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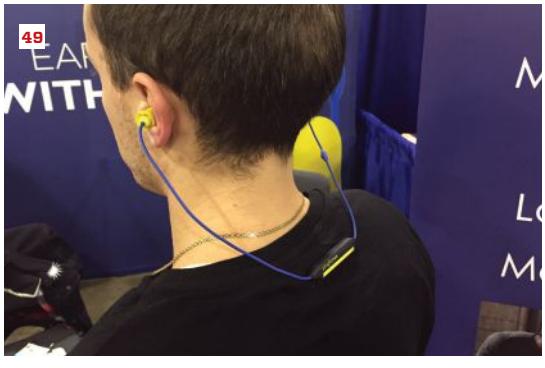
Contents



On the cover: Jonah Vannamee, of Caleb Contracting, in Cambridge, Vt., seals a vapor-open air barrier and weather membrane to the framing with a vapor-open waterproof tape. Photo by Tim Healey.

FEATURES

DEPARTMENTS

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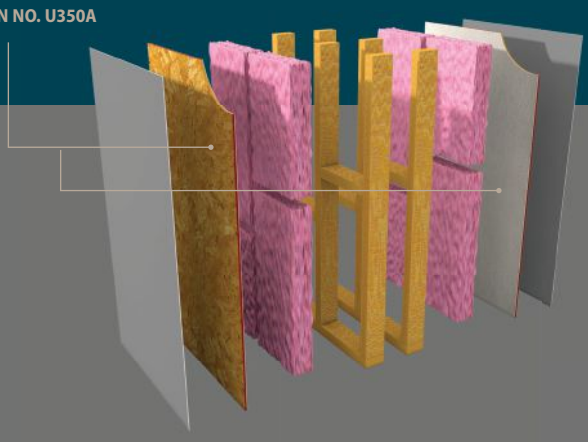

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Reader Feedback
The following excerpts are taken from comments in response to the JLC articles referenced.

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Letters

"STAYING WARM ON THE JOB," BY ROE OSBORN (REPOSTED ONLINE, 1/8/16)

Jason Laws (online, 1/11/16): I live in northern Maine, in Aroostook County. Our winters are long and cold, so I think plenty about staying warm. I tend to get hot easily (summer is a tough month for me) and enjoy the cold more. My feet and hands are what get the coldest but are the most difficult to protect. I like to wear a base layer of polypro long underwear, as well as liner socks and liner gloves. I also wear insulated overalls and an insulated work coat, plus insulated safety boots. If I get too hot, I can take off the coat and still keep the middle and lower portions of my body warm. I often wear a hard hat, and a hard-hat liner works great—many come with pockets for warmers on either side of your head.

I try to keep moving around and usually take my lunch in the truck to warm up. Up here, the wind can be tough, and working in an unheated house can be worse than being outside. A heat gun can solve something that got too cold.

Of course, the other challenge is keeping your tools working in the cold, as many aren't even supposed to be used in very cold weather, let alone should we be installing some materials, such as vinyl siding or asphalt shingles.

bpchleb (online, 1/8/16): These days, we wear battery-powered heated jackets and boot insoles. All the new Carhartt gear I've been field testing has been great—warm, waterproof, durable, and mobile, and, of course, it looks great. Writing this from St. Paul, Minn., where it's -7°F outside today.

William May (online, 1/8/16): Hahaha, up here in Canada, we frame and do roofing and siding all throughout the winter where sometimes it's *minus* 30 degrees and snowing, but we just keep going. As for dressing, after 10 minutes you don't feel your hands and feet for the rest of the day, so it's not a problem. Have fun working in your nice weather this winter, fellows.

"READY-TO-ASSEMBLE CABINETS," BY GARY STRIEGLER (DEC/16)

Scott Jacobs (online, 12/4/16): I just finished my first RTA kitchen. Definitely not for every customer, but if price trumps a "showroom quality" finish, then these may be a good option. The quality control on RTAs isn't as exacting as I'd prefer, but with some adjustment and "squinting," the finish is passable. No instructions means a few hours watching videos, so figure this into your estimate.

Bruce Stenman (online, 12/5/16): Something to be wary of is the dimensions and drawer sliders that can be used. I found with some that the lengths were sufficiently different from the lengths used in the U.S. that replacement parts were a real problem when a self-closing type failed.

Greg Fischer (online, 12/4/16): Careful planning and experience, with an open mind, can make RTA cabinets into a great kitchen. I've been installing RTA cabinets for at least 15 years and never had a complaint, and the comment I hear most often is "How much?" Laser lines, proper shims, and adaptability, coupled with high-quality panels, pretty much erase qualms about the differences for those that don't have $15,000 to $20,000 in their budget for cabinets.

FIELD GUIDE SAMPLE: ELECTRICAL ROUGH-IN (ONLINE)

Mark Orel (online, 1/15/16): I don't like boring though joists. It takes more wire, but I prefer the look of a wood wire chase. We use some 2x2 material as spacers and nailers for strips of ¼-inch lauan that we screw to the 2x2s as a cover. It's neat and easy, and I don't have spaghetti in the basement ceiling. It also grants easy access. A little more time for the carpenter, a little less time for the electrician. But you can save a little time for the carpenter if you have the lumber supplier rip the lauan to width for you.

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BY ROE OSBORN

Construction Career Day

Last spring, I reported on a job fair that I attended at a local tech school. At the event, I was impressed by the effort the school made to expose students to real-life contractors in search of employees. The job fair was put on by the school and was open to vendors from every area of concentration that the school offered—including, but not limited to, the building industry.

Then last fall, I was fortunate to attend a Career Day event that was put on at the Barnstable County Fairgrounds by a partnership between the Home Builders and Remodelers Association of Cape Cod (HBRACC) and the Cape and Islands Workforce Investment Board (CIWIB). The all-day event was attended by more than 350 high school students at all grade levels from schools on Cape Cod and in nearby southeastern Massachusetts. But unlike the job fair that I had attended in March, Career Day was specific to the building industry.

LEARNING WHILE JOB HUNTING

As at the job fair, there were dozens of vendors looking for "fresh blood," new recruits to fill the employment voids that almost everyone in every phase of the industry is experiencing. Chris Duren, executive director of HBRACC, said that the workforce shortage is epidemic on Cape Cod, just as it seems to be all over the country. Working with the CIWIB was a unique opportunity to unite students who will be looking to join the workforce in the next four to six years with businesses who are eager to hire new employees.

But there was more to Career Day than vendors looking to sign on new employees. Outside, several stations were set up where students could experience hands-on snippets of building, from framing and installing windows to placing concrete and hardscape landscaping. These activities engaged the kids, who seemed genuinely interested in seeing firsthand things that they'd been learning in the classroom.

FROM JOB FAIR TO JOBSITE

While the hands-on demonstrations were going on outside, representatives from dozens of companies spoke to the students in a nearby metal barn about what their

More than 350 students attend Career Day, put on as a partnership between the Cape Cod Builders Association and the local Workforce Investment Board. Here, the students visit dozens of stations of companies looking for employees in every facet of the building industry.

Photos by Roe Osborn

specific businesses had to offer. The real eye opener for me was learning about the challenges those companies were facing in finding new employees.

I asked Lindsay Cole—a human resources manager at Cape Associates, a large building company on the Cape—where she looks for new hires. Her answer: "Everywhere!" The company is constantly looking for new employees, she said, and the tech schools offer some of the best prospects. Cape Associates works with programs where students alternate between two weeks in the classroom and two weeks on the jobsite. This is trial by fire for the students, and it gets them out applying their education in immediate and real-life situations. Having students in these programs not only gets them interested in the work, Cole said, but it also gives the company name recognition; when the students are ready to join the workforce, they are much more likely to apply to a company that they have experience with.

I asked Cole if Cape Associates was gearing up to hire students for a busy summer, and she pointed out that spring was actually the busiest time for work on the Cape, as first and second homeowners try to get their places ready to use for the summer. Cole also said that the company is developing a skills test to place incoming employees in the right section of the company and at the right level.

In direct contrast to that strategy was another I learned about from Matt Anderson, owner of a framing company. When I asked him how he recruits and qualifies the people who come to him

Outside, students take part in hands-on demonstrations of jobsite tasks such as installing a window (above) and installing pavers for a walkway (left).

looking for work, he said with a chuckle, "I hold a mirror under their nose and have them exhale. If it fogs up, then they're hired." In other words, the only prerequisite is being alive. He went on to say, "Seriously, framing is hard work and if someone is interested in giving it a try, experience is good, but not required. We figure out pretty quickly if a person is going to pick up the techniques and work well with the team. Most framers learn from being out there every day." He also said that he gets almost no calls from kids coming out of trade schools. By and large, his incoming employees are typically in their early 20s.

EXPOSURE TO OTHER AREAS OF THE INDUSTRY

Building companies and contractors weren't the only ones represented at Career Day. I also spoke with building officials, architects, and landscape designers, as well as folks from the local utilities, about the challenges they have in recruiting employees.

At the booth for National Grid, a major natural-gas supplier in the region, I spoke to Joseph Carroll, director of community and customer management. The supplier's biggest problem, he said, is an aging workforce, with an estimated 40% of the employees nearing retirement age. He added that he likes to show young adults that there are opportunities to stay on the Cape to live and work. For National Grid, some plumbing experience is a help, but the company has a nearby training facility and is willing to train employees to work in the field. Carroll also said that a big problem with teaching—both at schools and at facilities like National Grid—is that technology is moving more quickly than the education. Who is teaching the teachers?

In a positive follow-up to last spring's tech-school job fair, I spoke to Ann Sweck, a human-resources representative from W. Vernon Whitely, a Cape-based plumbing company with more than 70 employees. She said that the company had hired two students from the spring event. But she also said that its search for new employees has been constant, even through the recession. And once an employee is hired, Sweck said, the company uses a system she called "shadowing," in which a seasoned employee works with the new hire and monitors how the new employee progresses in various jobsite situations.

Finally, I had an interesting chat with Victor Staley, a building official from the town of Brewster, at a table representing code officials. He said that most kids don't aspire to be building officials, and most building officials come from working in the industry in some capacity. The building-official table had a constant audience of young faces, and Staley explained that it's important for them to see how the industry is regulated and for them to realize that a building official's main job is ensuring that a building is safe for its occupants. He said, "You never know, maybe someday one of those students will be out there working as a building official."

Roe Osborn is a senior editor at JLC.

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Q What is the difference between modified and unmodified thinset, and in what situations should each be used?

A Tom Meehan, co-author of *Working With Tile* (Taunton Press, 2011) and a second-generation tile installer from Harwich, Mass., responds: The question about when to use latex-modified thinset (called latex/polymer-modified mortar) versus when to use unmodified thinset (called dry-set mortar) has been the subject of many heated debates in the tile industry and has even had the pros and big manufacturers at odds.

Types of thinset. First let's look at what each type of thinset is composed of and how the Tile Council of North America (TCNA) describes the two types. According to the TCNA, dry-set mortar is Portland cement mixed with sand and additives that impart water-retentivity, and it's used as a bond coat for setting tile. (Water retentivity is the ability of the thinset to resist drying out rapidly when it comes in contact with porous tile.) Dry-set mortar is suitable for thin-bed installations of ceramic and natural stone tiles over a variety of surfaces. It's used in one layer nominally between 3/32- and 1/4-inch thick. After tiles are embedded, dry-set mortar has excellent water and impact resistance; is water-cleanable, nonflammable, and good for exterior work; and does not require that the tile be soaked for installation.

The TCNA describes latex/polymer-modified mortar as a mixture of Portland cement, sand, and special latex/polymer additives and says it also is used as a bond coat for setting tile. The TCNA doesn't list or describe the types of tile that latex/polymer-modified mortar is most suitable for, but it does say that the latex additives in thin-bed Portland-cement mortars are designed to improve adhesion, reduce water absorption, and provide greater bond strength and resistance to shock and impact. It goes on to say that these additives also allow some latitude in time, working conditions, and temperatures during tile installation.

Certain types of tile, such as glass tile, may require thinset that's designed specifically for that tile. Here, the bag of adhesive is clearly labeled for its purpose (right), and the thinset is applied to the wall in accordance with the tile manufacturer's instructions (far right).

Photos by Roe Osborn

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Changes in the industry. Years ago when I learned the tile-installation business from my father, the choices were plain and simple. When we tiled over concrete slabs, cement board, drywall (gypsum board), or similar products, we used dry-set mortar with no latex additive. And when we tiled over plywood substrate, we used latex-modified mortar. If we used dry-set mortar over plywood, the bond between the tile and the plywood substrate usually failed within a year. This was the thinset rule of thumb for many years.

In the last few decades, new types of tile have been gaining popularity, and many require different formulations of thinset for proper adhesion. For example, porcelain, which has taken a large share of the market, is very dense and has a low moisture-absorption rate. Glass tile—also popular—has an even lower absorption rate. These properties call for some sort of modified thinset. Because these types of resilient tile are being made by a variety of tile companies in a variety of configurations, thinset manufacturers have had to create different types of latex/polymer-modified mortars to work with the specific tile that's being installed.

It can make a big difference which type of thinset is used with each product. Manufacturers of specialty products like glass tile almost always specify the type of mortar to be used. Even some natural stone tiles require a specific type of mortar, and installers should not take those recommendations lightly. The formulation of today's tile is just too complex, so instructions must be followed exactly.

So the answer to this confusing question about which thinset to use—and when—is pretty simple: Always follow the tile manufacturer's recommendation. The manufacturer knows its products, and more importantly, it warranties its products only when they're installed according to its recommendations. If the tile manufacturer doesn't recommend or require a specific type of thinset, then go by what the thinset maker recommends for the type of tile you're installing. The TCNA is also a good resource. The TCNA Handbook is the best all-around reference for all types of tile information, and the TCNA has technicians on hand who can help you choose the right thinset.

Exceptions for membranes. So far we've talked about thinset choices for types of tile and for different substrates. But uncoupling membranes, waterproof membranes, and crack-isolation membranes can literally add another layer of confusion to the issue. As with the tile, you must consult or research the membrane manufacturer's instructions and use the correct setting material recommended for the specific product.

With some uncoupling membranes, you may actually need to use both types of thinset if you are going over a plywood substrate. The membrane bonds to the plywood with latex-modified thinset, and then the tile beds to the membrane with dry-set mortar—different mortar on each side of the membrane. And be aware that the installation process may be different for different types of membrane, so manufacturers' requirements have to be followed for the product to be warrantied.

So here's the million-dollar question: Will it be a disaster if I use the wrong thinset (latex modified) on *top* of an uncoupling membrane? The answer is no, but it is much better to use dry-set mortar as recommended by the tile manufacturer to maintain the warranty. The bond would still be there, but because the latex slows down the hydration process, the modified thinset does not set up as readily as the dry-set mortar. Using dry-set mortar also avoids other minor problems, such as latex leaching into grout joints in wet areas, or the need to wait before grouting or walking on the tile.

Additionally, there are dry-set mortars made especially for uncoupling membranes. These mortars have a little more Portland-cement content, which provides a stronger bond without latex. Dry-set mortar is also much cheaper than latex-modified thinset, so it literally pays to use the right product.

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Repairing Plaster Interiors

BY MYRON FERGUSON

I am often called to repair plaster work in older homes. Typically, it's to repair a cracked ceiling or areas of walls or ceilings where significant reworking of the plumbing or other mechanicals has been done. I've developed some efficient strategies for both situations that don't require rocking over or demolishing the entire surface.

LARGE WALL REPAIR

A difficult repair I did on a customer's plaster wall last summer provides a great example. Some major plumbing renovations had required opening up the wall and demolishing a big section of plaster. On top of that, a drain pipe that had been relocated into the wall cavity couldn't be pushed back far enough and stuck out beyond the plane of the existing plaster surface **(1)**. In this case, as it often is, the door casing and baseboard needed to be left in place, and I wouldn't be able to build up the plaster or joint compound to be too thick along the edges of the trim. All of this meant that I couldn't easily cover the wall section with board material, so I opted for using metal lath instead.

We settled for having the inside corner of the room just a few degrees out of square. To make that work, I began by ripping a piece of 2-by and installing it even with the plane of the pipe **(2)** to create a solid attachment for metal lath, which I could then roll out from the corner 2x2 over the drain pipe, and blend into the casing.

Fabric and lath. In previous repairs, I had discovered the use of plaster over wire lath that had been backed with rosin paper to help prevent too much plaster from falling through the lath. Instead of rosin paper, I used FibaFuse Wall Reinforcement fabric, which I use regularly for resurfacing ceilings, as I will explain


4


5


6


7


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later in this article. For the wall repair, I stapled the fabric over the opening in the wall **(3)**, and then covered it with wire lath, securing the lath with screws and plaster washers **(4)**. As luck would have it, the opening I was repairing could be covered with a single sheet of lath measuring 8 feet by 27 inches—a common size for wire lath.

Primer and base coat. Before applying the plaster over the mesh and ceiling repair, I first had to apply a plaster bonding agent **(5)**. In addition to helping the plaster bond to a variety of materials, the bonding agent reduces the water absorption out of the plaster, allowing the plaster to cure properly.

I mixed the base-coat plaster to a thick consistency, and I started applying the plaster along the bottom of the wall **(6)**. Because I used a thick mix, started along the bottom, and had the fabric behind the lath, I was able to build up the plaster to a thickness of at least ½ inch and taper it to nothing along the casing. When I returned the next day, the plaster had set up into a solid surface. The blend-in over the drain pipe already looked good.

For the next coat, I applied a thick coat of setting compound, which set up in about an hour. I then applied a thin coat of lightweight joint compound for the final coat **(7)**. This coat was just a skim coat of compound to smooth and fill in any remaining defects in the surface. When it was dry, I sanded it to a smooth finish with 220-grit sandpaper.

REPAIRING CEILINGS

Large ceiling areas can be repaired with pieces of drywall. On this job, an area of the ceiling above the wall repair had also been demolished, by the same plumber who installed the drainpipe. The plaster and lath was about one inch thick, so I padded out the


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ceiling joists with strips of ½-inch drywall **(8)** before installing large pieces of the same material to fill in the hole. Note that the plaster around the perimeter should be well secured with screws and plaster washers, and any small areas of exposed lath should also be secured.

Regular drywall can be used as a plaster base, but it—and any exposed wood lath you want to plaster over—must be treated with a bonding agent **(9)**. Next, I prefill any open joints and the perimeter of the patch with base-coat plaster **(10)**, into which I embed fiberglass tape. When that has set up, I follow with a coat of setting compound and feather in the patch before resurfacing the rest of the ceiling.

RESURFACING PLASTER CEILINGS

Many old plaster ceilings have shallow cracks over much of the surface, and it's time-consuming to apply tape over every crack even when you're using self-adhesive mesh tape. Then all those taped areas have to be concealed with multiple layers of compound. This is before the spider cracks are even considered.

Spider cracks are what I call the fine cracks that are sometimes all over an old plaster ceiling. They appear to just be cracks in the paint, but I was never sure what to do about them. Was it necessary to reinforce each one? Doing that would be difficult and time-consuming and require a lot of mesh tape.

Prep work. You're finishing over an existing surface, so if it's in poor condition, any material applied over it will be compromised. If the base is loose, dirty, or too absorbent, or if it offers poor adhesion or has some other problem, then the new surface may not create the stable, durable finish desired.

To prep the existing surface, I remove any loose plaster or paint and seal any watermarks or stained areas of the ceiling. Often, areas of the ceiling will have separated from the lath, typically because the keys into the wood lath have broken. These areas can be pulled in tight to the lath by using plaster washers.

If the surface is very smooth, first rough it up with a coarse-grit paper (80 grit or coarser). On glossy painted surfaces, I have used paint de-glossers with success, but using a plaster bonding agent, such as Plaster-Weld, is my preferred method.

I suggest V-grooving larger cracks, then filling them with setting compound and covering them with extra-strength fiberglass mesh tape. Areas that are recessed or crowned should be filled or feathered out at this time with a setting compound **(11)**. Using the setting compound allows me to complete the prep work and move right on to embedding the glass mat I plan on using to reinforce the entire ceiling.

Tip: Prior to starting a job, you should prep a test area to make sure that the method you are thinking of using is going to work. That way, when you start the work, you can feel confident that you will have good adhesion.

Resurfacing. To achieve a new, smooth ceiling surface over old plaster, I begin by coating the ceiling with a thin layer of joint compound. This acts as an adhesive for a fiberglass mat, which serves

as a reinforcement to bind small cracks together and create a new, even surface.

My preferred method for applying the joint compound is using a paint roller that has a ½-inch nap cover **(12)**. The skim coat could also be applied with a wide taping knife or even with a paint sprayer capable of spraying joint compound. The compound thickness should be about ⅛ inch (3mm). Edges close to walls and ceilings can be coated by applying the compound with a paint brush or taping knife.

I suggest using a heavy-weight all-purpose compound, rather than a lighter-weight compound, because of its greater strength and adhesion qualities.

The reinforcing mat I use, FibaFuse Wall Reinforcement, is a fiberglass mat (not a weave), and because the fibers are not particularly dense, it is quite porous. So it's easy to embed in joint compound, which is the adhesive that holds the material in place.

You should span the entire ceiling with one length. (On a wall, the mat should be hung vertically as one length, as well.) Position the first piece of wall reinforcement along a straight corner or chalked line and press it into the compound with a wide taping knife, working from the center toward the edges **(13)**.

Each adjacent piece of the fiberglass mat is butted to the prior piece. This method is preferred, and I do it by first snapping a series chalk lines at intervals the width of the FibaFuse roll. Because the mat is relatively thin, it can also be lapped and double-cut, as you might do with wallpaper. Double-cutting is when you cut through both layers with a utility knife and then remove the narrow strips, leaving tight-fitting butted edges.

Excess material along the edges and around cased openings gets cut off with a taping knife. The fiberglass mat cuts easily, so there's no need to use a sharp knife. Continue to embed tightly with the taping knife until the mat is smooth and compound is forced through the face.

Work one length at a time. Within a few minutes of embedding one length of the fiberglass fabric into the compound, apply a second coat of the same joint compound, rolling it on and working it firmly into the surface **(14)**. This process fills any voids in the surface and any dry areas behind the fiberglass mat. Immediately smooth and remove most of this layer of compound with a wide taping knife, leaving only a thin coat of compound over the surface.

Let the compound dry thoroughly—it will most likely take more than 24 hours. At that point, lightly sand with a fine, 220-grit sandpaper.

Coat again. After sanding the base coat, roll on more joint compound **(15)**. (A lightweight compound can be used for this final application). Remove and smooth with a wide taping knife, leaving the surface smooth and tight **(16)**. This process is similar to applying a Level 5 finish (see "Specifying Drywall Finishes," Nov/09). In most cases, no additional sanding is needed.

Myron Ferguson is a drywall contractor from Middle Grove, N.Y. For more articles, ideas, and techniques, visit his website at thisisdrywall.com.


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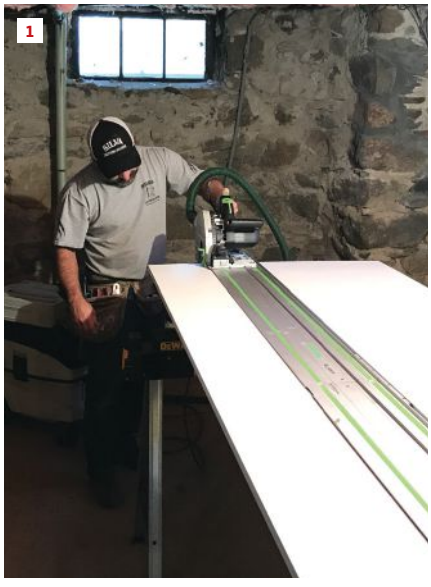

Photos by Emanuel Silva

Replacing Basement Windows

BY EMANUEL SILVA

When it comes to replacing windows, homeowners seem to give the least amount of thought to the ones in the basement. In many of the older homes I work on, the original wooden sashes on these windows are rotting away and no longer operate. Often, the sashes are nailed shut, making the basement damp and musty from lack of fresh air. Additionally, the inefficient single-pane glass in the windows is frequently dingy and loose with the putty falling out, letting in cold winter air but not letting in much daylight.

The typical fix is just sliding a replacement window into the existing wooden frame and running a bead of caulk around the outside perimeter. But for bigger problems, that's just a Band-Aid. Instead, I always suggest replacing the whole window unit—frame and sash. A modern-day double-glazed window is more energy efficient, and the thinner, modern frame lets it admit more light with less air leakage, while offering better security and easier operation. Recently, a client needed eight basement windows replaced in an older home with a rubble foundation, and here's how I approached the job.

MEASURE AND ORDER WINDOWS

I started by measuring the openings of all the existing windows around the outside perimeter of the frame. I then deducted for the frame, the sills, and the space needed for insulation, plus another 1/2 inch to deal with any out-of-square situations I might encounter in the openings. These measurements gave me the window sizes I needed.

With the windows ordered, I put together a list of material that I'd need to complete each window unit. I added up the widths and lengths of all the necessary pieces and figured that I could get them all out of two 4x8 sheets of 3/4-inch PVC. I also rounded up pocket screws, deck screws, PVC glue, foam insulation, caulk, and some mortar to complete my materials list.

FRAME FABRICATION

After the windows arrived, I used them to determine the exact sizes of the parts for the window frames. The original window sills extended only about 1/2 inch beyond the foundation, which concerned me. So I decided to make them about an inch wider to better deflect water away from the foundation.

I always cut the pieces I need from PVC sheets because I can make them any size I need with minimal waste. Using a Trac Saw, I ripped all the larger widths, labeling them as I went **(1)**. For smaller rips, I used a table saw. I then cut the sides of the frame to length on the miter saw, including the 12-degree angle needed for the sloped sill.

After cutting the sill stock to a rough length, I glued and screwed a 2-inch-wide piece onto the outer edge to double the thickness where the sill extended beyond the foundation **(2)**. After gluing the two pieces together, I ran the assembly through a table saw with the blade set at a 12-degree angle to make the outer edge plumb **(3)**. To help keep water from entering under the sill through capillary action, I cut a saw kerf 1/2 inch in and about 3/8 inch deep along the bottom outer edge of the sill. Finally, I stacked the head jamb and sill together and cut them to the same length with one pass on a miter saw.

To assemble the frame, I drilled pocket holes along the bottom edges and secured them to the sills with weather-resistant pocket screws and PVC glue **(4)**. I finished the frame by gluing and screwing the head jambs to the sides with deck screws to form simple butt joints.

WINDOWS GO INTO THE FRAMES

Before I could put the new units into the frames I'd built, I needed to install the interior stops for the windows to fit against. Taking the lengths directly from the frame, I marked each stop piece and cut it to length. After predrilling the stops and inserting screws in my holes, I screwed the stops into place, using a spacer block as a guide to space them evenly from the inside edge of the frame **(5)**.

Each window came with a head expander that slides up to fill the gap at the top of the window. I applied polyurethane low-expansion foam to each expander and slid it onto the top of a window **(6)**. Next I squeezed out a bead of caulk (I used DAP Dynaflex 230, an


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elastomeric latex sealant) onto the front side of the stops and pressed the window against the stops, leaving equal space along both sides for insulation **(7)**.

Opening the windows let me access the holes for securing the units to the frames, which I did with four screws short enough not to go through the frames **(8)**. I then checked the frame for square by taking diagonal measurements. If adjustments had been needed, I would have used the attachment screws to tweak the fit.

At the bottoms of the windows, I attached a sill expander that I had ripped to width on a table saw. After applying low-expansion foam to the bottom of the window, I tapped the expander into its groove, starting at one end of the window and slowly working my way to the other end until it was secure.

Next, I measured and cut the exterior stops for the top and sides. Then, installing one piece at a time, I filled the gap between the window and the frame with low-expansion foam and installed the stop to keep the foam from oozing out **(9)**. A bead of caulk applied to the back of each stop piece sealed it against the window sash before I screwed it into place. I finished by filling the screw holes with OSI Quad sealant.

PREPPING AND INSTALLATION

Removing the rotten and dilapidated old windows was pretty easy. They were no match for my pry bar and reciprocating saw. When all the pieces were removed, I cleaned the opening with a brush.

As I was removing the windows, I noticed that some of the openings needed additional attention. The old rubble stone foundation hadn't been maintained through the years, and a few stones were loose. After vacuuming up any loose debris, I applied a bonding agent that helped the new mortar adhere to the stones and to the old mortar. Using Type-N mortar, I secured the loose stones and then applied a coat of new mortar to the entire opening, brushing it smooth **(10)**.

The next step was installing the new windows and frames in the openings. Fastening the frames to the old stones with masonry anchors would have been extremely difficult, if not impossible. So after sliding the frames into the openings, I secured them to the house sill through the head jamb of the frames. To keep the units from moving in the openings and to air-seal around them, I sprayed low-expansion foam between the frame and the foundation.

After the foam had cured, I applied mortar around the perimeter of the frames, both inside and outside **(11)**. When the mortar had cured a few days later, I cleaned the mortar residue off the stones around the opening with muriatic acid.

The impact of the new windows was immediate. Opening the windows quickly improved the musty smell of the basement, which was much brighter with the added light. And the new double-glazed basement windows made of rot-proof material should easily perform better and last far longer than the original windows.

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


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BY MELANIE HODGDON

The Reluctant Bean Counter

One of my clients memorably told me that he was "living in" his QuickBooks files. He further remarked that he had never seen himself as "a financial guy" but had come to recognize that tracking and analyzing information was the highest function he could perform for his company. He laughed when I suggested that the title of the book he could write about his growth as a professional should be called "The Reluctant Bean Counter." So just how did he get here?

Together with his brother, this guy runs a successful remodeling company. He long ago abdicated responsibility for running reports to a team of bookkeeping professionals. They would dutifully send a mound of reports monthly to my client, who admitted that he simply filed them without even looking at them. Why? Because the reports lacked meaning and failed to answer the kinds of management questions essential to running his company. From the viewpoint of those very qualified bookkeepers, they were providing reports useful to a general business owner. However, lacking experience with the nuances of reporting for remodeling contractors, they missed reporting on what my client needed to see.

DOWNWARD SPIRAL

I often encounter excellent bookkeeping practices that still fail to answer the questions most important to remodelers. This can be a chicken-and-egg situation, because the contractor often lacks a clear vision of what he needs to know and so is unable to convey this information adequately to his bookkeeper. In addition, he or she is generally not familiar with the capabilities of the software and therefore misses opportunities to capture useful information.

On the other hand, the bookkeeper often lacks essential knowledge, too. With no clear direction from the contractor, most bookkeepers default to providing reports typical of a standard business. After all, having no experience with the specific requirements of the contractor, they aren't able to make suggestions themselves. And while they often have a strong background in the general capabilities of the accounting software used, they too may be unaware of its contractor-centric features.

As long as both the contractor and the bookkeeper are orbiting different universes, they just keep reinforcing a downward spiral of communication and understanding.

PULLING TOGETHER

In general, the only ways to change course and pull out of the ineffective spiral include

- Working closely with your bookkeeper to make sure he or she's providing you with what you want
- Modifying some of the accounting procedures to allow for a more practical treatment of how earned revenue is recognized
- Creating customized reports

You must also commit to learning how to read and interpret reports. With increased knowledge will come the ability to make specific, detailed requests for reports. The bookkeeper must likewise commit to learning why certain types of financial information are critical to you. This includes understanding the management decisions that you need to make.

You may not aspire to becoming a bean counter for your company. However, if you decide that the highest function you can perform for your company is to serve as an analyst and a planner, then you need to wrangle your bookkeeper and make sure you're getting the information you need. To do that, you will also have to change, and that's probably the hardest step. But just imagine: If your commitment to learning more about financials proves rewarding, you may actually stop feeling reluctant.

Next month, I'll describe how some accounting procedures can be modified, and I'll provide examples of the type of customized reports that can better serve a contractor. I'll also address specific types of management decisions that a bookkeeper needs to understand.

Melanie Hodgdon is president of Business Systems Management and the co-author of A Simple Guide to Turning a Profit as a Contractor.

BY TED CUSHMAN

A Passive House in Wildfire Country

Ramona, California, situated in the dry hills near San Diego, gets barely 16 inches of rain in a typical year. Almost all of it falls in a few torrential downpours during the brief winter rainy season; of the 15.18-inch precipitation total for 2016, 12 inches fell on a handful of days in January and December. In mid-summer, the sun-baked hills are bone dry. Last June, for example, the Ramona airport weather station received precisely zero inches of rain.

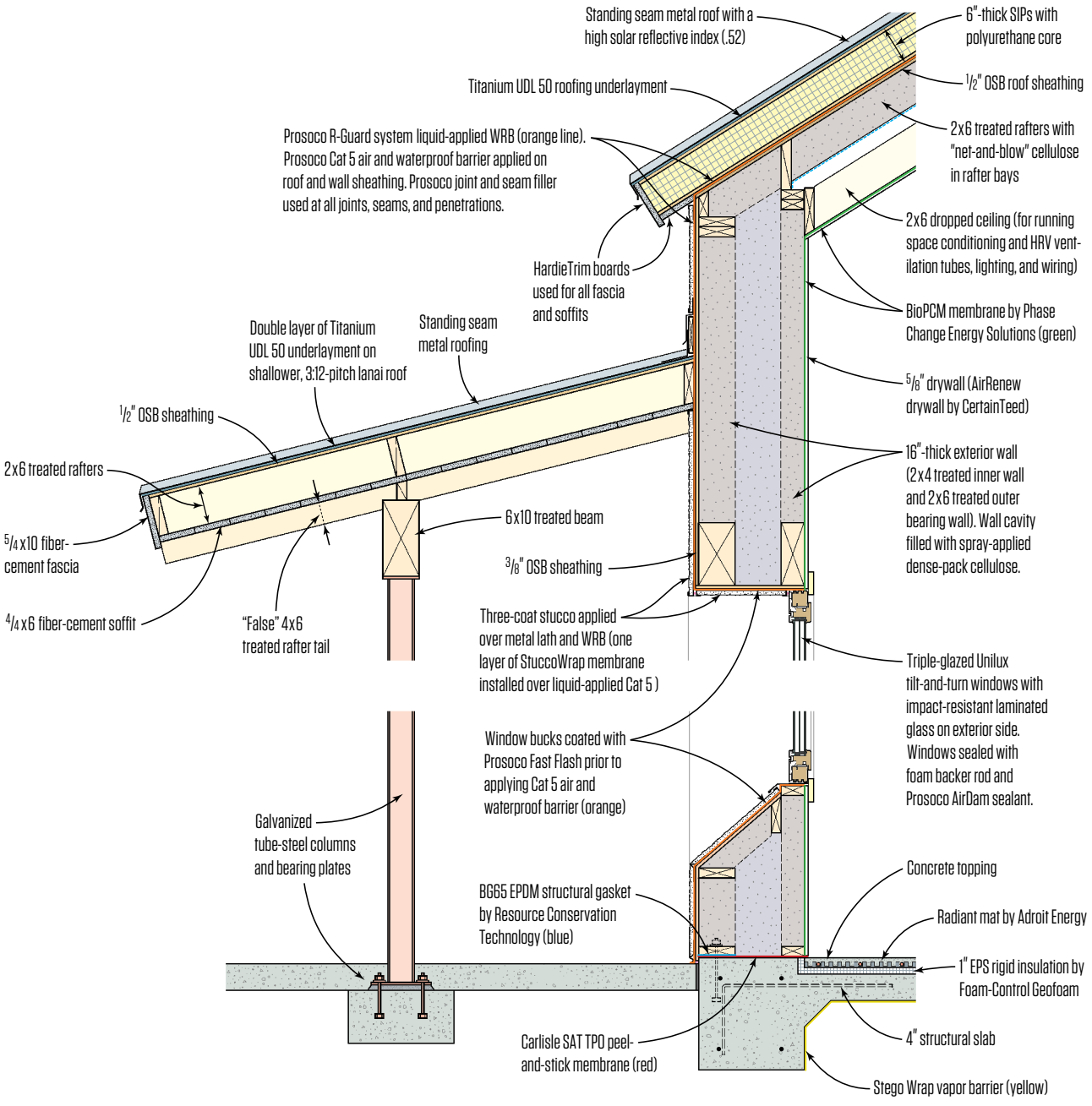
As it happened, when I drove up the canyon the week after Christmas to meet builder Jeff Adams of Alliance Green Builders and to tour San Diego County's first Passive House, it rained all day.

Dubbed "Casa Águila" (after the golden eagles that visit the area) by homeowners Amy McQuillan and Pete Beauregard, the hilltop home is a unique showcase for green technology. As required by the Passive House standard, the house is airtight and superinsulated. But construction also had to comply with California's strict Wildland Urban Interface (WUI) code for ignition resistance in a wildfire-prone area. In this case, the fire risk is by no means theoretical: Casa Águila is a replacement for an earlier dwelling, once located on the same lot. That previous building burned to the ground, along with a thousand other homes in the area, during the 2007 Witch Creek wildfire.

Photo: Alliance Green Builders

Above, a drone photo captures the panoramic view at the site of "Casa Águila," a Passive House in California's Wildland Urban Interface zone near San Diego. Solar panels in the foreground track the sun, extending the system's daily output from early morning to late afternoon. The helical wind generator at rear supplements the PV system's production, and roof-mounted panels heat the home's water.

Fire-Resistant Passive House Shell



"Casa Águila" achieves wildfire resistance with noncombustible exterior siding, roofing, and trim. Framing and wood trim are treated with fire-retardant sodium borate. The home's landscape is detailed as "defensible space," with stone patios and gravel beds. Deeply recessed triple-glazed windows have impact-resistant outer glass to defend against the risk of wind-blown debris in a firestorm. Double stud walls are insulated with dense-packed borate-treated cellulose.

Illustration: Tim Healey

But fire resistance and Passive House compliance aren't the building's only advanced features; it's also self-sufficient for water. Despite the dry location, the building gets all its domestic water from its rain catchment roof. Surplus water from the heavy winter rains is collected and stored in 10,000-gallon tanks: four to store roof runoff for use as domestic water and four to store ground runoff for irrigation, plus a fire-suppression tank that's required by the local fire department. Water is heated by a rooftop solar system with a heat-pump backup. Wastewater is recovered for food production: All the building's blackwater and greywater are treated on site (another first for San Diego County) and used—along with stored stormwater—to irrigate a terraced "food forest" orchard and garden.

And although the home was certified by Passive House based on energy conservation alone, there's also active power production on the site. Ground-mounted sun-tracking solar panels, along with a vertical-axis helical windmill generator, create a power surplus that makes the dwelling net energy positive. Some of the surplus is exported to the grid, but a deep-cycle backup battery system stores some of it in case of a power outage. (Power outages are frequent during wildfire season, when the local utility shuts off power lines in the dry hills to prevent downed lines from sparking more wildfires—like the catastrophic 2007 fire, which was started by a blown-down power line.)

And yes—they do have a pool.

PASSIVE HOUSE FEATURES

Passive House is a performance standard, not a prescriptive rule; buildings have to meet objective criteria for energy use, but how they achieve that goal is up to the discretion of the designers and builders. Ramona has only about 2,900 heating degree days, and about 1,600 cooling degree days—but as Adams' partner, Rich Williams, points out, summer heat is extreme, winter can bring frost, and daily swings are large. To limit solar gain, Adams and Williams installed a reflective metal roof over a superinsulated roof deck (dense-blown cellulose capped with 6-inch polyurethane structural insulated panels (SIPs). Windows are triple-glazed Unilux tilt-and-turn units with high solar reflectance. Architect Andrew Wilt's design called for shading to shelter the windows from the summer sun.

Airtightness is a key Passive House requirement in any climate, and for their first Passive House, Adams and Williams sweated the details. Wall plates are gasketed to the slab foundation. Walls and roof are air-sealed with Prosoco fluid-applied membrane, which continues up the walls and onto the roof sheathing. The SIPs, applied over the sealed roof deck, create self-supporting overhangs; false rafter tails under the eaves are exterior-applied.

FIRE RESISTANCE

Landscaping is a main component of WUI codes. As required by the California code (and enforced by the local municipality), vegetation is kept to a minimum near the house. There's also "defensible space"—paving, driveways, and gravel beds surround the building. A hydrant, connected to the backup storage tank, stands near the top of the driveway.

Carpenters apply 6-inch SIPs to the roof frame (top). The roof sheathing under the SIPs has already been air-sealed with fluid-applied membrane. Above, roofers install steel roofing panels on top of synthetic roofing underlayment.

Photos: Alliance Green Builders

Builder Jeff Adams inspects an air filter for the Zehnder heat recovery ventilator serving the home (above left). A smoke detector tied into the Zehnder controls at the system's fresh-air intake port (above right) is wired to shut the fans down and close a damper if smoke from a wildfire begins to enter the system.

Keeping the building's exterior noncombustible was relatively simple. The roof is metal; the exterior cladding is cement stucco. Trim is mostly Hardie fiber cement. The exposed rafter tails (as well as the wall and roof framing) are treated with fire-retardant sodium borate (also effective against termites).

But windows turned out to be a critical factor. "As lay people," explains Rich Williams, "we think that the fire just burns along the ground to the house, burns up to the eaves, and sets the house on fire." But in fact, he says, wind-blown debris can play a major role. The location's hot, dry Santa Ana winds, which blow from California's inland deserts toward the coast during the peak wildfire season, "get whipped up by the fires to extremely high velocity," he says. "That kicks up rocks and debris, and they shatter windows. Once those windows are shattered, embers and flaming material enter the home, and the house catches fire from the inside out." In the Witch Creek fire, according to Pete Beauregard, a neighbor's weather station clocked the wind at 120 mph—the threshold that triggers a requirement for impact-resistant windows and storm shutters in coastal hurricane zones.

"Originally, we were going to put in external aluminum roller shades," says Williams. "But the cost was around $70,000. Also, they're 12 inches deep. Even with 16-inch-deep walls, they were hard to accommodate. And besides that, these things are not only thermal bypasses, but also air leakage points in the envelope." Instead, the team opted for triple-glazed Unilux windows with an outer pane of impact-resistant laminated glass. "The up-charge for the impact glazing was $30,000," says Williams. "So compared with the roller shades, we saved the project about $40,000."

As the team spec'd out a Zehnder heat recovery ventilator (HRV), a thought occurred to them: If a wildfire did burn over the area, the ventilation system might suck in smoke and spread it throughout the building, damaging furniture and finishes and contaminating the ducts. So Alliance added a hard-wired smoke detector at the Zehnder's air intake, to shut down the HRV's fans and close an airtight damper if smoke starts to enter.

Wildfire risk is also a driver for the building's deep-cycle battery backup system. During the dry, blustery autumn, homes in the area lose power occasionally because the local electric utility shuts off power lines when winds get too rough (hoping to avoid a repeat of the 2007 disaster). Casa Águila's batteries are designed to hold enough charge to get the house through those down times. But the system isn't designed for the continual charge and discharge cycles that would let the house operate without a grid connection. Instead, the grid acts as the battery to compensate for variable wind and solar production: When the home makes more power than it needs, the excess is fed to the grid for use by the neighbors. At night, or when the sun and winds are both weak, the home draws power from the utility grid.

The 3.2kW wind generator and 21kW PV array are optimized to extend the home's energy-positive hours. The ground-mounted solar arrays pivot to track the sun—and on cloudy days, the system can even point the array at the brightest spot in the cloudy sky. The builders are monitoring the home's energy production and consumption to learn the patterns. Eventually, the plan is to install short-cycle batteries that will allow the building to run independently from the grid.

Ted Cushman is a senior editor at JLC.

Photos: Ted Cushman

Photo: Ted Cushman

The Evolving Envelope

A roundup of innovative materials for improving wall performance

BY JLC STAFF

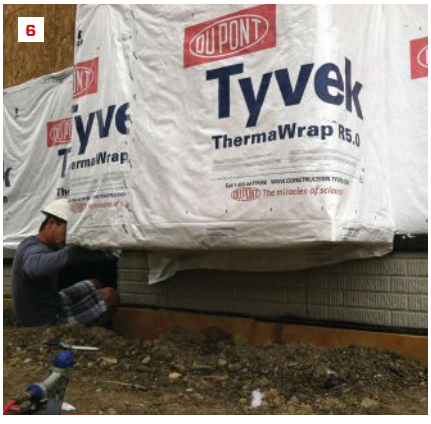
Builders are a conservative lot and change comes slow. Or that's the persistent rumor that frequently gets told, but it doesn't hold up well in the residential construction industry, especially when it comes to building energy-efficient envelopes. Changes in building practices over the last decade, pioneered largely by builders of net-zero and Passive House buildings, have ushered in a wide range of products that are already used by many builders and will likely soon go mainstream.

In this article, we present a number of the products that energy-minded builders are reaching towards, as well as a few products on the cutting edge. You may have seen them already if you regularly read the Energy column and the *JLC Update* newsletter, or if you follow the *BSC Newsletter* (Building Science Corp.), the Energy Vanguard blog, *Green Building Advisor*, or Matt Risinger's blog or YouTube channel. The point of this roundup is to look at trends in materials that can create an energy-efficient stick-built shell.

You can't talk about insulation without considering air leakage and condensation potential. If the building science in that statement isn't crystal clear, please follow the blogs and newsletters cited above. In the online version of this article, we will delve into the building science, explore details surrounding the code requirements, and link to some essential resources for a better understanding of how to use these materials successfully.

INSULATION

Perhaps the biggest change to mainstream envelopes has been the rising dominance of continuous exterior insulation. It began to sneak into the 2009 International Energy Conservation Code (IECC) as an option in climate zones 5, 6, and Marine 4. This option was expanded in the 2012 IECC to climate zones 3 to 5. And in climate zones 6 to 8, continuous insulation is required under the 2012 and 2015 IECC. With this mandate came a scramble among northern builders to figure out the door and window details needed to add at least 1 inch of extruded polystyrene (R-5) to exterior walls, and



Rigid plastic foam **(1)** is by far the most popular choice for continuous exterior insulation. Roxul ComfortBoard **(2)** allows walls to dry to the exterior. Agepan THD is a high-perm, wax-impregnated wood-fiber board **(3)**. "Perfect wall" construction covers all the framing, further eliminating thermal bridging **(4)**. Zip System R Sheathing **(5)** allows the sheathing, exterior insulation, and weather barrier to be installed all at once. Tyvek ThermaWrap R5.0 **(6)** is a little tricky to install but can meet code requirements.

Photos: 1, Ted Cushman; 2, Tim Healey; 3, 4, Matt Risinger; 5, Tim Uhler; 6, Parkside Distributors

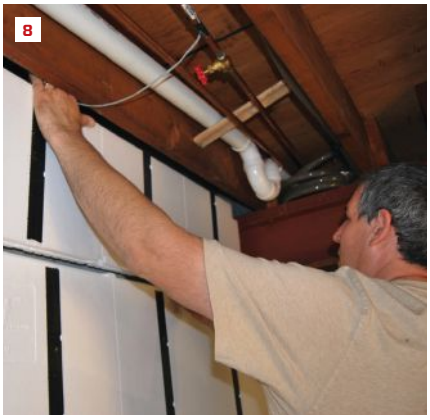
to learn how best to attach siding through a layer of foam.

Continuous exterior insulation obviously provides more insulation than you can pack in the depth of wall studs. And with the added covering, you also get a big reduction in thermal bridging, which would otherwise siphon heat through the framing.

The tricky part is that if you're using an impermeable plastic foam, you need enough continuous insulation on the exterior to prevent condensation from forming inside walls. The foam warms the sheathing, and if it's thick enough to keep the wall sheathing above the dew point at the coldest times of the year, you're fine. If the foam is too thin, however, condensation may form on the inside face of the sheathing. The trouble is that rigid foam doesn't let that condensation dry, particularly if you've also followed the code prescriptions for an interior vapor retarder. This condensation build-up can lead to moisture damage and the risk of mold.

Finding the safe amount of rigid foam is easily done—but not by following code. The minimum insulation requirements in the code do not provide the safest prescription in cold climates. (See the online version of this article at JLConline for details on calculating the thickness of exterior foam and guidance on reducing condensation potential.)

There are a number of other products besides plastic foam gaining in popularity: Mineral-wool board (Roxul ComfortBoard and Owens-Corning Thermafiber are the two versions common in the U.S.) offers R-4 per inch and allows walls to dry to the exterior. Wax-impregnated, wood-fiber insulation board, such as Agepan THD, is one German-made product gaining popularity in Europe as a resource-friendly, permeable option. It's not a structural panel, but it is highly permeable. And owing to the wax content, it reportedly doesn't need to be covered by an additional weather barrier.



Termites can't tunnel in Foamglas **(7)**, making it a good choice for foundations, while InSoFar panels **(8)** have a built-in screw base that's convenient for finishing basements. Vacuum insulation **(9)** with R-values around 50 per inch has promise but is more common for refrigerators than homes. Spaceloft **(10)**, an R-8-per-inch aerogel blanket, is useful in areas like skylight wells where insulation thickness is limited. BioPCM (see also photo on page 33) regulates indoor temperatures by changing state **(11)**.

Leveraging the advantages of continuous exterior insulation, Joe Lstiburek's "Perfect Wall" concept puts all of the insulation outboard of the structural sheathing and leaves the framing cavities completely empty. The exterior insulation extends continuously from the foundation over the roof, thereby shutting down all thermal bridging. Matt Risinger built a version of this for a house in Austin, Texas (see photo 4, facing page).

One of the biggest innovations has been to streamline the installation process for continuous exterior insulation. Zip System R-Sheathing combines structural OSB, polyisocyanurate foam, and a water-resistive barrier in one panel. The big advantage here is the labor savings—one step instead of three. Adding tape over panel seams adds a minimal extra step to create the air barrier, as well.

Tyvek recently introduced ThermaWrap R5.0—a product that combines Tyvek housewrap with a 1 1/2-inch insulation blanket (a mix of polyester and polyolefin fibers). The result is vapor-permeable, but the insulation blanket must not be compressed. This means that door and window openings need to be surrounded by flat-framed 2x4s, and long fasteners need to be used to attach siding. Nailing off the siding also requires a deft hand to avoid compressing the blanket.

Below-grade insulation. There are a few innovations in below-grade insulation. Foamglas, a revival of a product that's been around since the 1950s, is one from Pittsburgh Corning that includes countless tiny air bubbles (like most foam insulation)—only these are encased in glass. Below grade, its chief advantages are a combination of termite-resistance and high compressive strength, making Foamglas a good footing base and an insulated support for masonry.

EPS (or expanded polystyrene, commonly known as beadboard) is typically not a great choice for below-grade insulation because it can hold moisture. But as an interior basement insulation, InSoFast

Photos: 9, Ted Cushman; 11, Alliance Green Builders

Perhaps the easiest way to air-seal a building is to tape off the sheathing joints—provided you use a high-quality tape. Some acrylic-adhesive tapes can work if the tape film isn't too permeable, but butyl seems to be the material of choice for adhering to plywood or OSB. Siga makes several tapes to seal either the exterior **(12)** or interior of sheathing **(13)**, but Zip System **(14)** is gaining market share as a go-to air seal in new construction. Taping sheathing won't replace sausage packs of high-grade caulk and foam sealant **(15)**; there are many cracks and crevices in a stick-built shell that need focused attention **(16)**.

panels are heating up as a compelling option. The 2-inch (R8.5) panels have a grooved side to face masonry or concrete, while plastic "studs" on the interior side function as a screw base for drywall. Most popular for basements, they may also be a good choice for continuous exterior insulation installed over a WRB, because the screw base provides a ready attachment for siding.

Space-age physics. Silica aerogel is one of those "space-age" materials that have been discussed for decades but have only recently been used in home-building projects. It derives from a gel in which the liquid component has been replaced by a gas, producing the lowest-density solid known. The results produce materials on the order of R-8 per inch. Cabot Corp. (a chemical company best known for paints and coatings) has championed this class of materials; the company incorporates it in a number of coatings used on the commercial side to reduce surface temperatures of mechanical components and has developed it in blanket form as an envelope material. Aspen Aerogel distributes several products as a roll material that's seeing action in areas where there just isn't room for thicker insulation. Skylight wells are one example.

Vacuum insulation, though still in the future, is a compelling material. The principle here is the same as for a Thermos. Heat doesn't conduct through a void (for instance, outer space). On Earth, it's difficult to create a perfect void, so manufacturers speak in terms of how "hard" a void is. If it's not hard enough, air creeps in and allows heat to transfer across the space.

Vacuum panels (in which a vacuum has been drawn inside a foil-sealed panel) are starting to gain traction for refrigeration and for opaque glass units in commercial buildings. Dow Corning is a leader in this technology and continues to work on its VIP insulation panels for homebuilding. At R-50 per inch, it's a noble quest.

Photos: Matt Risinger

Vapor-permeable weather barriers that adhere to the sheathing offer a tighter air seal than loose housewraps. Delta Vent SA requires a primer on the sheathing **(17)**, while Henry Blueskin **(18)** has a release paper over the adhesive back. Fluid-applied air barriers are gaining popularity in commercial markets but in residential construction tend to be used mostly for window flashing. In concrete-block markets, however, there are few other effective materials **(19)**.

Photos: 17, Matt Risinger; 18, Ted Cushman; 19, Parksite Distributors

Phase shifting. The wackiest physics relates not to heat flowing through materials, but to thermal mass (the absorption and re-release of heat energy) as a way to regulate heat flow. "Phase change materials" use substances, like wax, formulated to melt or solidify at the specified temperature to which a wall or ceiling might warm or cool. Just as ice keeps a cold drink near water's freezing point until the time all the ice has melted, phase change materials keep a room cool as the wax melts or warm as it solidifies.

This idea has resulted in real-world building materials. BioPCM by Phase Change Energy Solutions is one example. Produced in a plastic sheet with pockets of meltable wax, the product comes in various melting points tuned to different set-point requirements and will reportedly help to flatten the temperature curve in a building and stabilize indoor temperature and help to prevent short-cycling of equipment.

AIR-SEALING

By definition, insulation (anything with an R-value) stops conductive heat flow. But moving air, or convection, is the way most energy in the built environment moves, so you can't address the energy-efficiency of a building shell without controlling airflow.

One of the easiest ways to help control airflow is by taping over structural sheathing joints. Of course, you can tape over the continuous exterior insulation joints. But the more inboard the air seal is, the less likely it will short circuit around built-out edges of the insulation and outboard junctures between building parts. Taping the sheathing can be done from the outside or the inside, provided you have a high-quality tape that will stick to plywood or OSB.

Currently there are tons of "construction tapes" on the market. Many housewrap tapes work well for housewrap and for plastic foam. If you care about using vapor-permeable exterior insulation,

Today, the trend in vapor retarders is towards products with "variable permeability." These are materials that are relatively vapor-closed when exposed to dry air, but become increasingly vapor-open when exposed to more humid air. The Kraft-paper facing on batt insulation is the poor man's version. But more permeable and variable alternatives exist: Cosella-Dorkin introduced Delta-Sd-Flexx **(20)**; ProClima manufactures two smart vapor barriers, trademarked Intello **(21)** and DB; and CertainTeed supplies a smart vapor barrier called MemBrain **(22)**.

put the air seal inboard of the insulation using a vapor-permeable tape. Siga is a good source for a variety of permeable tapes with aggressive bonds. Best of all, they can be torn by hand, which helps on the labor side, though they are expensive on the material side.

Research shows that loose-applied building wrap is not as effective as a weather barrier that adheres to the sheathing. If you've ever positively pressurized a weathered-in building (before the cladding has been installed) with a blower door, you may have witnessed the housewrap billowing out as air gets pushed out through the seams in the sheathing. (If not, try it.) It's an enlightening experience. The air exchange in a building never moves in one direction; air from a building is sucked and blown with fluctuations in air pressure from a myriad of sources. An air barrier that sticks to the sheathing will stop the outward as well as the inward flow of air.

DEALING WITH DIFFUSION

In most parts of the U.S., we heat in the winter and run the AC in the summer. The vapor drive flows from inside outward in the summer and in the opposite direction in the winter. So if you block vapor flow on one side or the other, you run the risk of condensation building up on a surface inside the walls. Compared with the amount of water vapor that air leaks can deposit in a wall, it's small, but it can't be ignored. Online, we provide a thorough description of this building science.

To limit vapor diffusion, the current trend runs towards "variable permeability"—products that limit diffusion, or are relatively vapor-closed, when exposed to dry air but become increasingly vapor-open when exposed to more-humid air. The reason: A forgiving wall is one that can dry easily. It doesn't really matter which direction—to the inside, or to the outside, or preferably to both.

Photos: 21, Ted Cushman; 22, Matt Risinger

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FOR GREATER GOOD™

Photos by Bud Walker

Two Essential Saw Stands for Finish Carpentry

Build them yourself for optimal portability and function

BY GARY STRIEGLER

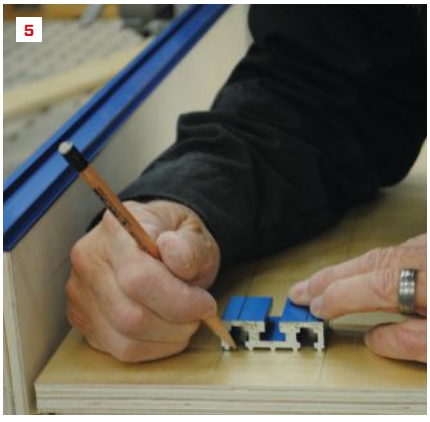
The two tools our crew uses the most for finish work are a miter saw and a table saw. To make the best use of them, we built a couple of custom stands. Both are made primarily from 3/4-inch plywood and incorporate clamping and measuring products from Kreg Tool Co. The Kreg products help maximize the efficiency and accuracy of the tools, and the plywood construction makes the stands sturdy enough for everyday use, either in the shop or on the jobsite. And both stands are light enough for two crew members to carry easily.

MITER-SAW STAND

The miter-saw stand sits on a pair of mini-sawhorses and has three basic parts: a platform for the saw to sit on, left and right wings for supporting the workpiece, and a fence for the work to sit against **(1)**. I'm able to rip everything out of a sheet and a half of plywood; I can usually round up a few plywood scraps from the shop or on the jobsite, so I buy just one sheet to build a stand.

Platform. To build the platform, I first make a 23 7/8-inch-wide rip for the top and then rip two sides 5 7/8 inches wide. The top and sides are the full length of the plywood sheet. For the crossmembers, or gussets, I cut five 5 7/8-inch-by-22 3/8-inch rectangular pieces out of my scraps.

I drill three pocket-screw holes in the ends of each crossmember, along with holes every 6 to 8 inches along the edges of the 8-foot sides. The crossmembers screw to the sides at 2 feet on-center to make a frame that forms the backbone of the platform. To complete



After building the platform and adding the support wings **(1–3, previous page)**, lay out for the clamping track on top of the wing **(4)**. Using a small section of track, mark out the bolt positions **(5)**. After slipping the bolts through drilled holes **(6)**, flip the top over and tighten the locknuts **(7)**. Add strips on either side of the track for the final, flat wing surface **(8)**.

the platform, I pocket-screw the sides of the frame to the top.

Support wings. The stand you build has to be customized to fit the particular brand and model of saw that you own. For it to work for your saw, the most critical part of making the support wings is taking a dead-accurate measurement of your miter saw's bed height and then building the support wings to a matching height. For the wings, I make two frames similar to the platform. The sides and gussets for the wings are the height of the miter-saw base minus two thicknesses of plywood.

To figure the length of the support wings, I place the miter saw squarely on the platform and rotate the saw table to the maximum cutting angle on both sides. This gives me how much clearance I'll need—and I make sure to add plenty of room for my fingers.

For the depth of the wings, I measure from the front of the platform to about ½ inch behind the saw fence (I'll explain why I measure to this point later, when I describe the fences). I nail the wing frames together with 1½-inch 18-gauge brads and then pocket-screw the wings to the platform flush with the ends and the front edge **(2)**.

Fences and tracks. I make the fences out of the same ¾-inch plywood, about 6 inches tall and the same length as the wing frames. To attach the fences, I pocket-screw them to the platform, as well as screwing them to the backs of the wings **(3)**.

I install two different tracks on the saw stand. The first is Kreg's top track, which simply mounts on top of the fence. This track holds a metal stop that I position and clamp in place for making repetitive cuts. To use the Kreg Production Stop, the track has to be 2½ inches above the finished height of the support wing.

The second track is Kreg's Universal Clamp Trak, which lets me insert a variety of Kreg clamps to hold work perfectly still. To install this track, I set the bottom plywood layer of the support-wing tops on the installed frames. I rip lengths of plywood at the correct

Using a straightedge, adjust the saw fence perfectly parallel with the wing fences **(9)**. Extra space can be left to help with cutting crooked boards. Drive screws through each saw foot to hold it in place **(10)**. Bolts and wing nuts replace the screws at a later time. Nail blocks around the saw feet to ensure perfect placement in the stand each time the saw is set up **(11)**.

width to center the track off the fence. With the rip in place, I scribe along one edge **(4)**, and then set the track in place and scribe along its edge.

Using a short section of track, I mark out the holes for the securing bolts **(5)**, making sure that they don't line up with any of the support-wing gussets. I position the bolts every 6 to 8 inches, alternating from side to side. I drill slightly oversize holes for the bolts to provide a little latitude for positioning the track.

The hex heads of the bolts slide into slots in the track, and with a little patience, I position all of the bolts and guide them into the holes I just drilled **(6)**. After carefully flipping over the top, I start a washer and locknut on each bolt. Then I flip the top back, line up the track on my lines, and tighten one bolt on each end to hold the track in position. After checking one more time to make sure the track is lined up properly, I snug all the other nuts **(7)**.

With the track secured, I nail the first layer of the support-wing tops to the frames. The strips of plywood that I'd ripped earlier nail in beside the track to complete the surface of the support wings **(8)**.

Position the saw. The next step is to center the saw on the stand and to align its fence exactly parallel to the stand fence. The centering part is easy, but aligning the fences takes a bit more work. I place a straightedge against the saw fence and then tweak the saw position until its fence is perfectly parallel but ½ inch forward of the stand fences **(9)**. Many carpenters put the fences in the same plane, but I like to put the saw ½ inch in front of the stand fence so that when I have a crooked piece of trim to cut, I can still hold it tight against the saw fence and make a good cut.

When the saw is positioned just right, I screw it to the platform with a couple of truss-head screws **(10)** (like I use for pocket joinery). This position is exactly where I want the saw to sit every time I set it up. To make this placement repeatable and foolproof, I nail small blocks around the back feet of the saw **(11)**. Later I'll replace

The stop system doubles as a measuring system for cutting on the miter-saw stand. To position the adhesive-backed measuring tape, slide the stop up to a board with a known length and mark the track **(12)**. Place the tape with the length aligned with the mark **(13)**, and then adjust the pointer on the stop until it's perfectly positioned **(14)**.

the screws with more-permanent hex-head bolts and wing nuts.

Accurate measuring system. On most of my projects, I need to make a lot of repetitive cuts, often with tolerances as little as 1/32 inch. Kreg's Top Trak and Production Stop work well for this task, but I also apply an adhesive-back tape measure on top of each track so I don't have to pull out my tape measure every time I need to cut a different length.

To position the tape correctly, I cut a block of wood at a specific length (31 inches in this case). I set the block against the blade and then slide the stop over to the block. I make a pencil mark on the track in line with the pointer on the stop **(12)**. I get only one shot at placing the tape, so after making sure the track is clean and free of dust, I place the 31-inch measurement on the tape as close to my pencil mark as possible **(13)**. I press the remaining tape onto the track and carefully trim the excess tape with a utility knife. As a final calibration, I slide the stop back against the 31-inch piece (still in contact with the blade) and micro-adjust the pointer exactly to the 31-inch measurement **(14)**.

Because the track stop ends several inches from the saw blade, cutting short pieces repetitively can be problematic. So I keep a 10-inch block of wood with the stand that acts as a stop extension. Then to cut, say, a 2-inch length, I just set the stop at 12 inches with the 10-inch block of wood against it, and the saw is ready to cut as many 2-inch lengths as I need.

It has been four years since I built the first one of these saw stands, and that first one still works fine. Over time, it has developed a slight sag in the middle, but I'm guessing that flipping it over for a weekend with a little weight on it would reverse the sag. Increasing the platform height by a couple of inches or adding a layer of plywood to the bottom side would probably help, but that would also add weight. And for most of the cuts I make with casing trim and panel moldings, that slight sag doesn't matter much. I've thought of

The table-saw stand and worktable starts with a 2-by frame pocket-screwed together **(15)**. Backer blocks at each end will support the clamp track **(16)**. Center the frame on the top and attach it with pocket screws **(17)**. The overhang helps with clamping work to the table. Lay out the track the same as with the miter-saw stand, and attach it with nuts and bolts **(18)**.

many modifications that I could make to the stand, such as adding storage or work lights (I did add an old-fashioned pencil sharpener), but for me, this design hits the sweet spot between portability, cutting accuracy, and durability.

TABLE-SAW STAND

Go into most cabinet shops, and you're likely to find a table saw surrounded by outfeed tables. Several years ago, we started building stands for our jobsite table saws that have integral outfeed tables. We soon realized that with all the sanding, routing, and assembly we do, the outfeed tables doubled as great work stations.

I've built several versions of this outfeed table-saw stand over the years, but after purchasing one of DeWalt's smaller table saws recently, I built a newer version that has greater versatility as a work station and is much lighter and more portable than previous models. I equipped this stand with clamping capabilities and added a lower shelf that serves as a central storage area, so anyone looking for more nails, glue, sandpaper, light bulbs, or even another pencil knows where to look first.

Worktable top. The design of this stand was simple: two ladder frames that support the worktable top and the lower shelf; 2x4 legs; and a platform for the saw that cantilevers off one end. To cut down on the weight, I made the work top and the shelf out of 3/4-inch plywood instead of MDF, and I built the frame for the lower shelf out of plywood instead of 2x4s. Earlier models had six legs, and I cut that number back to four.

After cutting the 2x4 pieces for the worktable frame, I assembled them using long-length pocket screws **(15)**. I also drilled pocket holes in the frame for attaching the table top. The frame is 96 inches long by 21 inches wide, but the plywood for the worktable is a full 24 inches wide and only 88 inches long. The extra width allows the crew to use the edges for clamping, and the shorter

A lightweight storage shelf adds to the usefulness of the worktable. Pocket-screw the plywood frame together **(19)**. Next screw the 2-by legs to the frame, using a framing square to keep them perpendicular **(20)**. Position the shelf frame on spacers and screw it to the legs **(21)**. Build the cantilevered saw platform out of 1/2-inch plywood **(22)**.

length let me attach clamp track at both ends of the worktable. To support and attach the clamp track, I attached plywood backers at both ends of the frame **(16)**. After perfectly centering the frame on the top, I screwed the two together using the pocket-screw holes I'd drilled earlier, driving screws through the plywood backers, as well **(17)**.

The clamp track attached in a similar fashion as with the miter-saw stand. I set the track in place and marked the positions of bolt slots. I drilled three pairs of holes for the bolts, and after slipping the bolt heads onto the track, I fed the bolts through the holes. Again I used washers and lock nuts to secure the track in place **(18)**, and a strip of plywood filled in to the edge of the frame.

Shelf and legs. To save weight, I made the frame for the lower shelf out of 6-inch-wide rips of 3/4-inch plywood. The crossmembers pocket-screwed to the sides on 24-inch centers **(19)**.

For the next step, I added the legs. Using a framing square to keep the legs perpendicular to the top, I mounted the legs behind the clamp track to keep the ends of track free for sliding the clamp into it **(20)**. I drove five screws to attach each leg to the worktable frame.

With the stand still upside down, I put a 2x4 spacer against each leg to hold the lower frame in place while I screwed it in place **(21)**. After cutting 3/4 inch off each of the spacers, I used them to hold the lower shelf up against the frame while I screwed them together.

Saw platform. So far, this table was just like any other worktable I'd made, except perhaps for the lighter weight. To turn it into an actual outfeed table as well, I needed to add a platform for the table saw (which I bought without a stand). I chose this saw because of its combination of power and portability. Adding the platform behind the table would turn my portable saw into a stationary workhorse saw that would still be easy to move around.

With the cantilever design, the weight of the saw would be offset by the mass of the worktable. To create the cantilevered platform,

Screw 2x4 braces to the table frame to hold the saw platform **(23)**, and screw the platform to the legs and braces with single screws **(24)**. Put the saw on the platform and use a straightedge to align it with the table before attaching the platform permanently **(25)**. A clamping plate added to the top increases the stand's usefulness **(26)**.

I ripped two sides out of ½-inch plywood. Cleats attached to the sides at one end to support another piece of ½-inch plywood nailed between the two sides **(22)**. To determine where to attach the platform, I first measured the exact height of the saw to the table top. Adding the thickness of the cleat and plywood platform gave me the distance from the worktable top to the bottom of the cantilever. I measured down that distance less the thickness of the top on two of the table legs and then cut two additional 2x4 braces at that length. The braces screwed to the table frame to support the end of the platform opposite the saw **(23)**.

After nailing the saw platform to the sides, I set the assembly in place and attached it to the legs and the braces with single screws **(24)**. I then set the saw on the platform and placed a straight edge on the worktable and saw to make sure they were in the same plane **(25)**. I adjusted the height as needed before permanently attaching the platform with additional screws. I screwed a stop strip to the platform to keep the saw in place, and I reinforced the back edge of the platform with blocking.

Clamps. Being able to clamp work to the outfeed table greatly increases its usefulness, so I centered a Kreg bench-clamp plate along one edge of the table. To rout the mortise for the plate, I tacked guide boards in place and used a router bit equipped with a guide bushing. After screwing the plate into place **(26)**, I attached plywood blocking to the underside of the worktable below the clamp plate to reinforce the area around the plate once it is mounted.

When both the table-saw stand and miter-saw stand are set up on a jobsite, I'm amazed at how much work we can get done in such a compact space. It's the next best thing to working in my shop.

Gary Striegler owns Craftsman Builders, in Fayetteville, Ark., and teaches workshops at the Marc Adams School of Woodworking. His website is craftsmanbuildersnwa.com.

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Cool New Tools for 2017

Eight noteworthy products from the annual STAFDA show

BY CHRIS ERMIDES, DAVID FRANE, AND BRIAN WAY

Photos by Chris Ermides, David Frane, and Brian Way

Tool manufacturers, distributors, retailers, and manufacturers of related products met for the 40th annual STAFDA event in Atlanta this past November. If you're not familiar with the event, which is run by the members-only group Specialty Tools and Fasteners Distributors Association, it is one of the biggest events of the year during which tool manufacturers give a first look at tools coming to market. Those of us who attend walk the floor with anticipation and excitement that some would argue takes on a dork-like flare fairly quickly. Seeing cool new tools for the first time is fun—especially when they reinvent a category or otherwise provide solutions that are sure to help tradespeople become more efficient and better at what they do. There were dozens of new tools at the event—and *JLC*'s sister publication *Tools of the Trade* is covering many of them online. But these eight are ones that we thought were of particular note.

1. EXPANDABLE SPIRIT LEVELS

The Type 80T Levels, which have been available in Europe for nearly a year, are expected to be released to the U.S. market in the spring or summer of 2017. The levels will be available in two lengths: 25 inches extendable to 41 inches, and 36 inches extendable to 59 inches. Unlike the XtL Exact Length Levels, which house the extension arm in the bottom of the level and so are somewhat wider, the Type 80T Levels extend from the back, resulting in a smaller profile. Stabila says the 25-to-41-inch level will cover most header sizes for doors, and the 36-to-59-inch level will be more multi-functional. The extension arms on the Type 80T Levels are lockable and provide a continuous scribe edge. Stabila intends for both levels to help window and door installers, as well as cabinet installers and millworkers. The 25-incher is expected to sell for $130 and the 36-incher for $180. stabila.com —*C.E.*

2. DARTH VADER'S FACE SHIELD

The only thing worse than wearing a face shield is not wearing one and getting hit by a chunk of debris or splashed with something toxic. Brass Knuckle's Vader Combo is a pair of goggles attached to a face shield. Smaller and lighter than traditional face shields, its close fit makes it hard for debris to come in from the sides or bottom. The goggles are vented and have an anti-fog coating to prevent condensation from obscuring your view.

I had to try these things on because they made the mannequin that was wearing them look like Darth Vader. They were more comfortable than the goggles and face shields I've worn in the past. They're said to fit over eyeglasses, but mine wouldn't fit because they have thick plastic temples—wire rims might have worked better.

The Vader Combo has been out for a few months and sells for $13 to $14. A version with smoked lenses, for use in bright sunlight, will come out early next year. brassknuckleprotection.com —*D.F.*

3. 18V POWER IN A 12V-SIZED PACKAGE

During its product development research, Makita discovered that many tradespeople have both 12-volt and 18-volt tools. It also realized that we often reach for the most compact tool available for the job. With both of those findings in mind, Makita decided to look for a solution where it could offer a more compact drill/driver and impact driver for its 18V LXT battery platform. The result is the 18V LXT Sub-Compact Brushless Combo Kit (CX200RB). The tools are both black to distinguish them from the 12V versions, which are about the same size.

When equipped with a 2.0-Ah battery, the 1/2-inch Drill/Driver (XFD11ZB) weighs a mere 2.8 pounds. It has a no-load speed of 0–500 and 0–1,700 rpm. While those numbers are smaller than for a typical 18V drill/driver (the XFD07MB, for example, runs at 0–550 and 0–2100 rpm), it still delivers on power. According to Makita, the sub-compact model will drill a hole up to 1 7/16 inches in diameter in wood and 1/2 inch in steel (compared with 3 inches in wood and 1/2 inch in steel for the XFD07MB).

When equipped with a 2.0-Ah battery, the 1/4-inch Impact Driver (XDT15ZB) weighs in at 2.6 pounds. It has a no-load speed of 0–1,300 and 0–3,000 rpm and impacts per minute of 0–1,600 and 0–3,900 (compared with the XDT11Z, which runs at 0–2,900 rpm and has an impact rate of 0–3,500 ipm). The XDT15ZB delivers a respectable 1,240 inch-pounds of torque—enough to drive long TimberLoks in 4-by and 6-by material.

The kit is available now and sells for $230. It comes with the drill/driver, impact driver, two 18V LXT 2.0-Ah batteries, rapid charger, and carrying case. makitatools.com —*C.E.*

4. SELF-SEALING NAILS

You may or may not be aware that there are trim fasteners available that automatically fill the holes they create. The fasteners, which are made of a blend of polymer resin and fiberglass, can stay proud of the material they're nailed into and then be sanded flush to the surface—not possible with steel fasteners. Several years ago, *Tools of the Trade* reported on a company called Raptor, which held the original patents on composite staplers and nailers and composite fasteners and had been selling composite nails and nailers all over the world since 1993. Raptor's original patent,

however, expired a couple of years ago. Now, Senco has developed its own version of composite staplers and nailers, which it expects to release in late February.

This new line of Senco fasteners is designed specifically to be used with a new line of air nailers and is not compatible with traditional nailers. The drive pins on the new tools are shorter than normal; this will allow the fasteners to protrude past the surface. The exposed composite fasteners can be stained or can be milled and painted or stained to blend into the final product. With these fasteners, shorter is better. As a general rule, a 3/8-inch penetration into your substrate is all you need to achieve maximum holding power, although there are some exceptions.

The important thing to remember when using composite fasteners is that they provide temporary holding power until your chosen adhesive dries. These fasteners actually have twice the holding power of similar-sized steel fasteners but only half the shear value. You cannot use these fasteners on load-bearing applications, as they will snap. Woodworking, CNC fixturing, PVC fabrication, and lumber tagging are examples of possible uses. senco.com —*B.W.*

5. COMPRESSOR IN A BOX

At first glance, this may look like a typical stack of Systainers filled with various nail guns. But look again, and you'll see there's an air compressor thrown in the mix on top. Cadex, a company known for its pneumatic finish nailers, launched this new Italian-made air compressor at the show. As a carpenter who specializes in commercial and institutional millwork, I work every day with a rolling Systainer system on jobsites where noise can be a big problem for my customers. I often use vacuum clamps, air nozzles, and all sizes of pin and staple guns. A compressor like this, with a decibel reading of 68db, will keep my workspace compact and the noise at an acceptable level for my customers.

The compressor will be available in two models: a 1-horsepower SYS/3-COMP and a 1.5-horsepower SYS/4-COMP. The SYS/3, which is expected to release this month, has a duty cycle of 60%, where most compressors run at 40%. Both units have a maximum pressure output of 139 psi and kick on at 110 psi. The SYS/3 will deliver 1.9 cfm at 90 psi—enough to run two finish nailers or one larger tool like a 16-gauge nailer or angle brad nailer. It weighs 29 pounds. The suggested price on this "compressor in a box" will be $500. The SYS/4-COMP, available this spring, will offer double the cfm, weigh 31.5 pounds, and sell for about $640. cadextools.com —*B.W.*

6. ESTWING TAKES ON STILETTO

Best known for its single-piece steel hammers, Estwing is introducing the AL-Pro this year, a multi-piece hammer with a steel claw and striking face attached to a single-piece aluminum head and handle. The head is hollow and contains shot to dampen vibration and provide a dead blow. The hammer has a magnetic nail starter and like most other Estwings, a thick nylon-rubber grip to eliminate shock.

In the past, framers used 22- to 28-ounce hammers and paid the price with arm and shoulder problems. The current thinking is that lighter is better and what light hammers lack in driving force can be made up for by using a faster swing—which is why AL-Pro framing hammers weigh only 14 ounces. Stiletto popularized this idea with its titanium hammers. Estwing went with aluminum because it's

lighter and easier to work with, and it's not subject to the patents Stiletto holds on titanium.

The AL-Pro is intended to compete with premium hammers such as those from Stiletto. Available with a smooth or milled face, it will sell for about $130 and is expected to hit store shelves in early 2017.

An interesting side note is that the AL-Pro is produced at the Estwing factory in Rockford, Ill., using aluminum castings supplied by an American company that makes receivers for AR 15s. Demand for those rifles has been high, so Estwing had a tough time getting the necessary castings at first. estwing.com —*D.F.*

7. HEADPHONES WITH HEARING PROTECTION

Plugfones are earplug headphones that allow you to listen to audio while they block ambient sound from tools and machinery. There are a few different models—I have the most basic corded one. At STAFDA, Plugfones launched a new, Bluetooth model, the Liberate. When paired with a phone or media device, the Liberate allows you to listen to audio without a wired connection—and to answer the phone or ignore a call with the push of a button.

The world is filled with devices that allow you to listen to audio with ear buds or plugs. What's different about these is they have an EPA noise reduction rating (NRR), so you know they'll block a certain amount of ambient sound. Plugfones' devices have an NRR of 25, which means they reduce noise exposure by about 25 dB—when the earplugs fit perfectly. The manufacturer (of these and other earplug phones) recommends cutting the NRR in half (de-rating) to account for a less-than-perfect fit. So if you're working in an area with 100 dB of sound (for example, with a circ saw or chain saw), Plugfones will reduce your exposure to somewhere between 75 dB (100 - 25) and 88.5 dB (100 - 12.5). It's worth noting that the PEL (personal exposure limit—as set by OSHA) is 85 dB for an eight-hour day. Subject your ears to more than that on an ongoing basis, and there's a good chance your hearing will suffer. Price: $100. plugfones.com —*D.F.*

8. SMOOTH AND STRONG FISH TAPE

I stopped by the Southwire Tools booth, where I had the chance to try out the new line of Simpul fish tapes. Designed to be pushed or pulled through EMT and PVC conduit, the tapes are composed of a spiral extruded polymer meant to reduce the amount of force required in these situations. I haven't pulled a lot of wire through conduit in my career, but I was impressed with how easily the fish tape moved through the series of bends and turns that were set up at the STAFDA booth. Southwire says that the new fish tapes are "virtually unbreakable" and that they are kink resistant. The new line of tapes is available in 75-, 100-, 125-, and 240-foot lengths and two leader styles: a swiveling metal leader and a glow-in-the-dark nonconductive leader. The fish-tape lines themselves are said to provide the strength of steel tape with the nonconductive properties of fiberglass. A 75-foot nonconductive fish tape retails for about $80 online. There's a $3 upcharge for the metal-leader version. southwiretools.com —*C.E.*

Chris Ermides is editor of Tools of the Trade; *David Frane is a former editor of* Tools; *and Brian Way is a* Tools *contributing editor.*

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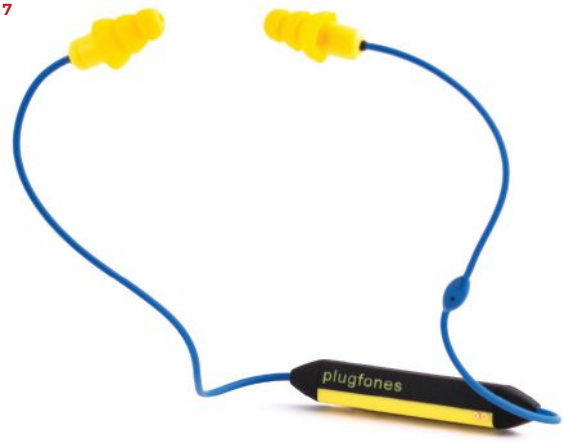

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The new Simpson Strong-Tie® LSSJ jack hanger has arrived. More importantly, it will greatly simplify the way you connect jack rafters to hip/valley roof framing. The LSSJ features a versatile hinged seat that adjusts easily to the roof pitch, is skewable up to 45° and installs easily with nails from one side.

The code-listed LSSJ is your faster, easier jack hanger. To learn more, visit **strongtie.com/lssj** or call (800) 999-5099.

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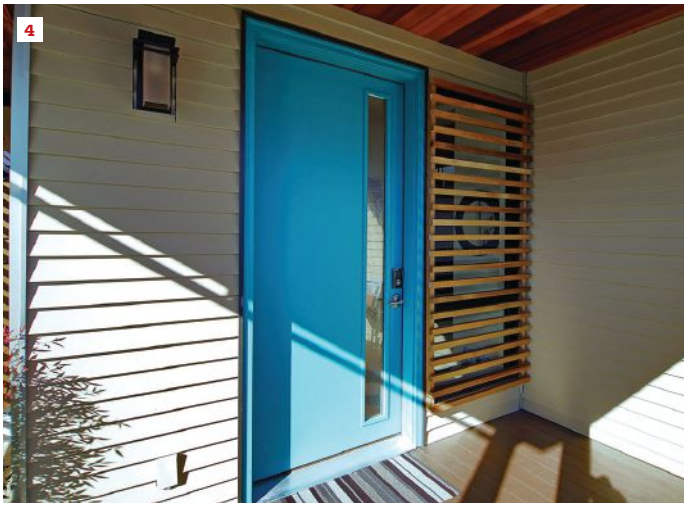
BY LAUREN SHANESY



1. Instant Filtered Water
Pfister's new Lita Filter Faucet incorporates the company's "Xtract Filter Mode," a built-in filtration system for purifying water. According to the company, the integrated filter removes chlorine, mercury, pesticides, and other chemicals that can be found in tap water, and the high-flow system delivers filtered water two times faster than most conventional systems. Users can switch between tap-water and filtered-water modes by pushing the faucet handle back. The faucet ranges in price from $625 to $675. pfisterfaucets.com

2. A Window With Double-Digit R-Value
The new Zenith series ZR10 double-film fixed picture window from Alpen High Performance Products offers a .10 U-factor—which corresponds to an R-value of 10—the highest of any commercially available window in the U.S., the company claims. The high-performance windows block 99% of UV rays, resist condensation and air infiltration, reduce noise, and offer warm interior glass surface temperatures in cold-climate winters and cool interior glass surface temperatures in warm regions, says the maker. Pricing varies. thinkalpen.com/r10window

3. A Synthetic Underlayment for Metal Roofing
Made from plastic fibers that are spun-bonded into a nonwoven mat, the new Synthetic Guard Plus Underlayment from Tamko Building Products is printed with lay lines and cap-nail locations—including locations for high-wind applications—for easy installation. The underlayment is ideal for metal roofing, as well as for mechanically fastened-tile, wood-shake, asphalt, slate, and composite roofing, says the company. Pricing varies. tamko.com/residentialroofing

4. A Water Barrier for Contemporary Doors
Simpson Door Co. has expanded use of its "WaterBarrier" technology to contemporary, flush doors made from any kind of wood and featuring different shapes, designs, and windows with standard raised or flush Shaker moldings. The water barrier combines a moisture-resistant overlay with a thermoset acrylic latex topcoat on the door's exterior. The moisture-resistant surface can then be painted any color for a contemporary finish. Pricing varies. simpsondoor.com

5. Seamless Finish for Pocket Doors
Pocket doors are now easier to finish, with Johnson Hardware's Universal Jamb Kit, a set of jamb pieces that can be cut to fit any kind of pocket door frame up to 3'-0" x 6'-8" x 1 3/8" in a 2x4 wall. The pieces can be cut to length and nailed in place, eliminating guesswork. The opening can then be finished with a casing of choice (not included in the kit). The kit includes a strike jamb, split jamb, and split header. Pricing begins at $50 for the factory-primed model and $68 for the stain-grade clear-pine model. jhusa.net/1510.aspx

6. Electronic Flood Sensor
The Fibaro Flood Sensor is the first flood sensor to be introduced to Apple's HomeKit system. Equipped with gold telescopic probes, the Flood Sensor can detect water as soon as it appears, even on uneven surfaces. If water is present, an LED indicator and sound alarm will trigger to alert homeowners on their smartphone through the Apple Home app. The Flood Sensor also has a temperature sensor, allowing homeowners to check unheated areas, like a basement or garage, for winter problems such as burst pipes. Paired with Fibaro's new iOS 10 app, the device can be controlled remotely through voice commands using Siri. The sensor is priced at $70. fibaro.com/us

7. A Storage Solution for Forgotten Kitchen Space
The Toe Space Drawer from Dura Supreme Cabinetry increases kitchen cabinet storage by utilizing a space that is commonly forgotten. Fitted along the bottom of any straight 18-, 21-, or 24-inch cabinet, the extra drawer increases storage without adding square footage to the kitchen. The touch-latch mechanism allows users to open the drawer with the touch of their foot, eliminating knobs or handles. The drawer is priced at approximately $125. durasupreme.com

8. Easily Transform Countertops
Caesarstone's new Transform line of countertops is the first surface overlay from the company. The quartz overlay fits over existing kitchen and bath countertops, allowing for a new look without extensive construction or demolition in the space. The material is low maintenance and is scratch, stain, and heat resistant, according to the company. The Transform overlays will be available in select colors. Pricing varies by color and ranges from $50 to $60 per square foot. caesarstoneus.com

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9. An Effortless Patio Door

The automated Multi-Slide Patio Door from Weather Shield can be controlled by a discreet push-button panel on the wall or connected to most smart-home systems through a smartphone app. It can be installed in openings as large as 50 feet wide and 10 feet tall, and it's available in single and bi-parting options with either 1 3/4- or 2 1/4-inch-thick door panels. Sensors prevent the door from closing on a person, an animal, or an object, and the system has a battery backup to power a limited number of operations in case of a power outage. Pricing varies by dealer. weathershield.com

10. A Strong Adhesive

RM Lucas has introduced single-component non-skinning butyl to its line of adhesive sealants. The #8660 provides a permanent seal between concealed end-laps, metal roof panels, standing-seam roof panels, ridge cap, wall panels, and other areas that require a nonhardening weather seal. The sealant comes in a neutral color, and while prices vary by distributor, the company estimates the cost at $6 to $7 per tube. rmlucas.com

11. Liquid Barrier Fills Nooks and Crannies

This new liquid flashing from GCP is ideal for difficult detail areas. Perm-a-Barrier is a fluid-applied flashing that protects hard-to-reach areas, such as joints and fasteners, of window and door rough openings from air and water entry. According to GCP, the flashing provides an airtight seal, is water-vapor permeable, and prevents moisture from being trapped in the wall cavity. It fully bonds to framing without priming, adheres to common construction substrates (such as wood, block, concrete, and metal), is damp-surface tolerant, and eliminates the need for joint reinforcement tapes. Pricing varies. gcpat.com/construction/en-us

12. Hidden Support for Floating Countertops

Federal Brace is expanding its line of hidden countertop supports with the Harrison Top Plate, a steel-plated brace with two extended arms on each side. The support is ideal for knee- or pony-wall applications, such as breakfast bars or serving areas, where the look of a floating counter is desired. The plate supports countertops weighing up to 375 pounds and extending past the end of the plate 4 inches or less. It's available in three sizes with either 10-, 12-, or 14-inch supports and a 3.25-inch center plate. Prices start at $88 and increase with size. federalbrace.com

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BY TIM UHLER

Sawzall Vs. Flexvolt

For years, we swore by corded recip saws. Our go-to was a Makita JR3050T. Then three years ago, we were sent a Milwaukee Fuel cordless recip to try out—and we have not used a corded one since. Recently, Milwaukee sent me its updated cordless Fuel recip for review, and we've been using that for a few months. (By the way, locally if I say recip saw, no one knows what I'm talking about. Everyone uses the term Sawzall, even though that is Milwaukee's label and not a tool classification.)

FUEL SAWZALL

This recip saw shipped with two M18 XC 5.0-Ah batteries and a charger (and a box to store the kit). An LED light illuminates the blade and cutting area; the blade clamp is tool-free (called "Quick-Lok Universal"); and the tool hook is a good, large one (see photo, bottom left). The tool also has a brake on the blade. The adjustable shoe is a nice addition to sort of "set the depth." I use it only occasionally but appreciate it when I do.

This latest Milwaukee is driven by the company's Powerstate Brushless Motor, which, according to Milwaukee, provides more torque, longer motor life, and longer runtime.

Performance. I'm not going to get into how many 2x4s I could cut on a charge. For me, those numbers are meaningless. I judge a tool on how it performs for me on site, and I listen to guys on my crew and consider their comments in the review. How many 2x4s it cuts depends on a lot of variables—the blade, the temperature outside, the material—that will differ from site to site. Generally, I never completely drain a battery's charge, because I change batteries before that happens; in the course of my work flow, I always need to go get nails or something, and while I'm at it, I swap batteries.

This recip is a step up from the first M18 Fuel and is a better recip than any corded model I've tried. I find that it cuts very quickly, but at the same time, I have a lot of control over the cutting. We recently had a customer decide to add five windows after we'd finished sheathing 2x6 walls. We were able to cut all five openings in less than 30 minutes total. And the cuts were so clean that if you didn't know it had been a remodel situation, you couldn't tell.

The saw has all the power I need as a framer and a remodeler, with the added convenience of not having a

Power and control. The latest Milwaukee M18 Fuel cuts fast, but at the same time, the user has a lot of control over the cutting. For work on a framing site, the author contends, it performs better than any corded model he's tried.

Pros
- Speed
- Low vibration
- Customization (OneKey)
- Rafter hook
- Mobility (Cordless)

Cons
- Cost (potentially)

cord to drag around. The hook lets me hang it off a ladder when I'm doing work up high. And another thing I like about this tool is that it has low vibration, which for me means less fatigue.

One-Key. The One-Key app from Milwaukee allows me to inventory all my Milwaukee One-Key compatible tools, track their location (with some restrictions), and even report a tool stolen.

The real beauty, though, of using this app with this tool is that I can change cutting speed, start speed (for instance, soft start), start duration, and cutting brake. Then I can save the settings and assign them a number from 1 to 4 on the tool as profiles. For common materials and cutting, I can save the profile in the app and just hit the corresponding button on the tool. Even the work-light duration can be set. Using the slow-start feature allows me to cut threaded rod without damaging the threading. A separate setting allows me to cut wood quickly.

Bottom line. I recommend this tool with no reservations. There is nothing for me to complain about, not even any nitpicky things to mention. It is a solid tool that is a pleasure to use. It is fast but very controllable. Faster means we get our work done more quickly, and clean means our work looks good.

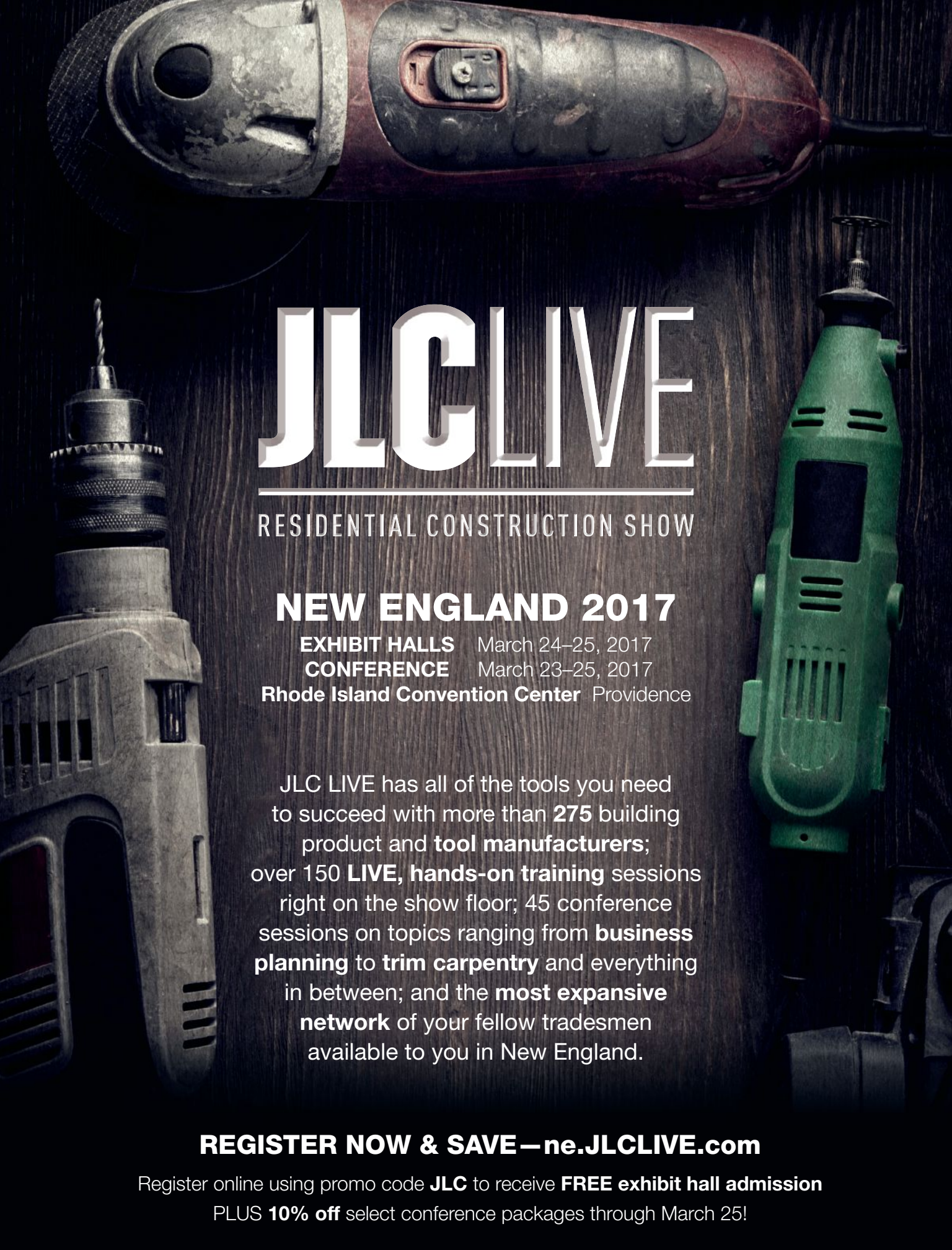
At $450 with two 5.0-Ah batteries or $550 with two 9.0-Ah batteries, the kits aren't cheap, but I think they are worth it. We don't have any complaints with the 5.0-Ah batteries; the 9.0-Ah batteries run longer but add a little weight. What this translates to for us is fewer chargers out. Or you can buy the tool bare for $250, if you already have enough batteries.

For our crew, we stay cordless 80% of the time now; we only roll power out to a beam-cutting saw and run one cord to either a light or a radio (sometimes both).

FLEXVOLT

Last summer, DeWalt released its new line of FlexVolt batteries and tools to a lot of fanfare. I was looking forward to the release because of how much the company had been hyping the new offerings. Most of the tools DeWalt has been releasing in the FlexVolt line aren't of interest to me as a framer—I don't want a blade-right cordless saw as an everyday saw, don't need a heavy-duty grinder, table saw, or sliding compound miter saw. However, its FlexVolt reciprocating saw with a brushless motor looked interesting.

What is FlexVolt? The FlexVolt tools are designed to run on one or two 60V Max FlexVolt batteries, which also convert automatically to 20V Max when mounted in a 20V tool. Since different tools have different power demands, DeWalt is trying to cover them all with one battery system that is flexible to the tool. In a 60V



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FlexVolt tool, the battery has less runtime than it does in a 20V Max tool. There's a lot to read about it in tool blogs covering FlexVolt.

Features. One feature that I like and that's becoming ubiquitous in cordless tools is an LED light that illuminates the work being done. DeWalt has included one in this recip saw. The blade change is keyless, and the trigger is variable speed. The shoe is not adjustable beyond pivoting; I don't use adjustable shoes on other recip saws that often, but it's a nice feature when I need it. Most of the saw has a rubber overmold, which I found very grippy and comfortable to use. It doesn't have a rafter hook, which was disappointing.

Performance. I was excited to use this tool and figured it would have loads of power and just tear through wood like the Milwaukee M18 Fuel we had been using for a few years. I had mixed results. At first I thought that this recip might be slower than our first Milwaukee M18 Fuel, and then we received the new one for review. The new M18 Sawzall seemed to be much faster than this DeWalt.

We set up two tests to see if the speed difference was real or perceived. In the first test, we cut 2x6 stock on edge one-handed. One guy had the DeWalt and one guy had the new Milwaukee recip. They raced, then switched so that each saw was run by both guys. Both times, the Milwaukee beat the DeWalt by a large margin.

For a second test, we tried the same arrangement, except we cut 4x4 stock. This time, the DeWalt won both times. In all these tests, the recips had exactly the same brand-new Diablo blades. Though the tests were not completely scientific, I learned that my initial feelings weren't correct. The DeWalt does cut very fast under certain conditions—namely, it cuts faster in thicker material where there is more consistent blade friction.

As I used the saw, I found the FlexVolt battery to be large and heavy, although not a nuisance. I had a lot of control while cutting, and I didn't feel much vibration. I couldn't get the blade to stop in anything; it had plenty of muscle.

Worth changing platform? Personally, I wouldn't switch to DeWalt's ecosystem just for this recip saw, but if you are already heading in that direction, you won't be disappointed. For me and for the work that I do, the Milwaukee is a better option. If I didn't have a huge investment into either battery platform and was looking to buy my first cordless reciprocating saw, I would buy the Milwaukee.

You can buy this tool, one 60V Max battery, a blade, a 20V/60V fast charger, and a bag for $300.

Tim Uhler is a lead carpenter for Pioneer Builders in Port Orchard, Wash., and a regular contributor to JLC.

Competitive features. Similar to the Milwaukee, the DeWalt FlexVolt recip offers a toolless blade change (above), and the battery has a fuel gauge (right). The DeWalt cuts faster in thicker material.

Pros

- Good battery life
- Plenty powerful
- Rubber overmold provides a comfortable grip

Cons

- Nonadjustable shoe (length)
- No rafter hook
- Comes with one battery (replacements cost $150 to $200)

February Advertising Index

Advertiser	Page
ABC Supply Company	8
American Honda Power Equipment	10
Calculated Industries	6
Chief Architect	13
Dryer Wall Vent	28
DuPont Building Innovations	40
FastenMaster	OBC
Feeney, Inc.	18
Festool USA	7
Franmar	12
GCP Applied Technologies (formerly Grace)	IFC
Greenbuild	58
Huber Engineered Woods, AdvanTech	16, 17
Huber Engineered Woods, ZIP	IBC
Intercorp/Strong-Point	54
Jamsill	4
JLC LIVE New England	61
Lenox Tools	14
LP Building Products	5
Malco Products	2
Marvin Windows and Doors	3
MiTek Builder Products	39
Norbord	48
Protective Products	63
Simpson Strong-Tie	53
SoftPlan Systems, Inc.	4
The Tapco Group/Grayne Engineered Composite Shingle	26
Tjernlund Products, Inc.	63
TYPAR	9
ZIPPKOOL	6
ZipWall	28

Classifieds

BY DAVE HOLBROOK

A Sine-Wave Pattern Rocks a Railing

Last fall, working for Cregg Sweeney Artisan Builders, I helped build a decorative railing for a veranda on a large, Craftsman-style custom home in South Orleans, Mass. The architect's plans called for a sine-wave pattern created by rectangular cutouts placed at staggered elevations in the vertical slats of each railing section. The railing's finish height was 18 inches above the veranda's decking, while the deck's surface itself was 2 feet above the planned final grade—close enough to grade that a guardrail wasn't required. Built in solid mahogany, this promised to be a one-of-a-kind undertaking.

Cutting the stock. Keith Jalbert began by installing 4x4 mahogany support posts between the deck's columns, breaking the nominal 14-foot column spacing into three equal sections **(1)**. We secured the posts to the deck framing with solid blocking and TimberLok screws. The railing cap was cut from 8/4-by-8-inch mahogany and had an 8-degree dual pitch to shed water, and a 1/4-inch-deep groove underneath to accommodate a 2x6 subrail.

For the vertical slats, the perforated sine-wave pattern required five basic "forms," stepping down in sequence and, when flipped end-for-end, stepping up again. Finish carpenter Liam McCooe and I ripped 1x4 mahogany decking to a 2 1/2-inch width and then cut it into 15-inch lengths. Next, I roughed out the 1/2-by 2-inch perforations with a drill press, using a simple jig with movable end stops and a 7/16-inch spur bit to bore four adjacent holes, while Liam used another jig, clamped to a router table, to clean up the perforation profile with a 1/8-inch-radius solid carbide straight bit. We readjusted both jigs for each of the five groups.

Assembling the pattern. The painting crew dipped each slat in an exterior, oil-based stain bath—wiping them and stacking them on drying racks **(2)**. When they dried, we used small blocks of 1/2-inch MDF as spacers between the slats, clamped the assembly together, and fastened the slats to a 5/4 mahogany cleat frame with stainless-steel brads **(3)**. With the slats nailed to one frame, we laid the next frame on top and fastened it off. While McCooe focused on slat layout and assembly, I stayed a step ahead of him, cutting and joining the cleat frames, two per section. Each pair of frames was accurately cut to fit its specific location between columns. We worked from one end of the deck to the other in sequence, placing assembled sections in their allotted space. Finishing the installation, we screwed the railing sections through their cleats into the columns and the subrail, using stainless trim-head screws. All told, we made rectangular cutouts in 567 vertical slats for 34 individual railing sections **(4)**.

Dave Holbrook is a JLC contributing editor, in South Orleans, Mass.

Photos by Dave Holbrook

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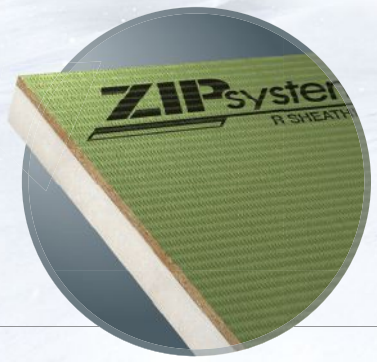

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