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THE JOURNAL OF LIGHT CONSTRUCTION

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Method-A Window Flashing

Retrofit Moment Frames

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On the cover: Two lead carpenters from Anderson Framing and Remodeling, in East Sandwich, Mass., go over a floor plan while snapping chalk lines for exterior walls. Photo by Roe Osborn.

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THE JOURNAL OF LIGHT CONSTRUCTION (ISSN 1056-828X), Volume 34, Number 7, is published monthly by Hanley Wood, One Thomas Circle, NW, Suite 600, Washington, DC 20005. Annual subscription rate for qualified readers in the construction trades: $39.95; nonqualified annual subscription rate: $59.95. Publisher reserves the right to determine recipient qualification. Canada Post Registration #40612608/G.S.T. number: R-120931738. Canadian return address: IMEX, PO Box 25542, London, ON N6C 6B2. Periodicals postage paid at Washington, DC, and at additional mailing offices. POSTMASTER: Send address changes to JLC, Box 3530 Northbrook IL 60065-3530.


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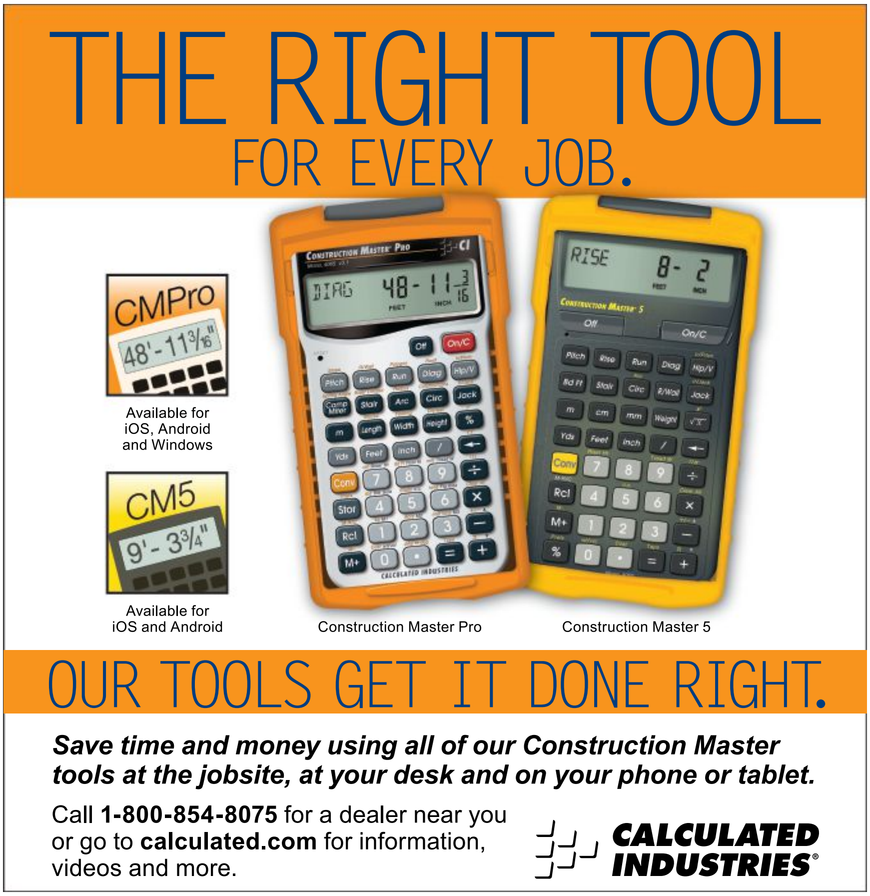

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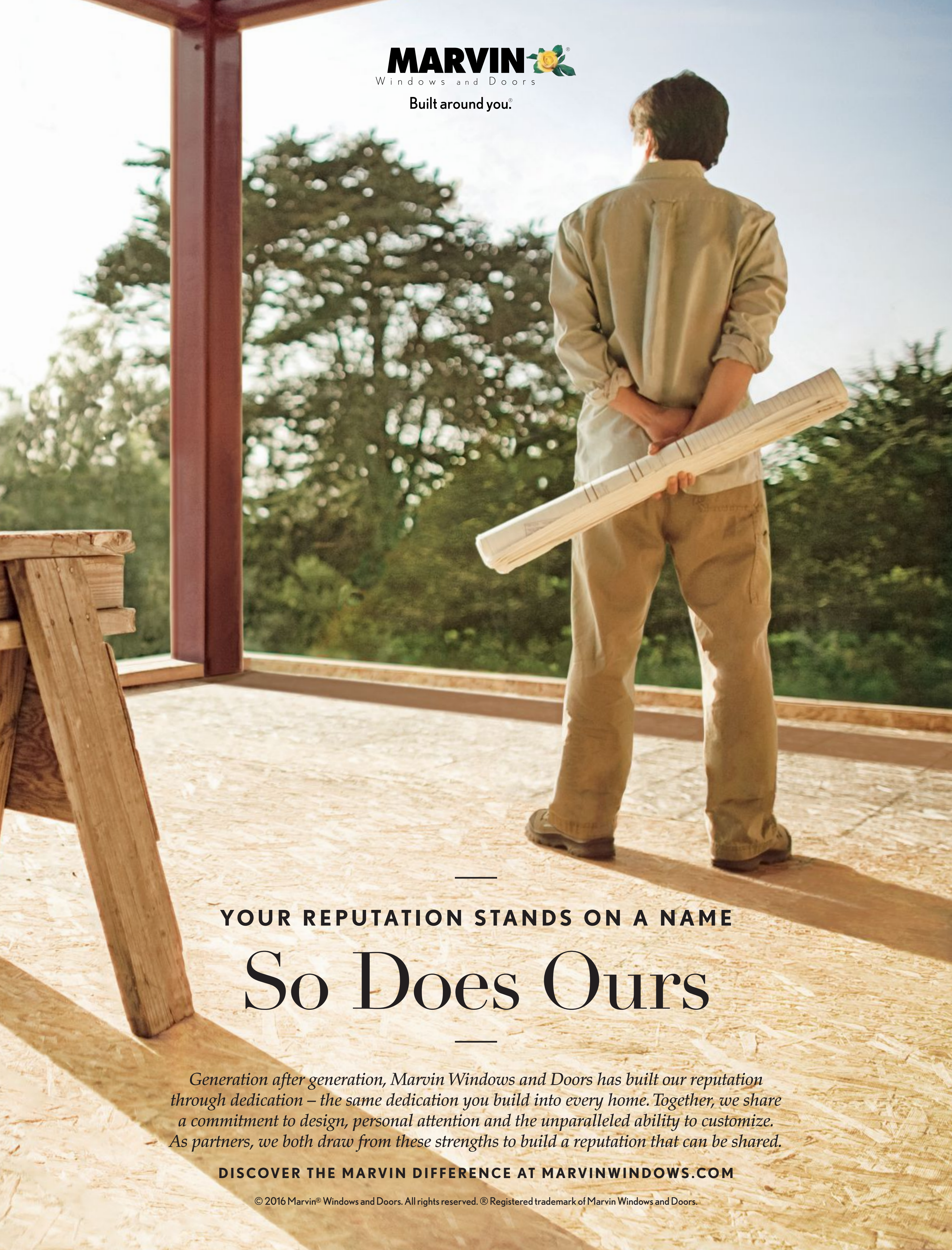
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Training the Trades From the Ground Up

BY ROE OSBORN

Photos by Roe Osborn

Ann Sweck, a human resources representative from Whiteley Plumbing and Heating, in West Chatham, Mass., interviews a student at a job fair at Cape Cod Technical High School.

You can't open a trade journal these days without hearing about the shortage of skilled workers in the building industry. But there's hope. I recently attended a job fair at a Cape Cod Technical High School near my home and was impressed with what I saw and heard.

Among the potential employers from the building trades that came to the event were building companies, plumbing companies, and building supply companies. Ann Sweck, a human resources representative for W. Vernon Whiteley, a local plumbing and HVAC company, said that the company had a number of CC Tech students working for them. "They come to work in the summers and end up staying with the company," Sweck told me. She also said that the skill level of the students coming out of the school is very high. "These kids are trained in the very latest technologies in the industry. They end up bringing some of our seasoned employees up to date on some of these things. The give and take is tremendous to watch."

When I visited the table of Polhemus, Savery and DeSilva, an architectural design and building firm in the area, construction manager Ray Tourville was speaking with Ryan Peterson, a junior in the carpentry program. Ryan had spent the last two summers working on a framing crew. PSD was looking for students to place on its building crews, but also to work in its architecture office. Tourville said the company had two CC Tech students working as architecture assistants in the past couple of years and spoke very highly of the training that the students brought to the job.

Interestingly, many students I spoke with were planning to take their specialized schooling to the college level. Junior Drew Silva, who attended the job fair in a jacket and tie, said that finish carpentry and furniture making were his biggest interests, and that he was considering applying to the North Bennet Street School. Trevor Thompson, from the engineering program, said he planned to apply to Worcester Poly Tech. And senior Terri Hibbert said that although framing was her favorite part of carpentry, she was going to attend the University of Massachusetts at Dartmouth, in its teaching curriculum. Her goal was to teach at a technical high school, paying it forward for other students like herself.

Barbara Lennon, a representative for MidCape Home Centers, talks to a tech student about how his skills could be put to good use at the building supply center.

I also spoke with folks from local building supply houses. Barbara Lennon, a human resources representative from MidCape Home Centers, said that tech students bring a basic knowledge of building with them that gives them a leg up in contractor sales or for going out in the field to price a job.

Brent Warren, a carpentry instructor, told me about the co-op program that the school offers. Second-trimester juniors who have the academic qualifications are given the opportunity to work two weeks per month on actual crews. For the students, this means working for pay while learning from full-time workers in their given field.

The enthusiasm of these highly-trained students as well as of the contractors eager to include their skills on their crews was great to see. It doesn't solve the problem entirely, but it is a wonderful first step.

Roe Osborn is a senior editor at JLC.

RRP: Renewal Update

BY SUE BURNET

If you've been out of the loop with the EPA's ever-evolving Lead-Safe RRP rules, here is some good news: Certification renewals can now be done online in some areas of the country. (For those folks working in AL, DE, GA, IA, KS, MA, MS, NC, OK, OR, RI, UT, WA, or WI, or in the Bois Forte Tribe, please consult your state program for renewal requirements.)

INFORMATION IN A NUTSHELL

- Online training for re-certification is valid for only a three-year period rather than the typical five-year period. (Five-year renewal re-certification is available by taking the four-hour hands-on course at an approved training facility).
- Online re-certification is only available for every other renewal. If you choose to renew online this time around, you'll need to go back to the classroom for renewal the next time your certification expires.
- If your certification has already expired, you will have to take the eight-hour hands-on course again.

COSTS

- Online certification renewal course costs are around $60 to $130.
- Hands-on refresher courses typically run between $125 and $225.
- The full eight-hour initial course will set you back roughly $200 to $350.

Costs may vary from area to area, so check with a local training facility for exact amounts. (There are links on the EPA site to locate training facilities in your area). To learn more, go to www.epa.gov/lead/getcertified.

Sue Burnet and her husband, Greg, own Toolbelt Productions (toolbeltproductions.com).

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Q An exterior wall in a client's finished bathroom has a mouse infestation. The wall contains plumbing (for a pedestal sink) as well as electrical wires. I need to gut the wall carefully from the exterior without disturbing the interior finish. How can I insulate the wall properly and keep the critters out?

Rodent-Proofing and Re-insulating From the Exterior

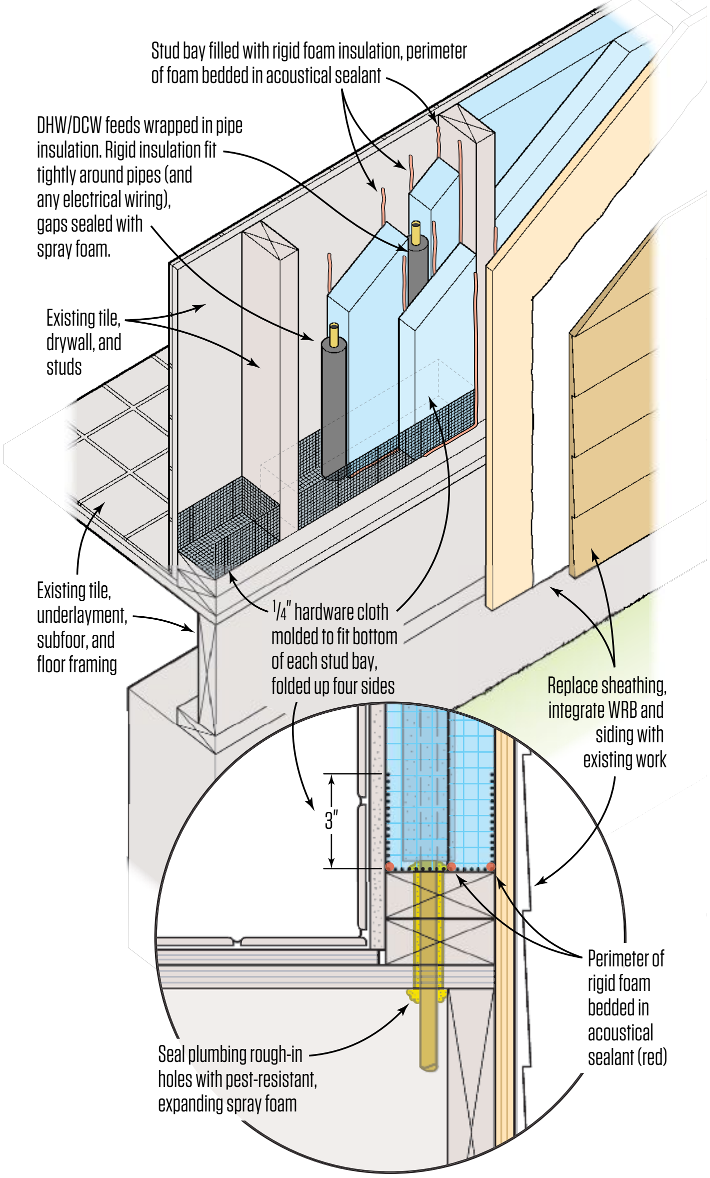


Illustration by Tim Healey

A Steven Baczek, a residential architect from Reading, Mass., who specializes in designing durable, low-energy homes, responds: Aside from being careful that you don't dislodge or damage any tile, mirrors, or other delicate interior surfaces, you need to keep the mice from returning, insulate the wall, and provide a good level of airtightness to prevent moisture problems from occurring in a vulnerable wall in what is a notoriously damp room in most houses.

After you've removed the exterior finish and sheathing, it should be obvious where the mice have been living. Mice can be carriers of many diseases, so protect yourself with a good respirator and gloves when you handle the contaminated insulation. My guess is that the mice have been getting into the walls through the spaces around the plumbing pipes and electrical wires, and with any luck, those bays are the only ones that have been contaminated. After removing all of the insulation from the wall, inspect the studs and the back of the wallboard. If there is a lot of staining, clean affected areas with a cleaner specifically designed to neutralize rodent urine, such as Nature's Miracle.

Keeping the mice from returning is a challenge given how little room they need to gain access. I worked on an old home a few years ago with a mouse problem. We lined the joist bays with ¼-inch hardware cloth that we custom bent for each bay. For that project, we sprayed foam over the hardware cloth. The mice have not returned after more than six years. In your case, I would first mold hardware cloth, turning up the four sides at least 3 inches, to fit the bottom of each stud bay, like a small cage. Where the plumbing comes up through the bottom of the bay, carefully cut out the hardware cloth to the exact size of the pipe. For the larger exit plumbing pipe, I'd fashion an L-shaped collar out of the hardware cloth to fit around the pipe as added protection.

This strategy assumes that the mice are coming in at the bottom of the stud bay. Check the tops of the bays as well. Mice are resourceful and can gain access from the top, especially if electrical wires are fed from above. If there is any doubt at all, I'd do the hardware-cloth treatment at the tops as well. And speaking of the electrical cables, inspect all of them thoroughly—mice are famous for gnawing on the insulation around wires. Have your electrician replace any damaged wires that you find.

To insulate the wall, custom-rip unfaced rigid foam-board insulation for each stud bay and pack the entire depth of the bay solid. Either EPS or XPS products would work fine. Cut the insulation to fit tightly around the pipes and the wires in the bays.

Before installing the first layer of foam board, run a healthy bead of an acoustical sealant, such as Tremco's Acoustical/Curtain Wall Sealant, around the perimeter of the stud bay. After setting the first layer of insulation into the sealant, bed each additional insulation layer in sealant along the studs and plates. The acoustical sealant provides a continuous air barrier between the rigid foam and the wood frame, and it stays flexible over time, so the air barrier will not be affected by any future movement in the framing. Fill the spaces around pipes with pest-resistant expanding foam, such as Great Stuff Pestblock.

Finally, as you sheathe and finish the wall, be sure to blend the new work into the existing assemblies. The drainage plane and areas of water management need to be integrated with the existing work and sealed properly to ensure the weather-tight integrity of the new wall.

Q Each member of my crew has his or her own way of coiling extension cords. Most of them just use their wrist and elbow. Is there a right or wrong way?

A Roe Osborn, senior editor at *JLC,* responds: I was lucky in that the first carpenter I ever worked with was very particular about how he coiled—and uncoiled—his extension cords. The fact that some of my extension cords are still in good shape after three decades is a testament to the good habits I learned from him. The method I describe here is the one I learned, but I encourage readers to share their own methods with us.

Most "tubular" products, including extension cords, air hoses, and braided rope, have a natural lay, which means that the material "wants" to go into a natural, relaxed curve as it coils up. The natural lay comes from the manufacturing process and is part of the material's nature.

Coiling a cord by quickly wrapping it around your wrist and elbow forces the cord into unnatural curves and forces the wires inside the cord into unnatural positions. Those wires can become kinked, or in worst-case scenarios, they can fray or break if improper coiling is repeated. You've probably noticed that the cords coiled in this manner are a twisted mess that becomes hard to straighten when you need the whole length. Also, coiling a long cord this way creates a bulky bundle of small loops that is difficult for most hands to hold. But there is a much better way that is less stressful to the cord.

Uncoiling is the easy part, so let's deal with that first: When setting up for a job that requires using an extension cord, start by plugging it into the power source and then uncoil the entire length of cord, even if the whole length isn't needed. Just grab the top of the coil and walk away, letting the cord uncoil evenly. When working outside, I usually walk past where I'll be working and then walk back. For the typical 50- or 100-footer, this process takes about 30 seconds—short time invested. With the cord completely uncoiled, it's easier to reposition if I need to use electricity elsewhere.

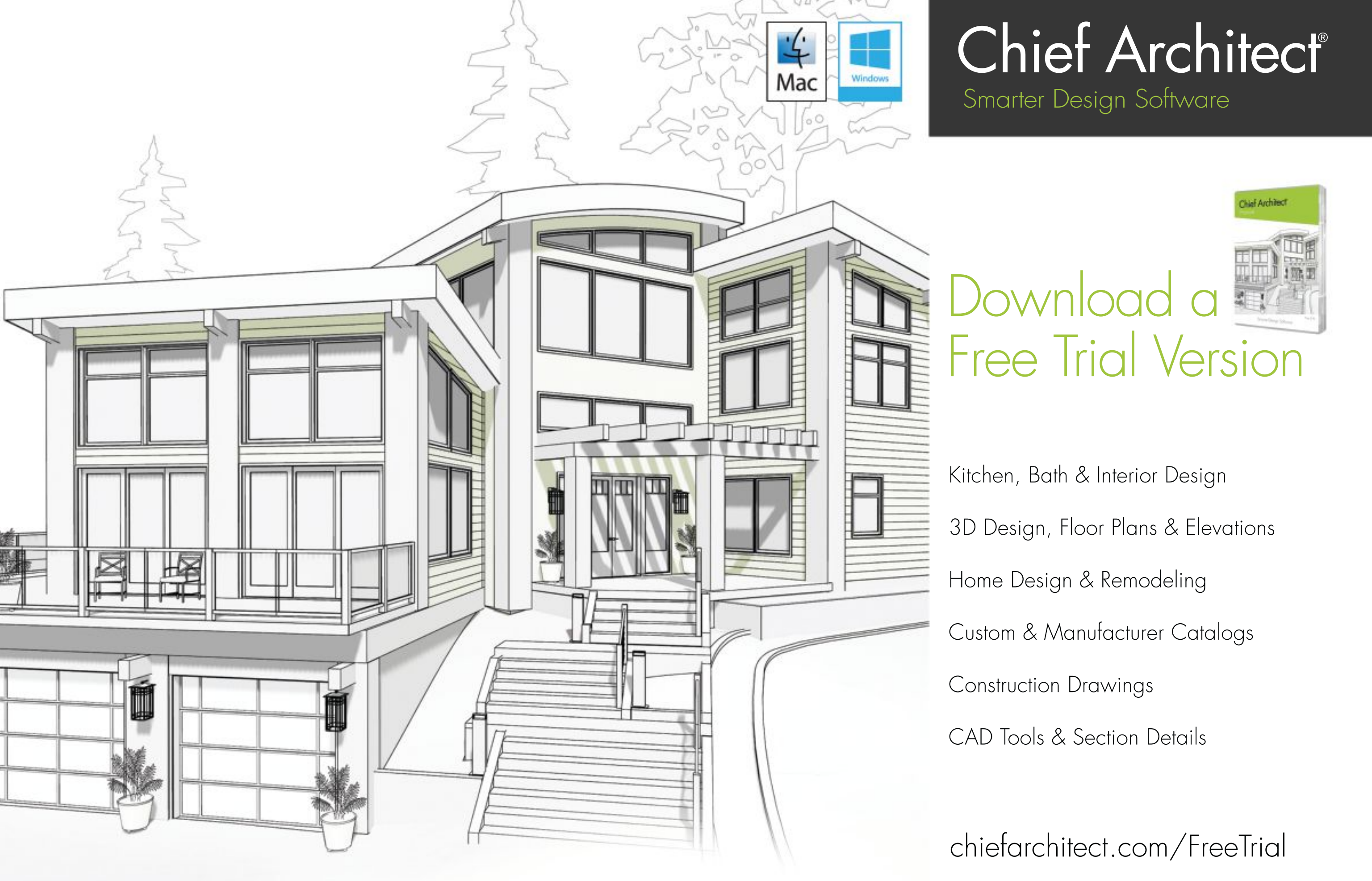
When packing up, unplug the cord from the outlet and coil it up from that end. Gathering the cord in one hand, I extend a length of cord out with the other hand. As I bring the length back to the gathering hand, I twist the cord gently between my thumb and finger. The cord then falls into a natural loop. If you twist too much or too little, a figure eight forms. If that happens, drop that loop and gather it again until it loops naturally. I repeat the process until the cord is completely coiled up. Coiling in that direction and having the whole cord paid out lets the end of the cord twist freely one way or the other so that you can easily manipulate the cord into nice, even coils.

When you reach the other end of the cord, use a Velcro tie or a short length of rope with a small loop at each end to keep the coil together. Coiling up most cords takes less than 30 seconds, again a pretty small investment of time for cord longevity.

The length of the cord dictates the size of the loop. For shorter cords (10 to 20 feet), the loop diameter might be just 12 to 15 inches. For longer lengths, I make loops 24 inches or greater. I have one super-heavy-duty cord that is 150 feet of #10 wire. I actually coil this one up on the ground in much larger loops, again carefully laying the cord down in a relaxed coil.

If you have a cord that is kinked from being coiled improperly, lay it out in a straight line on a hot, sunny day. The sun's heat will make the cord more pliable and many of the kinks will work themselves out just by virtue of the wires trying to return to their natural position inside the outer covering of the cord. Gently stretching problem areas can help them relax back to where the cord will coil naturally. While the cord is still warm from the sun, coil it up properly.

Another technique is coiling in one direction and then reversing direction with each subsequent loop. Supposedly, this method eliminates the need for the little twist for each coil, but I've never been able to get the Zen of this method down. If you can describe it, or have another successful cord-coiling technique, please let us know.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BY JOHN SPIER

Photos by John Spier

A Radiant Panel Primer

I've lived for many years in a home with radiant floor heat, and I prefer it to any other type of heating system. The combination of comfort, efficiency, and cleanliness, along with ease of use and low maintenance, is hard to beat, and many of my clients are choosing radiant heat for their homes as well. While the radiant heat in my own home was a little out of the ordinary—the radiant tubing was integrated into a 90,000-pound structural concrete slab—most people opt for more conventional construction. The best system I've seen to deliver hydronic radiant heat over a wood-framed floor uses factory-made panels with pre-cut grooves for the tubing.

These panels were originally developed and sold by Stadler-Viega as "Climate Panels"; similar products are now being made by other companies, including Uponor, whose system I used in this project. These "on top" radiant panels (installed directly over an existing subfloor) are an evolving technology—those I used here are a marked improvement over ones I used just a year ago.

The basic concept is the same: Modular plywood panels assemble to create a subfloor with grooves that accept PEX tubing. The system I installed uses 5⁄16-inch-diameter tubing, but systems using 3⁄8-inch-diameter tubing are also available. (Larger-diameter tubing loses heat more slowly, so longer loops can be used in the layout). The panels are backed with a thin layer of aluminum (about the thickness of flashing) that helps distribute heat more evenly. The radiant panels I install are usually covered with tile or wood flooring.

DESIGNING THE SYSTEM

As with most hydronic heating systems, the PEX tubing can be supplied with water or antifreeze heated by just about any type of water-heating appliance, such as a boiler, or even with water heated by the sun. Additionally, there are many options for controls, manifolds, pumps, and other distribution technologies.

Design and engineering of a complete system is job specific and beyond the scope of this article, but most good plumbing and heating supply houses or contractors have engineers available to review your plans and help you design the system. As the building contractor, I am responsible for installing the actual panels that hold the tubing. Interestingly, when I first started installing these systems many years ago, my heating contractor told me that the actual panel installation was a job for carpenters, not plumbers.

The first step is developing an overall plan that includes the tubing requirements and the number of loops for each room you are heating. The total amount of tubing that can be put in a given space is usually determined by the square footage of the room. The panels typically have a 7-inch spacing between grooves, which results in approximately 1.7 linear feet of tubing per square foot of floor area. In reality, the layout usually produces numbers that are somewhat less than that, so rather than calculating by square footage, I divide the width of the space by 7 inches to get the number of runs, and then multiply that number by the length of the room to get the linear footage of tubing that I'll need.

For most distribution systems, the length of each loop shouldn't be more than about 300 feet—longer lengths are difficult to pump efficiently and result in a temperature drop from one end to the other that's too great to produce heat effectively. So dividing the total tubing length in a room by 300 gives you the number of loops needed. From there, I find a location for the manifold, and then develop a layout scheme that will allow all of the loops to begin and end at the manifold.

COMMON-SENSE LOOP DESIGN

A heating engineer can design a layout that precisely matches the loops to the Btu requirements of the different parts of a space, but following a few basic rules can work as well. I lay out my loops so that the outbound legs first serve areas with the greatest heat requirements, such as bathrooms and along exterior walls, especially north-facing walls or walls with many windows or doors. I set up the loops so that as the fluid cools, it returns through a path closer to the interior. I also try to make the loops in the higher-load areas shorter, while the loops for interior areas can be a bit longer.

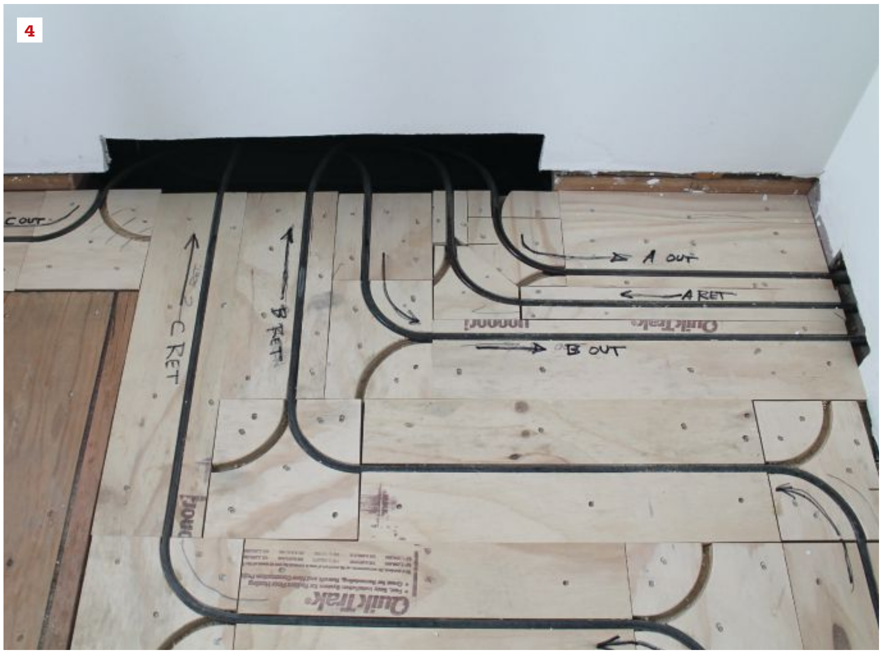
Additionally, I design my layout to avoid running tubing under cabinetry or built-ins, or in other areas where it makes no sense to distribute heat. Lastly, if I'm installing wood flooring, I try to run the tubing perpendicular to the flooring direction wherever possible to keep the tubes visible when I'm fastening the flooring planks.

INSTALLING THE PANELS

For most of my projects, radiant floor panels are installed on OSB or plywood subflooring, which I clean and scrape carefully to ensure a flat surface. I grind down any high spots and fill low spots with self-leveling filler. The panels themselves come either as assemblies of six panels attached together accordion-style, or as single panels. I usually buy only six-panel assemblies and cut singles from an assembly as I need them **(1)**. There are also return panels with semi-circular loops that connect the ends of the straight runs. If I need to direct the tubing in a perpendicular direction, I cut off a quarter-turn section from a return panel or cut a smaller portion of an arc to direct the tubing at an angle.

I snap reference lines to keep the panels square and parallel within the space, and then run a row of single panels along one wall as a guide, with a return panel positioned at the end **(2)**. The panel assemblies come with the ends of the panels staggered to align and interlock them as they are installed. To fit them against the return panel, I cut the ends of a whole assembly flush in one shot on a chop saw **(3)**. Then it's just a matter of working across the floor, adding panels or assemblies as needed. If I need a narrower width, I simply rip it on a table saw.

The panels are nicely milled, so once I've started straight and square, the entire installation usually goes quite smoothly. Large, open spaces go easily and quickly, but smaller, more complex rooms such as bathrooms can be challenging—often involving many runs of single widths, with lots of quarter turns and offsets. In these spaces, I often dry-fit all the panels before nailing them in, and as I install them, I keep track of the flow direction with arrows on the panels **(4)**.



ATTACHING THE PANELS

Uponor recommends screwing the panels down with 10 screws per panel, but I've had good luck with galvanized ring-shank subflooring nails that have good pull-out resistance. I shoot them in with the same coil gun that I use for siding installation, driving nails about every 6 inches along both sides of every panel.

Once the panels are installed and all of the loop paths checked and confirmed, it's time to install the tubing. First, the floor is swept and the grooves carefully vacuumed clean; one small pebble or stray nail under the tubing can puncture it, with a resulting leak that can be difficult to repair later. My plumbing contractor generally sends a couple of guys with a roll dispenser to install the tubing **(5)**, but I find it cost effective to be on hand to help them. The tubing often needs some persuasion with a hammer and block to snap it into the grooves, and as a carpenter, I'm much better at that operation than the average plumber.

Once the tubing is installed and connected to a manifold, it can be air-tested, and then hooked up and supplied with heat. We install wood flooring directly over the radiant panels. In tiled areas, the installer puts in a cleavage membrane and installs the tile on top of the membrane **(6)**. Clients are always happy with a radiant floor system. And as the contractor, we love having that warm, comfortable radiant heat underfoot as we finish the rest of the interior.

John Spier owns Spier Construction, a building and remodeling company on Block Island, R.I.

Getting Kickout Flashings Right

BY MARK PARLEE

Photos by Mark Parlee

I founded my own framing and siding company back in 1990, and while my brother still runs the siding division, much of my work these days comes from consulting on failed exteriors. On most of these jobs, there is one detail—the kickout flashing at roof-wall intersections—that I see done wrong *most* of the time. In a neighborhood of 30 homes, I expect to find at least 28 with exterior problems, and most of these will have no kickouts. When they do exist, they will be of substandard quality.

Some builders do recognize this as a vulnerable spot, and in a good-intentioned but feeble effort, often smear gobs of extra caulk into the siding notch. Others will install a piece of metal flashing (recognizing that a flashing is required by code), but this metal is rarely large enough to deflect roof run-off into the gutter. The resulting damage from the overflow—gallons and gallons of water regularly pouring over the wall area below—can be catastrophic. I've had jobs we ended up remediating that had earthworms in the wall. The sheathing and framing had rotted all the way to grade level to such an extent that the wall had essentially turned to dirt.

DO IT RIGHT THE FIRST TIME

The photo above shows a correctly detailed kickout on an EIFS stucco exterior. This kickout is particularly important because it terminates directly at a window opening—a fairly common occurrence, but one that can be especially devastating: If the kickout is wrong, chances are high that the window flashing is worse, and there is

A pre-made, one-piece TPO kickout, like this one from DryFlekt, is large enough to deflect roof runoff into the (yet-to-be-installed) gutter.

With horizontal siding, the author installs a trim board along the rake, keeping it a minimum of 1 inch above the roofing.

little hope of keeping water out of the wall. Water can quickly find its way to interior finishes, leading to extensive mold—problems that carry enormous liability and a higher price tag. It would be so much easier and less expensive to invest in $15 worth of flashing to begin with.

The details are essentially the same for all cladding types. The process starts with a large, one-piece kickout flashing with a return that is big enough to prevent runoff from overflowing the top. We typically use ones made by DryFlekt (dryflekt.com). Unlike with a site-made metal kickout, you don't need to worry about making bends, and the flashing won't corrode. The ones from DryFlekt are made of a thermoplastic polyolefin, or TPO, which is pretty good at resisting UV degradation and stands up well to a wide range of temperatures, so it's unlikely to become brittle and crack. We have put in hundreds of these over the last decade and have never had a problem.

We usually begin by installing a piece of peel-and-stick flashing, folding it into the corner between the roof and the wall. The kickout goes in next, followed by standard step flashings. The job shown at top left is typical for a reroof, where we cut in and begin detailing the intersections first. The roofer, of course, will come along later and slide new shingles between the steps. And the WRB will be folded down.

We bed the edge of the WRB in a thick bead of sealant, and then bring the siding down, keeping it at least 1 inch above the finish roofing. For stucco, stone, or masonry veneer, we terminate the cladding with a weep screed held off the roof 1 inch. For horizontal siding, we typically install a trim board along the rake, which will simplify future reroofs (see photo, bottom left). This board has a simple aluminum Z-flashing along the top edge to protect the exposed edge of the trim board and can be applied directly over the WRB, because any water that gets behind the WRB will drain out onto the step flashing.

Mark Parlee, is a building-envelope consultant (thebuildingconsultant.com) and builder (parleebuilders.com), in Urbandale, Iowa.

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BY MELANIE HODGDON

Making Commissions Work

I've had a number of questions from clients recently about how to handle sales commissions. A big question is whether these should be considered a job-related cost (and therefore recorded as part of cost of goods sold, or COGS) or overhead (recorded as an expense). In this article, I'll examine what you need to think about. Please note that percentages included in this article are not intended to be recommendations for commissioning. Also, all figures are theoretical and do not include any allowance for slippage.

WHAT ARE COMMISSIONS BASED ON?

It's important to provide salespeople with incentives in order to keep them selling. But you need to lay down some ground rules, and one of the most important is that salespeople need to aim for a target margin, not a number. It's one thing to sell $500,000 worth of jobs, but unless those jobs hit the target margin, they can be detrimental to the company's financial health. To explain why, let's look at two scenarios, A and B, detailed in the charts below.

Scenario A: Commissions based on sales. In Scenario A, the salesperson hasn't been provided with a target margin and is free to sell a job at whatever price seems to work for the customer. His or her focus is on making the sale since that's what the commission is based on. This is good for the customer and good for the salesperson, but it's bad for the company.

In Scenario A (see chart, below), the sale price was achieved using a range of markups between 29% and 35%. This fluctuation may have been due to the salesperson's assessment of what the customer would easily

Scenario A

	Job 1	Job 2	Job 3	Job 4	Job 5	Total
Estimated Costs	$35,000	$68,000	$50,000	$30,000	$28,000	$211,000
Markup Used	32%	29%	34%	32%	35%	
Selling Price	$46,200	$87,720	$67,000	$39,600	$37,800	$278,320
Theoretical Gross Profit	$11,200	$19,720	$17,000	$9,600	$9,800	$67,320
Theoretical Gross Margin	24%	22%	25%	24%	26%	24.19%
Commission on Sales Price @ 1.50%	$693	$1,316	$1,005	$594	$567	$4,175
Net (Gross Profit Less Commission)	$10,507	$18,404	$15,995	$9,006	$9,233	$63,145
Effective Gross Margin Incl. Commission						22.69%

Scenario B

	Job 1	Job 2	Job 3	Job 4	Job 5	Total
Estimated Costs	$35,000	$68,000	$50,000	$30,000	$28,000	$211,000
Markup Used	37%	37%	37%	37%	37%	
Selling Price	$47,950	$93,160	$68,500	$41,100	$38,360	$289,070
Theoretical Gross Profit	$12,950	$25,160	$18,500	$11,100	$10,360	$78,070
Theoretical Gross Margin	27%	27%	27%	27%	27%	27.01%
Commission on Gross Profit @ 5.35%	$693	$1,346	$990	$594	$554	$4,177
Net (Gross Profit Less Commission)	$12,257	$23,814	$17,510	$10,506	$9,806	$73,893
Effective Gross Margin Incl. Commission						25.56%

Scenario A

Income	$278,320
COGS	$211,000
Commissions (as COGS)	$4,175
Gross Profit	$63,145
Gross Margin	22.69%
Net Margin	22.69%

Scenario B

Income	$289,070
COGS	$211,000
Gross Profit	$78,070
Gross Margin	27.01%
Commissions (as Overhead Expense)	$4,177
Net Profit	$73,893
Net Margin	25.56%

swallow. This approach results in the following:

- The salesperson ends up with $4,175 in commissions.
- The company ends up with $67,320 from which the commission amount is deducted.

Scenario B: Commissions based on achieved gross profit, or margin. In this scenario, the commission is based on the achieved profit (or more likely, the achieved gross margin) of the completed project, so the salesperson is motivated to sell jobs at a price that will produce as much profit as possible. Commissions are based on a stepped percentage plan: If the project fails to meet the target margin, the commission will be reduced; if the project's target margin is exceeded, the commission will be increased. It's to the salesperson's advantage to sell high, as that should produce the greatest profit, and therefore the greatest commission. This is good for the salesperson and good for the company, and if the price is realistic, it's good for customers, who should receive an exceptional experience owing to an adequate production budget.

In Scenario B (see chart on page 27), the sale price was achieved using a strict 37% markup because the company's target gross margin is 27%. If a price doesn't provide the target margin, the salesperson's commission will be reduced or eliminated entirely. Therefore, she's motivated to sell with an eye to engineering profit rather than on simply making the sale. As a result:

- The salesperson ends up with $4,177 in commissions (note this is $2 more than in Scenario A).
- The company ends up with $78,070 from which the commission amount is deducted.

HOW TO CLASSIFY COMMISSIONS

Because many contractors believe that commissions are part of job costs, their impulse is to classify commissions as cost of goods sold (COGS). In fact, this creates a number of problems.

Cost of goods sold = muddled margins. As soon as commissions are included in COGS—with direct costs such as materials, labor, and subcontractors—the achieved margin from the actual production portion of the job is diluted. In Scenario A (see chart, above left), the original (precommission) margin was 24.19%. However, because commissions were included in COGS, the gross margin reported on the Profit and Loss dropped to 22.69%. If you wish to create a profit-sharing or bonus program based on gross margins, the inclusion of commission costs muddies the waters. Profit-sharing and bonus plans should encourage production workers to strive their utmost to use efficient production practices to maximize gross profit. Mingling sales-related costs with production costs confounds this.

Overhead = customers paying for commissions. If you include commissions as part of your overhead, then your customers pay for them, because your markup is designed to cover your overhead. (If it isn't, you're in big-time trouble!)

By classifying commissions as an expense (see chart for Scenario B, above right) rather than as COGS, you will get a clear achieved margin that includes only production-related (as opposed to sales-and-production related) costs. This number will be useful for calculating bonuses or profit-sharing. Excluding sales commissions will also restrict COGS to costs that are, at least to a certain extent, controllable by your production workforce.

Adding the cost of commissions to your overhead allows you to include the cost of commissions when creating a budget, and ensures that your customers pay for them.

MAKE IT WORK FOR ALL PARTIES

Whenever you make decisions about how to handle a new cost, both in reality and in terms of your financials, be sure to look ahead and engineer a policy that will work for the benefit of all parties (company, employee, customer). Structure your financials to avoid having to "back out" costs or explain things to your workforce, your tax preparer, or a prospective buyer.

Melanie Hodgdon is owner of Business Systems Management.


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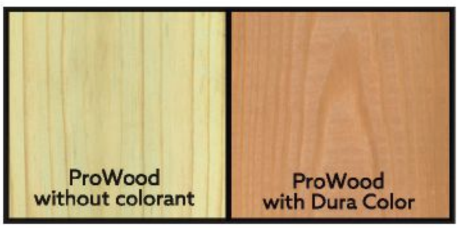

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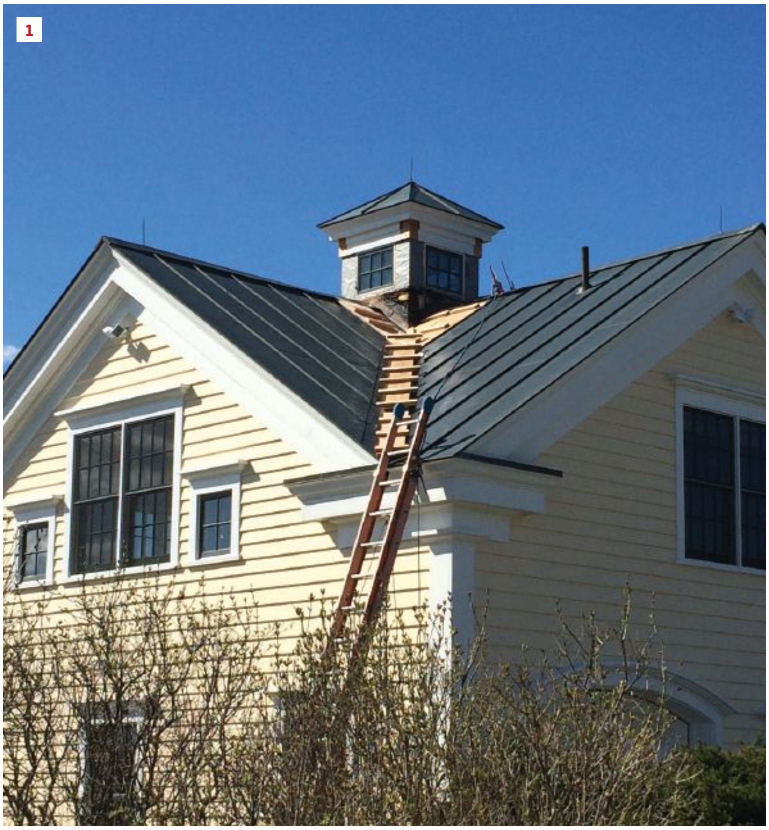

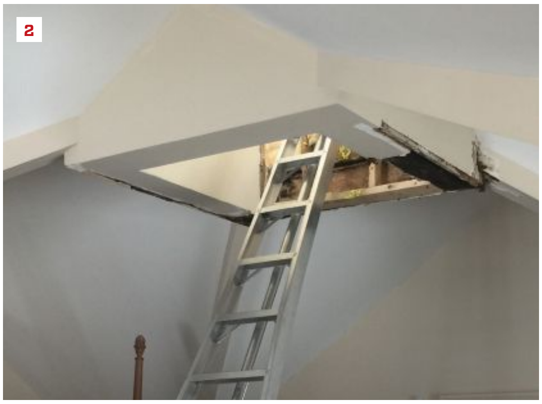

Fixing a Poorly Flashed Cupola

Last fall, my company was asked to investigate a roof leak originating from a cupola atop an attached carriage-house garage **(1)**. From the exterior, nothing appeared to be wrong with the cupola or the surrounding roof. But the inside was a different story. The house was fairly new, approximately 10 years old. Above the garage was a guest bedroom with a cathedral ceiling that reflected the roof's four valleys. At the peak, the cupola, with its four awning windows, served as a light well. According to the homeowners, there had been gradual, periodic leaking around the interior light well since the home's initial construction. After a particularly bad storm last summer, the water staining worsened, prompting them to remove the damaged drywall—exposing open-cell-foam-filled stud bays and water damage to the framed enclosure **(2)**. That's when they called us.

Photos by Isaias Antonio-Santos

A WHOLE BOWL OF WRONG

During our inspection, the clients informed us of the leaky cupola's history. The original builder had blamed the window manufacturer for the leak, and the manufacturer had blamed the builder. After a lot of finger pointing, the builder agreed to "remedy" the problem by retrofitting a piece of ¾-inch quarter-round trim around the windows on the exterior, rendering the awnings inoperable. The feuding parties moved on—without having solved the problem.

We began our investigation by removing the outer, plywood-clad finish base of the cupola **(3)**. The copper roof-to-wall flashing had been reverse-flashed, with the copper placed on the outer surface of peel-and-stick—the previous builder had omitted the housewrap, which could have easily lapped the vertical leg of the roof-to-wall flashing. Another red flag was that sheathing behind the peel-and-stick at the top of the base felt spongy, which led us to remove the cedar corner boards and wrap-around sill **(4)**. We then discovered that where the cupola's upper portion transitioned to its wider, lower base, there was no flashing; the upper portion's Typar drainage plane dumped onto the 2-inch-wide, exposed plywood strip at the stepped-out base **(5)**.

So, as far as flashing was concerned, the workmanship on the cupola was a whole bowl of "wrong." There should have been either pan flashing installed under the existing cedar wrap-around sill or a metal cap installed over it. Without such details, this handsome architectural feature had become a conduit for water.

THE FIX

Our plan was to rebuild the cupola's base in place, salvaging as much of the upper portion as possible. We set up temporary roof protection made from plywood and 2-by stock (see photo 1, page 31). After removing the existing peel-and-stick, we found that roughly half of the cupola base's sheathing and framing was rotted beyond repair, while the other half had slight water damage, but was still structurally intact.

Starting where the damage was the worst **(6)**, we carefully removed the deteriorated material, a little at a time to keep the cupola stable. Fortunately, the existing framing wasn't too far gone, and we could confine the demolition work to the upper portion of the base and to the exterior. We cut the existing framing down to just above the existing copper roof-to-wall flashing (which was in good shape and we were able to re-use), finding structurally sound wood closer to the roof deck. We spliced new 2-bys to the existing studs of the cupola's base **(7)**, then sheathed the base and began work on the sill.

The existing windows didn't need to be replaced. The damage was confined to the frame's outer, factory-applied wood sill. The seam between the protruding, factory sill and the trim had held water and caused

8

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them to rot, while most of the framed sill, which concealed the awning's operable hardware, was not damaged **(8)**. This saved us from having to do any interior trim or drywall work. We managed to remove the rotted portion of the sill, then pulled the sashes and began waterproofing the base.

We applied Grace Ice and Water Shield, lapping the existing copper roof-to-wall flashing. Then we installed Zip System Stretch Tape, which sealed the 2-inch-wide, stepped transition between the upper and lower portions of the cupola. We ran the Stretch Tape down the window jambs and later covered the existing sheathing at the corners with building paper. Also, to help determine the finish elevation of the top of the cupola base, we dry-fit a new "through-sill" to replace the rotted exterior part of the windows' factory sills, and used blocking to represent a new wrap-around sill to finish the top of the cupola base **(9)**. We made these finish sills out of Boral, tapering the stock for drainage, while kerf-cutting the underside of the wrap-around sill to provide a drip.

For the cladding on the cupola base, we cut the triangular shapes out of a ⅝-inch 4x8 sheet of PVC by Koma, fastened them with screws at trim locations, and glued trim pieces on top to hide the fasteners **(10)**.

Next, we installed aluminum pan flashing, slipping it under the existing window frames about an inch and running it up the flanking walls. We used four pieces of flashing, Zip-Taping the vertical joints at the corners, as well as lapping the horizontal legs of the metal flashing and setting the lapped joints in a bed of OSI Quad Max sealant **(11)**.

Then, we installed the Boral wrap-around sill, applying the OSI sealant at the mitered seams and fastening it with stainless-steel ring-shank fasteners. We butted the new through-sill up against the existing window frame, running sealant along the seams **(12)**. The through-sill solved the problem with the leaky seam between the existing factory-applied sill and trim; the window sash's weatherstripping now sits on top of a solid piece of Boral. For the wall trim and corner boards, we used 5/4 Boral to match the existing salvaged cedar stock **(13)**.

The entire restoration took two carpenters eight days to complete, not including the painting.

Kyle Diamond is a partner with his father, Dale, in New Dimension Construction, in Millbrook, N.Y.

BY TED CUSHMAN

Positive Energy

Terry Brennan, David White, and Cramer Silkworth put three devices to the test: Testo 417 (top), TEC Flowblaster+ (center), and "Bagometer" (bottom).

Photos: Ted Cushman

This March marked the 16th year for the Building Energy trade show and conference in Boston, Mass., put on by The Northeast Sustainable Energy Association (NESEA). Your reporter caught the train to Boston to attend "BE16" and to bring you this report.

NESEA's roots date back to the oil-crisis days of 1974, when a group of builders, architects, engineers, and homeowners organized as the New England Solar Energy Association in hopes of reducing the region's reliance on imported oil. Over the decades, the group's geographic base and its scope of interest have expanded, resulting in the current organization: a professional association whose members' interests, professional roles, and practice areas span a broad range in the field of building energy, including not just residential design or construction, but commercial and institutional specialties as well.

Educational sessions at this year's conference spanned the same broad spectrum. No single observer can sum up the whole smorgasbord; but a random walk through the conference offerings was well worth the time spent. A small selection of snapshots (left) give you the flavor.

SMALL AIRFLOWS, SMALL MEASUREMENTS

If you build tight houses, you have to think about providing fresh air. In a lively session titled "Moving Beyond Faith Based Ventilation," old-school guru Terry Brennan teamed up with New York City Passive House young bloods Cramer Silkworth and David White to take a close look at how air ducts and fans actually perform (compared with how designers and builders hope they're going to perform). Brennan—himself a member of the ASHRAE committee that writes rules for residential ventilation—started with a brief history of recommendations for ventilation airflow rates, dating back as far as the mid-1500s (when a German scientist devised a bellows system to send fresh air into underground mines). Then the audience got involved, as Brennan, White, and Silkworth broke out a whole assortment of specialized devices and measured the airflow in a small demonstration duct assembly.

The results from one measurement to the next seemed pretty consistent, as long as the team was using the same device. But from one method to the next,

The final version of Kaplan and Thompson Architects' planned "Bayside Anchor" affordable housing project in Portland, Maine, is on track to earn Passive House Institute U.S. certification despite a series of radical cost cuts.

Rendering courtesy of Kaplan Thompson Architects

measurements seemed to vary by as much as 30%—evidence, if any was needed, that airflows are hard to pin down precisely. The exercise lent some support to an approach long advocated by building scientist Joe Lstiburek: Size the system to provide a range of flows from 30% below the ASHRAE standard to 30% above it, and then let the homeowner set the dial based on comfort.

BIG BUILDINGS, BIG CHOICES

If you're interested in big buildings, BE16 gave you plenty to think about, and a lot of chances to learn. One high-value offering was a three-hour preconference session presented by well-known Passive House designer and consultant Adam Cohen. Cohen discussed methods and approaches he says can help large-scale structures pass tough Passive House metrics at costs that are competitive with conventional code-compliant construction.

Other presenters zoomed in on high-performance details. In a full-day session on air leakage, Larry Harmon of Air Barrier Solutions detailed the lessons learned from years of retrofit air-sealing work on millions of square feet of commercial and institutional buildings. And in a session called "Break It or Lose It," building-performance experts Andrea Love and Jeffrey Abramson focused on thermal bridging, analyzing infrared images from the facade details of university buildings and office complexes and discussing practical ways to stop the bleeding.

When it comes to budgets, the world of big buildings can be a tough environment. Architect Jesse Thompson of Kaplan Thompson Architects (KTA) told an interesting tale of cost-cutting in a session called "Huddle Together for Warmth." KTA won a Deutsche Bank design competition with its proposal for "Bayside Anchor" (left), a public housing project in Portland, Maine. Then, successive reviews by Maine's public housing authority forced the designers to implement two brutal rounds of cost-cutting. Heat pumps were scrapped in favor of electric resistance strip heating; exterior rigid insulation got the ax in favor of double walls with fiber insulation. But the project survived—and in fact, is still in the running to achieve Passive House certification (at least on paper).

Thompson used the project to shed some light on the differences between the original Passive House standard created by Europe-based Passive House International (PHI) and the evolving U.S. standard authored by Passive House Institute U.S. (PHIUS). Under the old European method, the Bayside Anchor project didn't make the cut. But under the new PHIUS rules, which measure allowable energy use based on energy use per occupant instead of per square foot, the affordable project's high density made the difference, and the project passed.

But will the contractors on the job be able to actually deliver the promised results, despite the shaved-down details? "Yeah," said Thompson with a grin. "I hope so. We'll see."

BIG POWER FROM SMALL SOURCES

Individual buildings represent a key to slashing energy demand, and increasingly, they also figure into power supply. Solar panels have come down in cost to levels that make on-site power generation a serious alternative to investing in energy conservation. But there's a catch: Integrating millions of solar panels with the regional power grid is no simple matter.

On the other hand, a technical solution for that problem is also in view: home-scale energy storage using batteries—which, like PV panels, are dropping in price as technology advances and production ramps up. Two back-to-back sessions addressed that big policy challenge and the growing opportunities, with presenters including Judith Judson, from the Massachusetts Department of Energy, Todd Olinsky-Paul, from the Clean Energy States Alliance, and Betty Watson, from SolarCity.


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Insulated cathedral roof bays are exposed as part of a side-by-side test of various insulation and venting options under real-world conditions. Ventilation has obvious benefits, Kohta Ueno reports, but some unvented solutions can work.

Photo: Building Science Corporation

BIG DATA FROM SMALL DEVICES

If small power sources are starting to have big implications, the same can be said of small information sources. In one of the most thought-provoking sessions at the conference, data wizard Michael Blasnik presented aggregated data collected and reported by millions of smart Nest thermostats now installed around the United States. Nest thermostats collect data on indoor and outdoor conditions and heating- and cooling-system operation every 30 seconds and report it to a central data collection system. Their motion sensors even record when a house is occupied and when it's empty. The result is a huge pool of precise, detailed information on how mechanical systems function in real houses. Blasnik has access to the aggregated information, and his analysis of the data has revealed many intriguing questions, and possibly some answers. (Google, by the way, which now owns Nest, does not have access to the data, according to Blasnik.)

One interesting angle: Blasnik observes that while air conditioners in the U.S. are typically oversized in theory, they may be undersized in practice, because of the way people operate their houses. A system may be perfectly sized for keeping the house at the constant design temperature; but if the occupants turn the air conditioning off when they go to work and then expect their system to quickly cool the house by 5°F or 10°F as soon as they get home, the equipment will struggle. It can take hours for a supposedly "right-sized" central air conditioner to bring a house at 80°F and 80% relative humidity down to the comfort zone. In the big picture, the evening demand surge caused by thousands of systems working overtime during early evening hours could be contributing to peak load problems for the whole power grid in warm climates.

Another puzzling observation from Blasnik's data: Heating-system runtimes seem to be about the same in much of the U.S. during the cold months, from mild Kentucky or Tennessee right up to frigid Wisconsin and upstate New York. Apparently, the regional spread in levels of insulation cancels out the difference in climate, leaving heating systems to cope with much the same load in houses across a wide range of climatic conditions.

FLAT ROOFS, STEEP ROOFS

It wouldn't be an energy conference without some frank discussion about bulk water leakage and moisture condensation. In a jam-packed two-part session, Building Science Corporation's Kohta Ueno teamed up with consultant Peter Marciano to present on-site details, problems, and solutions spanning the worlds of low-rise residential and mid-rise commercial roofing. Marciano drew from decades of field experience installing and fixing flat roofs, parapets, and facades, while Ueno discussed his organization's industry-leading research into the field performance of unvented cathedral-roof construction and insulation alternatives. An insulated flat ceiling with a ventilated attic, Ueno acknowledged, is clearly the safer choice. But the goal of bringing HVAC air handlers and ductwork within the insulated and air-sealed envelope leads naturally to the option of an insulated and air-sealed roof plane—and that brings on the challenge of creating robust details for the insulated rafter system.

One general observation that seems to apply to both flat and sloped unvented roofs: Solving the building-science issues of an unvented assembly is much easier if you put rigid insulation outboard of the framing and the fiber-insulated cavities. It's when you deliberately exclude the option of rigid sheet insulation that you start to encounter the really tricky moisture and air-leakage risks.

Ted Cushman is a senior editor for JLC.

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Layout Lines for Exterior Walls

Get everything straight and square now to avoid headaches later

BY MATTHEW ANDERSON

A couple of years ago, I wrote a two-part article on how my crew squares up a new foundation, sets mudsills, and installs the first-floor deck ("Mudsill Layout for a Complex Foundation," May/14, and "First Floor Deck for a Complex Foundation," Jul/14). The next step is laying out for wall plates.

Once we have put down floor sheathing and set the Lally columns, the crew sets up to build the first-floor walls. We make lists of all the framing "parts" we'll need—headers, cripples, sills, studs, and jacks—and crew members begin cutting, labeling, and assembling those parts, as well as building corners and partition backers. While "the framing factory" jumps into action, two lead carpenters begin the process of laying out the walls on the first-floor deck.

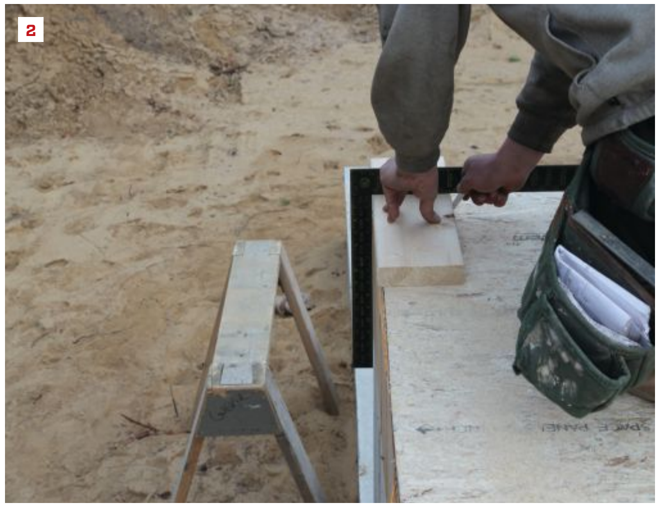
Photos by Roe Osborn

ESTABLISH A BASELINE

The house that we'll use to explain the layout process has a fairly simple design, created by Patriot Builders, based in Harwich, Mass. The back wall of the house is straight and uninterrupted. It meets the back of a two-car garage (which we will leave out of the layout discussion for now).

The front wall of the house makes three jogs to create three different planes. The first jog forms a short wall that continues from the front wall of the garage. The second jog creates the longest section of the facade, and the third jog completes the facade.

The end wall that the house shares with the garage is uninterrupted, while the wall at the opposite end of the house jogs in slightly and



continues uninterrupted except for a small fireplace bump-out.

The first thing we do in the layout process is mark the inside edge of the longest exterior wall—in this case, the back wall of the house. We cut layout blocks out of 2x6 plate stock about 16 inches long. Then, using a framing square, we line up the block with the rim joist to make sure that the block is perfectly in line with the deck framing **(1)**. We mark both sides of the corners at either end of the wall **(2)**. This first wall is the baseline, or reference, for laying out the rest of the walls on the deck.

Next, we mark out the other corners of the house. For most houses, we usually just go around with the 2-by block, mark the other corners, and then check diagonal measurements. But because of the jogs in this house, we altered our strategy slightly.

PARALLELS AND PERPENDICULARS

We started by marking the corner of the first jog. Holding the block at the overall length of the end wall shared by the garage, we again marked along the inside edge of the block **(3)**. As before, we also marked the other side of that corner.

At the opposite end of the house, we measured up from the baseline and marked the same distance. Because of the jog on that end of the house, that measurement actually fell in the fireplace bump-

out. After determining the exact length of our baseline wall, we measured over that distance from the first jog to create a second "corner," again using our block to make the marks **(4)**.

Those corners along with the baseline corners gave us the largest rectangle on the deck to check for square. Measuring diagonally from corner to corner, we adjusted the positions of our second set of corners until the diagonal measurements were exactly the same **(5)**. In this case, the positions shifted toward the garage about ¼ inch, which is well within expectations for a typical deck frame **(6)**. These adjusted marks positioned the perpendicular walls so that they would be absolutely square to the back wall of the house.

SNAPPING CHALK LINES

With those corners verified, we snapped chalk lines for the walls we had established, starting with the baseline wall **(7)**. We always snap permanent layout lines in black chalk; it seems to stand up better than other colors to weather and to all the activities and traffic that take place during the wall-building process.

After snapping out the baseline wall, we snapped lines for the two perpendicular end walls that we had laid out as well, making sure that we hit the adjusted marks. That gave us layout lines for the wall shared by the garage, as well as for the perpendicular wall with the jog at the opposite end of the house. At that end, we

extended the line all the way through the fireplace bump-out **(8)**, which would help with the next steps in the layout process.

WORKING AROUND THE PERIMETER

The crew members could now work off those three snapped lines to lay out the shorter walls. Because we were still working on the end of the house with the fireplace bump-out, we measured off that perpendicular line **(9)**, and then we snapped a line that gave us the layout line for the last wall section on that end of the house **(10)**.

At that point, we had not yet snapped the line parallel to the baseline that formed our original rectangle, so we snapped that line across the entire deck **(11)**. That line served a number of purposes. First, it permanently marked the corner, which set the length of the perpendicular wall. Also, it gave us the layout line for the parallel wall of the first jog, and most importantly, it provided a secondary baseline (parallel to the first one), which made it easier for us to lay out the other parallel walls on the front of the house. Working off that line, we marked the lengths for the remaining parallel walls **(12)**, and then snapped lines for those walls **(13)**.

Lines for the shorter perpendicular walls were next. We didn't have a perpendicular line close by for laying out the adjacent wall of the first jog, so we measured over from the shared garage wall and

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projected the layout line up. We started by marking out the length of the wall at the jog corner, and again at a point farther down the shared wall **(14)**. Holding the end of the chalk line at that point and extending it through the corner mark to the next jog, we snapped the layout line for that wall.

Extra lines on the deck can be confusing, so we used a great trick for snapping a shorter line. After stretching the line taut, a crew member places his foot on the line to hold it in place at the end of the wall. Another crew member can then snap a shorter line **(15)**.

For the perpendicular wall of the second jog, we measured from the wall on the opposite end of the house and snapped that line.

FINISHING UP

The only exterior walls left to lay out were the short parallel walls for the fireplace bump-out and the jog at that end of the house. For the fireplace area, we simply held our layout blocks in place to mark out the wall positions **(16)**. These smaller areas are where we are most likely to find variations in dimensions, as well as corners that might not have been framed square. To fix discrepancies, we choose the larger of the two measurements and adjust both walls to that measurement. For example, if the depth of the fireplace bump-out is supposed to be 24 inches, but one side measures $23\frac{7}{8}$ inches and the other $24\frac{1}{8}$ inches, we would make

both sides 24⅛ inches to reflect the larger measurement. This adjustment helps keep the area as square and true as possible as the walls are framed, which makes framing the roofs for those small sections much easier.

The position of the short jog wall on that end was determined by the length of the perpendicular wall. So we marked that length from the original baseline **(17)**. Because these walls were just 2 feet long, it was easier to draw the lines with a framing square instead of snapping chalk lines **(18)**. The last wall to lay out was the bearing wall near the middle of the house. This wall happened to align with the short jog that we just laid out, so we simply made the same measurement from the baseline along the shared garage wall and snapped a line between the two marks **(19)**.

Measuring, squaring, and snapping all the layout lines for exterior walls for this house took less than 30 minutes, a fraction of the time that it took to describe the process in words. The key is to work methodically, taking precise measurements and snapping accurate lines. This careful layout will reward you as the rest of the house frame fits together much more precisely.

Matthew Anderson is the owner of Anderson Framing and Remodeling, a building company based in East Sandwich, Mass.

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Nat Rea Photography

Installing Flanged Windows: Two Strategies Compared

Part 2: A proper AMAA 'A-1' method, step-by-step

BY GENE SUMMY

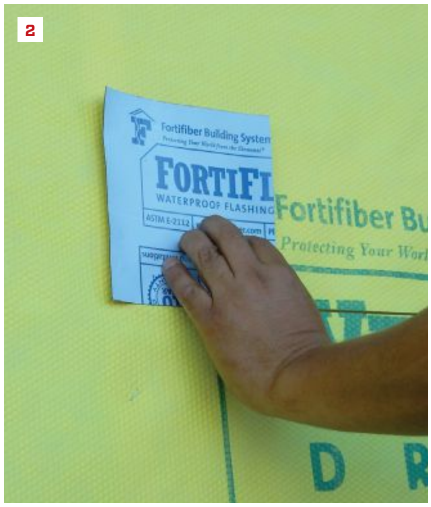
In January, *JLC* published Part 1 of this series, which examines the two predominant window flashing techniques—AAMA "A" and "B" methods. In Part 1, I delved deep into the step-by-step process for completing the "B" method. After more than 20 years of installing windows, and inspecting and testing window installations all over the U.S., I feel the "B" methods are more robust, reliable, and durable under typical jobsite conditions.

In a nutshell, my preference boils down to this: Sealant is absolutely necessary to any window installation. Some denigrate it as a "barrier" system that will fail and say that we need a "drainable" assembly instead. The fact is we need both. We do need to lap materials and provide a sill pan that will allow water to drain out of the window assembly. But we also need sealant. For one, it's required by every window manufacturer out there, making its use an integral part of the building code. It's a fluid material that fills in the imperfections that exist between every window flange and wall surface. With the "B" methods, you don't cover the flanges with self-adhering flashing (SAF), and therefore you can inspect and verify that enough sealant was used—because you can see the squeeze-out.

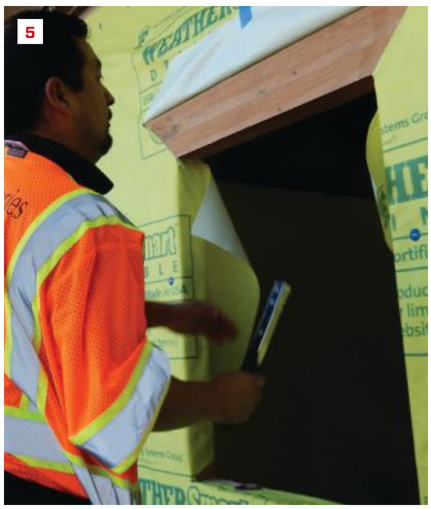
However, despite my arguments, some installers prefer to use the "A" methods. On the following pages, I outline step-by-step the process I instruct those installers to use.

Photos by Gene Summy

Gene Summy is a contractor and building inspector in Laguna Niguel, Calif.



Mark housewrap for cuts. Properly measure, mark, and cut the housewrap at each rough opening (RO). I recommend using the "modified I-cut" (sometimes called the "upside-down Martini glass") method. Locate the corners of the RO, then draw lines indicating the centerline and bottom-angle cuts and the cut along the RO's top edge **(1)**. Head laps should be cut at 45 degrees and to the width of the head and side flashing—no more, no less. A simple trick is to use a square piece of flashing as a template to help correctly mark the outer end of the cut **(2)**. Connect the "outer" mark with the top corner of the RO, making a 45-degree line **(3)**. It's important to get this lap cut right; head laps that are sliced at different angles and lengths are harder to seal.



Cut housewrap. A "modified I-cut" is easier for installers to get right than a "true I-cut" (or a full cut-out), which requires fairly precise cutting of the housewrap flush with the sill (or sides) **(4)**. Pull the resulting flaps into the RO. Secure flaps with a few staples, keeping the housewrap taut in the opening—do not over-pull the flaps. At the head, cut along your angled (45 degree) lines to the width of the flashing to create a flap in the housewrap; temporarily hold it up with tape **(5)**. At the sill corners, I highly recommend using plastic corner pieces **(6)**. Run a bead of sealant along the RO's sill and jamb in preparation for the rigid-plastic flashing corners. This is especially important if a drainable housewrap is to be installed (as shown here). If a flexible flashing product is used for the sill, sealant is not needed.

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Flash the sill. Staple the flashing corners in place on both sides of the sill. The corners help seal the sill's three-directional corner from pinhole openings in the membrane flashing and provide protection in case the window is roughly slammed into place **(7)**. Install self-adhered flashing (SAF), starting at the sill. Each end of this sill flashing should extend at least 9 inches (the width of the flashing material) beyond the opening so the side flashing can fully lap over it. Roll the SAF flat with a J-roller **(8)**. Cut the SAF and fold it down onto the RO's sill. Note: If a cementitious cladding, such as stucco, brick, or stone veneer, is planned for the house, install a through-wall flashing apron first under the self-adhered pan flashing. This will ensure that water drains to the exterior **(9)**.

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Install end dams. Using a J-roller, roll flat the peel-and-stick applied to the sill, being careful not to create wrinkles. Surprisingly, I don't often see installers using a J-roller, but this tool helps improve the adhesion of SAF, even in cold and wet conditions **(10)**. Install an end dam at each end of the sill by creating three-directional corners made of SAF. These need to cover the vertical leg of the plastic flashing corners (if you use them), and must lap a minimum 1 inch onto the sill. Slit each patch so it can be folded onto the face of the sheathing **(11)**. After folding the patch onto the sheathing, J-roll the patch legs. Note: If not using plastic corners, you must apply the patches without creating wrinkles or "over stretching" the material. The corners must be absolutely tight to the RO. The benefit to rigid flashing corners is you can create tighter corners, avoiding wrinkles more easily **(12)**.


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Apply sealant. Before installing the window, apply a fat, $\frac{3}{8}$- to $\frac{1}{2}$-inch-wide, continuous bead of sealant to the back of the nailing flange—rather than around the RO—on both sides and the top of the window **(13)**. If applying the sealant to the flange is not practical, perhaps because of a window's size or location, apply it around the RO such that the bead will line up with the outer edge of the flange. This way, it seals the edge and will ooze through any pre-punched holes. Along the bottom fin, the sealant should be discontinuous. Either leave a series of 3- to 4-inch gaps in the sealant, or omit the sealant at the lower fin. I like leaving gaps at the sides **(14)** and under any vertical mulls. Be sure the sealant is compatible with the membrane; I recommend using the same manufacturer for both the sealant and the flashing, or you can use a butyl-based SAF.


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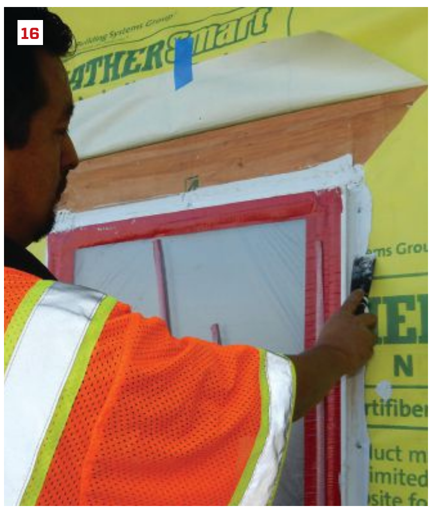
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Set the window level, square, and plumb. Shim as required. Watch for sealant "squeeze-out" everywhere sealant is used—along the edge of the nailing flange and at any pre-punched holes. Proper squeeze-out confirms that the window is adequately set in sealant. Use exterior-grade, self-tapping pancake screws, 8 to 12 inches on-center **(15)**. The compression from the fasteners creates a "gasket" between the fins and the WRB or the sheathing at the head **(16)**. Also, be sure that the squeeze-out is buttered flat before it hardens **(17)**. I cannot emphasize this enough. The next layer of flashing will need to lie correctly on it. Not buttering your squeeze-out flat in an A1 installation method is a recipe for disaster. Note: The window shown here is masked off with plastic and red tape for future water testing.

Install self-adhered side flashings. If you are using a drainable housewrap product, as shown here, use at least 9-inch-wide material. (For smooth-faced WRBs, 6-inch-wide SAF is adequate.) Apply the SAF carefully. Use a J-roller to ensure adhesion and eliminate wrinkles **(18)**. If adhesion is difficult because of weather conditions, use a primer. Pay special attention where the side flashing laps onto the sill flashing, and J-roll the lap to ensure adhesion **(19)**. Nailing flanges typically have mitered corners, which are "welded." The resulting seams often create raised surfaces, which cause the SAF to bubble and wrinkle at this critical juncture. Ideally, the SAF should lie flat on the fin, transitioning to the sill flashing without "fish-mouthing." This is an area where I suggest sealant be applied at the edge of the membrane to prevent water from passing under the SAF.

Install self-adhered side flashings.

Install the head flashing last. Here, the installer flushed up the end of the head flashing with the outside of the side flashing, but it's preferable to extend each end past the side flashing. J-roll the peel-and-stick flat to fully adhere the membrane **(20)**. Next, drop the head flap down. Prior to taping it off, apply a dab of sealant at the top of the 45-degree cut **(21)**. This may seem unnecessary, but this little dab is important, particularly for drainable housewraps. Water can potentially get behind the tape at this juncture. Tape the head lap closed at the ends **(22)**. Strips of SAF membrane are better than construction tape, but the tape will work, too. If the flap needs to be taped along the bottom edge, use short pieces with gaps between them so any water that might get behind there can drain out.

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Seal side-flashing edge. For added protection, apply a bead of sealant along the edge of the side flashing where it butts into the window frame. This will help if the SAF does not adhere properly to the nail fin because of dust, cold, or moisture **(23)**. Tool the sealant bead with a finger. The sealant helps mitigate potential moisture entry points from wrinkles in the side flashing **(24)**.

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Seal gap at sill. Also, I always recommend applying a bead of sealant along the seam below the window. J-rolling cannot always be relied on to seal this troublesome "lumpy" spot, and fish-mouthing easily occurs here **(25)**. Tool the sealant with a finger. Sealing this juncture is important; if water migrates behind the SAF, it'll find the path of least resistance, working its way into the interior. Even if the flashing installation is executed perfectly, as illustrated in this story, there is potential for water to get in, most likely through the pre-punched holes or cracked nailing fins **(26)**.

Seal the interior. On the inside of the window, apply a bead of sealant 6 to 8 inches down each side and all the way across the bottom **(27)**. Tool the sealant into place using a finger. This will stop any unintended water from reaching inside the home. Apply low-expansion foam around the rest of the RO **(28)**.

Water testing. After many years of water testing windows in the field, I am certain that 80% or more of the water intrusion we observe is due to flashing and sealant errors. Shown is a recent AAMA 502, ASTM E 1105 water test we performed where we isolated the window out of the test—only the flashing method, sealant, and WRB were being evaluated. The "window leaks" we are called to investigate are usually not window leaks at all, but flashing and sealant leaks. All of these leaks may be easily prevented by following the steps in this article **(29, 30)**.

Photos by Al Potter

Retrofit Moment Frames

In California, more cities are requiring moment frames on 'soft story' openings

BY DAVID LOPP

More than 120 people died in the California earthquakes of 1971 and 1994. In the 1994 Northridge earthquake alone, 16 fatalities occurred in the collapse of one building—a "soft story" apartment complex, Northridge Meadows. The loss of life was accompanied by the high cost to repair or even replace buildings damaged in the event.

Soft-story multifamily buildings are common in many California metropolitan areas. They are typically constructed with tenant parking on the ground level and two or more floors of apartments above. The parking level is referred to as a soft story because the upper levels are supported on very narrow walls, or oftentimes on posts, to provide wide openings for cars to enter.

To demonstrate the structural shortcomings of a soft-story building in an earthquake, visualize a tabletop with wobbly legs supporting a lot of weight. The table will support the weight, but shaking it side to side will cause the legs to buckle and collapse. The effect on soft-story structures can be the same. The narrow walls were designed for supporting vertical loads, the weight of the upper floors, but will fail when lateral loads are applied.

MANDATED RETROFITS

After years of consideration and study, code officials in the San Francisco Bay Area and in the City of Los Angeles have recently adopted ordinances that require soft-story seismic retrofits. The purpose of

SIMPSON STRONG-TIE STRONG FRAME

In addition to MiTek's Hardy Frame, there are Simpson Strong-Tie soft-story retrofit products, including moment-frame and shear-wall solutions. The Simpson Strong-Tie Strong Frame Special Moment Frame (SMF) is designed for retrofitting large openings, such as garages and storefronts, using I-beam-like components that are bolted together on site. Strong Frame uses a patented Yield-Link structural "fuse," which is "designed to bear the brunt of seismic forces, thereby reducing the risk of collapse and isolating damage for a less labor-intensive and more rapid post-earthquake repair," the company states. To learn more, visit www.strongtie.com/softstory. —JLC

the ordinance is to provide the structural integrity to prevent loss of life, to mitigate a possible building collapse, and to prevent inhabitants from being displaced from a condemned building. There are currently well over 18,000 wood-frame buildings identified that will require retrofitting under the local ordinance. The *Los Angeles Times* has reported that in the City of Los Angeles alone, there are an estimated 13,500 buildings identified, each of which must be retrofit with code-approved seismic structural solutions.

Time requirement. The amount of time the building owner has to complete the retrofit can vary depending on where the ordinance was adopted. In L.A., building owners have seven years to complete their retrofit requirements. In the City of San Francisco, the required completion date depends on the building type. Type I buildings ("any building containing educational, assembly, or residential care facility uses") must be retrofit by September 2017. Type IV buildings ("any building containing ground floor commercial use") have until September 2018 to submit permit applications, and until September 2020 for the work to be completed.

Contractor opportunities. The Los Angeles and San Francisco building departments are the first to adopt soft-story retrofit ordinances, and these may lead other jurisdictions to adopt similar policies. Industry observers agree that the soft-story retrofit requirements should, and will eventually, be adopted into many, if not all, of California's high seismic zones. From there, look for ordinance adoption to occur in other states, such as Oregon and Washington, with high Seismic Design Categories.

While the adoption of retrofit ordinances is good for public safety and a pragmatic way to retain housing in a major earthquake, it also offers a business opportunity for contractors who are willing to train in, prepare for, and market these retrofit services. Estimates of the collective retrofit business range from $150 million to as much as $200 million. (Google "soft story retrofit" to see a burgeoning list of websites with information on codes and solutions.)

ACCEPTABLE SOLUTIONS

Code-evaluated structural solutions and materials for soft-story retrofits are widely available. There is not a single solution for all buildings nor is there a single solution within a particular building. For some conditions, conventional plywood shear walls may be appropriate; in others, pre-fabricated structural-shear-wall systems or manufactured moment frames will be necessary. But for maintaining parking areas beneath multifamily, soft-story buildings, retrofit moment frames are frequently the best solution.

Moment frames consist of columns and a beam joined with a "moment connection." Loads are resisted by these frames through bending in the beam and columns. In addition to resisting lateral and vertical loads, the moment connection transfers rotational movement at the top of the column where it connects to the beam.

Moment-frame classifications. There are three types: Ordinary Moment Frame (OMF), Intermediate Moment Frame (IMF), and The Special Moment Frame (SMF). This classification is based on how much deformation (movement) the moment frame is capable of while undergoing the expected loads, and how far that movement will take it from an elastic level into the plastic level.

OMFs are expected to resist only limited inelastic deformations so they are more commonly used in lower seismic regions (defined by a Seismic Design Category). IMFs are held to a higher standard and are qualified for use in low- to mid-Seismic Design Categories. SMFs are designed to resist significant inelastic deformation and are typically used in high Seismic Design Categories.

SMF OVERVIEW

Special Moment Frame requirements include using moment connections that have been prequalified and—unless the system has been proven to perform without it—lateral bracing of the beam. Qualified beam-to-column special moment connections include both bolted and welded types. Be aware that many of the SMF installation stages, such as field welding or bolting, must be witnessed by code officials or building inspectors. Check with the building department to ensure that you stay in compliance.

Currently, there are two major manufacturers offering standardized, prefabricated Special Moment Frames—MiTek, which makes Hardy Frame, and Simpson Strong-Tie, which makes Strong Frame (see sidebar, above).

The Hardy Frame SMF is preassembled and welded at the factory, then delivered to the jobsite ready to install. It uses the MiTek SidePlate connection with wide flange columns, and a rectangular Hollow Structural Section (HSS) for the beam. This connection and beam profile typically allow the frame assembly to fit within standard 2x6 framing, and the use of an HSS beam means that additional lateral bracing is not required.

Installation of any moment frame requires column base plates anchored to the foundation, and connection from the frame's beam to the building using a collector, or "drag," that delivers the lateral loads. The photos on the next two pages show a typical retrofit application using the Hardy Frame SMF.

David Lopp is Vice President of Technical Support for the Hardy Frame Shear Wall System (hardyframe.com/softstory).

1. Pad footings. Dig the foundation where the columns' hold-down anchors will be located. The minimum embed depth, the edge distance from the front and back of the footing, and the distance from the end of the footing to the centerline of the anchor are provided by the moment-frame manufacturer. However, the Engineer of Record may require larger footings. Digging the footing a little deeper not only ensures meeting code for moisture protection, it also makes installation of the moment frame and anchors in retrofit applications easier.

2. Anchorage. The Template Kit shown includes two Templates, two Bolt Braces, eight anchors with two washers and four nuts per anchor, and rebar shear ties. Anchors should extend $4\frac{1}{2}$ inches beyond the top of the Template. The Template has two slotted holes, one at each end, which are used to measure the inside "steel-to-steel" dimension of the moment frame. When installing the "Bolt Brace" at the embed end, check that the bolt centerlines are oriented in the same direction as the Template.

3. Frame delivery and placement. The Hardy Frame SMF is delivered to the jobsite completely pre-assembled with wood nailers attached. There is no field assembly, no field welding, and therefore no required special inspection for the Hardy Frame assembly. With the footings prepared and the shoring in place, the site is ready for the installation of the moment frame. Here, the installers have tilted the top of the frame back, away from the building, then moved it toward the point of installation and lowered the column bases into the foundation hole.

4. Raising the frame. For retrofit applications with the frame installed within the existing wall line, raise the moment frame until the 3-by nailer on top of the beam is in contact with the building collector. Once the moment-frame assembly is correctly positioned, check that it is plumb and install temporary shoring.

5. Install anchorage. The anchorage can now be installed at the column base plates and suspended in the open footing. Be sure that the connection has nuts and washers above and below the base plate. The anchors should extend at least one thread beyond the upper nut for easy inspection that all threads in the nut are filled. A Bolt Brace at the embed end acts as a spreader and ensures the anchors will not sway independently while concrete is being poured, and will keep the anchors parallel and plumb. The rebar reinforcement shown is designed by the Engineer of Record for this project. Be sure to get the anchorage inspected prior to pouring concrete.

6. Ready for concrete. In this photo, the Hardy Frame SMF is installed and ready for concrete to be poured at the footings. Connectors to transfer shear from the blocking in the floor system to the wood nailer on top of the SMF beam will be framing angles, as specified by the Engineer of Record. The label shown on the left column provides illustrations of typical bottom and top connections for the installers and the building inspector's reference.


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Following in Boccia's tradition of innovation they are introducing the next generation of Hollow Kick Molding with a built in vapor retarder to reduce the pollutants that may permeate the floor cove. This new design will still provide the same drainage characteristics that the industry has come to rely on with the protection of a sealed floor.
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Products

JLCONLINE.COM

BY LAUREN HUNTER

1. Pretty Privacy
Hy-Lite Windows offers four privacy-window styles in its new Home Designer Collection: Baroque (shown), Metro, Mission, and Prairie. Available in 48-by-48-inch ($475) and 30-by-60-inch ($525) sizes, the Baroque-style window—the most popular in the collection—has silk-screened tempered privacy glass with clear lines and is suitable for kitchens, bathrooms, and dressing areas. hy-lite.com

2. Natural-Looking Light
Designed to replace 5- and 6-inch ceiling can fixtures, Cyron Lighting's new neutral-white downlight LEDs provide up to 100W of illumination while using 15W of power. The lamps' color temperature is 4,000K, allowing fabric and paint colors to appear "just right"—not too warm or too cool. UL listed and Energy Star certified, the fixtures are compatible with electronic LED dimmers. Choose from three white-toned trim options that are gasket-sealed for less air infiltration. Priced at $25. cyron.com

3. Safer Receptacle
Get the benefits of arc prevention and grounding together in Leviton's SmartLockPro Dual Function AFCI/GFCI Receptacle. Compliant with the National Electric Code for use in residential kitchens and laundry areas, as well as for modifications, extensions, or replacements, the device has "test" and "reset" buttons, and a light that indicates a status of normal, mis-wiring, or AFCI or GFCI trip. The maker's patented reset lockout prevents the device from being reset if it's not functioning properly. It's priced around $30. leviton.com/dfci

4. Share the Load
MiTek's new VTT Valley Truss Tie is an 18-gauge G90 galvanized steel tie that transfers loads from valley trusses to the supporting structure. The connector resists sliding forces created from downward loads when a valley truss is set on a sloped lower roof. This eliminates the need for support wedges under the truss's bottom chord, and means framers won't need special-order trusses with bevel-cut bottom chords. The VTT has double-dimple nail holes, prong teeth, and a flat design that requires no field bending to match the roof pitch. At $2.95 each, the VTT is designed for roof pitches from 0/12 to 12/12. Pitch guide embossments let users attach to a valley truss on the ground. mitek-us.com

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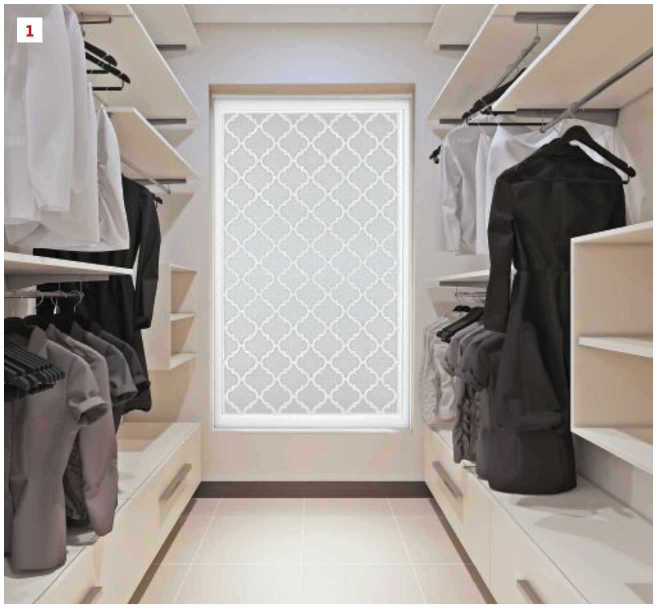

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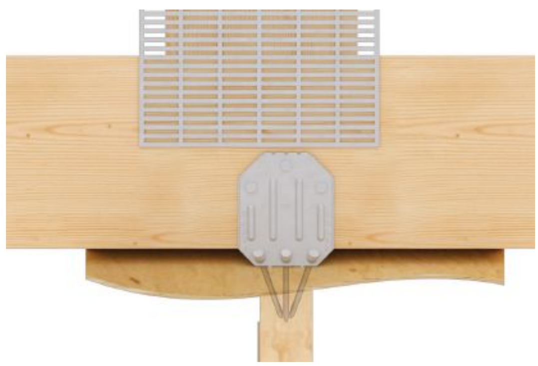

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5. Fabulous Faux

Add a rustic touch to ceilings with new cellular PVC designs from Fypon. Hand-hewn and rough-sawn beam styles are meant to deliver an Arts & Crafts look at a fraction of the cost of timber. With pricing ranging from $113 to $900 depending on style and size, both styles come in 4x6-inch, 6x8-inch, and 8x10-inch dimensions, and in lengths from 8 to 24 feet in 2-inch increments. Beams attach to mounting blocks screwed to the ceiling. Decorative beam straps are available. fypon.com

6. In the Trenches

New C- and CX-Series Ditch Witch walk-behind trenchers have compact and ergonomic designs. CX-Series trenchers have a CX Track system with a shorter left track and longer right track. C-Series trenchers have an offset rear-tire design. Easy access to machine components improves maintenance. Six available models dig at depths from 24 to 48 inches, ideal for laying pipe or cables, trenching for drainage, and prepping landscape projects. Check with dealers for pricing. ditchwitch.com

7. Fine Floors, Outdoors

Cabot Gold exterior finish for decks and outdoor furniture mimics the appearance of interior hardwood floors through a two-coat process. For a successful application, Cabot calls for clean, bare wood, at least 24 hours between coats, and three days before furniture is returned to the deck. Choose from four colors for use on both cedar and pine. Available in spring 2016, Cabot Gold will retail for about $20 per quart and $46 per gallon. cabotwoodcare.com

8. Comfort Controller

The Bosch Control Smart Room Thermostat works with compatible Bosch and Buderus condensing boilers and lets users control heating and hot-water. Energy Management System technology matches boiler output with demand. The programmable thermostat comes with a temperature sensor and remote boiler control in one device, and has an easy-to-use touchscreen and an iPhone- and Android-compatible app. Bosch Control is the only thermostat of its type, Bosch says, that can adjust a boiler's flow temperature to the minimum level required to enhance condensing operation, while still maintaining room comfort. List price is around $225. boschheatingandcooling.com

9. Ladylike Finish
Grohe has introduced a new rose gold finish for its Grandera collection to give its modern look a more feminine touch. The finish is available on a wide range of bathroom products so your customer's shower, tub, and bathroom sink can all be coming up roses. The Grandera lavatory centerset faucet (shown) costs $645 in chrome, $847 in brushed nickel, and $895 in rose gold. grohe.com/us

10. Lightweight Underlayments
National Nail has expanded its line of Stinger roofing products to include three synthetic underlayments: EXO25, EXO35, and EXO55. EXO synthetic underlayments are UV-resistant and can remain exposed for up to six months during construction. The company says the synthetic woven fabrics offer high tear strength and proprietary, non-skid additives for better roof deck contact and high slip resistance. Each roll covers 10 squares, but weighs just 20 to 28 pounds, depending on the product. According to the maker, the lighter weight and the preprinted nailing patterns and overlap lines help increase productivity. Priced from $60 to $115 per roll. stingerworld.com

11. Clean, Safe, Smart
Improve efficiency and safety during demolition with the Smart Chute construction-debris removal system from Quantum Smart Solutions. Designed to shuttle debris directly into a dumpster or truck, the company says Smart Chute helps keep jobsites cleaner and eliminates labor hours wasted on moving trash materials from around the jobsite to a dumpster. Constructed of lightweight non-rusting aluminum, the Smart Chute's components nest for easy assembly, disassembly, and transport. The top of the chute attaches to the structure with heavy-duty hinges. Three available sizes are priced starting at $12,000, and can be used in configurations ranging from 8 to 40 feet to service debris removal up to a four-story elevation. quantum-smart.com

12. Life on the Ledge
The aptly-named 246Ledge is Eldorado Stone's newest ledgestone option, saw-cut dimensionally at 2-inch, 4-inch, and 6-inch heights for uniformity and ease of installation. The vertical edges are left natural for a rustic appearance. It's available in flats and 90-degree corners, and in eight colorways including weathered ore, shown. Pricing varies by product and project. eldoradostone.com

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DeWalt 12-Volt Cross-Line Red and Green Lasers

BY BRUCE GREENLAW

Green-beam construction lasers have been around since Topcon introduced the TP-L3G pipe laser in 1996. Green beams are up to four times easier to see than red ones, but until recently, the intricate diodes that projected them were too pricey and power-hungry to go mainstream. Thanks to a recent technical breakthrough, though, true green semiconductor diodes are now available that cost less and are more efficient than their predecessors. That's why a bunch of new green-beam point, line, and rotary lasers have recently hit the market.

DeWalt, for instance, just added a new family of line lasers to its 12V MAX cordless platform, each of which comes in a red-beam and a green-beam version. After test-driving the new cross-line red laser (DW088LR) and cross-line green laser (DW088LG) side by side over the past few weeks, I not only love the green beams, but I'm impressed by the practical design of these lasers.

LINE COVERAGE

The DW088LR and DW088LG project a horizontal and vertical line either independently or together so they intersect. According to DeWalt, the horizontal line fans out at least 100 degrees and the vertical line at least 130 degrees.

Like most competing lasers, the DW088LR and DW088LG use an internal pendulum to self-level. The base of the laser must be within about 4 degrees of level for the pendulum to work. If the inclination is between 4 and 10 degrees, the beams flash once per second to indicate that you're outside the self-leveling range. Exceed 10 degrees, and the lines quickly blink three times

Bottom two photos by Bruce Greenlaw

about every six seconds, projecting uninterrupted layout lines for five seconds between each series of blinks. According to DeWalt, the reduced blinking is designed to be less distracting for when you tilt your laser to project sloped layout lines, such as for setting stair rails or angled tile.

To help prevent shock damage, the pendulum automatically locks when you switch off the tool.

GREEN VERSUS RED

Before using the two lasers, I checked their plumb and level lines for accuracy. Both lasers were good to go.

According to the specs, the red-beam DW088LR has a visual range of up to 50 feet, while the green-beam DW088LG ranges up to 100 feet. I tried both lasers in a variety of interior spaces, and the green beam was clearly brighter. The difference was especially pronounced in a kitchen and a utility room that were brightly lit by overhead fluorescents.

Outdoors on a fairly bright but drizzly day, I was surprised that I could easily find the green beam on yellow metal siding with the laser placed 50 feet away. The red beam virtually disappeared at 25 feet. On a sunlit wall, I could barely even see the green beam with the laser placed just 5 feet away. The pulsed red and green beams, however, allow you to use a detector to locate the lines when they're too faint to see. DeWalt's DW0892 red-line and DW0892G green-line detectors extend the working range to 165 feet. I've seen both versions sell online for less than $100 each.

DeWalt also sells green and red laser-enhancement glasses, but they have minimal impact in direct sunlight.

RUNTIME

Both lasers come in a kit only, which includes a drop-ceiling attachment and a blow-mold case. But the green laser comes with a 2-amp-hour battery and a charger, while the red one comes with an "AA Laser Pack" that slides onto the back of the laser just like a 12V MAX battery (photo, bottom left). DeWalt says it chose this configuration to keep the price of the red laser lower. The four AA alkalines are supposed to deliver 12 hours of runtime when powering two laser lines and 27 hours when powering one. Substitute a 2-amp-hour 12V MAX battery, and you get 20 hours and 39 hours, respectively.

Despite the breakthrough in green-diode technology, green lasers still draw a lot more power than red ones. The DW088LG would deliver only 4 ½ to 6 ½ hours of runtime on AA batteries. The 12V MAX battery, on the other hand, delivers 8 to 14 hours. Both lasers have an excellent four-bar battery gauge on board.

OTHER HIGHLIGHTS

Both lasers are permanently mounted to an L-shaped bracket that allows them to rotate 360 degrees on their vertical axis, which can be a blessing for aiming layout lines. The brackets have ¼-20 and ⅝-11 sockets on the bottom for tripods and laser poles, and two mighty rare-earth magnets on the back that stick to a metal strip on the drop-ceiling attachment and to other ferrous metal. The brackets can also hang from a nail or screw.

The lasers are built to be exceptionally rugged. DeWalt says it tested their shock resistance by dropping them onto concrete from a height of 1 ½ to 2 meters with the pendulum locked. They also have an Ingress Protection rating of IP65, which means they're dust-proof and won't be damaged by rain.

THE BOTTOM LINE

I wish DeWalt would provide a padded pouch for these lasers that could slip onto a toolbelt for added convenience and protection on site. But overall I'm really impressed. The economical lasers are easy to use and promise to be exceptionally

rugged. And unlike competing lasers, they belong to a cordless platform. You can use them indoors for setting everything from windows, doors, and cabinets to tile, electrical boxes, and suspended ceilings. Add a detector, and you can easily use them outdoors for decks, fences, and more.

I'd be perfectly happy with the red-beam version, until the first time I struggled to see my layout lines. Then I'd regret not buying the brighter green version. The green one costs $150 more than the red one, but includes a 12V MAX battery and charger while the red laser doesn't. Both lasers come with a 3-year warranty and 90-day money-back guarantee.

DW088LR Specs
Beam color: red
Functions: crossing horizontal and vertical lines
Range: 50 feet visual; 165 feet with DW0892 detector (not included)
Accuracy: ±1/8 inch at 33 feet
Self-leveling range: ±4 degrees
Battery runtime: 12 to 27 hours with AA batteries; 20 to 39 hours with 2-Ah battery
Weight with AA Laser Pack: 1 pound 13 ounces
Price: $200
Includes: AA Laser Pack, drop-ceiling attachment, plastic case

DW088LG Specs
Beam color: green
Functions: crossing horizontal and vertical lines
Range: 100 feet visual; 165 feet with DW0892G detector (not included)
Accuracy: ±1/8 inch at 33 feet
Self-leveling range: ±4 degrees
Battery runtime: 4.5 to 6.5 hours with AA batteries; 8 to 14 hours with 2-Ah battery
Weight with battery: 1 pound 14 ounces
Price: $350
Includes: one 2-Ah battery, charger, drop-ceiling attachment, plastic case

Bruce Greenlaw is a contributing editor to JLC *and* Tools of the Trade.

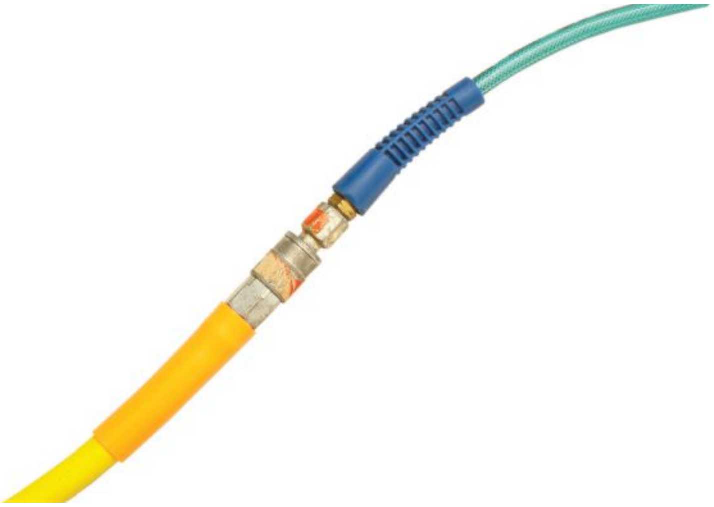

Photo: Chris Ermides

One Framer's Choice in Air Hoses

BY ERIC MACDONALD

When it comes to air hoses, material type and tubing size are the main factors to consider. When I first started in the trade 25 years ago, rubber was about the only option out there. Now you can choose among rubber, nylon, PVC, and polyurethane. As a framer by trade, I have very little use for PVC and nylon. PVC is the least expensive, but I've found it difficult to work with—especially in cold temperatures, because it doesn't flex much. Nylon is mostly used in coil hoses, which have no place on a framing site because they aren't very durable and they don't offer much maneuverability. So for years I used nitrile-rubber hoses because they are durable and fairly flexible (although less so in cold temperatures), and have the highest PSI rating of all the options.

But these days, reinforced polyurethane tubing has been my go-to choice because it's lightweight, flexible (even in cold weather), durable, and easy to repair. The first brand I bought was Flexeel (coilhose.com). When it first came out, it was a little pricey compared with the other options, but I quickly learned that it was money well spent. Since then, many other brands of reinforced polyurethane hoses have become available (most air-nailer manufacturers offer them), and the price is now down to that of rubber hoses.

I prefer lightweight hoses that lie flat while I'm framing, and I like to keep the weight of my framing nailer down when I'm working off of a ladder. As someone who frames full-time, I prefer 3/8-inch (I.D.) hose, which provides enough air storage to keep the compressor from running too often. A lot of guys run 1/4-inch hoses straight from the compressor to their framing guns without a glitch, though I feel they're putting more pressure on their compressor this way.

But I've opted for a compromise. To keep the weight down while still maintaining the air delivery I need, I've recently started running a 3/8-inch rubber hose off my compressor and then adding a 1/4-inch polyurethane line between it and my gun. This setup adds air storage within the hose (since the hose is basically an extension of the compressor's air tank), while still giving me the maneuverability and flexibility of the smaller-diameter, lighter-weight polyurethane hose.

Eric MacDonald is a contributing editor to Tools of the Trade *and a framing carpenter in Altamont, N.Y.*

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BY PAUL MARTIN

At first, the author wasn't sure what had happened. Then he felt a slight pinch on his finger and he realized he'd tripped the SawStop.

I'm That Guy

My world didn't stop, the saw did.

Over the last 48 years on my journey to master woodworker, I've learned carpentry, cabinetmaking, and furniture restoration along with guitar and violin making. Currently, I work on specialty custom products and finishing at Gerstner and Sons, in Dayton, Ohio. Looking back, I can remember working on at least 21 different power saws. I've seen accidents happen—and I know how to avoid them—but I've always been respectful and have never said it couldn't happen to me; I knew that it could. I was always careful—until the one moment I wasn't.

I was at work. The cut was moderately difficult, but nothing I hadn't done before. There was no kickback; I had control. Suddenly, there was a loud pop and everything stopped. At first, I didn't know what happened. I thought the saw had broken. Then I noticed a small pinch on my finger, and it began to dawn on me. "That was the SawStop. I touched the blade." In a fraction of a second, the saw sensed my finger and an aluminum shoe had fired into the blade, stopping it instantly.

The other guys at the shop came running. "Are you OK?" they asked. Sure, I was OK, but I was embarrassed. "Holy mackerel," I thought, "I'm that guy. I'm supposed to be one of the best, but I'm also that guy who had the accident." At least I wasn't that guy without a finger.

I reported to the shop manager. Red-faced, I "fessed up," ready to take whatever came. "I did it," I told him. "I tripped the SawStop." His only question was, "Are you OK?" He took a new SawStop cartridge out of a drawer and we walked back to the saw—once a cartridge fires, it has to be replaced with a new one. The blade is shot too. As we installed a new shoe and blade, I started to feel grateful. Yes, I had made a mistake. It never should have happened, but at least I don't have to pay for it for the rest of my life.

After we'd set up the new blade and cartridge, there was one more place I had to go. Carrying the spent cartridge and blade, I knocked on the door of the president's office, poked my head in, and showed him the pieces. "I just wanted to tell you what happened," I said. "I'm sure you had some questions about your investment when you switched over to SawStop saws, but I'm glad you did. Thank you."

Paul Martin works at Gerstner and Sons, in Dayton, Ohio.

Photo: Paul Martin


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