accumulating until retirement.



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A "Both/And" Treatment for Windows

by BRIAN CAMPBELL

The two most common ways to trim out a window are wrapping all four sides with casing (sometimes called "picture framing") or installing a horizontal stool on the bottom that supports the side casings and has a separate "apron" trim below the stool. Sometimes, however, I am called on to do a "both/and"—installing casing that wraps the window as well as a stool that overlaps part of the casing.

What's interesting to me is that carpenters often think they have to choose between picture frame or stool and apron trim. To have both a picture frame and a window stool is sort of unique. Once I learned about this unique treatment, I started running

into it on a wide range of homes, and every time it changed the way I think: it's not either/or—it's both.

I've encountered this window treatment on Tudor-Revival- and Queen-Anne-style homes, particularly for windows that come down near the floor. I've also encountered it on Beaux-Arts and Classical Revival homes from the late 1800s and early 1900s, which are known for their elaborate woodwork and strict symmetry of architectural elements. In these cases, the bottom of the windows are often filled in with woodwork to provide visual symmetry with door openings. I've even seen it (and

reproduced it) on Spanish Colonial Mission homes whose woodwork tends to have very simple, clean lines.

Two Common Cases

Regardless of the architectural style, there are two common situations where this detail comes into play:

Casing that runs past the sill and continues to the floor. If the window is low to the floor, it's not uncommon to have the side casing run all the way down. It's worth noting that in most cases, the casing runs to the floor. It doesn't run just to the top of the baseboard. Instead, the baseboard is interrupted by the casing so the panel infill reads almost like a "separate furnishing," or like a door. The area below the window is filled by a stile-and-rail panel that is independent from any baseboard or wainscoting that may or may not be included in the room.

A picture-frame casing with an overlapping stool. When the windows aren't close to the floor, I sometimes see (and reproduce) a picture frame around the entire opening with a stool added below the window. In that case, the stool has very short "horns" that lap onto the face of the side casings. These overlapping horns do not extend past the side casings, as is typical for a traditional window stool. For the amount of overlap, I've seen a range, from about 1 inch of overlap down to about 1/4 inch.

Trim Process

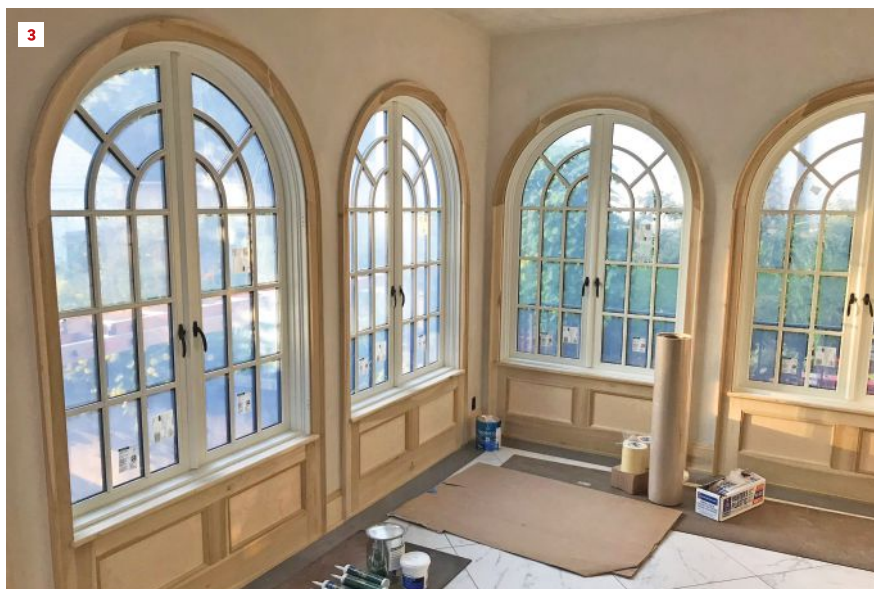
Once I have the window set and my jamb extensions are figured out so they flush to the interior wall, I case the window. I rarely miter the corners when picture-framing a window unless



Two examples from a Classical Revival home: In its simplest form, the stool overlaps onto picture-frame trim (left). In the home's formal living areas where windows are larger, the casings come all the way down to the floor and the area below is filled-in with panels. The stiles and rails around the panels are on the same plane as the casing.

PHOTOS BY BRIAN CAMPBELL

Carpenter's Log / A "Both/And" Treatment for Windows



that's already an established look in the home. Most of the time I butt join the corners because it's more stable, and staying true to the period of the older homes I typically work in, it's how most traditional casing was typically done. Miters tend to open either at the toe or the heel as wood shrinks across the width of the board. With a miter, this shrinkage of both meeting boards adds up. A butt joint, on the other hand, "sees" only half of this shrinkage. If the casing has a profiled edge, I typically cut a jack miter where only the profiled edge is mitered and the flat of the board is cut straight to receive the butt end of the meeting board.

If the casing doesn't run to the floor, you have to account for the thickness of the stool when measuring for the side casing. I will clamp a piece of stool stock to the window, accounting for the reveal on the window, and then measure to the bottom of this piece of stock. Or I may hold the stool stock in place and draw a line to measure to.

If the area below the window will be filled, I set all the panels between the casings before I install the stool. The panel can be tricky sometimes because the stiles are often flush to casing, and depending on how flat the wall is, these two don't always track together and may need to be sanded flush.

When installing the stool, I almost always cut a miter return on the ends of the overlapping horns, particularly with stain-grade work. That's because on stain-grade work, the end grain will stain much darker and always ends up looking like the proverbial sore thumb—unless you cut a miter return. For painted work, you can round over the end grain at the end of the horn, though the painter may need to fill this grain to smooth it out. The horns are a small detail, but they make the difference between a seamless finish and one that draws the wrong kind of attention.

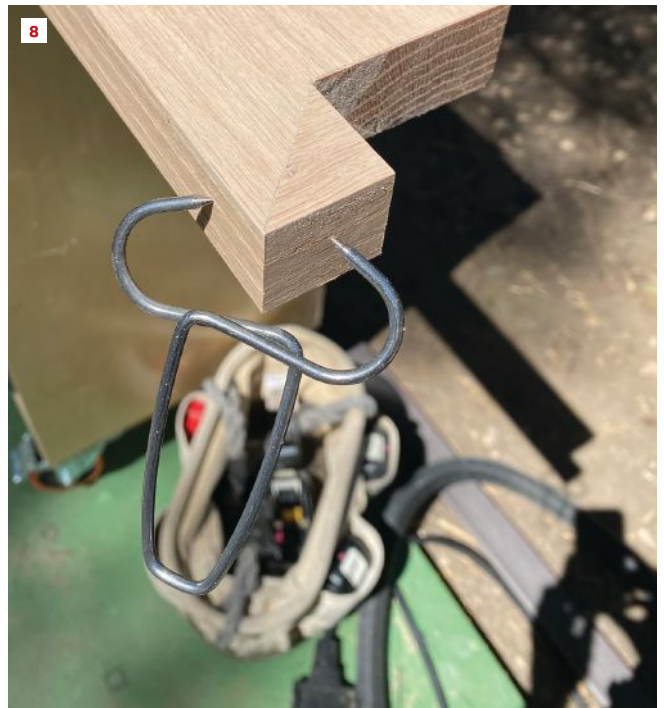
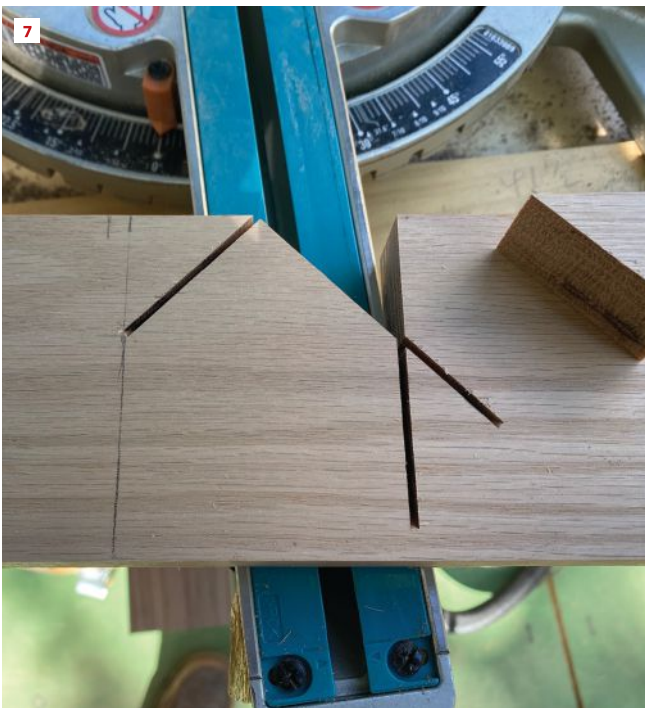


While common for ornate interiors, such as this Tudor Revival interior trimmed out by the author (3), the modified stool also suits the clean lines of a Spanish Colonial Mission style home (4), where the author reproduced the trim style found throughout the home around an interior window separating an office space from a glassed-in porch.

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



The author builds his panel sections after running the casing to the floor (5). Since the vertical stiles on these sections sit flush to the casing, sanding is required where the author has drawn squiggles across the edge-to-edge joints to show him how much to sand (6).



For the sill of the Spanish Colonial Mission window on the facing page, the author cut the sill extension and its return from the same board. This three-cut method (7) can be done quickly and helps prevent the small return piece from getting thrown by the saw. The stool on the left side and the miter cut still needs to be finished with a Japanese saw. Once cut, the rerun is glued and clamped into place (8).

TROUBLESHOOTING



Managing Engineered-Wood Flooring Failures

Glue-down floors are especially problem-prone. Here's how to reduce your liability.

by DOUG HORGAN

WE STARTED INSTALLING “ENGINEERED” wood floors years ago, expecting that their multi-layer construction would be more stable and show fewer shrinkage cracks in our dry winters. Unfortunately, we’ve seen enough of these floors fail that we are now very cautious about installing them at all. This past winter, two floors failed during a cold, dry month; one will likely need to be torn out and reinstalled, while only two boards were affected on the other, so that will be a straightforward repair. As with most callbacks, the worst part of these types of failures is disappointing our cli-

ents and the strains put on the project schedule and our company reputation—challenges we prefer to avoid. In this article, I give my perspective on what causes engineered flooring failures, look at the reality of manufacturers’ (non) warranty coverage, and share a couple of steps we take to minimize risk.

Built-In Problems

Engineered flooring is made of glued-up pieces of wood, usually with a top layer, known as a “lamella,” that’s thick enough to be sanded, just like a solid hardwood floor. Usually, below

the lamella are layers of plywood-style veneers, or sometimes layers of solid wood glued together crosswise to the top layer. In some, there’s a bottom layer of the same species as the top; these are called “balanced” floors—the fact that the top and bottom layers move at the same rate creates a symmetrical, tension-neutral structure that prevents bowing, warping, and cupping.

There are three main installation methods for engineered flooring: floating, nail/staple down, and glue-down. The problems we’ve seen occurred most often with glued-down

PHOTOS BY DOUG HORGAN

applications when the indoor humidity was poorly controlled.

The problems come in winter, when indoor relative humidity in a leaky building in our area may go below 15% for several weeks, and stay in the low 20s even longer. In these conditions, the top lamella loses moisture to the dry indoor air and each piece of flooring becomes a bit narrower. Unlike a piece of solid wood, the top layer of engineered flooring is glued to layers below in a cross-grain construction. Wood shrinks across the width much more than along the length, so the layers below the lamella, with grain running perpendicular to the lamella, don't shrink much at all. The top layer shrinks, but the layer below does not. Eventually, some pieces of the flooring fall apart from the stresses, and we get a call about edges or corners rising up, or large cracks appearing in the middle of the pieces.

There are four factors that make a failure more likely, in my experience:

Strength of the glue. Today's glues are incredibly strong, as you know if you've ever had to remove a glued down floor. We usually have to use chipping hammers or a power scraper. Glue seems to restrain the bottoms of the boards more than fasteners do, and the glue layer likely reduces the ability of the bottom layers to change moisture levels with ambient conditions (the glue is not very moisture-permeable). That can lead to moisture differences between the top and bottom pieces.

Width of the boards. With wider boards, there's more total shrinkage of the top lamella and more stress on the joint between the top layer and layers below. Our worst failures were on 9- and 7-inch flooring, while flooring that's less than 5 inches wide has only failed once for us.

Species and cut of the top layer. As with solid-sawn flooring, quarter-sawn oak shrinks less than plainsawn oak, and much less than plainsawn maple, for example.

Relative humidity in the space. All the issues we've seen can be traced directly to low humidity conditions. Some happened in buildings that were leaky and the wintertime indoor humidity was running very low; others happened when humidifiers were turned off or malfunctioning.

Most of the floors we've installed don't have issues, but enough have had them that we instituted a warranty sign-off for engineered floors over 5 inches wide. Clients who want a floor with wide boards accept responsibility for delamination or cracking.

Manufacturer Warranties Fall Short

We contacted the manufacturers for the first couple of engineered floor failures. That's when we realized the warranties essentially don't apply to real-world conditions, and this is true whether the warranty is from a big national manufacturer or from one of dozens of mom-and-pop floor companies around the country. The written warranties I've checked all state that humidity must be maintained in a narrow range 100% of the time. Typically, this range is 45% to 55% RH, though some companies have a slightly wider range, such as 35% to 55%.

I have measured summer and winter indoor humidity in dozens of houses in our mid-Atlantic area, and it's rare to find one that stays below 55% RH all summer, or above 35% all winter (much less 45%). In spring and fall when HVAC systems may not run much, RH readings above 70% are not uncommon. If a humidifier isn't turned on, readings below 15% are normal in winter (in the large, poorly-sealed houses and condos we work in). It's essentially impossible to meet the warranty requirements of any engineered flooring brand I've investigated.

Even if we think we've done okay with the indoor humidity, the few times we've reached out to manufacturers they have denied warranty coverage. The letters we've received basically

state that the fact that the flooring delaminated is proof that humidity levels were not maintained. We don't usually have recordings of the indoor humidity levels in each room on every project going back to the flooring installation date (who would?), so we can't prove we did stay in the stated range.

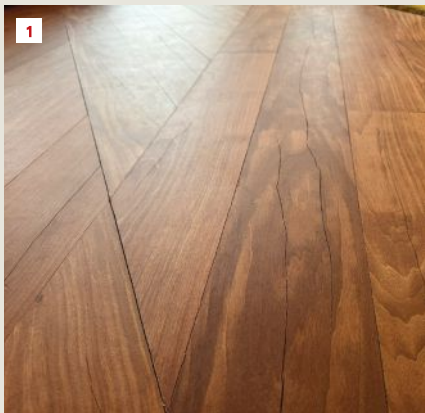
The warranty on one brand of flooring we installed had an unusual requirement: In order to maintain warranty coverage, we would have to install a humidity monitoring computer in a recess in the subfloor! This contraption required hardwired power and an internet connection, which would send humidity readings to the flooring manufacturer. The device cost hundreds of dollars, and installation and maintenance would probably bring total costs to close to \$2,000 over a few years—not a prudent investment since in all likelihood the device would just prove that the house went out of the 35% to 55% range. All it takes is one summer party with doors frequently opening for the house to go outside that range.

All in all, in our experience, manufacturers don't cover cracking or delamination. We decided we would be happy to install engineered flooring, but since wider flooring is so risky, we discuss the issue with clients and have them sign a specific warranty exclusion for these problems. We also don't install flooring with a moisture content higher than around 11%.

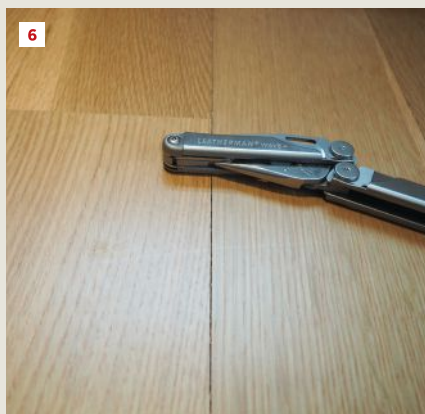
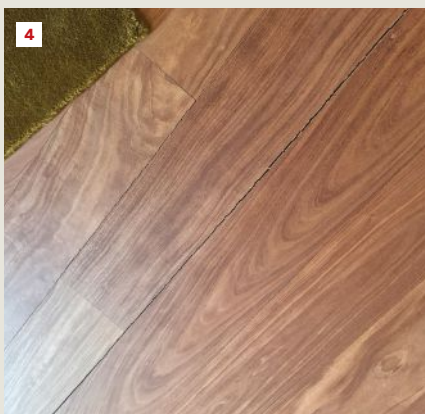
Wide floors are trendy right now and several clients have accepted a warranty limitation (only on cracking or delamination; we still cover finish issues or other problems). In the two floors we had problems with this year, we had discussed those exclusions ahead of time. It's still unfortunate, but at least the responsibility was with the people who made the decision.

Doug Horgan is vice president of best practices at BOWA, a design/build remodeling firm serving the greater D.C. area.

MANAGING ENGINEERED-WOOD FLOORING FAILURES



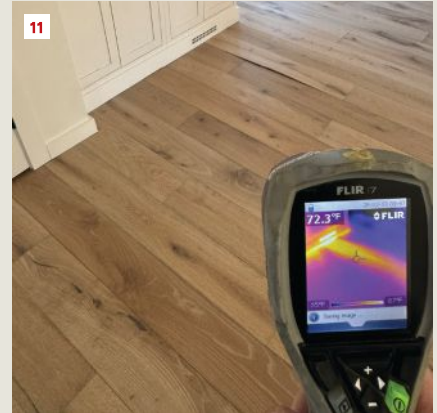
An engineered floor installed in a high-end condo in Washington, D.C., began to fall apart this winter when temperatures dropped lower than in years past and the indoor relative humidity hovered around 20%. In addition to cracks in the top lamination, called the “lamella” (1), the material also delaminated (2, 3). This home included a humidifier but it was not running.



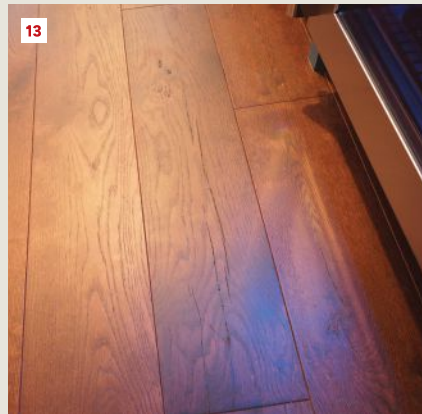
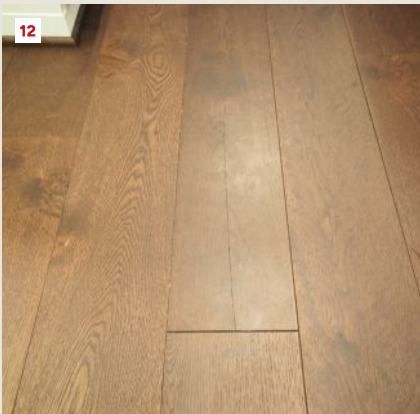
These cracks (4) might be considered “normal” for winter conditions, but because of the irregular finish that bridges the cracks, the client objected to them. In another D.C.-area condo, low wintertime relative humidity led the floor with a rift-sawn white oak lamella to delaminate in a few areas (5), and shrink slightly in others (6). This client was extremely demanding and objected to this shrinkage.



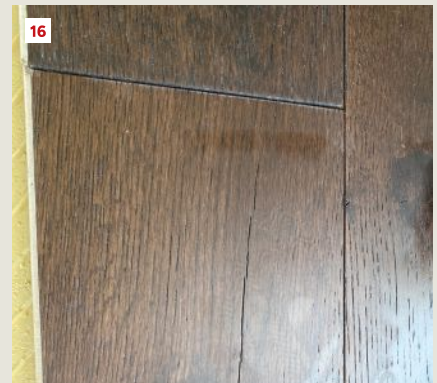
A 7-inch-wide floor with a maple lamella (7) began to delaminate this past winter. Instances like this occurred throughout the apartment. The author’s company has a warranty exclusion on engineered floors with boards over 5 inches wide, but the clients still opted for tearing it out (8) and replacing it on their own dime.



After breaking a prybar (9), the crew resorted to an electric chipping hammer to remove the polyurethane glue. At a moisture content of almost 14%, the new flooring was too wet to install and the crew had to wait several days for the material to acclimate to 9% to 11% (10). In a Maryland home, an engineered floor with a hickory lamella began delaminating near a heating vent where the flooring was driest (11).



In another single-family home in northern Virginia, the ash lamella cracked on many of the flooring boards (12). In some areas, the flooring had cracks that had been filled at the factory (13) and these cracked more over the winter when indoor humidity levels fell. The owner opted to tear out and replace the flooring, and this time the crew used a power floor scraper (14).



The owners decided to install the same flooring, which, like all the floors shown in this article, is a glue-down floor (15). Surprisingly, the new flooring had its share of cracks (16) and finish blemishes, fresh from the factory. The author pointed these out to the owners but they opted to proceed nevertheless.

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FOUNDATIONS



Monopour: The Evolution of ICF Construction

A walk-through of pouring the footing and the stemwall at the same time

by ARON JONES

THINK BEFORE WE TALK ABOUT THE pro's and con's of a monopour (pouring the footing and the stemwall at the same), it is important to define what makes a successful concrete day. We can start with the industry standards. For instance, the American Concrete Institute's tolerances (ACI 117M-10) specify that foundations be no more than $11/16$ inch out of level over 6 feet, and the NAHB says that walls should be no more than 1 inch out of plumb.

Most custom builders, including myself, would never be happy with

those tolerances. My preference for the top of the wall is that it's no more than $+/-1/8$ inch out of level over 6 feet and no more than $1/8$ inch out of plumb. I also want the foundation to be relatively square: $+/-$ less than $1/4$ inch over 20 feet (while ACI accepts $1/2$ inch). In addition, my definition of a successful day includes "No extra concrete was ordered and all concrete was placed on the day intended."

I should also note that while this was not the first time I used a monopour system, it was the first time I used one with an ICF foundation. The first time

you do anything new it's rarely perfect, and often there are lessons learned. So when trying new materials or techniques, I prefer to do so on a smaller project. Smaller projects typically mean less risk and/or re-work if things don't go well.

This home, which I'm calling the "Eventide Project" on Grand Manan Island in New Brunswick, Canada, was a good one on which to try out the system. Although it was a two-bedroom home, rather than pouring a full foundation for the whole house we only poured one under the service and

MONOPOUR: THE EVOLUTION OF ICF CONSTRUCTION



The crew starts laying out lines for the footings and foundation (1). The Fastfoot bags are placed on the ground, sections are overlapped, seams are taped, and the bags are held down with rebar (2). Now the ICF blocks are placed to determine stacking joints and cuts (3).

mechanical areas, an idea I borrowed from Boston-area architect and JLC contributor Steve Baczek. What we ended up with looked like an oversized service corridor: 34 feet 3 inches long by 13 feet 3 inches wide. The bedrooms were supported by piers.

This project may be the first one we did where going small was a hindrance, but we will cover that in Lessons Learned, below.

We used the MonopourHD system from Fab-Form Industries in Delta, British Columbia. Their system of bracing and footing can be used with any ICF product (we used Nudura here) as well as with traditional poured foundations, and includes the "Fastfoot" bag footing form and wall bracing hardware. I have used Fastfoot on multiple projects, as far back as 20 years ago. So, while not having experience with an ICF monopour, I was familiar with some of the products involved. And Fab-Form was a great resource throughout the process, from planning to concrete placement. There are helpful details on their website, and I was able to reach them by phone and talk to a person if I had any questions.

Now let's dive into the step-by-step process of using this system. The photos offer a visual overview while the text will provide additional detail.

Getting Started

Ideally you begin with a level site—I recommend no more than a

+/- 1-inch deviation from level over the entirety of the footing area. (This will also come up in Lessons Learned.)

Begin by spray-painting your layout on the ground. I used rope as a guide to paint straight lines. Living in a fishing community, used rope is easy to come by and works very well for this application. String can work well too. It is also important to ensure your corners are located correctly and that the layout is square. I own a Stabila LA180 layout station with laser level but chose to calculate the diagonals of the corners manually, using the 3-4-5 method to confirm that all corners were square.

The directions from Fab-Form ask for three lines to be painted on the ground: one outside of the footing, one outside of the ICF wall, and one down the centerline of wall. I followed these directions, but I believe I could have gotten away with two lines: one down the center of the wall/footing, and one outside of the wall.

Batter boards were set up after the lines had been painted, but this could have been done before. While this may seem like we were going backwards, it was critical to the success of the project. You want your string lines about 4 inches above the top of your footing elevation. If your footing will be 10 inches thick, you want these strings at least 14 inches off the ground. The string also needs to be exactly 8 inches outside of the ICF wall, according to the directions, which is the mini-

mum to get outside the MonopourHD brackets. (We followed that for three walls and used 10 inches for the fourth wall.) The strings should be easily taken down and put back up.

Assembling The System

With the string in place, lay out the Fastfoot with its centerline directly on the top centerline you painted on the ground. You need a minimum 12-inch overlap at any joint between Fastfoot sections, and I recommend taping the joints at these overlaps to help prevent spillage (although I left one area untaped to give an escape route for any rainwater buildup). Then lay rebar on the centerline. The rebar is to keep the bag in place but then will be tied into the rest of the required system dependent on your local requirements and seismic zone.

Next, tie your footing rebar. The amount of rebar you use will vary by project region and zone, so be sure to follow the specifications in the plans. For this project we used three horizontal runs of 10M (1/2-inch) rebar in the footing. A splice length of 24 inches was required to finish. There was no specific tie pattern or spacing on the spreaders required by the plan. Ensure you keep the rebar within the footing layout.

Start building your ICF wall. We use Nudura ICFs from Tremco on most of our projects, which is what we used here. I start in the corner and work



Here you can see where rebar is snapped into the ICF webbing per the plan's spec (4). HD brackets are attached in pairs (one outside, one inside) to the ICF block (5).

inwards toward the stacking joints. A stacking joint, or marriage joint, occurs in the middle of an ICF wall when the dimensions of the ICF block cannot equal the wall dimensions in whole forms. Blocks are cut on either side of this joint to meet the required wall length. This process is repeated at the same point in each successive course, creating a vertical joint.

With the first course complete, install rebar and form lock. This is a critical step. Form lock is a wire ladder that is snapped into the cavity of the ICF on the first course and then on every other subsequent course. It helps keep the walls straight and resistant to pressure. Once the first ICF course is complete, move on to the second one.

With two courses of ICF in place,

install the MonopourHD brackets. These brackets hold and level your ICFs before and during the pour. Start at a corner, and ensure the bracket is at least 16 inches away from the inside corner. (This leaves room for the footing.) Install the brackets in pairs—one inside the form and one outside—at 6-foot intervals. Ensure you move the Fastfoot material, so it is not trapped under the bracket.

Using a laser level and a 2-foot spirit level, begin taking the wall to the required height. Think footing depth plus 36 inches (each course of Nudura ICF is 18 inches high). I found that getting the entire foundation close +/- 1/2 inch, then fine-tuning the elevation to perfect, was most effective.

Confirm the wall dimensions,

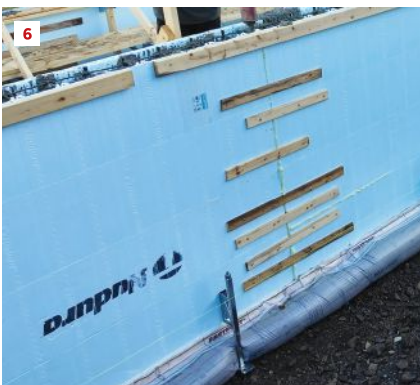
check for square, and confirm you are on your layout. Tie the stacking joints together. Pin the MonopourHD brackets to the ground at corners and then work down the lines to ensure they stay on layout all the way along the layout lines. I used grade pins as they worked best for our soil conditions, but local conditions may vary.

Continue building the ICF wall as normal, complete with rebar and form lock as required.

The wall is braced with Fab-Form's "Zont" wall bracing system. This system is built around metal brackets called Zonts that are screwed into the web of the ICF wall. They're connected to one another with 2-by horizontal walers and vertical strongbacks. The wall is braced, and plumb is adjusted with the company's "Zuckle" wall aligner: a turnbuckle attached to a diagonal 2-by that can be adjusted with a drill. The system also includes "Zat" brackets that attach the vertical strongbacks and support a walkway for accessing the top of the forms.

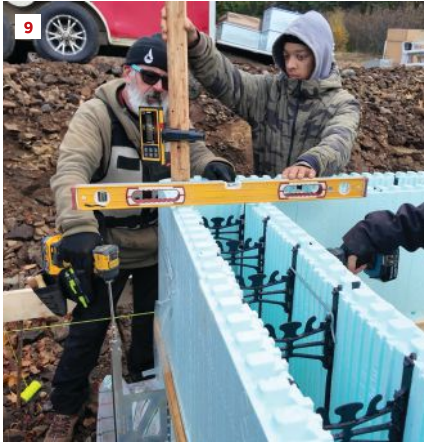
Fab-Form has further information and videos showing how this all comes together on their website at fab-form.com.

Check the top of the wall for level. To adjust or fine-tune, unlock the cams (clockwise) on the "Zonts," which ensures you aren't lifting the bracing as well as the wall. These cams lock the 2x4 walers and



This is an example of a stacking or marriage joint. It is bound with strapping and glued (6). The HD bracket can be raised or lowered with a drill/driver or socket wrench (7). Checking for wall straightness is done with each adjustment and new wall course (8).

MONOPOUR: THE EVOLUTION OF ICF CONSTRUCTION



Adjusting for elevation and level across the block is done in unison on bracket pairs (9). A ground pin to hold the HD bracket is driven into the bedrock just below the soil (10).



strongbacks against the wall. Lock the cams (counterclockwise) when the adjustment is complete.

Place round rebar chairs on the footing rebar to space it up off ground. Place the vertical rebar and tie it to the footing bar if required. This is a great point for rebar inspection if required.

Attach the Fastfoot to the ICF. I used strapping for the attachment on our job, but Fab-Form recommends strips of plywood and I wish had followed that recommendation. (See Lessons Learned.) Use the "Fold Distance Calculator" on the Fab-Form website to determine your fold distance. The fold distance line is the line that's flush with the top of the batten fastener. (Fold distance is also dependent on the size of footing you're pouring.) Be sure to use the Monopour markings on the Fastfoot, not the printed lines for a conventional footing. Fab-Form recommends using a 1½-inch plywood batten in the fold to secure the Fastfoot to the ICF. I suggest you listen.

You are now ready for the concrete.



With each block course and bracing attachment the crew confirm square (11). Note how the Fastfoot material is moved out from under the HD bracket (12).



Concrete Day

Planning is key for any project, and probably more so for a monopour. Winter conditions, cold soil, and cold aggregate all affect cure times for concrete. Your project may require accelerator, depending on conditions and size.

This is our "Game Day." There are no second chances with concrete. (Well, that's not entirely true; but any second chances will be very expensive.) Tasks need to be assigned to individuals; everyone needs to know the plan. The crew needs to be adaptable to the situation and ready to help one another if things go sideways.

We began our concrete day by wheel-barrowing crushed rock to help get the concrete truck enough traction to get to the pump truck. We then added "Super-P" plasticizer to the concrete—a liquid plasticizer from Matrix Construction Products (matrixcp.com) that allows the concrete to flow more easily without adding water and accelerator to the truck.

The first lift of a monopour should



This is the "Zont" bracket to hold walers and strongbacks. The plastic cam locks them in place (13). The foldable "Zat" (14) creates the walkway with guardrail when attached to the bracing. It also provides the attachment for the "Zuckle" wall aligner hardware.



fill the footing and about 6 inches of the ICF block depth. You want time for this lift to stiffen before going to your next lift. (It is important that you consider this carefully; ask me how I know).

While waiting for the footing to stiffen up we placed concrete in the columns on the project. As noted above, these columns supported the bedrooms. This was where lessons learned (as noted below) really started to kick in. We took a long pause (coffee break) while we waited for the concrete to stiffen up.

Then the pump truck driver indicated we had to start pumping again. We proceeded in conventional lifts, which for ICF is usually 4 feet, probably stressing this system to its max. Finally we got to the final pass to top up the taper blocks.

Lessons Learned

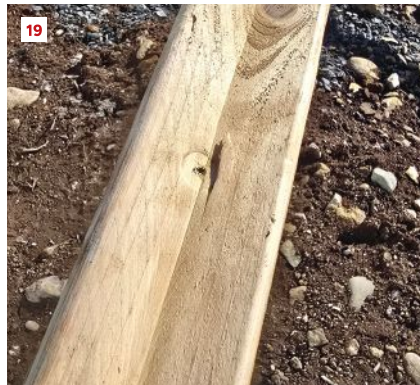
Here are the main lessons I learned on this project.

Ensure your site is level. We didn't ask for a level crushed stone pad like we typically do, and we paid for it in labor needed to level out our first two courses of block. While the excavated area was close to level, close was not enough and resulted in extra work.

Wait until the wall is elevated by the brackets before placing rebar chairs on the footing rebar. Placing the chairs ahead of time created a hindrance when laying and joining block.

As I said, this was a situation where a small project turned out to be a hindrance. If you finish that initial lift of concrete too quickly (footing and 6 inches of block) there is no time for it to stiffen. Ordering your first truck with only enough concrete for the first lift (especially in colder months) will allow you to add the required amount of accelerator for the footing to stiffen in the required time frame.

Don't use strapping! The instructions say to use 2 inch-wide strips of 1/2-inch plywood to attach the Fast-foot. (I think if I do a larger pour in the future I will use 3/4-inch ply). I had standard 1-by strapping available and used that instead. I think if I hadn't



"Zuckle" brackets are pinned in place (15). The Fastfoot material is attached to the ICF at the fold to allow for the required footing size (16). The footings fill with concrete during the pour. One seam was left untaped to allow water to escape (17). The author fills the ICF block while a helper vibrates the mix (18). The result of not following the manufacturer's suggestion was that the strapping cracked, which nearly allowed a blowout of the footing during the pour. The author will be sure to use plywood strips as suggested in the future (19).

also used washer-headed screws the attachment would have fully failed. As it was, some quick thinking saved one area and the rest held up.

Would I Do It Again?

Yes, that is the answer. As carpenters, we're used to adapting. We've watched tools evolve, materials change, and building codes tighten. A monopour is just another step in that evolution—one that rewards skill and planning. With the labor

pool shrinking and build costs rising, monopour may be a technique you need to shave the costs of labor and resources. Is it perfect for every project and situation? No. But I do believe we will see more monopours in the future. In fact, my next new build may be a monopour.

Aron Jones is co-founder and site supervisor of Big Dog Construction on Grand Manan Island, New Brunswick. Follow him on Instagram: @bigdogconstruction.gm.

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REMODELING



Practical Energy Upgrades

Wise building-performance improvements for middle-income, repeat clients

by JEREMY KASSEL

MET MICK AND LAURA WAVERLY in 2014 when they bought an early 1900s Dutch Colonial in Albany, N.Y. Since then, they have become long-time, repeat clients. Their home has beautiful interior millwork, including coffered ceilings, French doors, solid hardwood floors, and built-up window and door casings. But like a lot of older homes, this one was not well insulated, had older windows, and was generally in need of weatherization and energy upgrades. That's where I stepped in.

In the years since we met, the Waverly family has had us do a ton of

work on their home. Whether my role was to perform the work or to provide a lead for the owner to hire another trade, I always got that first phone call. As a sole proprietor, I sometimes function as the general contractor and sometimes I play more of a consulting role, helping the owner hire and coordinate contractors for roofing and mechanicals—work outside the domains of demolition, carpentry, waterproofing, and insulating that I typically perform. Could I have made more money as the GC? Possibly. But I earn nearly all of my income from my

own billable hours, and find it is often in my best interest to give a trusted, repeat customer the name and number of a trusted trades professional for work that falls outside my wheelhouse. That frees me up to do what I do best, and it relieves me of considerable risk.

I believe that my experience with the projects completed on this home, as detailed below, can offer contractors some ideas on how to make an older home more comfortable and more durable. The project descriptions may also suggest ways to communicate the value of this work to their clients.

PRACTICAL ENERGY UPGRADES



Cold floors and high heating bills prompted questions from the homeowner. Insulating the rim joist with closed-cell spray foam was the first step the author recommended.

Fun or Functional?

The Waverlys have always chosen pragmatic and responsible ways to upgrade their home, choosing work that enhanced durability, rather than those “fun” projects that might bring them joy but did not add to the home's long-term resilience. Like many middle-income home owners, their primary focus has been on removing uncomfortable conditions, such as cold floors (and those high heating bills), rather than on adding luxury. Of course, aesthetics and design are still important to them. Like most people, they want a beautiful home. However, when the budget is limited, projects that reduce discomfort usually take precedence over nonessentials, and the Waverlys have always been especially tuned to the functional aspects of their home. They see their home as a long-term investment and know that paying upfront for energy upgrades, for instance, provides both comfort and long-term fiscal health.

Rim Joist Insulation

The first upgrade the Waverlys hired us for was insulating the rim joists in the basement. I recommended this initial scope of work because I consider it “low-hanging fruit.” It’s typically not a heavy lift from an install perspective, especially when the basement is not finished and is completely accessible. In upstate N.Y., it’s common to see warm basements with rim joists that are insulated with fiberglass. But this offers no air-sealing effect, so condensation can form on the backside of the rim joists. I have seen this condition, and the rotten rim joists that result, more times than I can count. I suggested using closed-cell spray foam (CCSF).

Despite the environmental concerns that some people have toward CCSF, it serves a purpose and serves it well. It checks all of the boxes that we were looking for: insulation, air sealing, and ease of installation. A common alternative is what we call “poor man’s spray foam,” which is cutting blocks of rigid insulation board, fitting them in the bays, and using canned foam to seal the edges. This is a DIY-friendly approach, but is time-consuming to get a tight seal. And given the straightforward layout and clear access after we cleared the way, the spray foam contractor was able to shoot the entire job for just over his minimum fee of \$900. In 2014, this was a no-brainer and money well spent.

The result? Less heat loss in the winter, fewer drafts during windy conditions, and, of course, warmer floors on those cold winter nights!

Wet Basement Woes

When Mick and Laura moved into their home, they quickly discovered that the existing basement sump pump was running far too often for their comfort level. It had no battery backup, and their fear was that in the event of a power outage they would be left with a basement full of water. The solution was a new, heavy-duty sump pump with a battery-powered backup installed by a local contractor I recommended. When power is lost in the home, a sensor re-

lays a signal to a module that enables the sump pump to be powered by a deep-cycle marine battery. The battery is kept at full capacity with a charger and tender (which monitors the battery and switches to float mode to prevent overcharging) when the power is up and running. After I saw the relative simplicity of this system, I installed one for another client who had similar conditions and concerns.

Additionally, to alleviate the general higher relative humidity levels in the basement, the Waverlys had a commercial dehumidifier installed by the same company that installed the sump-pump backup system. Although there are no metrics or data to share, the basement is noticeably drier and the usual musty smell is gone.

New Roof

When the Waverlys bought their home, they hired my friend Tony Blue of Squared Away Contracting in Albany to perform a roof inspection. While the roof was included in their pre-purchase inspection, the report was superficial



A heavy-duty sump pump with a battery-powered backup and commercial-grade dehumidifier have helped keep the basement noticeably drier.

and limited in scope. Tony's inspections are much different. Based on his recommendations, which included a careful inspection of the attic, it was clear it was time for a new roof.

The older three-tab shingles were removed and replaced with architectural shingles. This, coupled with new soffit and ridge venting, now offers a durable, well-vented roof assembly that performs better than the previous box vents. Additionally, the low-slope, flat-lock tin roofs on the porches were replaced with rolled SBS asphalt. The Waverlys hired Tony and his company directly. This saved them from cold-calling roofing contractors, not knowing what to expect or whom to trust with such a critical upgrade to the home. It also saved them a sub-contracting markup and saved me from the responsibility for any future roof leaks or blow-offs.

New Windows

Two years ago, we replaced all of the older vinyl replacement windows in the Waverly house with new replacement units. The old vinyl replacements were getting foggy, and some were not easy to operate any longer. It was time.

The Marvin Elevate line provided a perfect fit for an early 1900s Dutch Colonial. The factory-painted interior on this line offers an authentic, traditional look and feel, while the fiberglass exterior provides modern durability. I typically steer customers toward full-frame, new-construction windows, which are easier to flash and air seal. However, the Waverly home has a multi-piece interior casing set that would have been cost-prohibitive to remove and replace.

A crucial step that is overlooked by some window-replacement companies is removing the sash weights and insulating those pockets between the jack-stud and window frame. Using a combination of rigid insulation and DAP Draftstop 812 gun foam, we wanted to make sure we could get the new replacement windows as well sealed as possible. Too many times we have seen clients spend their



New architectural-grade shingles, a ridge vent, and a rework of the soffit venting was an important and early upgrade to the Waverly house. This scope of work included rolled SBS to replace the flat-lock tin on the side porches.

hard-earned money on replacement windows, only to complain that they could still feel cold air coming in from around the old window frames.

Heat Pump Water Heater

When the Waverly family bought their home, domestic hot water was provided by a standard natural-gas water heater. While this is typical and effective, it's not the most efficient appliance for making hot water. Mick Waverly did some research on his own and decided to go with a new heat-pump water heater (HPWH.) This was a smart upgrade for using less natural gas, but the replacement offered some lessons—both for the homeowner and for me.

This was my first client to install an HPWH, and the lessons learned proved valuable in helping me make choices for subsequent HPWH installs



Heat-pump water heaters recover more slowly than gas-fired units. In retrospect, this unit should have been upsized.

PRACTICAL ENERGY UPGRADES



The author replaced the tired vinyl windows with new Marvin Elevate windows throughout. While he usually prefers full-frame windows when replacing windows, it would not have been cost-effective to disassemble and reinstall or replace the elaborate, multipiece interior trim.

for other clients. The first lesson was that HPWHs have slower recovery times than gas units. Going from a standard 40-gallon gas unit to a 50-gallon heat-pump unit wasn't enough. In hindsight, they should have chosen a 65-gallon unit to provide more hot water. The other lesson is that placing the unit near the home's forced-air furnace provided some efficiency gains. Although a furnace doesn't kick off as much heat as a boiler with hot water piping, it does provide some nearby ambient warm air to help with the efficiency of making hot water.

Smart Switches for Outdoor Lighting

Smart switches are often used as replacements for traditional light switches. They have small control buttons, and are sometimes Bluetooth-enabled, making them easy to program and control from a phone or tablet. Smart switches on the exterior not only provide the convenience and safety of illuminating ingress areas between sunset and sunrise, but also



ensure that lights will not stay on longer than necessary. While outdoor lighting is not a huge energy draw, keeping light fixtures from being left on too long qualifies as low-hanging fruit. This upgrade was installed by a trusted electrician who I have worked closely with for years.

Air Sealing and Insulation

The most labor-intensive energy upgrade to the Waverly home was re-insulating the attic ahead of a solar installation. Mice had overrun the joist bays, ruining the blown fiberglass and leaving a heavy odor of urine in their wake. Some bays were never insulated in the first place. Air sealing was nonexistent. This was evident by condensation on the underside of the floorboards, which faced the living space. The floor joists were 2x6, which leaves only so much space for cavity insulation, so we wanted to be sure to detail our work with care and precision, offering a Grade I install.

The process was as follows, working

in half of the attic at a time so we had staging and storage room:

- 1) Remove half of the floorboards (7) and stockpile them on the opposite side of the attic for later re-installation.
 - 2) Rent a gas-powered insulation vacuum (8) to remove half of the attic insulation. Hoses went directly out a gable-end window and into massive bags in the bed of my dump trailer.
 - 3) Use a shop vac and cyclone separator to vacuum up the remaining smaller bits that weren't handled by the larger gas-powered vacuum. The result is a clean, dust-free space (9).
 - 4) Redline air seal the entire space, paying close attention to areas of concern such as two-ply headers that have space between them, top plates of walls, penetrations, and so forth (9, 10, 11). (By "redline" air seal, I am referring to sealing with a mind toward creating a continuous air barrier. (For more on this, see "Air-Barrier Basics," 5/19).
 - 5) Use copper mesh and plywood to keep rodents out of larger holes and avenues.
 - 6) Install R-23 mineral-wool thermal insulation (10, 11).
 - 7) Re-deck the newly-insulated areas with the previously removed floorboards.
 - 8) Switch sides and repeat the process in the other half of the attic.
 - 9) Work included moving electrical and building an airtight box over the bathroom exhaust (12). This is a location that is often poorly detailed and tends to leak a lot of air.
- Because the newly installed mineral wool only yielded about R-23, future plans included adding more insulation on top of the floorboards, but only after the solar folks had completed their work. We wanted to leave them some working room without ruining what would have been a second layer of insulation that would have been in their way.



Wood Burning Insert

The Waverlys' original fireplace was what you would expect in a home built in 1919. While the open firebox created ambiance in the living room, it didn't really heat the space. In fact, it would

draw and draft air through the living room and right out of the chimney. The solution? A high-efficiency insert for wood heating, provided and installed by a local chimney/fireplace company with which I have a relationship. With

an airtight firebox and blower motor, wood not only burns more slowly and efficiently, but it can actually heat the living space. Hardwood firewood is not only abundant in upstate N.Y., but it's fairly easy to procure. This wood-

PRACTICAL ENERGY UPGRADES



Traditional fireplaces pull a lot of conditioned air out of a house. A new insert (13) proved to be a much more efficient way to add wintertime comfort to the home. The author installed this car charger (14), which allows the owners to charge their car for \$80/month.

burning appliance helps the home use less fossil fuel, and also crosses over into the fun category of home upgrades.

Solar Panels and Electric Cars

The latest upgrade to the Waverly home is a new solar panel array on the roof. The new panels, which are tied to the local power grid, produce and export a surplus of electricity. Given the tax credits at the time, the cost of the panels will be paid off and break even in as little as three years. The Waverly family is effectively banking electricity with the utility during the sunny months, then getting it back during winter when the panels may be covered with snow or the weather isn't as sunny.

Two new cars in the family—a completely electric 4-door sedan and a hybrid-electric SUV—rounds out the equation of removing a reliance on fossil fuels. While some folks might see this as a purely geo-political or environmental decision, the proof is in the electric bills: The all-electric sedan costs less than \$80/month to charge at home.

I installed the car charger, as it was a relatively straightforward task for us to do. (For more, see "Wiring an EV Charger, 11-12/22.") Because the garage in this Dutch Colonial house is quite small and houses bicycles, lawn tools, and outdoor power equipment, it is not used for parking vehicles. As such, we installed the electric car charger outside on a small, site-made stanchion on a retaining wall. It's centrally located in the driveway, and it's fed with AC line voltage through grey PVC conduit.

Financing The Work

It's worth noting here that the Waverly family's finances are similar to that of many clients I work with. They have been able to pay out of pocket for some of the smaller projects, but the majority of the work on their home has been afforded through a home-equity line of credit. This is extremely common, as very few of my customers are financially liquid enough to just write checks for the improvements. As homeowners using HELOCs pay

them off, they are then able to choose another upgrade project for their home. This allows them to improve their homes without going broke or living outside their means.

HELOC rates have soared in the last two years, making them less attractive for many people, so it will be interesting to see how the Waverlys (and other clients) finance future improvements. The point is that, like most homeowners, they've gradually upgraded their home as money became available. The lesson here is that it's advantageous for a contractor to establish a solid relationship with clients, acting as an advisor to help them understand which improvements the home needs and ranking those improvements according to the best return on investment. The reward can be repeat clients and work stretching over many years.

Jeremy Kassel is the owner/operator of Kassel Construction in Glenmont, N.Y. He can be found on Instagram: @kasselconstruction.

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by VINCENT SALANDRO

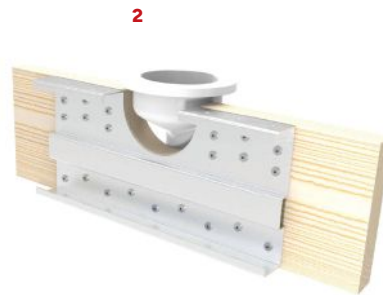
1. Wood-Look Fiber Cement

The TimberHue Collection from James Hardie combines the look of natural wood with the durability and performance of the manufacturer's fiber cement technology. The collection features a palette of eight colors to complement a range of architectural styles. Hardie says that TimberHue is engineered to withstand harsh weather, including snow, hail, and freezing temperatures. It's also formulated to resist moisture, humidity, pests, and external fire. jameshardie.com



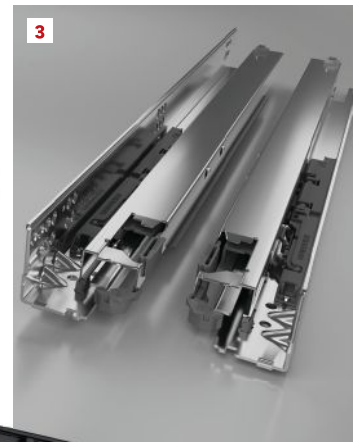
2. Joist Repair Reinforcer

The 28NR Joist Repair Notch Reinforcer from Metwood allows users to reinforce 5-inch-wide by 3-inch-deep notch cuts into 2x8 joists and does not require glue. It's made from engineered light-gauge steel and can be used on engineered I-joists or conventional framing. By allowing larger openings in floor joists, the joist reinforcer simplifies the routing and installation of utilities. The reinforcers help restore the strength of floor joists weakened by the placement of large holes or cut-outs. metwood.com



3. Undermount Drawer Slides

Grass America says that its Dynapro undermount drawer slides can be moved with just a slight pull or gentle push. They also claim that the glide is smooth enough to reduce noise and prevent the drawer from binding when being closed. Offered in both 2D and 3D versions, the latter supports tilt adjustment via an additional rear adapter. The slides are designed for wooden drawers up to 48 inches wide and according to the company will move in sync without the need for connecting hardware. grassusa.com



4. Large Swinging Doors

Marvin's Vivid Swinging Door is a part of the manufacturer's Vivid Collection, a line of windows and doors with large-format sizes and design-forward color palettes. The Swinging Door is available in up to three panels for a maximum width of 9 feet with a performance rating up to PG40 for air, water, and structural integrity. The collection features durable, low-maintenance Ultrex fiberglass inside and out with either an inswing or outswing option. marvin.com

4



5. Self-Adhering Roof Tape

CertaSeam Roof Tape from CertainTeed is composed of two waterproofing materials: an aggressive rubberized asphalt adhesive backed by a layer of slip-resistant film. A roll of CertaSeam is 50 feet long, with one roll covering a 16-square-foot area. According to CertainTeed, the rubberized asphalt layer seals around fasteners while protecting the roof from leaks caused by water back-up. The membrane forms watertight overlaps and protects asphalt shingles, slate, tile, cedar shakes, or metal roofing. It's self-adhesive and bonds firmly to the roof deck without the need for heat or special adhesives. certainteed.com



6. Three-in-One Fastening System

FastenMaster's Zip Hidden Fastening System for grooved composite and PVC boards features three integrated components—ZipClip, the Gapper, and the ZipStick—each designed to simplify installation and improve jobsite efficiency. The ZipClip is an integrated clip and fastener that locks down grooved deck boards; the Gapper is a deck board spacing tool; and the ZipStick is a stand-up cordless drill attachment used to install the ZipClips. fastenmaster.com



7. Under-Rail Deck Lighting

Under-rail lighting options in the Wolf Outdoor Living collection should prolong the entertainment window for outdoor living spaces. Keylink Underrail Lighting, designed specifically for the Chesapeake Series profile, is available in 4-, 6-, and 8-foot light strips with lens covers. Wolf says the strips are easy to trim to fit and come with clips to hold them in place. All Wolf deck lights offer long-lasting LEDs rated for 50,000 hours of service. wolfhomeproducts.com



8. Silver Stain Yakisugi

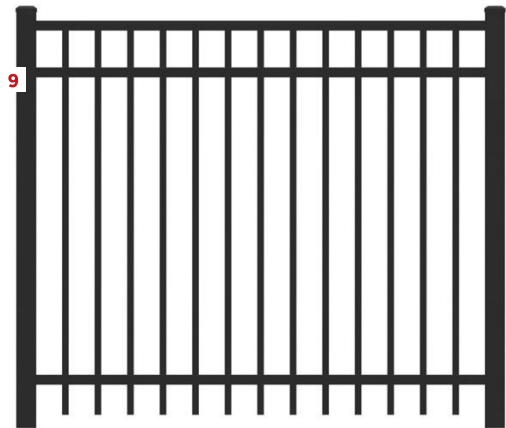
Nakamoto Forestry's new Weathering Stain Silver is available on its Gendai yakisugi and unburned sugi exterior wood products. The stain's two-part formulation combines a binder-free silver pigment and a reflective ferrous sulphate component; the pigment deposits a silver tone that washes away during the first year while the mineral reacts with the wood's tannins to naturally bleach and lighten the surface. Nakamoto claims that the stain creates a surface that will mature over time and will eliminate the need for future recoating. nakamotoforestry.com



Products

9. High Performance Aluminum Fencing

AlumiCast Surface Technology from Oldcastle APG is available in several of the company's product lines, including its Catalyst Manchester Fence and its RDI Fusion Rail. The company says that AlumiCast delivers the look of aluminum with the value and performance of composite materials by pairing the company's Compositore material with a proprietary aluminum-look cap layer that's formulated to resist splitting, rotting, warping, or molding. The technology is meant to offer a long-lasting alternative to aluminum railing products. oldcastleapg.com



10. Next-Generation Ventilation Mat

AeroNet wall and roof ventilation mat from Benjamin Obdyke is installed behind metal, wood, and composite roofing and siding materials to ensure proper drainage. Obdyke says that the new product is straightforward to install, eliminates the need for wood furring strips, and has good compression resistance—in fact, they claim that its grid system offers higher compression strength than entangled net matrix products. benjaminobdyke.com



11. Cellular Composite Siding Profile

Westlake Royal Building Products has added a new V-Groove Profile with a modern look to its Select cellular composite siding line. Meant for use in both horizontal and vertical applications, the V-Groove profile can match any home style, but its distinctive 12-foot length should make it especially suitable for vertical applications with high ceilings and contemporary architectural designs. westlakeroyalbuildingproducts.com

12. Fire-Retardant-Treated OSB

LP BurnGuard fire-retardant-treated (FRT) OSB has been engineered with fire-retardant material blended directly into the wood strands, a formulation that's meant to provide protection throughout the entire panel. Since the protection is built into the panel itself, LP BurnGuard FRT OSB installs in the same manner as standard OSB. The product incorporates the treatment during the manufacturing process unlike pressure-treated fire-retardant panels finished by third parties. It is manufactured in a one-step, code-compliant process and delivers through-panel, fire-retardant protection. lpcorp.com



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Tools of the Trade

ISOTunes Free Aware Earbuds

by MIKE WHALEN

As someone who has been working in construction and remodeling for 30-plus years, I use loud power tools almost every day. These include chipping hammers, reciprocating saws, chop saws, nail guns, fans, and vacuums, just to name a few. Every tool has its own decibel rating. Many subject the user to more than the 70-85 decibels (or dba) in an 8-hour period that's considered safe for an adult.

To prevent hearing damage, I always try to use ear protection. Whether on the job or mowing the yard at home, I've used plenty of the orange foam disposable ear plugs and the full over-the-ear " earmuff" hearing protectors. The biggest challenge I have had with these is the need to remove them to have a conversation with anyone on the jobsite.

In my search for alternatives, I started researching online to see if there were any "noise canceling" earbuds out there for the construction work site. To my surprise, I came across ISOTunes "Free Aware" earbuds. They let me listen to music or make phone calls while also protecting

my ears from potentially dangerous noise levels.

I demoed the ISOTunes "Free Aware" earbuds on the job for two weeks and was very impressed. I could adjust the environmental sound control in order to hear what else was going on around me. At the same time, louder noises are canceled out—like when a power tool starts putting out more than 85 decibels. (The buds are ANSI-certified 25 dB noise-reduction-compliant.)

The Free Aware earbuds also include the features typical with other styles of earbuds, such as the Bluetooth connection with your phone that allows you to listen to music or podcasts and make or receive phone calls. And they are controlled by tapping them to take a call, adjust volume, or play or pause music. If you have used other earbuds, then these features are much the same.

These earbuds also come with multiple sizes of ear tips, which allow for a more customizable fit. So far, I have had no issues with them falling out while I've been working on site and they've been comfortable to wear for the day. The charge on the buds lasted me for a full work day (the website claims 13 hours of use), even with constant music or nonstop calls.

In addition, the battery in the charging case has two full charges for the buds before you need to plug the case into a USB port for recharging. (A cord is included.) That's one more plus for these earbuds that allow you to use your phone and listen to music while protecting your hearing on the jobsite. Find out more at isotunes.com. Cost is \$199.99.

Mike Whalen is a project manager at DBS Remodel, a design-build residential remodeling company based in Poughkeepsie, N.Y. Check out Mike's new residential-construction-themed podcast, "Beyond the Belt," on Spotify.

PHOTOS BY MIKE WHALEN



The ISOTunes Free Aware Earbuds in use and the protective charging case (above).

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

Dewalt 2100PSI Electric Jobsite Pressure Washer

by MARK CLEMENT

Here’s a detailed accounting of how often I deploy a pressure washer: Not often.

I’m a remodeling contractor who has found a market strata building wood decks. I’ve heard from a lot of deck builders “I only use composite; get your customers to raise their budgets.”

And I suppose there’s a conversation to be had here, but my first two cents will be that if I only used composite because wood was beneath me, I’d be saying goodbye to somewhere around 50% of my annual revenue. Maybe I’m just bad at business. The point is, we also coat some of those decks and, as a result, I’ve used and destroyed numerous pressure washers: gasoline-powered units, cordless, and corded. They all share the same cluster of annoying attributes: They’re too big and they take up way more space than they deserve in the shop or on the truck.

The Test

With wood decks a focus of the business model, I use a wood/metal hybrid rail system, not 2x2; this takes out 75% of the future maintenance. Being able to say “Yes, we’ll clean and stain your deck” puts thousands of dollars in the till that otherwise wouldn’t be there. And, as generalists, our willingness to do this type of work keeps us in front of the customer who might be thinking about a new kitchen or basement next year. That’s a long way of saying: I don’t need my pressure washer until I do. Then I need it to not annoy me to death. DeWalt’s innovatively designed pressure washer does just that. The DWPW2100 PSI 1.2 GPM electric washer is easily the most elegantly designed, effective pressure washer I have ever used.

We used the tool to prep several wood decks we built for stain. This washing opens the wood grain, much like sanding, to better accept the treatment. I also used it to blast cobwebs and 25 years of dog hair from a deck we re-planked. I cleaned a mung-encrusted sidewalk at my home (always good for the mood) and I used it for cleaning impacted clay from around the workings of my tractor. Pretty sure I washed a few trucks with it, too.

Hero Function

This unit’s hero function—and this is a first—is how it behaves when I’m not using it. Unlike every other pressure washer I have ever owned, I can put it away.

The unit has wheels and a telescoping handle like a roll-aboard suitcase and is roughly the same size. I don’t see any reason for the wheels and handles on this light, easy-to-carry unit, but I love that everything but the hose is contained inside the unit’s roll cage.

The wand breaks down like a Jack Reacher (Tom Cruise

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The Dewalt DWPW2100 keeps things simple and compact. The author finds it highly portable and very easy to store when not in use.

PHOTO BY MARK CLEMENT

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version) sniper rifle and is stored in the body of the tool. Nozzles are secured in this compartment, too. Make sure you know which nozzle does what.

In Action

This unit is gloriously corded. In an enterprise like pressure washing, I need full-tilt-boogie all day. Batteries and chargers that will both deplete and get wet? No, thank you.

The cord is amply long and wraps up easily. Unlike gasoline-powered units that are loud, heavy, and require all the gasoline maintenance interactions, the DeWalt is also “draggable.” I can yank the hose to finish that last little bit (can’t do that with a heavier beast that would also be prone to tipping), rather than stop, move the unit and hose, and re-set.

2100 PSI. Pressure washing most stuff a remodeling contractor has to pressure wash doesn’t really require a whole lot of pressure. In most cases the chemicals/detergent do the heavy lifting of grime separation from the substrate and pressure washing is really enhanced rinsing.

I’ve had plenty of luck at the very bottom end of the PSI range in the past, around 1,500. It’s a light truck versus a one-ton, but I’m just hauling mulch, not plowing a Target parking lot so to speak.

For the 600-PSI jump on the DeWalt, I have a welcome and a warning. The increased output is awesome and delivered measurable results in everything I did with it. But, if you’re not careful, it’s going to blow up wood fiber if you get the wand too close to the wood.

Front, back, switches. DeWalt uses what appears to be the same gasketed, threaded hose-to-unit connection with the same thread climb as every other unit I’ve used. DeWalt’s industrial design, *unlike* every other unit I’ve used, makes this fitting accessible and gives plenty of room for your hand. I still have to fight to get the threads started, but it is a vast improvement over other units.

If I used this tool every day, I’d have a protocol for this, but I don’t. The tool is a cube. The cord comes out of one corner, the hose out of another. And there’s an on-off switch someplace else. Nice and simple.

The DeWalt unit is about three times easier to manage than any other pressure washer I have ever used. See more at dewalt.com. Cost is \$330.

Mark Clement is a deck builder and remodeler in Ambley, Pa. Find him on Instagram @myfixituplife and on YouTube at My Fix It Up Life.

Freud Industrial Glue-Line Ripping Blade

by CLAYTON DEKORNE



While working with Brian Campbell recently on an article, he turned me on to Freud Industrial’s 30-tooth LM74R010 Glue-Line Ripping Blade. This is not the thin-kerf model, but the full-kerf ($\frac{1}{8}$ -inch-thick) version that retails for around \$80. Brian mentioned using it to rip oak and other hardwood boards for a finished edge on stain-grade work without hav-

ing to run the edges through a jointer. On his recommendation, I bought one in February and have been using it to rip oak stair treads and maple banding for shelves. Without hesitation, I can say I am blown away by the results.

For starters, this blade has transformed my crappy table saw (one I regret buying to replace a beloved Bosch model that was stolen) into a half-way decent tool. I think a lot of that comes from the heavy plate, which is laser cut with squiggly expansion slots that noticeably reduce vibration and sideways movement. The teeth have a triple-chip grind (TCG)—alternating trapezoidal teeth that rough out the cut and flat-top teeth that finish the cut. The 12-degree hook is not as aggressive as some blades designed for fast cutting, but it’s in the positive range needed for a ripping blade. And certainly, the feed rate allowed by this tooth design and the full-kerf blade is noticeably slower than many table saw blades I’ve used, even ones with many more teeth. But going slow and steady, the resulting edge came out very smooth. It was completely acceptable to install with only a quick touch with a sander, but that was mostly just to knock the corners down to avoid splinters. Gone were the usual circular saw marks that otherwise only go away with a jointer or power plane, or with way more sanding than I ever care to do.

Some folks on woodworkers’ forums have noted that a glue-line ripping blade is not necessary if you have a well-tuned table saw. But the whole point of my experience is that you can get amazing results on an ordinary or even a cheapo job-site saw. Yes, a well-tuned shop saw with a thin-kerf rip blade might give you similar results and possibly allow you to cut faster. But for site work, compared to the extra step of jointing (assuming you even have a jointer onsite) or sanding saw marks off the edges of boards, this blade will more than make up for its price and slower feed rate.

PHOTO BY CLAYTON DEKORNE

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Thirty Seconds That Matter

by CLAYTON DEKORNE

It was a crisp morning under a bright Colorado sky in late summer, 1979. I had recently graduated from high school and gotten a job on a framing crew building condos near the Beaver Creek ski resort. We were all living on the jobsite. I slept in a tool shed because I didn't have a truck; the others—except two local boys hired as helpers—either slept in their trucks or bivouacked onsite.

These others included a grizzled old timer, the crew boss, and a couple of thirty-something career framers, one of whom I'd met in my hometown in N.M. He was the guy who'd hooked me up with this crew, which traveled all over the West, framing during summers and mostly hanging out and skiing during winter. I was the same age as the helpers but could hold my own as a full-fledged carpenter by then—though I was in no way an expert, particularly at the style of framing these guys practiced.

They measured boards with a tape and used a framing hatchet—the same ones they always kept on their belts in lieu of a hammer—to make their layout marks. None of their saws had blade guards, and they ran a pair of ancient Hitachi guns like they were automatic weapons. I was always at least two paces behind them on any given task. (I kept my guard on and used a pencil; what can I say?) And I was literally behind Diego when he sliced the end of his boot off, along with all the toes on that foot.

Diego had been cutting blocking with the board propped up on his foot. He would plunge the spinning, unguarded blade straight down for each cut, moving with minimal effort and maximum speed. Practiced as he was at this maneuver—he must have done this many thousands of times—it seemed inevitable something like this would eventually happen.

When it did, the whole front of my shirt got splattered with blood; I was so shocked I just stood there stupidly. But Andre, the crew boss, hardly missed a beat: He first grabbed Diego's hands and pressed them against his bloody stub of a foot, then picked up the boot end, ran to his cooler, dumped out a bag of tortillas, put the boot and toes into the bag, slammed it into the cooler, grabbed a box of shop rags from his truck, and sprinted back to Diego's side. Andre lifted Diego's hands off the wound and replaced them with a handful of shop rags. As we learned later, Andre's reaction was the smartest thing anyone could have done in the moment. Because Andre acted swiftly to keep the severed toes dry and cool, doctors were able to reattach them. Diego walked with a slight limp for the rest of his life, but the toes remained functional. He kept framing houses for the next thirty years without chronic foot pain.

Ten years later, I got a chance to imitate Andre when a co-worker sliced through the bone in his thumb while making a tricky cut on a miter saw. He didn't slice the entire thumb off—it was still hanging by a cord of flesh. I wrapped the wound up in a tee shirt, put his whole hand in a plastic bag, and had him hold his bagged hand in a small cooler full of melting ice while I drove him to the emergency ward. Doctors were able to reattach the thumb, which remained a bit stiff but was otherwise intact.

We've all seen people play stupid games with saws. And I would guess that most of us know someone who has severed digits. Next time it happens, realize that what you do in the first thirty seconds can be the difference between damage you can fix and the loss of something you can't replace.



Advice From Former EMTs

□ Most complete amputations don't bleed as much as you might think, because the severed blood vessels retract into the stump. But amputations should be treated the same as for bleeding. A tight pressure dressing at the end of the stump should be adequate. Save all severed body parts in a dry plastic bag, and put them in a cooler. Give the body parts to the EMS personnel, because a lot of limbs/digits can be reattached if you hurry.

—*Joshua Yamamoto, Baltimore, Md.*

□ Don't apply tourniquets to prevent bleeding from an amputated area. Doctors have found that contaminants below a tourniquet will circulate back into the victim's tissue and cause problems when released. If you do feel that a tourniquet is the only way to keep a person from bleeding to death (if, for example, you are many hours from medical help), don't take the tourniquet off. Leave it on until you get the victim medical attention. In most cases, amputations can be treated successfully without tourniquets if you apply pressure and act quickly to retrieve the extremity, keeping it cool and dry to keep the tissue alive.

—*Donald Rouse, St. Louis, Mo.*

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