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39



49



57

On the cover: On an energy retrofit near Bristol, Vt., a layer of sheathing is used to secure new foam insulation and simplify the installation of flashing and housewrap. Photo courtesy Mike Shepard

FEATURES

- 39. Best Practices: Continuous Exterior Insulation**
Installation details for applying several types of rigid foam on exterior walls.
- 49. Thermal Imaging With a Blower Door**
This technique uses changing pressure to reveal the worst air leaks in a building.
- 57. How to Build a Double Winder Stair**
Stacked modular boxes create a code-compliant winder stair one tread and riser at a time.

DEPARTMENTS

- 11. From the JLC Forums**
Gluing laminate to drywall
- 13. Q+A**
How best to grout and clean textured tile; installing outlets in boxed columns
- 19. On the Job**
Replacing classic door trim
- 25. Business**
Managing your business using Evernote Premium; filing a mechanic's lien; calculating overtime
- 33. Troubleshooting**
Dealing with roof moss
- 65. Energy**
Options for handling crawlspace air
- 70. Products**
No-clog rainscreen; siding insulation; more
- 75. Toolbox**
Construction-calculator app; rethinking amp-hours; cordless heated jackets; more
- 77. Advertising Index**
- 80. Backfill**
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Gluing Laminate to Drywall

It's not as straightforward as it sounds, according to this February 2013 thread

The customer wants laminate backsplash up the entire wall from counter to cabinet. The house is circa 1855, and the cabinets are the built-in-place style from the last remodel in the '60s. Usually I can slip the laminate behind the cabs a ¼ inch or so and avoid trying to template it exactly. But to do so here means I have to slide the laminate up the wall behind the cabs, which is a tight fit in places ... No way to do this with contact cement.

I'm looking for an adhesive I can maybe apply to the wall with a notched trowel and which would give me [a 15-minute] working time. Anyone have experience with alternative glues for laminate?
—*John/Charleston, Charleston, S.C.*

Trowel-on Liquid Nails? [liquidnails.com] —*tjbnw1*

I didn't see laminates in the "recommended" list [for the LN series], but looking further I find [the CB10/CBP10 series], which does have "plastic laminates" in the list and may be my best bet. Water cleanup is always a plus.
—*John/Charleston*

The problem with your scheme here is that you want to put bare laminate on ... drywall or plaster. That's not a good idea. Don't ask how I know.

You really want to apply the laminate to a sheet of at least 1/4" plywood, MDF, or similar. Then you can glue that to the wall any way you like. To avoid a real long scribe, use a trim piece—whatever is appropriate with the decor.
—*dgbldr, Michigan*

Customer wants no trim [she's an architect], but I don't follow why laminate directly on to the drywall is a bad idea. I've seen it done plenty of times. —*John/Charleston*

Plastic laminate may not be specifically listed, but PL Premium and Liquid Nails work well ... I would be more inclined to use a grabber adhesive, like the stuff for shower stalls or, better yet, Loctite WB construction adhesive, but I know the urethane-based adhesives work. You could also try adhesive made for FRP panels.

Every Walmart has miles of plastic laminate stuck directly to drywall ... I'm not saying it's good design ... [but] it's not a bad idea. The substrate has to be a flat, smooth surface, primed with a paint that allows for a strong mechanical bond, and there has to be a way of terminating the laminate so it looks finished and nothing can get behind it. —*dave_k*

Wilsonart emailed me back and said:

"[Laminate applied to drywall] is not a recommended application due to the internal bond strength of the material.

"With that said, we do know it is done quite frequently and if working time is required, a Liquid Nails product will give you the best opportunity of maneuvering the laminate during the open time of the adhesive. Contact [cements], as you mentioned, dry much quicker and do not allow for working time; water-based adhesives would not be efficient either due to the moisture of the glue being adsorbed during the drying time by a paper-based product such as drywall. If Liquid Nails is

utilized, make sure a uniform coverage is created [to avoid] the glue line telegraphing through the laminate. This can be addressed by using a thicker product, such as our 350 product, which has more mass and can help mask the glue line after bonding."

Formica Corp. called me back and said that there are no adhesives that will work with laminate on drywall (including contact cement).

So it sounds like both companies agree with *dgbldr* that it's a bad idea. I told the customer what Formica said and she said, "Just put it up. I've been warned." She's an old customer and I can count on her to stand by her word, so I'm going to put it up with something tomorrow.
—*John/Charleston*

I am guessing we are talking about 18"+/- vertical laminate, and if using a "thick" laminate, perhaps an adhesive is not necessary (esp. given the "wonky walls") You mention an electrician. He is probably installing receptacles about 4"-0" o.c. and likely to the lower side of the 18" vertical.

Perhaps use the "thick" laminate variety and let the electrical cover plates be the mechanical "clamp" on the low side of the backsplash (high side captive by uppers), and sparingly apply adhesive to any areas not otherwise clamped/captive. This may result in a flatter/non-deformed backsplash and also provide the opportunity to selectively use adhesive should the need arise. —*Charlie V*

I really didn't mean to start a thread about if it's a good idea to put laminate on drywall. I'm OK with the idea. —*John/Charleston*

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Q I've installed slate tile on many of my projects and it's always a challenge to grout the textured surface and then get it completely clean afterward. Is there a trick to grouting tile with a textured surface and removing all the haze from it?

A Michael Byrne, a veteran tile installer and consultant, and the moderator of *JLC's* ceramic tile forum, responds:

For any type of tile, you need to use proper grouting techniques if you want an attractive finish, but textured surfaces require extra care and more time. "Textured" can mean anything from small bumps on ceramic tiles to the craggy ridges of hand-split paving stones. For most ceramic tiles with a textured glazed surface, normal grouting techniques work just fine, whereas on particularly rough surfaces, I may apply the grout with a grout bag. Slate tiles usually fall somewhere between the two extremes.

One trick is to keep the grout and haze from drying on the tile surface. Grout-release liquids or sealers may be applied to the tile as a barrier, but these products may have to be removed after grouting, which creates its own set of problems. Also, releases and sealers must be allowed to dry before grout is applied, slowing down the installation.

Instead, I prepare all but the slickest tile surfaces in a way that is simple and inexpensive—and especially help-

ful when the surface is textured. All you need is a bucket of clean water and a sponge. Simply wet down the tile surface with a damp sponge immediately before grouting, and keep the water and sponge close by to keep the surface damp as you grout. This "wash" fills in the tiny nooks and crannies in the textured surface, so the grout doesn't stick. It's important, however, not to get the tile so wet that puddles form on the tile or in the grout joint (excess water can significantly reduce the cohesive and compressive strength of the finished grout). Note also that some textured tiles are very absorbent and may need to be washed several times to keep the surface damp.

Depending on the air temperature and humidity, as well as the coarseness of the tile surface, I may grout and clean only 10 square feet or work the entire surface. (Cooler temperatures and higher humidity mean I can work a larger area before the grout starts to set up). If the grout is soft and has yet to set up after packing 10 square feet or so, I'll grout another 10 square feet and check the starting point again. If it has still not begun to set up, I keep installing more grout—about 10 square feet at a time—until the grout at the starting point has begun to set up. As each 10-square-foot section is grouted, I scrape off any excess grout with a trowel, holding its face 90 degrees to the floor and on a diagonal to the joints (photo, left). This makes cleanup easier and faster.

Cleaning. Once all the joints in the area I'm working on are grouted and the excess grout removed, the next step is damp-cleaning. Start by lightly scrubbing about 10 square feet of the surface with a moderately damp—not wet—sponge in a circular motion to loosen the grout that is beginning to set up. Rinse the sponge, wring it out thoroughly, and then lightly scrub the surface again. Repeat until all visible traces of grout are removed. When the entire installation has been damp-cleaned, the surface may appear to be clean, but it's actually covered with fine cement particles, which cause the haze that can be so difficult to remove from a textured surface.

For the final cleaning step, rinse the sponge and wring out as much water as possible, then re-rinse the

Remove excess grout by scraping the tile with the trowel held at 90 degrees to the tile (photo below). After scrubbing the tile, wipe with a clean sponge, making one pass per side of the sponge before rinsing (inset).



Photos: Roe Osborn

sponge in a bucket of fresh, clean water. Again working in the same small area, slowly wipe the surface of each tile, moving the sponge parallel to the grout joints (inset photo, page 13). After one pass, turn the sponge over and make a second pass that slightly overlaps the previous stroke. Then rinse the sponge and repeat until the area is clean before moving on. Never use the same side of the sponge for more than one pass, to prevent redepositing grout material onto the tile.

If some haze remains once the tile surface is dry, you may need to lightly re-clean the floor with the sponge, repeating the one-pass-per-side step. If after that small patches of light haze still linger when the tile dries, a light rubbing with a soft, clean cloth or towel should remove them.

Dried haze. Crucial to the success of any tile job is staying at the installation until the surface dries and re-cleaning the surface as necessary to remove any lingering haze. If you wait until the next day, the haze will have had time to partially cure, which will

make final cleaning difficult, tiring, and time-consuming. If buffing with a soft cloth or towel does not remove all the haze, scrub the affected areas with a fine-grain plastic abrasive pad and a little water. Then clean again with the one-pass method described above. Persistent haze may require a grout cleaner, but first make sure the cleaner won't harm the tile. Spot cleaning may change the appearance of the tiles, so after checking the cleaner's effectiveness on a small area, use it on the entire floor.

The last-ditch strategy for removing haze is acid cleaning, which is hazardous work that requires careful preparation, use of safety equipment, careful application, thorough rinsing, and proper disposal of the rinse water. But be aware that cleaning with acid may not be appropriate for some stone tiles.

Once the floor is clean and dry—and before it is opened for foot traffic—seal the grout and tile surfaces with a sealer made specifically for use with stone and approved by the grout manufacturer.

Q If I box in a Lally column in a finished basement, do I have to install an outlet there?


A Harlan Madsen, an electrical contractor in Bloomington, Minn., responds:

In living areas, the National Electrical Code (NEC) requires outlets on wall sections that are 24 inches or longer, so it would not be necessary to install an outlet on a column unless boxing it in created a wall space at least 24 inches long. But keep in mind that this distance can be measured around corners, and the perimeter of a 6-inch by 6-inch box measures 24 inches—which technically meets the NEC threshold for requiring an outlet. (A large-diameter round column could also meet that threshold, but we've never had to install an outlet in that situation).

Still, installing an outlet isn't a bad idea. Because boxed columns often function as room dividers, we often install outlets on them, regardless of their size.


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
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BTW253 / Z

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LXSF01 / Z

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BJR182Z

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BHR241 / Z



BVR850 / Z



BVR450 / Z



NEW LXMT025 / LXMT02Z



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BY EMANUEL A. SILVA



Replacing Classic Door Trim

A client recently asked me to replace the elaborate trim around the front door of her older home. The door and door jambs were in good shape, but the trim had deteriorated on account of inadequate flashing and sealing. The project also created a great opportunity to make sure the door was weathered-in properly at the same time.

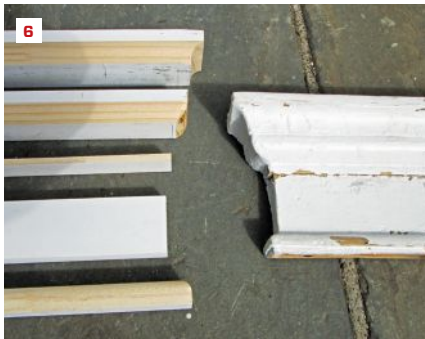
The original trim consisted of wide, layered casings with plinths and capitals that mimicked columns, and a classic built-up entablature above the door. I suggested replacing it all with PVC—wood requires more attention to detail during installation to achieve the best results—but the client insisted on wood to match the other trim on the house. To replicate the original as closely as possible, I photographed the details on the trim before I removed it and used the photos as a reference during the installation.

PREPPING THE WALL

I began by removing the existing trim and setting aside the small detail sections that I needed to replicate. I loosened the clapboard siding around the door, removing any that had cracked or rotted, and patching in pieces of new sheathing where the old had to be replaced **(1)**. I refastened the original sheathing where needed and covered all the exposed sheathing with self-adhering membrane, interlocking it with the existing felt-paper weather barrier using flashing tape.

SIDE CASING GOES ON FIRST

I removed the old door threshold and installed an aluminum flashing pan that I had formed with a homemade jig **(2)**. I covered the sill of the door frame with the pan and sealed it in place with self-adhering membrane. I then turned my attention to the trim details,



cutting and installing the side casings first. Because they were quite wide, I made them in three pieces: an inside section that attached directly to the door jamb, an outside section that butted into the siding and extended up to the cornice, and a third piece that overlaid the first two to mimic a supporting column. I ripped each of these sections to width from 5/4 stock and routed an ogee on the edge of the inside sections where they would be attached to the jambs. For all the trim, I pre-primed the pieces before using a high-quality paintable caulk at every wood-to-wood connection.

I held the trim about 1/2 inch off the side of the house with blocking strips for drainage and air circulation (3) and fastened it in place with countersunk stainless-steel screws. I've gotten better results attaching trim this way and plugging the screw holes, than relying on nails and putty. I typically wait until all the pieces are in and then plug the holes as I prep for painting. The second and third side pieces were installed next (4) followed by the head casing (5).

ADDING THE CAPITALS AND PLINTHS

The first ornamental pieces to be installed were the plinths (at the bottom of the columns) and the capitals (at the top) (6). This decorative molding can be made in a mill shop, but that can take weeks and add a lot to the budget. Because these profiles were pretty simple, I just routed the edges, using bearing-guided bits (7). With the original capitals and plinths at hand, I was able to closely match them.

Each capital consisted of five pieces, which I primed and then glued and tacked together on the workbench before caulking and screwing the assembly in place (8). The plinths were also made of five pieces: three for the base block and two for the decorative layers on top. I installed the bases first and then each top layer as a single piece. Once the moldings and casings were installed, I sealed all the joints with latex/silicone caulk.

RECREATING THE ENTABLATURE

Next I built the entablature, or ornamentation, over the door. The outside pieces of the

side casings formed the sides of the entablature; layout lines on the casings aligned the sections of trim as they went in. I pre-assembled all the moldings as "kits" at my workbench, starting with the architrave—a simple flat board with molding—which I placed on top of the capitals (9).

Above that would go the frieze, but first I built the cornice—the top part of the entablature. This consisted of a soffit that rested on another band of molding defining the top of the frieze section. I built the soffit at my workbench in two pieces: a bottom part with attachment blocks and a fascia that wrapped around it (10). The bottom part fit around the tops of the side casings and attached to the wall with pocket screws. The fascia then screwed to the blocks.

A band of crown molding—with angled blocks reinforcing it from inside (11)—topped off the cornice. A cleat installed above the cornice created a slight pitch for the cornice cap so that it could shed water.

The final piece of the entablature was the frieze board, which I made from 5/4 stock

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On the Job / Replacing Classic Door Trim



with blocking at the ends to make it sit proud of the molding below. The frieze had a simple curved face and slight curves at the ends, which I created with a jigsaw and a disc sander (12).

FINISHING UP

I topped the cornice cap with a layer of self-adhering flashing that slipped under the building paper above the door (13). I also added a layer of lead flashing over the whole thing and sealed it against the wall with flashing tape (14).

With the trim around the door finished, I installed a natural oak threshold with an apron below. I had put off this step to keep

the threshold from getting scuffed during construction. Next I filled in the siding around the door, caulking the sides to the casing and leaving the appropriate drainage space between the siding above the door and the cornice cap. Once I had plugged the screw holes and filled the nail holes in the trim, it was ready for the final coats of paint.

For a finishing touch, I built a copy of the original beadboard storm door out of cedar and painted it bright red. Installed on wrought iron hinges, the colorful door completes the restoration of this classic entry.

Emanuel Silva owns Silva Lightning Builders, in North Andover, Mass.

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BY JOE STODDARD

Using Evernote Premium in Your Business

We first looked at Evernote (evernote.com) around four years ago (“Faster, Smaller, and More Connected Than Ever,” Dec/09) and were impressed with its simplicity, flexibility, and downright usefulness. At that time Evernote allowed you to capture practically any type of digital or real-world information, then retrieve it at will via a killer search engine. The basic idea is so simple that it’s easy to miss all the ways Evernote can be used to manage your business and personal information, which is the biggest reason I wanted to give it another look.

Evernote is one of a new breed of “cross-platform” applications that store information in “the cloud,” which means that you (and your team) can work with Evernote data from any device that can get online and has a Web browser. Or you can install a dedicated application for your smartphone, laptop, or tablet that will synchronize data between devices for online/offline use.

There are three versions of Evernote: “free” (limited capability); full-featured “Premium” (\$5 per month); and “Business” (\$10 per user per month), which adds a centralized console to control multiple employee accounts. For this column I’m focusing on Premium, because it has some features that are critical to Evernote success in business, such as the ability to extract and index text from photographs and even handwritten notes.

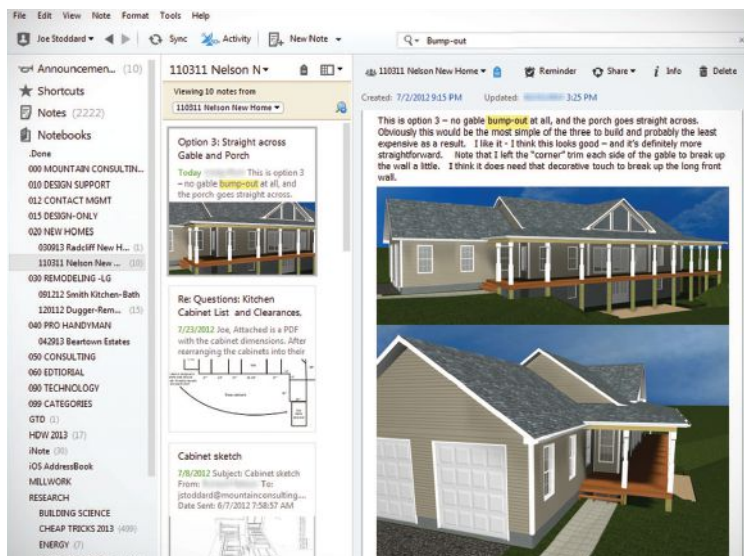
EVERNOTE BASICS

Since our first look, Evernote has added a few key collaborative features (such as Reminders), and has expanded its stable of “helper” applications, so it’s even more capable. With a little creativity, and without spending much more than your elbow grease, Evernote can be used for almost any application that requires capturing, organizing, and retrieving information, including to-do and reminder lists; jobsite walk-throughs and punchlists; and job specs, contracts, and photos, to name a few.

Notes. The base unit of information in Evernote is a Note, which can be hand-typed, clipped from other sources, or a mix of the two. But Notes are not just text—they can be a mix of practically any kind of digital information imaginable, including photos and audio-video. You can also embed PDFs and Microsoft Office or Google Apps documents. A big part of the Evernote magic is the software’s ability to extract text of any kind (including handwritten scrawls on a scrap of 2x4) and make the resulting text searchable.

Tags. Individual notes can be further organized by assigning subject matter tags to them. This is a belt-and-suspenders approach because every word in every Note is already indexed by the search engine; but organization nuts will appreciate the ability to add another layer of organization when searching for information.

Notebooks. Notes are optionally stored in Notebooks, and they in turn can be further organized into Stacks, as shown at left.



Evernote’s customizable desktop organizes Notebooks into Stacks (left column), and displays sorted notes from the active notebook (center), as well as the active note (right). Search results highlight every instance of the search term (“bump-out” in this example).

CREATING NOTES

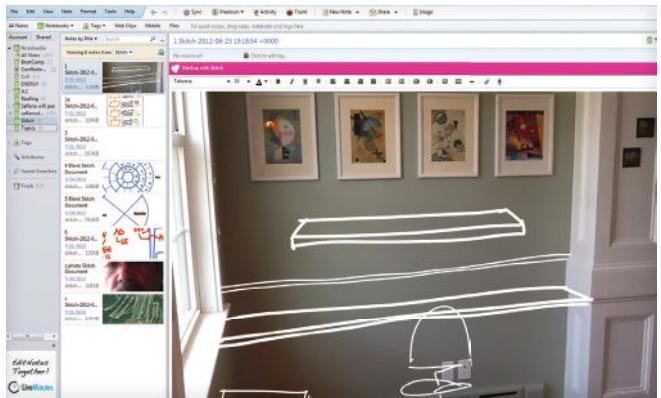
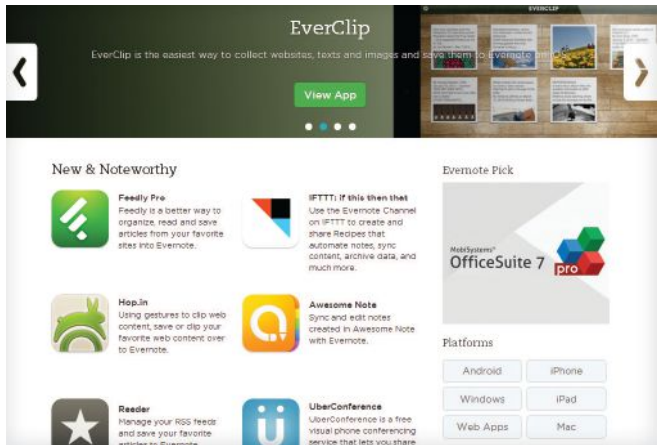
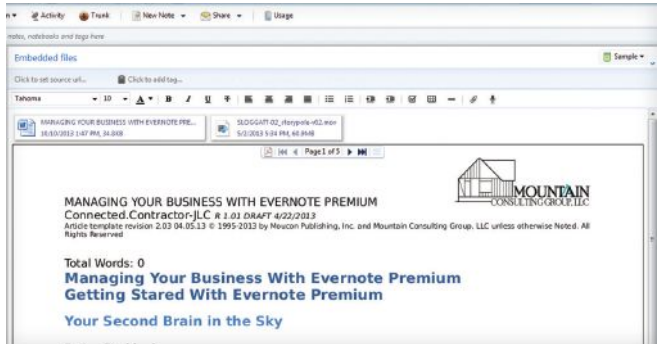
Notes can be created from the New Note menu, but there are also extensions that will send data to Evernote from many popular applications and Web services.

Email address. Evernote provides each user with a unique email address. By using the CC: or BCC: fields in your email software, both the body of any message and any attachments can be automatically saved to the default folder in Evernote. This is a fantastic tool for tracking expenses or making sure that no piece of project correspondence falls through the cracks.

Phone camera. Forget scanner apps: With Evernote, just take a photo and save it to the appropriate folder. This works equally well for a packing slip, a vendor invoice, or the serial number of an appliance you install, and takes a fraction of the time that keying in the information would. Similarly, a picture of the side of your plumber's truck showing the phone number and Web address will be indexed the same as a picture of his business card.

Web clipper. This tool lets you selectively grab any information you encounter online and convert it to a Note. Links can remain live if you want them to, and Evernote provides some markup tools, so you can highlight the important information in the captured clipping. The Web clipper is ideal for creating product notebooks or best-practice manuals.

Sharing. Putting the right information in the right hands at the right time is the key to good project communication. Evernote can make any static information collaborative by sharing Notes or Notebooks. Notebooks (and the Notes in them) can be shared selectively, either by individual email address (which keeps the contents relatively private) or by a public link that anyone can reach—for example, from your marketing website or Facebook page.



In addition to text and images, Notes can hold links to document, audio, and video files, and can display full content from PDFs (top). Evernote also maintains a library of third-party apps that integrate or extend the program (center). One example is Skitch (now owned by Evernote), which enables editing and markup of photos on mobile devices (bottom).

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EVERNOTE IN PRACTICE

Too many contractors wind up purchasing much more software than they'll ever actually use. Instead of jumping into complicated building-specific software before you understand what you really need (see "Putting Lean Principles to Work," Feb/11), you can use Evernote as a tool for developing and testing all kinds of business systems.

For example, you might create a simple purchase order or a customer relationship management system to get your toes wet. After using it for a few months or a year, you will be that much more aware of the features you really need, and you may even discover that you don't need to buy a big, powerful application.

Similarly, Evernote helps you make use of what you have. For instance, many contractors have tons of forms and documents they've developed over the years that would greatly improve their operations if they could find an easy way to share those resources with their project teams. Evernote makes it easy to store, share, and retrieve contracts, boilerplate specs, policy and procedure manuals, construction details, and other documents you've already created.

MORE HELP

This column barely scratches the surface of Evernote's usefulness. The company maintains a wealth of ideas on its YouTube channel, and also maintains an App Center with third-party software and dozens of add-ins that work with Evernote. In addition, I've found these print resources to be helpful:

- *Evernote for Dummies*, by David E. Y. Sarna and Vanessa Richie (\$12.36 for paperback);
- *The Complete Guide to Evernote*, by David Garcia (\$1.99 for Kindle);
- *Mastering Evernote: The 2 Hour Guide*, by Brandon Collins (\$2.99 for Kindle);
- *Evernote Essentials 4.0*, Brett Kelly (\$14.99 PDF at nerdgap.com).

Joe Stoddard consults with contractors about technology. jstoddard@mountainconsulting.com, twitter.com/moucon

APP OF THE MONTH

HELLO

Forget typing. A contact management app from Evernote called Hello combines an excellent text recognition engine with your smartphone or tablet camera and GPS system to make entering a new contact as simple as snapping a picture of their business card, truck sign—even handwriting on a scrap of paper.

Hello creates a note, logs the location, date, and time of your initial meeting, and builds the contact's background record by scouring Facebook, LinkedIn, and Twitter for more details (with your permission, of course). A feature called Hello Connect uses audio tones to automatically detect the devices of other Hello users nearby, providing an easy way to document meeting attendance for example, or to sync additional contact information.



Hello is a free add-on and is available for iOS and Android devices at <http://evernote.com/hello/>



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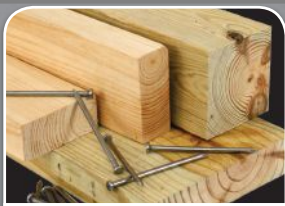
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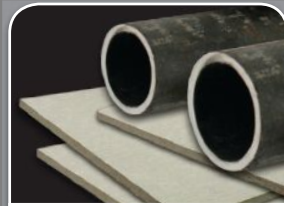
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Lien On

BY PATRICK BARTHET

Two specific requirements for the filing of a mechanic's lien—time and amount—were addressed in a recent case pitting a contractor against his customer.

The customer signed a contract for \$246,700. When customer-dictated changes increased the price by \$10,000, the contractor simply whited out the old price and inserted a new, higher price on the contract. While he claimed the customer had seen and agreed to the new price, the contractor had failed to obtain a signature or initials acknowledging the change. Sometime after construction had begun, the customer discovered the price increase and ceased making payments. Construction stopped, and the contractor timely filed a claim of lien for the balance still due to him for work done on the project. Two months later, the contractor amended his lien to include additional work he had to perform after initially closing work to protect the partially finished project from the elements.

The customer wasn't happy. She claimed the lien was filed late and for exaggerated amounts. The court, howev-

er, sided with the contractor, finding that the additional work done by the contractor to safeguard the yet-to-be-completed project was done in good faith, within a reasonable time, and pursuant to a contract. The court then determined this subsequent work extended the time for filing a lien; it was not remedial work (which would not extend the statutory deadlines for the filing of a lien), but rather work necessary to complete the contract.

It was a good day for the contractor. His good faith efforts to fulfill his contractual obligations, and his filing of a lien for the right amount and in the right time frame overcame his failure to obtain a fully executed contract with the new adjusted price.

Patrick C. Barthelet is founder and president of The Barthelet Firm (barthelet.com), a 10-lawyer commercial law practice focusing on construction-related matters. pbarthelet@barthelet.com

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BY DOUG DELP

WHAT HAPPENED

Good Guys Construction Co. pays entry-level carpenters a base rate of \$14 per hour. A few of these carpenters have become quite skilled, and when they perform higher-level carpentry, such as trim work, the company pays them an extra \$3 per hour. When the company pays them overtime, however, it bases the calculation on the \$14-per-hour base rate.

WHY IT'S WRONG

The Fair Labor Standards Act (FLSA) states that a non-exempt employee's regular rate of pay for overtime calculation "includes all remuneration for employment ..." (with a few exceptions). This "remuneration" includes incentives or bonuses tied to the employee's work, commissions based on production, and—significantly in this case—different rates for certain types of work or jobs. That means Good Guys Construction cannot pay overtime using the employee's base rate.

WHAT YOU SHOULD DO

Good Guys Construction has two options. The first is to calculate a weighted average of the two rates, then use it as the "regular rate" to calculate overtime pay for that week. To do this, the company would add together total earnings for the week, divide by the total number of hours worked at all jobs, then multiply this new "regular rate" by 1.5 to determine that week's overtime rate of pay.

The other option is to calculate overtime based on the rate paid for any work that was done after the employee qualified for overtime. If during this time the employee worked at jobs paying different rates, calculate overtime separately for each job.

Keep in mind that overtime regulations can vary by state as well. Some states require overtime to be paid when an employee works more than eight hours a day. To stay out of trouble, review your payroll recordkeeping, types of compensation, and overtime computation procedures. For questions about compliance, contact an attorney or a human resources professional.

Doug Delp is founder of The Delp Group (delpgroup.com), which provides human resources, benefits, insurance, and payroll services to small businesses.

Options for Calculating Overtime

Weekly Time Record

	Hours	Base Rate	Base Amount
Monday	8	\$14.00	\$112.00
Tuesday	8	\$14.00	\$112.00
Wednesday	8	\$14.00	\$112.00
Thursday	8	\$17.00	\$136.00
Friday	8	\$17.00	\$136.00
Saturday ³	4	\$17.00	\$68.00
Sunday ³	4	\$14.00	\$56.00
Total	48		

Options for Figuring Overtime

	Weighted Average	Actual Rate	
Avg. rate ¹	\$15.25	\$14.00	\$17.00
Hours	40	24	16
Base pay	\$610.00	\$336.00	\$272.00
O.T. rate ²	\$22.88	\$21.00	\$25.50
Hours	8	4	4
O.T. pay	\$183.00	\$84.00	\$102.00
		\$420.00	\$374.00
Total pay	\$793.00		\$794.00

¹ Total base rate earnings (\$732) divided by total hours (48)

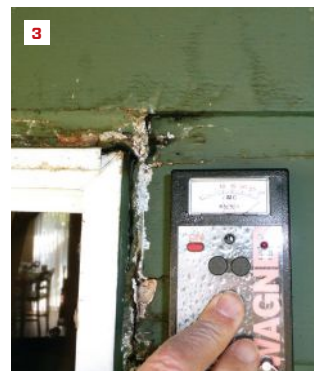
² Average or actual rate multiplied by 1.5

³ Qualifies for overtime

The sample Weekly Time Record (top) shows hours worked for an employee who is paid at different rates for different types of work. Weekly pay, including overtime based on \$14 per hour, would be \$776. But this does not comply with the Fair Labor Standards Act, which gives employers two options for figuring overtime in this situation: 1) Determine an average hourly pay rate for the week (\$15.25 in "Weighted Average" example above), then calculate overtime pay based on that amount; or 2) use an overtime rate based on the pay rate for each type of work. Both options increase the employee's weekly pay by about \$18.

BY GEORGE A. TSONGAS

1. More than just an aesthetic problem, a mossy roof left untreated can severely damage a home inside and out.
2. The roof moss plant will live happily in the nooks and crannies of a shingled roof and can grow to be several inches thick.
3. Moss absorbs moisture and transfers it to the roof system. Water from the saturated sheathing then runs down to the top plates and into the wall system. Here the affected siding and window trim have a sky-high moisture content.



Damage From Roof Moss

A common sight in wet winter climates is bright green moss growing on the roofs of both expensive and inexpensive homes. Here in Portland, Ore., thick moss on shingled roofs is particularly common. While roof moss may seem to be just a cosmetic problem, if left in place, it can severely damage your roof and even have disastrous consequences for other parts of your home.

Moss is a plant that grows naturally on just about any surface, including the ground, trees, and sidewalks, as well as roofs. It produces tiny spores that become airborne and land on roofs and other prospective growth sites. During the moist, cooler months, these spores grow into moss. In drier weather, the moss goes dormant, turning into a rust-colored plant mass. Moss is different from algae, lichen, or mold fungi, which are typically easier to clean and less damaging to a roof.

Moss readily grows on roof shingles, especially in the

spaces between shingles where the spores collect. In wet climates, moss commonly grows into a mat a few inches thick. Once established it acts like a sponge, soaking up and storing rainwater. Some of that water then wicks up under the shingles through capillary action and soaks into and through the roof underlayment (typically 15- or 30-pound felt), eventually saturating the roof sheathing below. Moss growth is usually greatest on north-facing roofs or on roof areas shaded by trees where solar drying is inhibited.

The wet roof sheathing is perfect for supporting mold growth. If the condition goes unchecked, the sheathing ultimately decays and loses its structural integrity. In severe cases—where the moisture content of the sheathing may exceed 30%—this decay spreads to the supporting roof structure, making the roof unsafe. Often this damage occurs in attics that have plenty of ventilation.



- 4.** Moisture from roof moss can cause damage inside a wall, ruining insulation and dry-wall and encouraging mold growth that can be dangerous to occupants of the home.
- 5.** The most effective way to remove moss is with a broom. Always avoid power washing, which can cause further damage to the roof.
- 6.** Moss-killing chemicals applied along the peak and at the midpoint of the roof plane will kill roof moss and prevent its return, but it's best to broom off the moss first.

I expect to see some structural damage in a roof with a severe moss problem, but in the house shown here, the damage to the walls below was a surprise. Water from the saturated sheathing and rafters had made its way down to the wall plates. Some of it then entered the outside of the wall cavity and soaked into the cedar lap siding. The entire wall of siding was water-stained, and it had a moisture content of over 30%; plus the paint was peeling and the window trim was decaying (photo, previous page). I didn't open the walls during my inspection, but when they were opened later for repair, the water damage to the wall sheathing and framing was extensive as well as expensive to repair.

Inside one of the north-facing bedrooms, I found severe mold growth on the ceiling and walls (photo, above), made possible by water that ran down from the roof sheathing and onto the ceiling. Similar mold damage was evident on the ceiling and the outside wall of a nearby bathroom. In that room, the ceiling drywall had already been

replaced once because of the water leakage and subsequent mold growth.

It's painfully obvious that moss can shorten the life span of a shingled roof and result in costly repairs—both structural and cosmetic—that would not be necessary if the roof were maintained properly and kept clear of moss.

One way to keep a roof free of moss is by installing zinc or copper flashing along the peak. As rain washes down the roof, some of the metal dissolves and kills the moss. I've even seen copper wire strung along the peak to prevent moss growth. Another option is brushing or "brooming" off the moss if the growth is not too bad. You can also apply moss-killing chemicals in liquid, granule, or powder form that are available in home stores or online. Applying such chemicals carries the downside of possibly contaminating groundwater, but these materials are effective at killing moss. I've successfully used the powder form to prevent moss on my own roof.

If the roof is free of moss, then zinc strips or treatment with chemicals will keep it that way. But if moss has already started growing, then it's best to carefully remove it with a brush or broom. I recommend doing this on a regular basis—typically once or twice a year. I would avoid power washing the moss off because that can drive moisture under the shingles, damaging the underlying roof components.

It should also be noted that some newer shingles have moss inhibitors built in that will keep moss at bay for up to 20 years. The incremental cost of shingles that feature these inhibitors is not great. Even the cost of annual moss treatment is insignificant compared with the cost of roof and wall repairs made necessary by the growth of moss.

George A. Tsongas, Ph.D., P.E., is a consulting engineer and building scientist and professor emeritus of mechanical engineering at Portland State University, Portland, Ore.

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INSULATION



Continuous Exterior Insulation

A guide to selecting and installing rigid foam on walls

BY CLAYTON DEKORNE

Continuous insulation—typically provided by rigid foam board applied to the exterior—increases the thermal performance of a framed wall in two ways. First, rigid foam provides more insulating value per inch than cavity-fill insulations, so it's the easiest and most cost-effective way to add R-value to a wall with the least increase in wall thickness. Second, continuous insulation (applied over the structural sheathing or directly to the exterior face of wall framing) eliminates much of the thermal bridging—the conduction of heat through studs and headers—that robs most framed walls of energy.

There are three types of foam that can be used as continuous insulation on the exterior of the building.

Faced polyisocyanurate (faced polyiso). At about R-7 per inch, this foil-faced material is hard to beat. Polyiso with no facing is super water-absorbent, but the foil-faced product is very water-resistant, so panels absorb less than 1% by volume. Tape sticks well to the foil facing, creating a lasting bond that will keep water from being absorbed through panel edges. Paper-faced polyiso can also be used. The paper facing sheds water but needs lots of air over it to promote drying; a rainscreen is imperative. The paper-faced product has the advantage of being more permeable than foil and might allow the wall to dry to the outside. With the foil-faced product, the wall cavity can only dry to the inside.

Extruded polystyrene (XPS) skins over during the curing process, making its unfaced surface non-water-absorbent (0.3% by volume). At R-5 per inch, XPS panels are a good value for exterior insulation, but if the budget allows, faced polyiso would be better, owing to its higher R-value.

Faced expanded polystyrene (faced EPS) is the least expensive and has the lowest R-value (about R-4). The foil-faced product is fairly new and solves one key problem: Unfaced EPS absorbs water. While sold in varying densities and configurations, even at the highest density the unfaced material is twice as water absorbent as foil-faced polyiso. A case can be made for installing a weather-resistant barrier (WRB) over unfaced EPS to protect it from water, but this requires some way to secure the WRB.

ASSEMBLY DESIGN

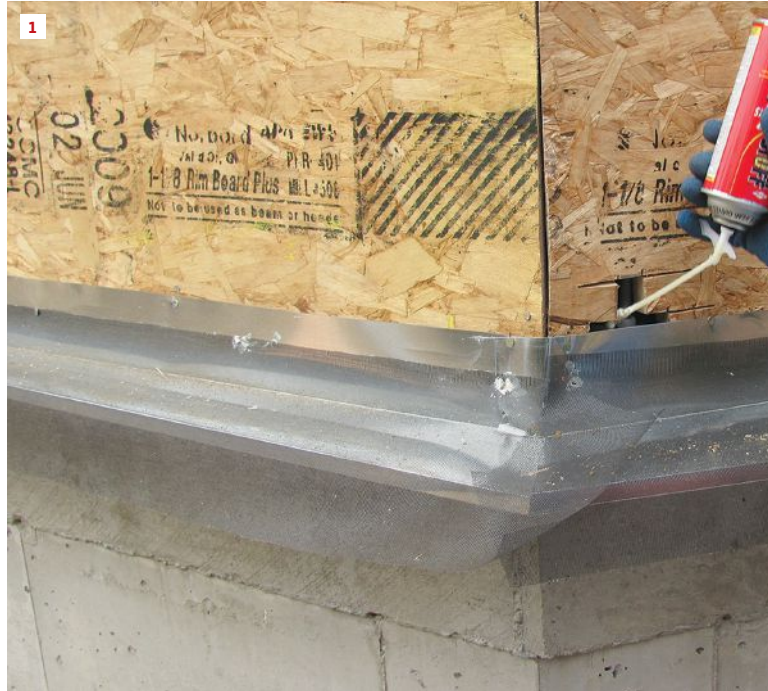
Structure. Foam sheathing doesn't provide racking resistance. Diagonal bracing, continuous structural sheathing, or intermittent shear panels are imperative beneath rigid foam (see "Bracing Walls for Wind," July/13). When using intermittent shear panels, the insulation thickness will need to be varied to accommodate the shear panel thickness (**Shear Panel**).

Insect protection. Carpenter ants can't digest foam, but they readily burrow through it and would happily set up home in foam panels if you give them the chance. Panel exposed edges need to be sealed off. This happens at most field seams, except at the bottom, where a galvanized metal flashing (**1**) must be installed (**Base Flashing, facing page**).

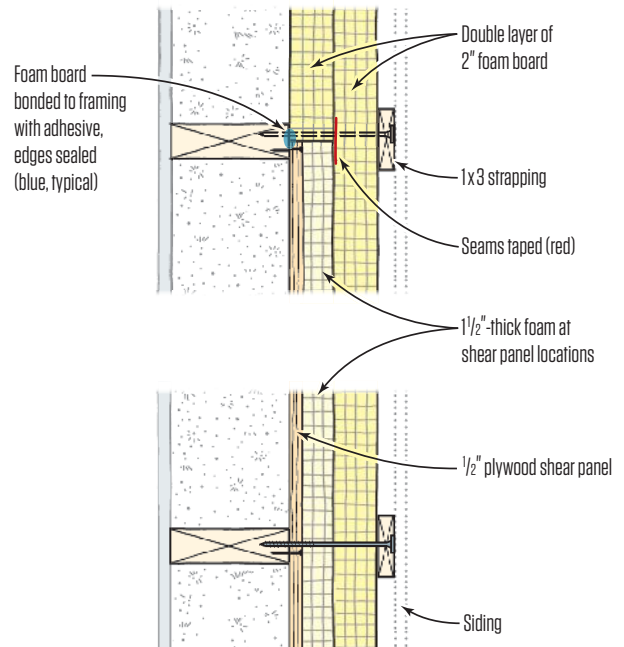
An effective WRB. Foam board will leak at the joints. Even foam panels with shiplap joints can't be relied on to keep out wind-driven rain. Any continuous exterior insulation detail must include a WRB, either under or over the foam. Applying the WRB under the foam makes it easier to fasten the WRB and integrate flashings. If you apply a WRB over foam, install wood sheathing first (see cover photo for this issue). Theoretically, you can secure a WRB against the foam with rainscreen battens, but it's a bear of a job to get the rainscreen to lie flat without lots of hands on the job.

Two layers. To help reduce water intrusion, install foam panels in two layers. The first layer goes in vertically, with the panel edges sealed to the framing with an adhesive, such as OSI's GreenSeries adhesive (osipro.com). The second layer goes in horizontally, with the field joints between layers staggered and corner edges woven together (**Corner, facing page**). This way, any water that gets past the first layer will hit a solid panel rather than another seam.

With foil-faced foam, tape all seams and terminations (**2**) for added protection. Taping XPS or unfaced EPS is not recommended. Foam panels will shrink slightly and will expand and contract with changes in temperature. This movement destroys the tape bond on unfaced material. The bond to foil, however, seems to last. (Dow Weathermate



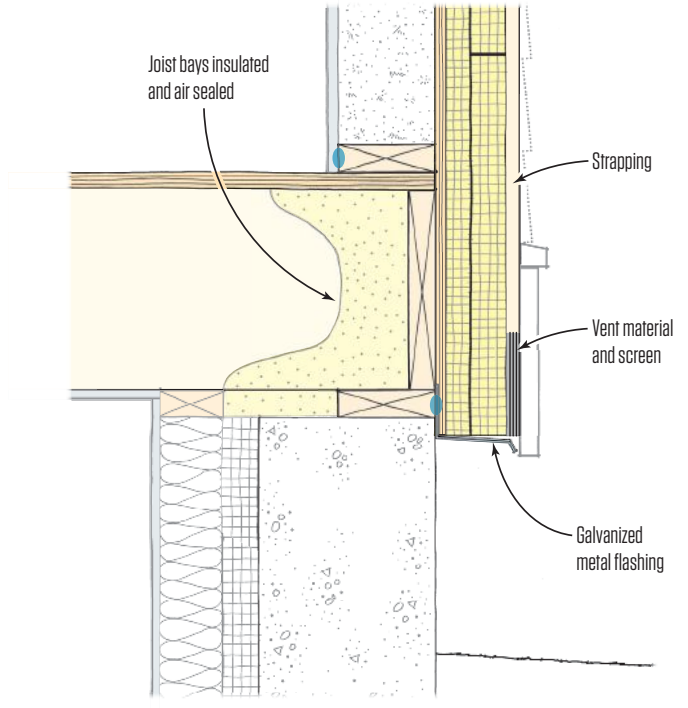
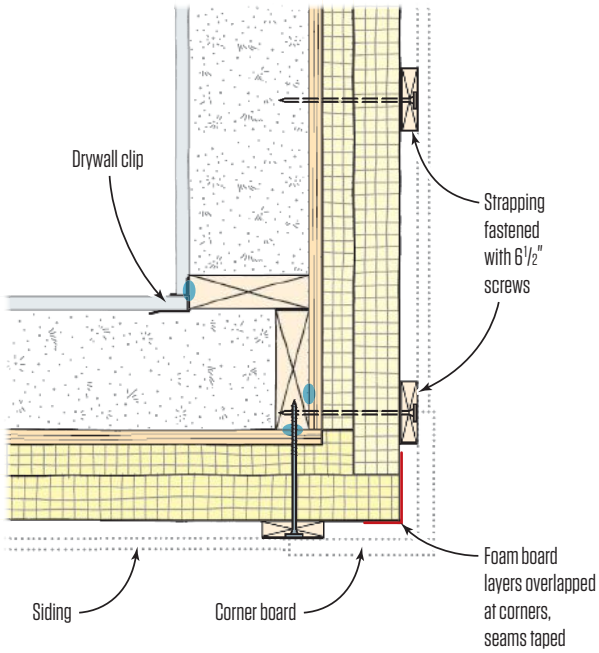
Shear Panel (Plan View)





Corner (Plan View)

Base Flashing



tape, building.dow.com, seems a popular choice for taping foam because it sticks even to wet surfaces.)

Rainscreen. Siding over foam should be placed over a rainscreen that will allow free drainage and promote drying behind the siding. On thick (more than 2-inch) applications, wood battens will provide a nail base for the siding.

Run vertical battens all the way to the base of the foam to allow for drainage. Do not terminate the battens on top of a skirt board; instead, fasten the skirt board over the battens to ensure drainage behind it. Block the base of the battens with a matrix ridge-vent material, such as Cobra Exhaust Vent (gaf.com), and insect screen (3). The ridge-vent material pushes the screen against the back of the siding; without it, the screen can sag between battens and allow wasps to move in.

Soffits. At the top of walls, the insulation and siding layers butt against the soffit (**Soffit Details, page 45**). Install insulation baffles to prevent ventilation air from blowing through the attic insulation. The best option is to notch the exterior insulation around truss or rafter tails, so it provides the required wind block between rafter bays. This will allow you to use a conventional vent chute, which is far faster to install.

Drying potential. Any wall covered with foil-faced exterior insulation, with more than an inch of XPS (without structural sheathing), or with any foam over plywood or OSB, is not going to dry well to the exterior. These walls should be allowed to dry to the inside: Avoid interior poly vapor retarders and oil-based wall paints. If code requires an interior vapor retarder, use paper-faced batts or another “smart” membrane.

FASTENING FOAM

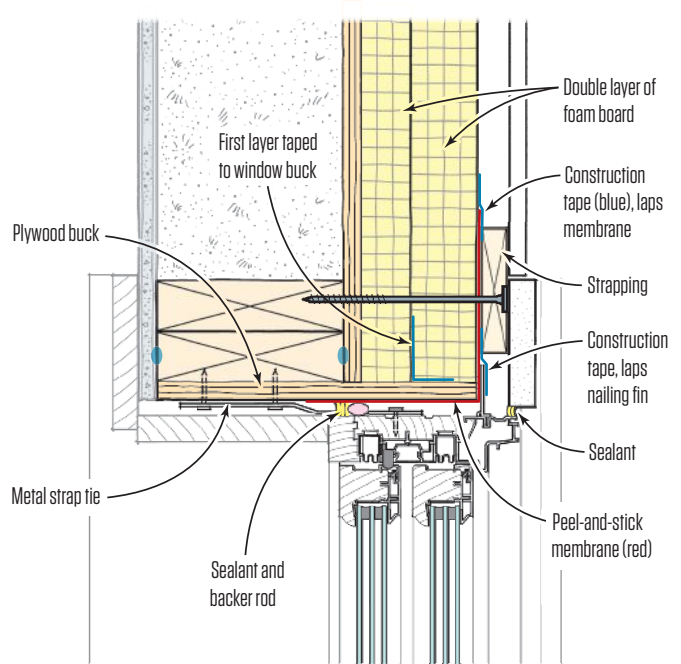
FastenMaster’s Headlok screw (fastenmaster.com) seems to be the fastener of choice for securing thick foam. Available in lengths from 27/8 inches to 18 inches, the screws can accommodate a lot of foam. They should penetrate the framing at least 2 inches.

The waffle head on Headlok screws provides a fairly wide surface where it contacts the foam, but driving heads flush requires slowing down to seat the screw. It’s easy to over-drive, creating a divot that can hold water. To avoid this, use insulation washers, or secure the foam with the rainscreen battens. Massachusetts builder David Joyce does it with the battens, speeding installation by securing each foil-faced panel with a single screw, then taping off all the seams to hold things in place. Once both layers have been installed, he fastens everything down with Headlok screws through the battens.

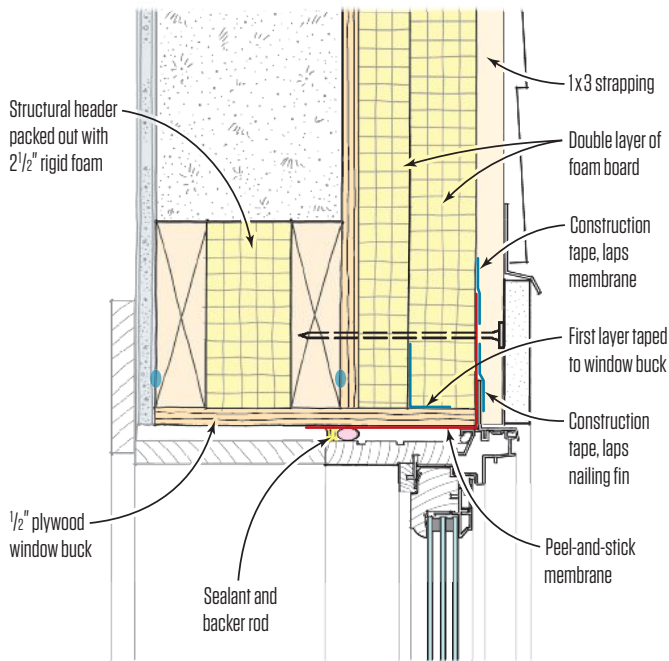
If you use this method, install Headlok screws every 24 inches along battens when supporting fiber-cement siding over 4 inches of foam; or every 36 inches over 2 inches of foam. With lighter wood or with vinyl siding,



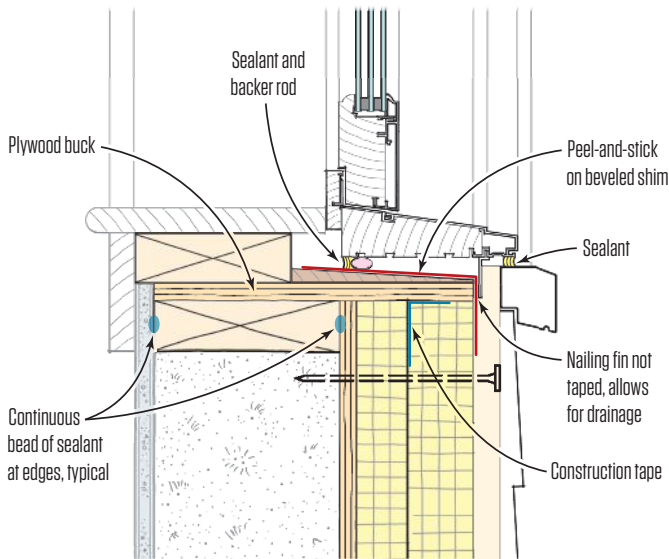
Window Jamb (Plan View)



Window Head



Window Sill



you can back off the fastener schedule to every 36 inches over 4 inches of foam, or every 60 inches over 2 inches of foam. In high-wind and seismic zones, these fastening schedules should be increased.

WINDOW AND DOOR DETAILS

These details are often cited as “problematic” with exterior insulation. But in practice they turn out to be pretty straightforward. To terminate and seal the foam board around window openings in new construction, most builders line the rough openings with 1/2-inch plywood bucks that project beyond the framing by the thickness of the foam. A window buck gives you the option of installing the windows recessed to the inside or flush to the outside. When installed toward the outside, however, strap ties may be needed to secure the window to solid framing (**Window Jamb, far left**).

Tape the outside edge of the buck to the first layer of foam before the window is installed (see photo, page 41). Also tape the nailing fins to the foam—first at the jamb, then at the head—but leave the bottom fin untaped for drainage (**Window Sill, left**). With the windows sealed to the foil-faced sheathing, any water that gets past the trim and siding will drain to the outside.

Exterior doors typically swing inward, so the door unit needs to be installed to the interior. A two-step jamb extension will often work to trim out a standard exterior door in a thick wall (**Door Jamb and Threshold, next page**). Best practice calls for using cellular PVC for the jamb extensions and other exterior trimwork.

RETROFIT DETAILS

Retrofit foam applications usually preclude a window buck. When replacement windows are installed, the work is typically done from outside, and the interior trim is left intact, requiring exterior jamb extensions instead.

Historical retrofits often require preserving the windows. Typically, windows are removed for restoration, then reinstalled flush to the exterior to retain the original building characteristics. In this case, interior jamb extensions will be required (**Retrofit Window Details, page 45**).

HOW MUCH FOAM IS ENOUGH?

During winter in cold climates, warm, moist air from the interior can leak into wall cavities. When this air hits a surface below dew point, that moisture condenses and can cause moisture problems if the condensation doesn’t readily dry. In cold climates, the cold surface in question is typically the back of the exterior sheathing. But with enough exterior insulation, the interior surface of the sheathing stays above the dew point temperature for the indoor air and keeps condensation problems at bay.

How much insulation is enough? In the *Building Science Digest* “Controlling Cold-Weather Condensation Using Insulation” (search BSD-163 at buildingscience.com), John Straube explains:

Condensation can be avoided by ensuring the temperature at the back of the sheathing is warmer than the interior air dew point temperature. If one assumes that interior finishes and exterior cladding have little thermal resistance (almost always a reasonable assumption) then the back of the sheathing temperature can be found using the equation:

$$T_{\text{sheathing}} = T_{\text{indoor}} - (T_{\text{indoor}} - T_{\text{outside}}) \times R_{\text{batt}} / R_{\text{total}}$$

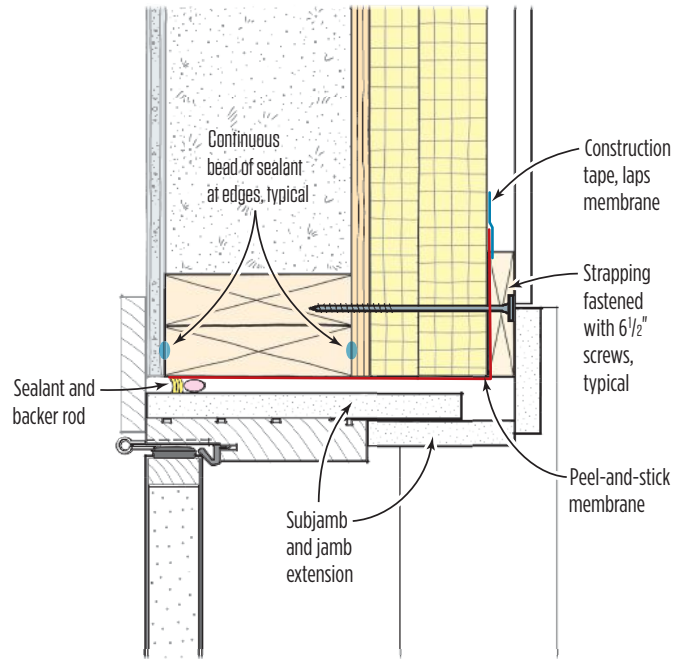
To “solve” this equation, we want the result (the temperature of the back of the sheathing) to be greater than the dew point temperature for the indoor air. Dew point temperature is a function of both the indoor air temperature and the indoor relative humidity. You can get this easily using the dew point calculator at dpcalc.org. A good ballpark for wintertime indoor relative humidity in a cold-climate city is 35%. At this level, indoor temperature at 70°F gives a dew point “target” of 41°F. In warmer climates, it’s best to assume a higher wintertime indoor relative humidity. For the outdoor temperature, Dr. Straube recommends a three-month wintertime average, which is readily available by state. (One source is currentresults.com; choose “Average Weather,” then “United States.”)

Note that in Dr. Straube’s equation we are multiplying by a ratio of the cavity insulation (R batt) to total insulation (R total). As you add cavity insulation to the wall, you effectively cool down the back of the sheathing, so we are looking for a suitable balance of the two insulations. The “perfect wall,” according to building scientist Joe Lstiburek, has all the insulation on the exterior, so the cavities see the same conditions that the building occupants do.

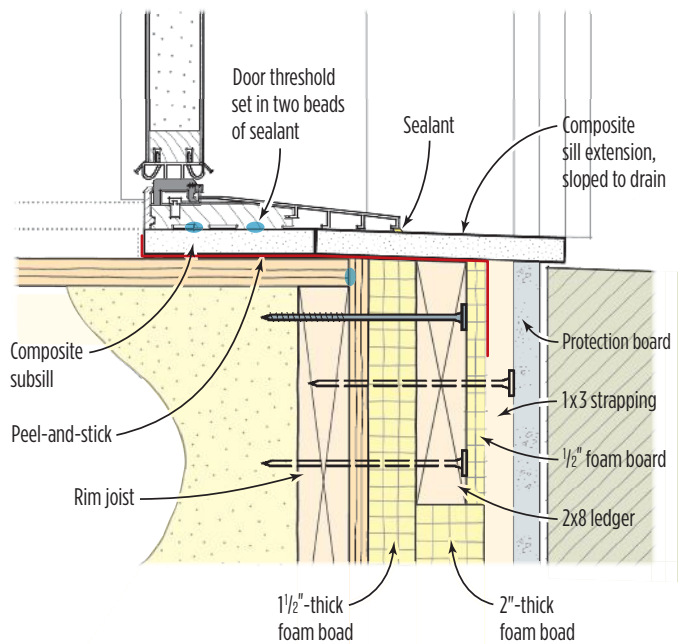
Knowing average weather conditions and your cavity insulation values, you can use the equation to back out a minimum exterior insulation thickness. We have done this in a chart (making wild assumptions about the indoor relative humidity and outdoor conditions), which you can see at JLConline.com. For these minimums, we assumed cavity insulation values at R-6 for a 2x4 wall and R-10 for a 2x6 wall. If you trust your insulator, you can use R-11 and R-15, respectively.

Details in this article were adapted from articles in the JLC archive. Special thanks to David Joyce who, while working on high-performance homes for the principals of Building Science Corp., pioneered many exterior insulation details that work.

Door Jamb (Plan View)

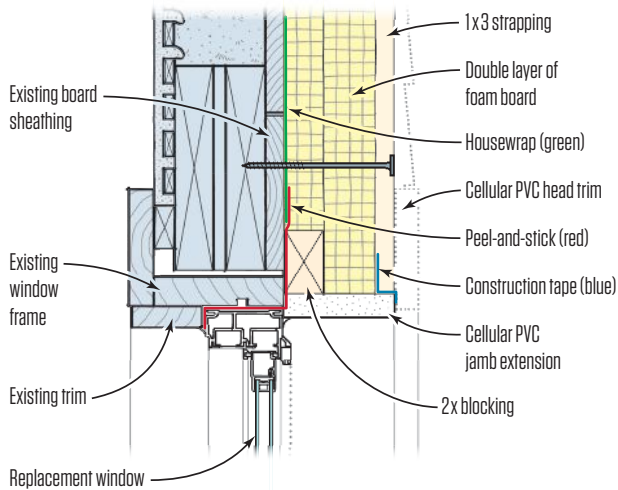


Threshold

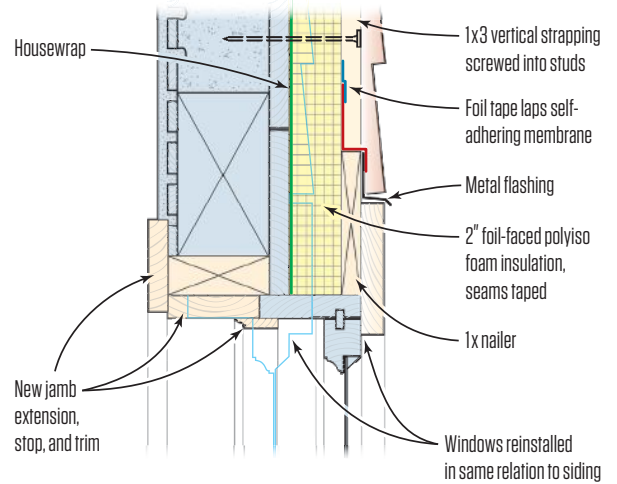


Retrofit Window Details

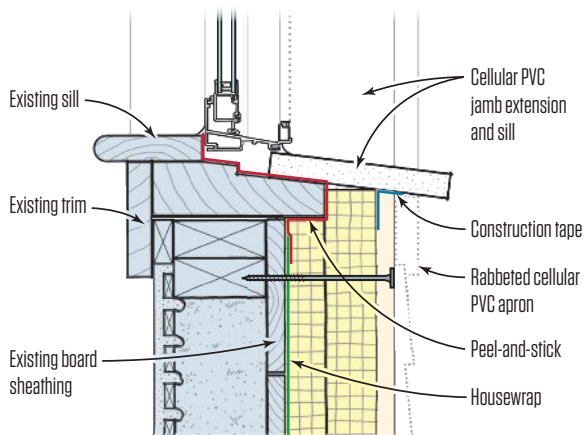
Head Detail



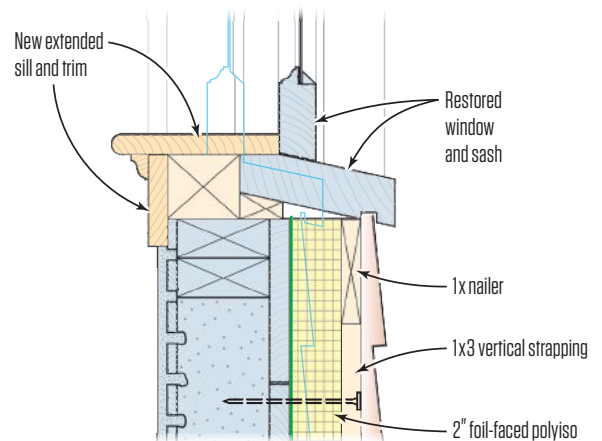
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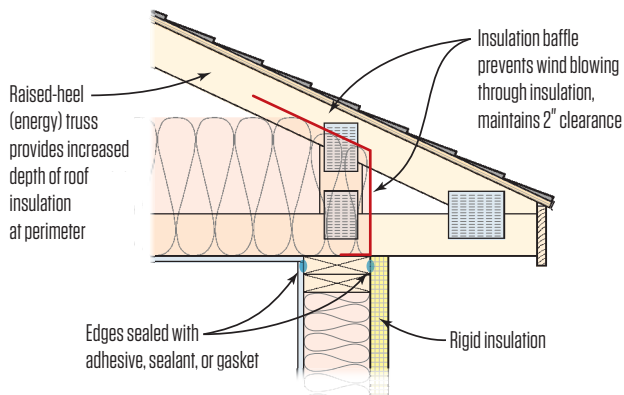
Sill Detail



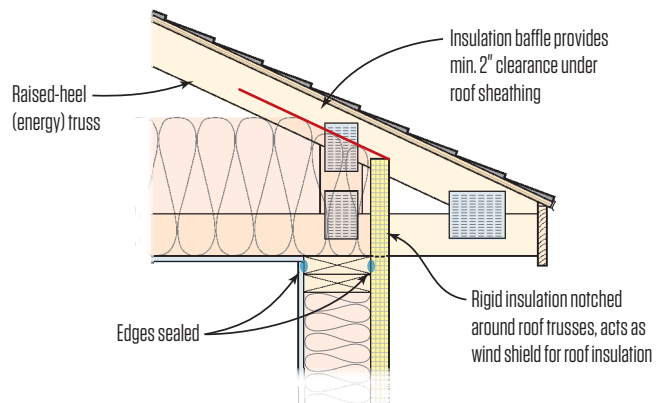
Sill Detail



Soffit Detail 1



Soffit Detail 2



TH



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Thermal Imaging With a Blower Door A procedure to identify the worst air leaks in a building

BY CLAYTON DEKORNE

Finding air leaks in existing homes can be a trying task. Driven by air pressure from inside and outside the building, air can sneak in through any crack or crevice in a building's envelope and move through any number of convoluted pathways within framing cavities. It's impossible to seal every hole in an existing building, so the real task is finding the most significant air leaks in order to tighten the home as cost-effectively as possible. But how do you identify which holes are the biggest leaks?

A simple inspection protocol developed for air-sealing homes under EmPower New York (a program providing energy retrofits

and education to low-income New Yorkers) uses a thermal imager, a.k.a. infrared (IR) camera, in tandem with a blower door. The procedure involves comparing thermal images taken with and without a blower door running, and enables home-performance workers to differentiate air leaks from insulation weaknesses.

Robert Kahabka, owner of Northern Comfort Diagnostics, a home-performance contracting and energy training firm based in Elmira, N.Y., helped to develop the technique—one of several in Empower New York's "Advanced Air Sealing Protocol." Kahabka explains the thermal-imaging technique he uses as a simple three-step process.

ONLINE ARCHIVES

This article assumes that readers know their way around an infrared camera for doing thermal imaging. If you're unfamiliar with these tools, please review "Getting Started in Infrared," Nov/11.

■ First, he views "static conditions" by scanning the building with the thermal imager but without the blower door running. This provides Kahabka with a "baseline" reading.

■ Next, he uses the blower door to depressurize the building (the blower-door fan is pulling air from inside to outside) and leaves the blower door running. The goal is to pull air of a different temperature through the leaks in the building envelope.

■ With the blower door running, Kahabka scans the building again with the thermal imager. This second scan gives him a sense of what is happening behind the drywall under "dynamic conditions."

By taking two similar sets of images—one set in baseline, or static, conditions, and another set in dynamic conditions—Kahabka can compare the two views. Any change in an image from the static to the dynamic viewing is probably related to air leaks. The procedure gives him the ability to see things going on behind the drywall and to find air leak pathways that may be occurring in areas where man cannot tread (literally).

BASELINE IMAGES

The first step is to scan the building before turning on the blower door. This is how most thermal imaging is done, and the goal is to find "insulation anomalies," as Kahabka calls them—areas of missing or thin insulation where conductive heat flow shows up on the screen of the infrared camera.

As with any thermal imaging, the bigger the temperature difference between indoors and outdoors, the better the image you'll get. But with today's IR cameras, all you really need is a 10°C—about 18°F—difference between indoors and outdoors.

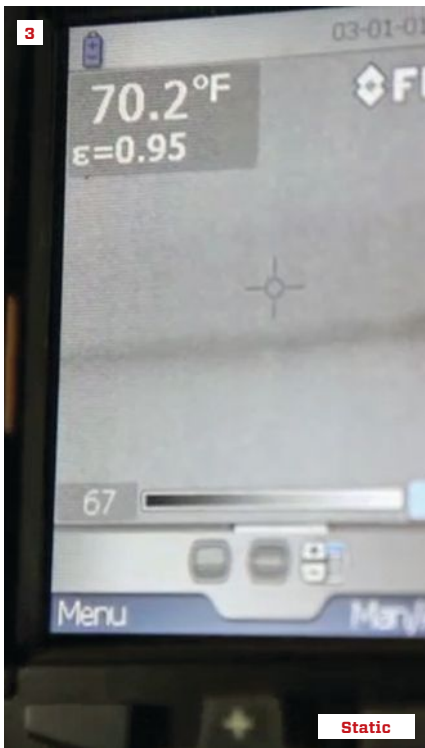
As Robert Kahabka looks at the building under static conditions, the insulation of the sidewalls looks pretty uniform. But in the corner **(1)**, the rim joist is clearly defined. At this point it's unclear if this temperature difference is due to missing insulation or air leaks, or both.

With the blower door running, the dark area in the corner grows as cooler outdoor air infiltrates the band joist **(2)**. At least two floor joist bays are changing temperature as well. If he ran the blower door a little bit longer, we might see more change, or if we had more "delta T" (a greater difference in temperature between outdoors and indoors), we would likely see more change.

Kahabka likes to look at interior wall partitions, too. "They can throw you curve balls," he says. "The interior walls often don't appear to be part of the building envelope, but they can be connected." As he looks at a partition wall in the living room **(3)**, he sees nothing in the flat area of the wall; he cannot see the frame. But clearly there is a temperature difference at the connection between the wall and the ceiling, and the first joist cavity in

the ceiling is a shade darker, or cooler, as well. Though not shown in the photo, this discoloration carried all the way across the room. Under depressurization, Kahabka predicted, this area would change significantly. And that is exactly what happened. When Kahabka looks at the same interior wall after the blower door has been running, he sees that the dark area along the top plate has grown **(4)** as the blower door moves air down the interior wall system.

Recessed lights are not typically a problem when they are between floors of a building. But when they are in the pressure boundary of the building, they become a serious source of air leaks. The can lights in the home office are in a poorly insulated ceiling that's completely open to the garage, and therefore are in the pressure boundary of the building **(5)**. This image was taken with the blower door running, and the incoming air has caused the surfaces around the light to drop about 3°F. This is air leaked directly into the building—you can feel it when you hold your hand up to the light with the blower door running.



DYNAMIC IMAGES

After walking through each room of the building, scanning and saving a set of baseline images, Kahabka fires up the blower door to depressurize the building. The amount of depressurization is not important. What you want is to drag air of a different temperature through the leaks in the envelope, but you don't want so much pressure that the thermal image changes too fast, because it helps to see how it is changing as you move through the house the second time.

The examples throughout this article show photos taken on a fall day at a house in upstate New York. It was not particularly cold—around 50°F—and the indoors was about 70°F, giving Kahabka enough of a temperature difference to map the changes in indoor temperature as the blower door pulled in cooler outdoor air through leaks.

The comparison helped Kahabka identify the areas where air leaks were having a huge impact on the thermal integrity of the insulation. There was insulation in these areas, but when air was pulled through it, the insulation R-value visibly collapsed. Prime examples are in the office (see images 5 and 6, far right) and the kitchen (see page 54).

In the latter case, a surprisingly big leak allowed air to be pulled across a wide area of the ceiling. The fix for this is not a standard one: Kahabka will recommend that the ceiling be dense-packed with cellulose. Dense-pack insulation is not often seen as an air-sealing material, but it is an effective way to shut down the leak pathways for air that is probably coming from a network of framing gaps—now buried beneath roofing, siding, and exterior trim—created when an addition was built on the exterior wall of the kitchen.

These are the types of leaks a home-performance contractor needs to focus on. If he's not hitting these, but is doing things such as weather-stripping doors and windows, then he's missing large areas of the building frame that are functioning as leak pathways directly into conditioned space.

We may not be able to feel all the air leaks. We may not be able to see them. But under dynamic conditions with the blower door running, the infrared is telling us that when the wind blows outside, whole sections of the thermal envelope chill down to a temperature where condensation can form, where there's energy loss, and where there will undoubtedly be comfort issues.

Clayton DeKorne is JLC executive editor. Robert Kahabka owns Northern Diagnostics, in Elmira, N.Y. Special thanks to Kelvin Keraga of EmPower New York and to the team at Learning Solutions Winstanley for their assistance with the images in this article.

In a large room with a cathedral ceiling that was built as an addition to the main building, Kahabka scans the interior gable end (1). At the gable wall-to-ceiling intersection, a small amount of discoloration appears. It's the last rafter, which is a little cooler.

After running the blower door for a few minutes, putting the building in "dynamic conditions" (2), Kahabka looks again with the thermal imager and sees some serious degradation of the insulation due to air leaks.

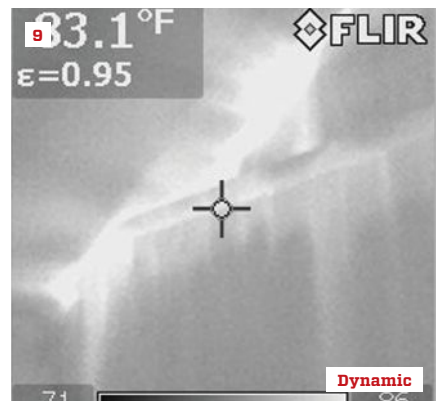
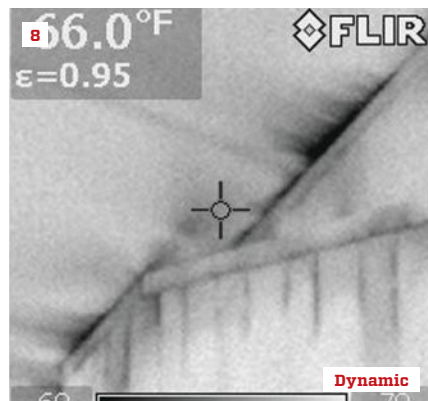
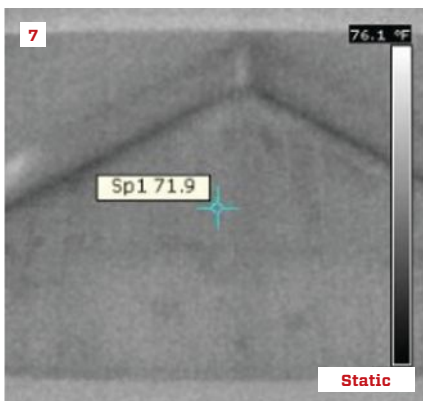
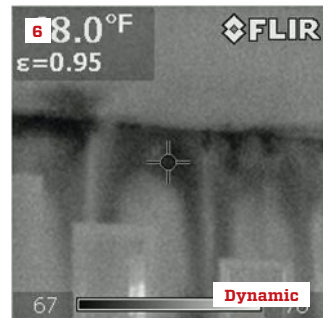
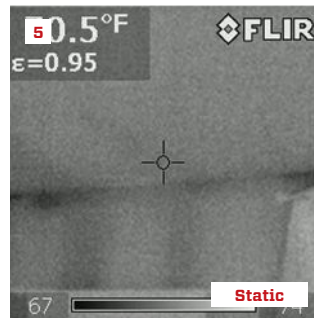
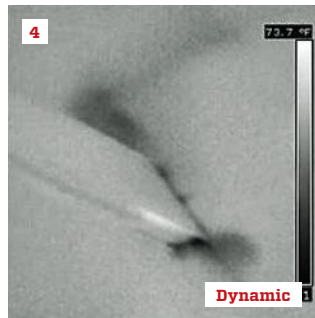
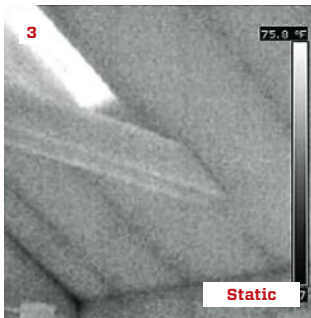
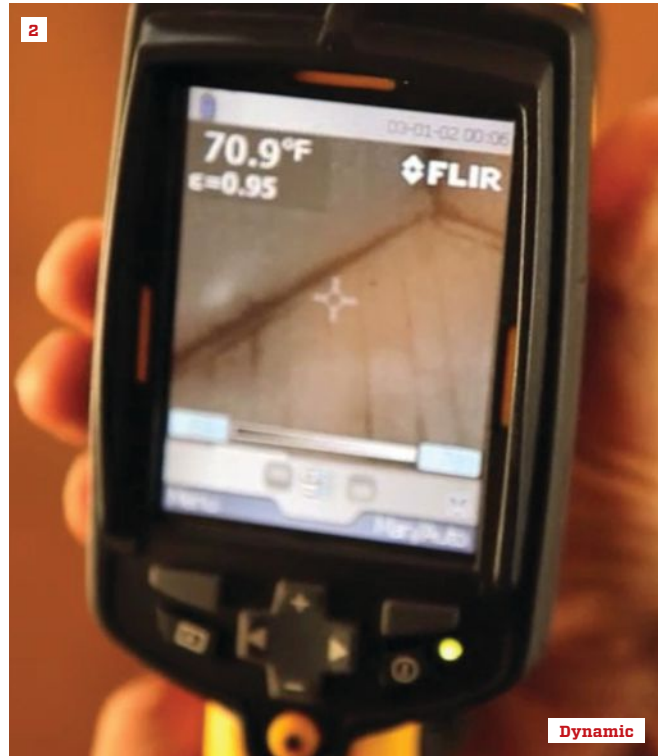
The smaller black-and-white images at right are thermal-imager output files that Kahabka saved from this job. The first one (3) shows a baseline image of the cathedral ceiling, which shows virtually no air leaks, although the rafters are clearly conducting heat. This doesn't mean that no air leaks exist. It's just that under the current conditions, with warm indoor air that's probably leaking out—past warm building materials as it moves to a colder outside—a temperature difference is not visible because the temperature of all the substrates and the air temperature are the same. But when he scans the ceiling

with the blower door running (4), air leaks begin to show clearly at the intersection between the ceiling and the exposed beam.

Similarly, the baseline image of the office wall (5) shows a little conductive heat flow along the framing. But when viewed under dynamic conditions, air flowing through the wall insulation causes a complete breakdown of the insulation's thermal integrity (6).

The most severe problem in the addition is the interface with the main part of the building. What looked like a well-defined thermal boundary under static conditions (7) has totally collapsed under dynamic conditions (8). The thermal boundary is clearly not functioning as a pressure boundary. As the blower door continues to run, the sun is shining on this side of the house, loading the building with solar energy. After a few minutes, the thermal image shows huge amounts of heat coming through the corner (9). The inside wall temperature is above 80°F. So even though it doesn't show up dark (cool air) on the image, it is still an air leak.

continued on page 54



Photos: color images, courtesy NYSERDA and LSW; black-and-white images, Robert Kahabka

continued from page 52

In the kitchen, Kahabka scans the surface of the partition wall separating the kitchen and the garage and (at the ceiling) a joist system between two stories of the building. The building is still in static conditions, and as he scans this area, he sees clear definition of the ceiling/floor framing.

Surprisingly, he also sees strong discoloration—a clear indication that this area is cooler than other areas within the building (1). He's beginning to pick up areas of deeper coolness where air leaks or lack of insulation—he can't tell which yet—are creating a serious change in temperature, visible as bright blue bands in a sea of warmer surface temperatures. If this image changes, he will be able to attribute the colder surfaces to air leaks. But if it stays relatively unchanged, it's probably an insulation anomaly.

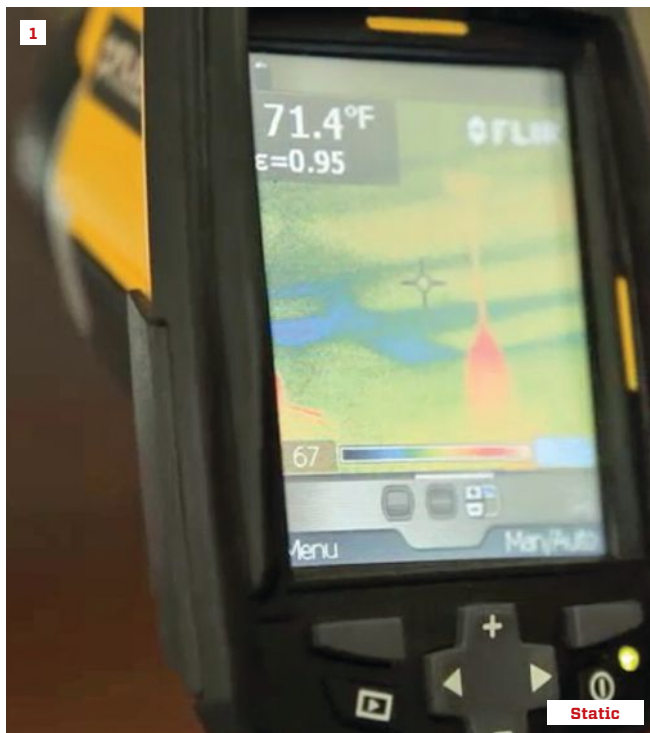
In fact, when Kahabka scans again with the house in dynamic conditions after the blower door has been running a few minutes, the answer comes to light (2). There is a tremendous amount of change from the


baseline infrared image—the deeper blue is caused by air leaks.

Where the dark blue has feathered down the wall, air has completely permeated the insulation and destroyed the thermal integrity of the exterior wall. This is the kind of air leak that can result not just in energy loss, but in serious condensation problems, and Kahabka predicts that when occupants sit at the breakfast bar below this area of the ceiling in the deep of winter (the house is near Syracuse, N.Y.), they feel the cold.

Even if the air is not entering the room and creating a draft, the chilled wall and ceiling create a large cold surface that is literally sucking the heat from the occupants' warm bodies.

The fix Kahabka will recommend for this is somewhat unconventional—unless you move in weatherization circles. He will suggest dense-packing the ceiling bays in this area. The dense-pack cellulose insulation will shut down the leak pathway from the interface between the addition and the main house that connects with this ceiling. It is probably the only way to access the leaks causing this.





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Building a Double Winder Stair Using modular boxes to stack one tread and riser at a time

BY DAVE HOLBROOK

Last September I began working on a 14-by-28-foot wing at a house in Orleans, Mass. The plan was to expand a small and awkward loft area into a full second floor and replace the existing, L-shaped stair with a double winder.

I don't build stairs as a specialty; over the course of 30 years, I've done maybe a couple of dozen. And until this project, I'd only built the kind of winders that come to a common point and aren't legal anymore. These days, a code-compliant winder can't measure less than 6 inches at its narrowest point. Depending on the available space, conceptually this can be kind of a head-scratcher.

Building designer Mark Farber drew the basic layout, fitting the stair between one wall and the loft's existing rim joist (see "Stair Plan," page 59). In addition to having the two-winder sections, the stair started and finished with common treads. The winders were also separated by two common treads at mid-flight, for a total of 12 treads and 13 risers.

LAYOUT

When I built the stair, I followed Mark's plan. Only later did I really start to think about how to lay out a winder to maintain a 6-inch minimum on the narrow end of the tread. Mark told me he'd done

BUILDING A DOUBLE WINDER STAIR

it by first assuming that the number of risers needed to reach the second floor would be the same as for a straight stair; in this case, 13 would cover the total rise of 93½ inches. He then drew a scaled plan, dividing the 90-degree turn into four 22.5-degree “treads,” as shown in his stair plan. Using a compass, he struck an arc that crossed each of the six lines representing winder risers at a point that would ensure they met the 6-inch code minimum. For this four-tread/three-riser winder design, he found that a 31-inch-diameter circle did the trick. It also meets the requirement for a minimum tread depth of 10 inches at the “walk-line,” which is measured 12 inches from the inner edge.

In a eureka moment, I realized that his method of laying out four treads at 22.5-degree intervals would serve for a stair of any width, and that there were only so many other ways to do it. The most common two would be a three-tread winder at 30-degree intervals or two treads at 45-degree intervals. But while the radius layout works for any width stairs, the actual width of a particular stairwell makes a difference in other ways: Each tread needs to be wide enough to meet code (36 inches), and because the stairs turn 90 degrees at both ends, the tread width affects the overall length of the stairwell. In this case, where the stairwell was constrained by existing walls on three sides, this overall length was critical and led to the next step in the layout process: figuring out how the turn radius affects the overall stairwell dimensions.

Lengthwise, the two common treads at each end take up 72 inches (36 + 36). Next I added 31 inches—the sum of each winder radius at the two ends ($15\frac{1}{2} + 15\frac{1}{2}$)—for a subtotal of 103 inches ($72 + 31 = 103$). Subtracting that subtotal from the overall length of the stairwell (123½ inches) leaves 20½ inches ($123\frac{1}{2} - 103 = 20\frac{1}{2}$). Two 10¼-inch-deep common treads cover this distance perfectly. Widthwise, the stairwell was wide enough to accommodate a 10¼-inch common tread as the first step down from the top.

MODULAR CONSTRUCTION

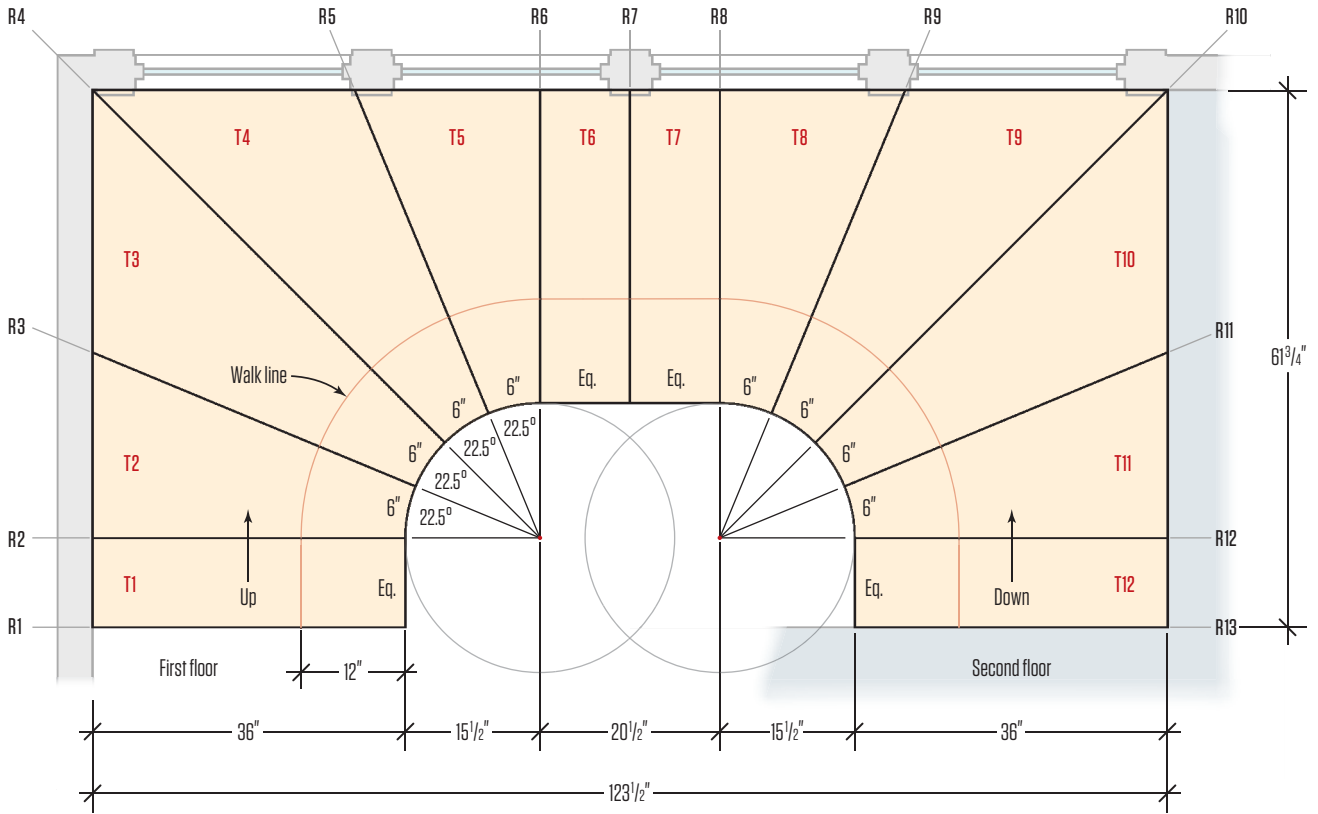
Since there would be plenty of running up and down during demolition and construction, I decided to frame the rough staircase early in the game. It didn't take me long to rule out cut stringers; I can still barely imagine what they'd look like, let alone what I'd cut them from. Instead, I decided to make uniform tread “boxes” and stack them in succession (1).

To verify the plan dimensions, I began by marking out the stair's overall footprint directly on the floor. I checked it for square and then used a laser to plumb the corners up to the second-floor joists. I also confirmed there would be no need to adjust the total rise because of out-of-level framing. Next, I drew a full-size winder plan on ¼-inch plywood (2a). Mark's drawing indicated that each winder occupied a square 4 feet 3½ inches on a side. I made a cut at 4 feet 4 inches (adding ½ inch to allow for drywall build-out on the wall) and squared off my template with a 4-inch-wide strip fastened to one of the long sides.

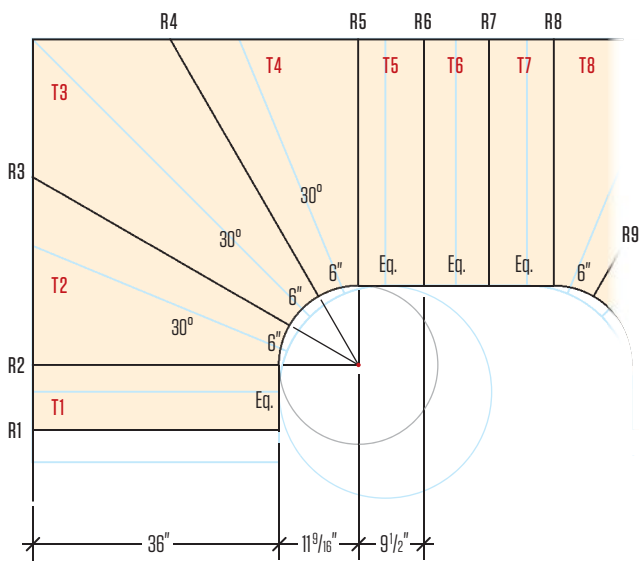
I tacked the panel to an area of floor where I could work freely around all sides (2b). From one corner of the template, I drew radial riser lines at 22.5-degree increments (2c). I used a site-made trammel



Stair Plan



Winder Options



The plan called for two four-tread winders with risers at 22.5-degree intervals (above). The arc of a 31-inch-diameter circle crosses each riser at a point that meets the required 6-inch minimum width at the inside of the turn. The radius of the winder circle plus the stair width determines the minimum space needed for each winder—in this case, 4 feet 3 1/2 inches.

The drawing at left shows how a three-tread winder layout differs from the four-tread winder layout described above. The three-tread design uses a smaller, 23 1/8-inch-diameter circle to maintain the 6-inch minimum. However, this configuration reduces the number of risers from 13 to 12, which results in steeper 7 13/16-inch risers, just over the code maximum of 7 3/4 inches. Between winders, it also requires three common treads (instead of two) with a rough depth of 9 1/2 inches, which, with a minimum nosing of 3/4 inch, would meet the code minimum depth (10 inches).

stick to swing a 15½-inch arc across the radial lines from their origin point. I checked to make sure this met the winder's 6-inch requirement by measuring the straight-line distance between radials at the arc's intersection. To verify the minimum allowable tread depth of no less than 10 inches at the walk-line, I swung another arc 12 inches beyond the first. Finally, to make the boxes stackable, I offset the back line of each tread on the template by ¼ inch—the planned thickness of the adjacent tread's riser.

In choosing the material for my sub-treads, I considered the likelihood of weather exposure during construction. That ruled out plywood, with its tendency to swell and delaminate. I also wanted to make sure that the finished assembly would ultimately walk without the squeaks that typically result from shrinkage and warping. I decided to use AdvanTech (huberwood.com) flooring, which I've seen perform flawlessly in other subfloor applications. For the vertical sides of the boxes, I used ¾-inch UL plywood because it has no significant voids in its laminations.

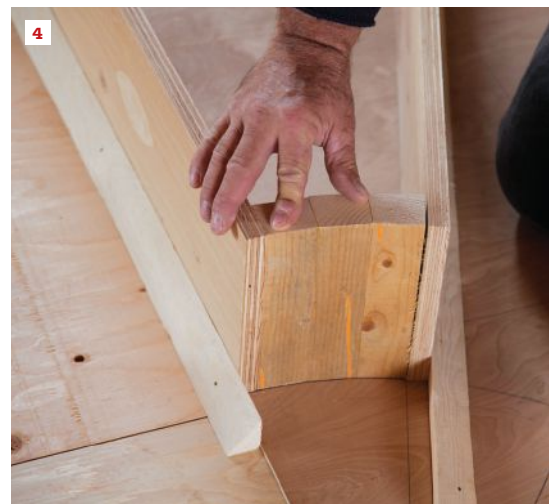
I ripped the UL into 7⁄16-inch-wide strips, the common riser height for this stair. As it turned out, Mark hadn't expected me to make actual radiused tread ends, and they could easily have been flat facets. But sticking to the plan and referencing the template, with a little trial-and-error I ripped 2-by scrap lumber into roughly 2-inch trapezoids with a 3½-degree bevel on two opposing edges (3a). Chopped to riser height, three pieces bonded together with yellow wood glue formed "curved" end pieces. I glued up the required eight ends in short order—low-tech masking tape provided sufficient clamping power (3b)—and let the glue dry overnight.

To cut and assemble the box pieces, I tack-nailed temporary stops along the front and rear offset lines on the winder template (4). The stops made it easy to accurately mark the cut lines in place without measuring, and provided a direct visual of the end-cut angles. They also held the boxes to a tight uniformity, which would be vital to final stair assembly. I used PL-Premium adhesive for all joints. To avoid splitting the plywood laminations, I used 2¼-inch 18-gauge finish nails and trusted the adhesive to provide a strong, permanent bond. With the four basic sides of a box completed, I then added intermediate bracing at 18-inch intervals to ensure a stiff tread surface (5).

Next, I applied the sub-treads. I flipped each completed box upside-down on the AdvanTech and traced the outline with a Sharpie (6a). I used the body of the pen to offset the line and allow for a small overhang, then cut the rough treads from the sheet (6b). I set each tread in adhesive (6c)—kneeling on the box to eliminate gaps—and secured it with finish nails (6d). It took one long day to make the eight winder boxes. The following day, with the adhesive dried, I routed the tops flush with the sides using a straight pattern-bit (7). I was ready to start stacking.

STACKING THE STAIR

For the starting tread, I'd already framed and leveled a regular, rectangular box in place, using cleats, screws, and adhesive to anchor it. I was working from a finished first-floor surface, so to account for the finish tread thickness, I reduced the riser height of





BUILDING A DOUBLE WINDER STAIR

this box by $\frac{3}{4}$ inch. I also made it deep enough to provide full support for the next box up. To maintain an accurate overlap, I tacked temporary stops $\frac{3}{4}$ inch in from the back edge of my first winder tread (8a,b). I ran a bead of adhesive along this edge, then stacked the next box on top and aligned them end for end.

I assembled the boxes in place, clamping a temporary support leg to each one. The clamps allowed me to check and adjust each tread for level as I went along. Once I had all four boxes of the lower winder stacked, I added plywood cleats that tied the back of each riser to the back of the box below it (9). Again, I used plenty of glue and screws. With the lower winder section assembled, I called it a day and let the glue dry.

The two common treads at mid-flight were conventional cut stringers, notched to bear on the winder below. I extended the top tread to support the winder tread above (10).

I assembled the upper winder just like the lower one, and finished up with the final, common tread at the upper landing. With the stair completely assembled, I shimmed and screwed each individual box from below to the studs and blocking in the exterior wall.

On the stair's open side, I supported the treads on 2x3 studs, following the curves of the two winders. The back side of the curved wall section is finished with wire lath and plaster (11). I finished the front side of this wall with vertical 1x3 T&G fir, which knuckled around the curves as if custom-made for the job (12). In the area under the stairs, we added lighting and a built-in desktop to create a small "found space" office (13).

I installed painted pine risers and, as a detail, let their ends project about $\frac{1}{8}$ inch beyond the finish wall plane. Using the same 1x8 southern yellow pine that was installed on the upstairs floor, I cut tapered lengths, three pieces per tread, and joined them with wood glue and biscuits. I'd considered using a taper-jig on the table saw to cut these pieces, but rejected that idea in favor of using my Festool track saw. This quickly produced accurate, glue-ready edges and also made short work of cutting the glued-up tread blanks to their scribed outlines.

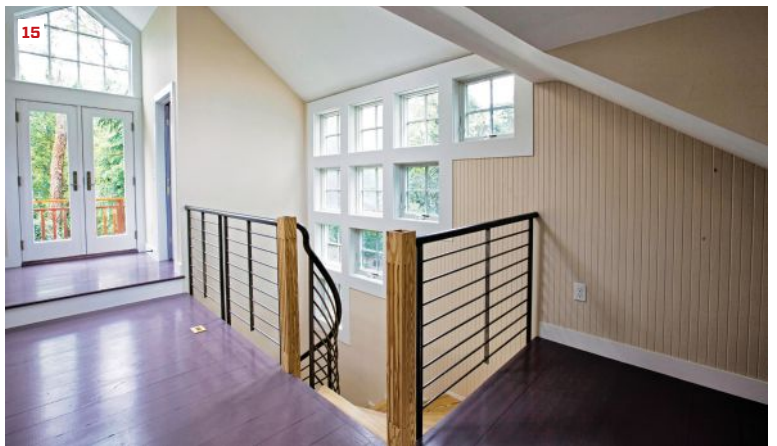
To make thicker 1-inch tread nosing, I biscuit-joined $\frac{5}{4}$ stock to the front edge of each tread and added breadboard nosing to the ends (14). I cut a curved profile into the ends using a router on a site-made plywood trammel base, which let me swing a suitable arc. Later, I used a round-over bit to create the nosing.

I installed the treads with PL-Premium, locking the back edge in under the elevated base of the finish risers. I face-nailed at the front of the treads and filled the heads with wood dough. The treads and upper floor are finished with three coats of a clear waterborne urethane.

The welded steel railing (15) was mostly site-assembled, a story for another day. The stair itself walked like a rock-solid, monolithic unit the day the glue dried. In all, it took seven days to complete and cost around \$5,700 without the railing.

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





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What Do You Do With Crawlspace Air?

Most crawlspaces are vented to the outdoors, but over the past decade, encapsulating the crawlspace (as shown below) has gained favor among builders of green and energy-efficient homes. It's often seen as the best way to eliminate the moisture problems that can result from vented crawlspaces. But what do you do about the air down there?

Before we address that question, let me point out that encapsulated crawlspaces are great for humid climates such as those in the Southeastern U.S. In a dry climate, however, it may not be worth the cost to encapsulate. So do what's most suitable for your climate.

Basically, your options are to do one of the following:

- Vent the crawlspace to the outdoors;
- Put a little bit of supply air from the HVAC system into the crawlspace;
- Use an exhaust fan to move air from the crawlspace to outside;
- Install a dehumidifier.

Let's take a look at each of these methods.



Say goodbye to the vented crawlspace. Encapsulating the crawlspace by insulating the walls and installing a heavyweight ground cover is gaining favor as a sensible way to control moisture problems.

Photo: Allison Bailes

1 Vent the crawlspace to the outside

Do this in a humid climate, and you're asking for trouble. Much of the time, the outside air that you bring into the crawlspace actually has more moisture in it than the crawlspace air you're venting to the outside. Although a psychrometric chart shows mathematically why it doesn't work, a look into just about any vented crawlspace in the Southeastern U.S. proves that venting to the outside is often a disaster.

The top photo on page 68 was taken at a house that was only a year or two old. Although the home builder had installed closed-cell spray foam insulation in all of the above-grade walls and in the attic, he left the crawlspace vented to the outside. The result was mold growing on the HVAC system.

Conclusion: Unless you're in a dry climate, venting the crawlspace to the outside is your worst option. It is absolutely your worst option in humid climates. And it's probably also the worst option in most climates if the HVAC systems and ductwork are located in the crawlspace.

2 Supply air from the HVAC system

If you encapsulate the crawlspace, adding a little of the air from the HVAC system is probably the most common method used. If there's already a duct system down there, it's easy and inexpensive to do. The air from the system helps to dry out the crawlspace air.

This puts the crawlspace under a slight positive pressure because the HVAC system is blowing some air down there. The house, then, gets a little bit of negative pressure because there's more return air being pulled from the house than supply air being blown into it.

Is that a problem? Not according to the *Closed Crawl Spaces* guide (crawlspaces.org) from Advanced Energy, a planning, technical, and engineering services firm headquartered in Raleigh, N.C.:

In Advanced Energy field tests, the small crawlspace airflow causes a negligible pressure effect that is far exceeded by the effects of duct leakage, stack pressure, or wind-induced pressures in the building.

How much supply air do you need to add to the crawlspace? Advanced Energy recommends 1 cubic foot per minute (cfm) for each 30 square feet of crawlspace floor area. The International Residential Code (IRC) recommends 1 cfm per 50 square feet:

Conditioned air supply sized to deliver at a rate equal to 1 cubic foot per minute (0.47 L/s) for each 50 square feet (4.7 m²) of under-floor area, including a return air pathway to the common area (such as a duct or transfer grille), and perimeter walls insulated [in accordance with the code's building envelope requirements].

This option may work well in the summer if the air conditioner is sized properly. If the system runs long enough, it can provide enough dry air to the crawlspace to keep the relative humidity below 70%, where you want it. In the swing seasons, however, and in homes that have oversized air conditioners, this method may not work well at all.

Another thing about this method that I'm not crazy about is that you're conditioning the crawlspace based on controls that respond to conditions in the finished space above. The crawlspace has its own conditions, though, and may not respond well to controls in another place.

Conclusion: Although it's the most common method of treating the air in encapsulated crawlspaces, using HVAC air may not work equally well at all times of year.

3 Exhaust air to the outside

First, note that I am not talking about the crazy idea of putting big fans in the crawlspace to exchange large quantities of air between it and the outdoors. (Yes, companies really do promote this, and it's a quick way to rot the wood in your crawlspace.) I'm talking about a small exhaust fan, as described in the IRC. In an unvented crawlspace, the IRC calls for the same exhaust ventilation rate for a crawlspace exhaust fan as it does for the conditioned air supply—1 cubic foot per minute for each 50 square feet of



Adding a small opening in a supply duct running through an encapsulated crawlspace is an easy, inexpensive way to dry out the crawlspace. Although commonly done, this approach doesn't work well to address moisture when the HVAC is not running.

crawlspace floor area. So a 2,000-square-foot crawlspace would need a 40-cfm exhaust fan. It's pulling just a little bit of air from the crawlspace.

The problem is that you don't really know where the makeup air for the crawlspace is coming from. Yes, the code specifies a pathway for air to move into the crawlspace from the house (such as a duct or a transfer grille), but air doesn't always follow the arrows in the diagrams. If the band joist isn't sealed well, for example, a lot of the air may be pulled from outdoors, which isn't what you want.

Conclusion: Exhausting crawlspace air to the outside could work but is probably less reliable than supplying air from the HVAC system.

4 Install a dehumidifier

In this method, you use a stand-alone dehumidifier for the crawlspace. (Again, we're talking here about

encapsulated crawlspaces only; although some people try to do it, you can't dehumidify the whole outdoors.) This method is controlled by the conditions in the crawlspace, not in the house above, so it will do the best job of keeping the crawlspace dry.

Brad Brinke of The Crawlspace Co., in Virginia Beach, Va., responded to my question about this topic on the Energy Vanguard Facebook page: "We have a very good track record with the dehumidifier here in Virginia. We install a humidistat and fan system to help the dehumidifier operate efficiently. We tried using supply air from the home and it did not work."

If you want dry air in your crawlspace, a dehumidifier is the way to go. Yes, they do have drawbacks: You have to buy additional equipment; they require maintenance; and if the drain fails, you may have a bulk water problem in the crawlspace.

If it's a small crawlspace, a standard dehumidifier that you can buy for \$200

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to \$300 may be sufficient. For medium to large crawlspaces, however, it's best to go with a more robust model, such as the ones made by Therma-Stor (thermastor.com). The company's "Santa Fe" line (see photo, lower right) is made for basements and crawlspaces.

Conclusion: Although more expensive, installing a dehumidifier is the best method for treating the air in an encapsulated crawlspace.

WHAT ABOUT TRANSFER GRILLES?

The quote from the building code that I mention earlier contains the following language: "... including a return air pathway to the common area (such as a duct or transfer grille) ..."

What this means is that if you pressurize the crawlspace with supply air or depressurize it with an exhaust fan, the code wants the crawlspace to be able to communicate with the house above the crawlspace to relieve the pressure.

The easiest way to accomplish this is with a transfer grille—a floor grille, like the type used over an HVAC duct boot, only with no duct attached; the grille is simply mounted over a hole in the floor leading to the crawlspace below.

Advanced Energy isn't a fan of this method. Instead, it recommends that the entire floor be air sealed to isolate the crawlspace from the house. There are some good reasons for this. If, for example, the intent of the opening is for house air to move downward (as in the case of the exhaust fan), the stack effect may win out if the crawlspace isn't perfectly sealed to the outside. Another potential problem is pollutants in the crawlspace air migrating into the house. These could be soil gases, such as radon, or fumes from paints, pesticides, or fuel stored in the crawlspace. Also, if an access door between the crawlspace and the outdoors is left open, it may not be discovered for some time. Meanwhile, the house is directly connected to the outside through that transfer grille.

Is it ever OK to install a transfer grille? Sure. If the crawlspace has no access from



Although the builder insulated all the above-grade walls and the attic with closed-cell spray foam, he left the crawlspace vented to the outside. The result: mold growing on the HVAC system (top). Installing a robust dehumidifier, such as this Therma-Stor Santa Fe model made for basements and crawlspaces, provides the most effective way to manage moisture in an unvented crawlspace (bottom).

outside and the homeowner doesn't store hazardous chemicals down there, there is little risk.

THE BOTTOM LINE

The best way to deal with the air in a crawlspace is to encapsulate it and install a dehumidifier. Adding supply air from

the HVAC system is tricky and may let the crawlspace humidity get too high in spring and fall. Now, go out there and turn those nether worlds into better worlds!

Allison Bailes owns Energy Vanguard, a home performance and training firm in Decatur, Ga. All photos by the author except where noted.



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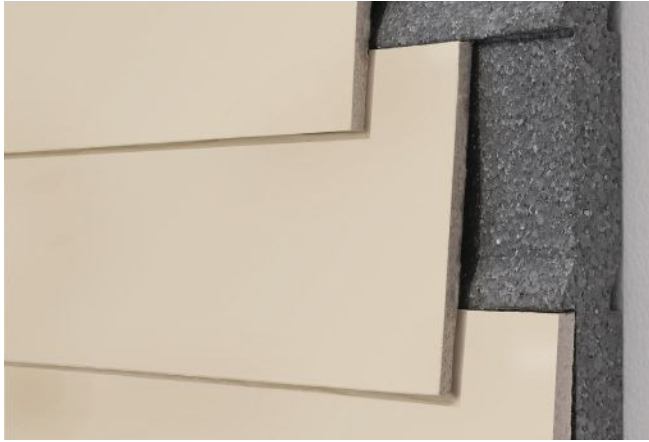


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Siding Guide

Not only does LineBacker Siding Insulation provide a thermal break but its parallel ridges serve as guides for the installation of horizontal siding planks. Contractor cost is \$13.50 per sheet for EPS or \$19 for Neopor—a mix of EPS and graphite that reportedly has 20% more insulating value. Progressive Foam Technologies, 800.860.3626, progressivefoam.com



Pretty Tough

Therma-Tru Decorative Impact Glass door and side lites meet coastal code requirements. The triple-pane laminated glass panels in approved Therma-Tru impact-rated doors can withstand winds up to 195 mph. Prices vary; a Fiber-Classic model with decorative glass (shown) retails for about \$1,700, finished and prehung. Therma-Tru Doors, 800.843.7628, thermatru.com



Petite Pump

A Saniswift gray-water pump makes it easier to add plumbing fixtures to rooms with no below-floor drainage. The size of a small wastebasket, it can pump up to 24 gpm (depending on discharge-line length) from three fixtures and handle a rise of 14 feet. An internal pressure switch automatically turns the pump on and off. Cost: \$265. Saniflo, 800.571.8191, saniflo.com



Flexi Post

With a 60-degree range (30 degrees in either direction), the Panorama Post supports topless glass guardrails at various angles. The powder-coated aluminum post comes in surface- and fascia-mount versions in eight standard and 180 custom colors; tempered glass panels are available clear or frosted in various heights. Durarail, 866.999.7245, durarail.com

BY CHARLES WARDELL



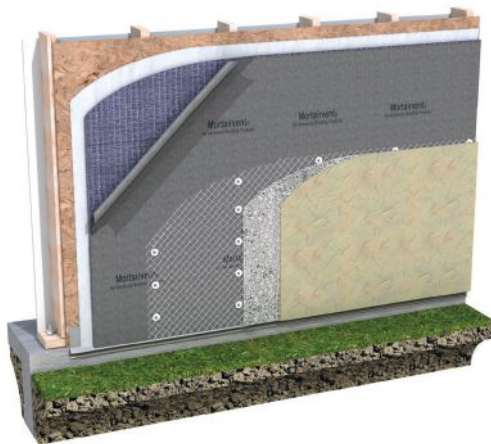
Field-Applied Flange

Many doors are sold with jambs but no flange, so a Jacksonville, Fla., contractor has developed a field-applied PVC flange. Zip Flash is simple to install: Run a bead of caulk down the back, then staple it to the jamb. It comes in 84- and 98-inch lengths for \$7.50 and \$8.50 respectively. A standard door needs 2 1/2 flanges. BAV Products, 904.321.6833, zipflashing.com



Outdoor Rangehood

The 30-inch-deep Best WPD39M Range Hood is UL listed for use in damp locations and offers a 3-inch wall extension. A sensor detects excessive heat and bumps up fan speed if needed. Hoods come 36, 48, or 60 inches wide, with internal or external blowers up to 1,500 cfm. Prices range from \$1,700 to \$2,800. Broan-Nu Tone, 888.336.3948, bestrangehoods.com



No-Clog Rainscreen

Although Mortairvent Membrane can be used with any siding, it should really earn its keep with masonry-based systems. It consists of a polypropylene mesh for drainage and ventilation, and a filter fabric that keeps mortar from clogging the mesh. Expect to pay 50 to 60 cents per square foot. Advanced Building Products, 800.252.2306, advancedbuildingproducts.com



Roof Board

InsulFoam's HD Composite—closed-cell EPS bonded to high-density polyisocyanurate cover board—has a UL Class-A fire rating. The 4x8 sheets come 1 1/2 to 6 inches thick and can be installed with mechanical fasteners or EPS-compatible adhesive. Contractor prices range from \$1.52 per square foot (R-12) to \$1.85 (R-30). InsulFoam, 800.248.5995, insulfoam.com

Products



Longer-Use Foam

DAP claims its Draftstop 812 polyurethane foam sealant can be reused for up to 30 days after opening. We can't guarantee that, but we did have good results after a week. The key is to reinsert the little "safety tab" in the straw's tip when not using the can. Make sure to squeeze the trigger and not pull up on it, unless you want a foamy mess. It comes in 16-ounce cans for \$16. DAP Products, 410.675.2100, dapspecline.com



Sunken Treasure

About a million cord of old-growth timber—yellow birch, red oak, pine—is thought to lie at the bottom of northern Maine lakes and rivers, lost during logging operations a century ago. Now it's being reclaimed for interior millwork, including flooring (\$9.50 to \$14 per square foot), millwood (\$3 to \$5 per square foot), and wainscoting (\$90 for 25 square feet). Maine Heritage Timber, 207.723.9200, maineheritagetimber.com



PVC Ceiling

Zip-Up Ceiling looks like a quick way to finish a basement ceiling: Install trim around the perimeter, then infill with paintable PVC panels and hidden rails that can be unzipped later for cleaning and overhead access. Impervious to water, the ceiling is mold- and mildew-resistant. Pieces come in 8-, 12-, and 16-foot lengths; 12-footers cost \$26 for rails, \$22 for trim, and \$48 per panel. Zip-Up, 888.449.4787, zipupceiling.com



Rigid Rock Wool

Comfortboard CIS (Commercial Insulated Sheathing) is a non-combustible stone-wool insulation board designed for use as exterior continuous insulation in rainscreen wall systems. The manufacturer says that it repels water but is breathable enough to allow outward wall drying. Available in several thicknesses; the 1 1/4-inch version costs 80 cents per square foot. Roxul Insulation, 905.878.8474, roxul.com

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LEGAL NOTICE

If you own or owned a Trex® brand non-shelled wood-plastic composite decking, railing, or fencing product purchased between August 1, 2004, and August 27, 2013 you may be eligible for benefits from a class action settlement.

Para una notificación en Español, visite
www.trex.com/legal/2013classactionsettlement.aspx
o llame 1-877-495-0068.

A nationwide settlement has been reached in a class action lawsuit in which the plaintiffs allege that certain Trex composite decking, railing, and fencing material is susceptible to mold, mildew, fungal, or other dark or gray growth or spotting, or color variation or color fading (the "Covered Conditions").

Who Is Included?

If you own or owned a Trex non-shelled wood-plastic composite decking, railing, or fencing product that was purchased between August 1, 2004, and August 27, 2013, you may be included in the Settlement. You may send in a Claim Form and, if applicable, a Supplemental Claim Form, to request certain benefits, or you can exclude yourself from the Settlement. The U.S. District Court for the Northern District of California authorized this notice and will have a hearing to decide whether to approve the Settlement. Get a detailed notice at www.trex.com/legal/2013classactionsettlement.aspx or by calling 1-877-495-0068.

How Do You Ask For Benefits?

You may receive benefits only if you fill out a Claim Form and, if applicable, a Supplemental Claim Form, and your Trex decking, railing, or fencing is affected by one of the Covered Conditions. The Claim Form and Supplemental Claim Form are available online at www.trex.com/legal/2013classactionsettlement.aspx, or you can call 1-877-495-0068 to request them. The Claim Form and the Supplemental Claim Form must be faxed, e-mailed, or sent by U.S. Mail and postmarked by May 27, 2014, which is nine (9) months from entry of the Court's order granting preliminary approval of the Settlement.

What Does the Settlement Provide?

If you meet the settlement and eligibility criteria, Trex will provide you with one of three options of relief: Tier 1 Relief, Tier 2 Relief, or Tier 3 Relief. Tier 1 Relief consists of a one-time cash payment of \$150, subject to pro rata reductions if the Tier 1 set-aside described herein is oversubscribed, but in no event less than \$20 unless pro rata reductions are required due to the cost-cap discussed below ("Tier 1 Relief"). At least \$1.4 million will be set aside to pay Tier 1 Claimants. The \$1.4 million amount was arrived at by taking the number of Class Members receiving Class Notice by Regular Mail and E-Mail based on Defendant's records (approximately 70,000) and multiplying that number by \$20. The \$1.4 million number is provided for illustration purposes; the final amount of the Tier 1 set-aside will be determined after Defendant, in consultation with Class Counsel, determines the total number of Class Members to whom Class Notice by Regular Mail and E-Mail will be sent. Once all qualified Tier 1 Claimants have received Tier 1 Relief, then any amount of the Tier 1 set-aside remaining will be available for Tier 2 Relief and Tier 3 Relief. Tier 2 Relief consists of: (a) reimbursement of the cost of purchasing cleaning product at a flat rate of \$18; and (b) a non-transferable payment certificate entitling you to a cash reimbursement equal to 40% of the retail purchase price paid by you to purchase certain new Trex decking and Trex-brand fasteners (if you used these in your current Trex Structure) to replace your existing Trex decking and Trex-brand fasteners, if applicable. Tier 3 Relief consists of: (a) reimbursement of the cost of purchasing cleaning product at a flat rate of \$18; and (b) either (i) a non-transferable payment certificate entitling you to a cash reimbursement equal to 50% of the retail purchase price paid by you to purchase certain new Trex decking and Trex-brand fasteners (if you used these in your current Trex Structure) to replace your existing Trex decking and Trex-brand fasteners, if applicable, and a payment for labor reimbursement at the formula rate of \$0.23 cents per linear foot of replacement decking, or (ii) a refund of 20% of the original purchase price of your current Trex Product. The Settlement is subject to an \$8.25 million cost-cap and a potential pro rata reductions if the total sum of valid claims exceeds \$8.25 million. More information is available in the detailed notice and at www.trex.com/legal/2013classactionsettlement.aspx.

What Are Your Other Rights?

If you fall within the class definition, you may remain in the class by doing nothing and be bound by the release and judgment in the lawsuit. If you do not want to be bound by the Settlement, you must exclude yourself prior to 45 days from the last date that Notice is sent by Trex or first published as set forth in the Notice Plan, which is described in the Settlement Agreement (the "Opt-Out Period"). Please check www.trex.com/legal/2013classactionsettlement.aspx for updates on the deadline. The detailed notice explains how to exclude yourself.

Any Opt-Out request must be sent by first-class mail to Defendant's counsel postmarked on or before the end of the Opt-Out Period. You must mail a letter requesting exclusion to Counsel for Defendant. For the address of Counsel for Defendant, go to the website at www.trex.com/legal/2013classactionsettlement.aspx or call 1-877-495-0068.

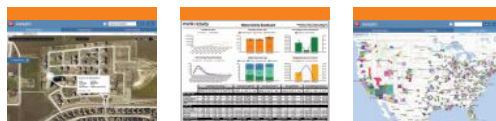
If you do not exclude yourself from the Settlement, you may object to it by filing an objection with the U.S. District Clerk, U.S. Courthouse, 450 Golden Gate Avenue, San Francisco, California 94102, and sending it to Defendant's Counsel and Class Counsel, postmarked not later than 21 days before the date set for the Final Settlement Hearing.

The Court will hold a hearing in this case, *Mahan v. Trex Company, Inc.*, No. 09-cv-00670-JW, on December 13, 2013, to consider whether to approve the Settlement and Class Counsel's request for fees, costs, and expenses of \$1,475,000 (including interest). Class Counsel will also ask for a payment of \$7,500 to each Class Representative. You or your lawyer may attend the hearing.

For more information, go to the website at
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EDITED BY BRUCE GREENLAW



DeWalt Mobile Pro Construction Calculator App

BY BRUCE GREENLAW

When I saw an ad for the DeWalt Mobile Pro construction-calculator app in the July *JLC*, I couldn't resist scanning its embedded QR code with my iPod to check it out. That zipped me to the iTunes App Store, where I learned that the app is compatible with iOS devices and is copyrighted by DeWalt, Cengage Learning, and Infinity Softworks. Cengage Learning develops teaching, learning, and research solutions, while Infinity Softworks created the PowerOne line of calculator apps, which include spreadsheet-like templates geared to specific occupations.

After downloading and exploring a freebie that includes a calculator and several templates, I bought all eight currently available add-on packs, which cost 99 cents to \$4.99 each or \$19.99 for the complete Master Pack. The packs bundle templates dedicated to busi-

ness, construction math, site work, concrete and masonry, carpentry, electrical, finish materials, and landscaping. The carpentry pack includes a trim-carpentry add-on that's also sold separately. Most buyers would be far more selective, but I wanted to tour the complete package to get a feel for the interface and see if I could spot some obvious strengths and weaknesses. After spending hours tapping, flicking, and typing, I think the pros far outweigh the cons.

FEATURES

The more I use the free construction calculator, the more I like it. It includes three keypads that collectively offer standard math and trig functions, and it allows you to enter feet or inches with fractions or decimals (but not metric units). Users are also able to

toggle between units in the view window. The precision is adjustable, and inches can be accurate down to $\frac{1}{64}$. What's more, you can calculate entire algebraic expressions by entering a single string of numbers and commands. Two types of storage are included: "History" displays a log of your entries and results, and "Memory" can store up to 10 numbers or equations, which can then be recalled to the calculator.

You also get nine free templates for calculating areas and volumes; converting between length, area, and volume units; and estimating slab concrete, drywall, paint, and studs. To use a template, you select it from a list, enter the required data, and view the results below. For help, you simply tap the "Overview" and "Examples" tabs up top. Each template automatically saves a history of your calculations, which you can view, name, annotate, delete, email, or recall to the template for further computation. You can also use the calculator while entering data into a template. On the iPhone and iPod Touch, calculated results can be entered directly into the templates.

I think the template format is great. Other virtual construction calculators I've seen mimic traditional ones, requiring you to use keystrokes in various combinations to enter data and view results. BuildCalc (buildcalc.com) is one impressive competitor that includes templates, but they're still tied to a keypad. The DeWalt Mobile Pro app isn't limited by this constraint.

ADD-ONS

The trade-specific add-on packs dropped a mind-boggling 129 new templates into the app (they're listed at dewalt.cengage.com/mobilepro). Thankfully, the app makes it easy to find a template without scrolling through the entire list.

The business pack includes more than two dozen tools for small and large businesses, addressing everything from auto loans and leases to marketing ROI and bid for profit. The concrete and masonry pack also goes impressively deep, estimating everything from the concrete, rebar, and rebar chairs required for foot-

ings to the yards or bags of concrete required to fill post holes (factoring in the post voids). It even estimates the masonry materials you need to build a brick house.

The site-work and landscaping packs collectively address fence materials, cut/fill, soil-compaction loss, pavers, and more. One template allows you to estimate the height of a tree by plugging in your height, the length of your shadow, and the length of the tree's shadow. The math add-on is mostly conversion templates that I will seldom use. The electrical pack is definitely geared toward pro electricians, but includes fundamental templates like Box Fill, Minimum Burial Depth, and Residential Service. The finish-materials pack costs a dollar, a low price for estimating tile, flooring, and countertops.

I have mixed feelings about the carpentry packs, though. On the one hand, you get detailed templates devoted to notching and drilling joists and studs and a stair template that factors in landings. On the other, some key templates are surprisingly lean. For instance, the template on baluster spacing calculates horizontal layouts but not stair-rail layouts. The baluster and stair templates are accurate to 1/16 inch. I wish they were accu-

rate to at least 1/32 inch to avoid accumulated error (though you can easily adjust your actual layout where necessary). As for roof framing, you can calculate the lengths of regular hip and valley rafters, cripples, and ridge boards, but that's it. Deck footings are calculated for covered decks only. I'm told that existing templates will be modified regularly as needed to improve their performance or keep them up to date, and that new templates and template packs are forthcoming. Once you buy a template pack, all of its upgrades are free.

THE BOTTOM LINE

I love the app's free construction calculator. It's versatile and convenient, and it includes trig functions that stair builders and roof framers will appreciate. I also like the easy-to-use templates. Because the calculator comes with free ones, you can take a test drive before buying any of the trade-specific add-on template packs. I see room for improvement, but this is a useful app that promises to evolve on the fly in response to customer feedback. An Android version is reportedly under discussion.

Bruce Greenlaw is a contributing editor to JLC.



RETHINKING AMP-HOURS

According to conventional wisdom, the amp-hour rating of a cordless-tool battery is strictly a measure of its capacity. For example, powering the same drill/driver under identical testing conditions, a new 4 amp-hour battery will bore about twice as many holes per charge as a new 2 amp-hour one. After all, the 4 amp-hour pack contains twice as many 3.6-volt cells as the smaller pack and therefore has double the storage capacity.

Some of our recent tool testers, however, swear that higher amp-hour batteries not only have more runtime than their compact counterparts but can also be noticeably more powerful. Reinforcing this opinion, Bosch recommends using its new MXH180 18-volt oscillating multi-tool with its 4 amp-hour pack rather than 2 amp-hour pack for maximum power and runtime.

That's surprising, so we called Jason Feldner, Bosch product manager for cordless tools, for an explanation. In a nutshell, he said the cell configuration creates less resistance in 4 amp-hour packs than in 2 amp-hour packs, allowing larger packs to deliver more power. How much more? "A powerful tool like a recip saw might see a 20% performance boost," Feldner says, "but that percentage can vary by pack and drops with less demanding tools and applications." —B.G.



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DeWALT	69	dewalt.com/multitool
DeWALT	69	dewalt.com/tablesaws
Diablo	29	DiabloTools.com/Recip
ExakTime / JobClock	6	exaktime.com/jlc
Factory Direct Screws	4	factorydirectscrews.com
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Ford Motor Company	36&37	ford.com/commercial-trucks
Grabber Construction Products	22	grabberman.com
Grace Construction Products	IFC	graceresidential.com/35yearsIWS
Greenbuild	73	greenbuildexpo.org
Grip-Rite/PrimeSource	24&48	grip-rite.com
International Code Council	79	iccsafe.org/jlc
JLC LIVE	46&47	jlcive.com
Kleer Lumber, LLC	23	kleerlumber.com
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Advertiser	Page	Website
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Makita USA, Inc.	16a&b	makitatools.com
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Masterchem Industries, Inc.	9	kilz.com
Milwaukee	12	milwaukeeetool.com/m18fuel
MiTek Industries, Inc.	35	usconnectors.com
NyloBoard	18	nylodeck.com
OMG	IBC	FastenMaster.com/hiddenfastening
Panasonic	27	us.panasonic.com/ventfans
Pearl Abrasive Co.	14	pearlabrasive.com
Porter Cable	56	portercable.com/20volt
Railing Dynamics, Inc.	64	rdirail.com
Screw Products, Inc.	30	screw-products.com
Shurtape Technologies, LLC	10	shurtape.com
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Titebond	21	titebond.com/PROvantage
Tjernlund Products, Inc.	79	tjernlund.com
Trex	74	trex.com/legal/2013/classactionsettlement.aspx
Versatex	2	versatex.com

* Advertising appears in regional editions



Heat Wave

Milwaukee introduced its first M12 cordless heated jacket in its signature red color in late 2010. Powered by Milwaukee's 12-volt Red Lithium battery, it resists water and wind, has three heating zones and heat settings, and delivers up to six hours of continuous heat per charge. Milwaukee now offers other options, including a new line of heated hoodies. The jackets, but not the hoodies, can also be powered by M18 18-volt battery packs.

Now Bosch and DeWalt have entered the

conversation. The new Bosch 12V Max heated jacket comes in black only, and also has three heat zones and settings. DeWalt's new line can be powered by 12V MAX or 20V MAX batteries, and includes jackets with and without removable or fixed hoods. Unlike the competition, DeWalt also has heated collars.

Overall, prices range from as low as \$100 for Milwaukee's bare heated hoodies (no batteries or chargers included) to about \$200 and up for jacket kits. —B.G.

Left to right: Bosch 12V Max Heated Jacket, Milwaukee M12 Cordless Heated Hoodie, DeWalt 20V/12V MAX Camo Heated Jacket.

SHOULDERING THE BURDEN

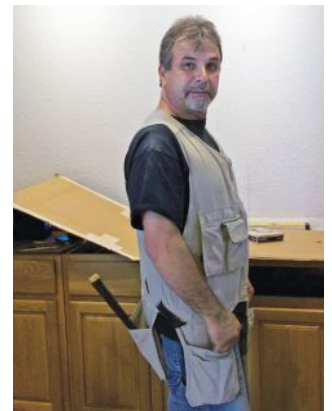
I've never liked wearing a toolbelt. The weight of the bags and tools always seems to put a strain on my back and hips. I wear a tool vest instead because it distributes the weight on my shoulders. My current favorite is the Blaklader cotton-canvas Bantam Kangaroo vest (#3120, blaklader.com). It has several deep-hanging pockets that hold my tape, Speed Square, chalk box, and other tools, plus hanging chest pockets with extra compartments for a cell phone and a pencil. It also has a hammer loop, but I don't use it because an exposed hammer head and a swinging handle can damage finish work. Instead, I drop my hammer into one of the two rear pockets head-first, which works well. The vest can expand to fit over a jacket, but I seldom use that feature because I normally work in comfortable interiors. Unless you expand the vest, the zipper hides behind a flap, so it won't scrape your work. The vest costs a reasonable \$55 online.

—Frank Caputo is a finish carpentry contractor in Cool, Calif., and presents the Exterior Living Designed to Last clinic at JLC Live New England.



FRIENDLIER VACUUM HOSES

Gary Katz, who presents the Trim Carpentry clinic at JLC Live, runs the vacuum hoses for his power tools through Flexo PET sleeves. Made by Techflex (techflex.com) from braided PET yarn in various sizes and colors, the nonabrasive sleeves prevent hoses from snagging and damaging work. Katz has also sleeved a hose and detachable Festool cord together, which keeps the cord out of the way and can be quickly transferred to a companion tool. Flexo PET sleeves expand up to 150%, but Katz prefers a loose fit that easily slips over hoses and cords. He then secures the sleeves with gaffers tape. —B.G.



Photos: bottom left, Gary Katz; right, Lina Mooney



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BY JON VARA

Technicians prepare for a controlled demolition of unexploded ordnance found in a burial pit on the Pinecastle Jeep Range, near Orlando, Fla.



Home on the Range

During World War II, the U.S. military leased 12,000 acres of cattle range near Orlando, Fla., to use as the Pinecastle Jeep Range, a munitions demonstration and training facility. After the war, the army tidied up a bit before handing the site back to its original owners, with the friendly advice that it might be best to leave certain areas undeveloped in the future.

But the future brought big changes, including air conditioning, mosquito control, Disney World, and hordes of retirees. In time, the old Jeep Range began to sprout houses and, eventually, the Odyssey Middle School.

Soon after the school opened in 2001, it became evident that quite a lot of military hardware had been buried under the school grounds decades before. Although it's never been determined whether the buried material was left there by the military or a civilian landowner, the U.S. Army Corp of Engineers (USACE) conducted a clean-up of the site in 2007 and 2008, removing 14 tons of scrap metal and debris, including 125 unexploded munitions.

Then things got interesting: With real-estate prices beginning their nationwide collapse, homeowners in residential developments on the margins of the range

sued builders for failing to disclose the area's history—which plaintiffs blamed for declining property values.

Meanwhile, the USACE continued inspecting the entire 12,000-acre range. When that work was completed last year, the team had documented and dug up an additional 5,000 objects, of which 24—none of them in residential areas—were found to be potentially explosive.

A number of lawsuits are still working their way through the courts, but at least one has been settled: In 2011, home builder The Ryland Group paid out \$1.2 million—without admitting wrongdoing—to a group of 118 plaintiffs. The modest size of that payout and recovering property values seem to have taken some of the steam out of further suits. But for some area residents, dreams of a big payday die hard. USACE project manager Frank Araico recalls one recent conversation with a landowner seeking to document the results of the inspection of his property. “I told him we could provide that, but that we hadn't found anything hazardous,” Araico says. “He gave me a blank look for a second, then said ‘Oh, crap.’”

Jon Vara is a JLC contributing editor who lives in Cabot, Vt.

Photo: courtesy USACE

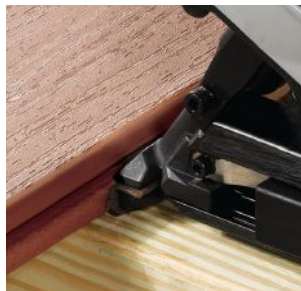
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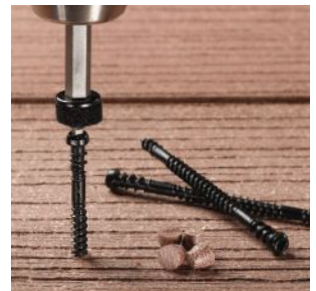
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