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On the cover: Wildfires threaten a subdivision near Portola Hills, Calif. To read about building homes to resist wildfires, see the story on page 51. Photo: fOOsion/E+/Getty Images.

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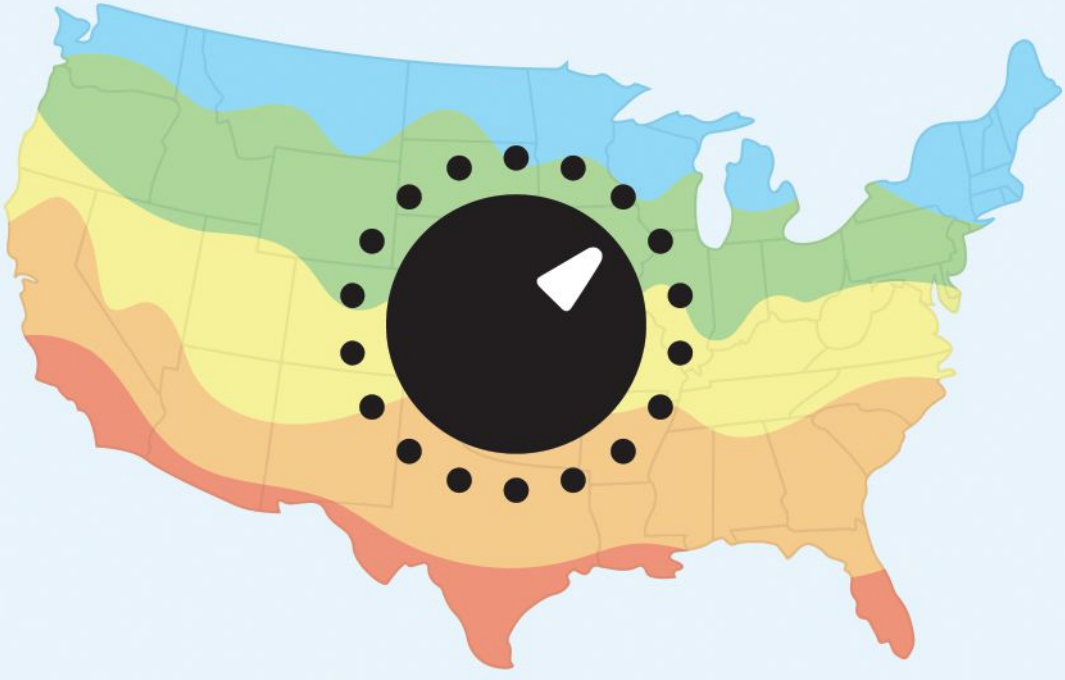

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BUILDING PRODUCTS

BY ROE OSBORN

Framing Rough Openings

In simple terms, a rough opening (RO) is a hole in a framed wall for a door or a window. Most door and window manufacturers provide RO dimensions and we build ROs to those sizes. But rough openings are a lot more than just holes. Wherever wall framing is interrupted for an opening, the structural functions of the wall frame must be accomplished by the RO framing.

The wall framing transfers the weight of the house down through the frame. *Studs*, the vertical members in a wall frame, are primarily responsible for that duty. When we remove studs for a door or window, we must redirect those vertical loads around the opening. We accomplish this with horizontal framing members called *headers* that act as beams that span the openings. Headers then transfer the loads to vertical framing supports—known as *king studs* and *jack studs*—on the sides of the opening. (Jack studs are also referred to as *trimmers*.) If the opening is for a window, we install a *rough sill* between the jacks, and short studs known as *cripples* below the sill. (Short studs used above a header are also referred to as cripples.)

The other structural functions of a rough opening are more subtle but no less important. We frame house walls to resist lateral loads and shear forces from wind or seismic activity. A wood frame skinned with properly attached sheathing offers good lateral resistance, but the framing around an RO must be able to offer the same resistance. In special cases, such as in high-wind areas or in active seismic zones, you may need to beef up RO framing or limit the number of openings.

In this article, we will walk through laying out and framing basic rough openings.

Roe Osborn is a senior editor at JLC.

Photos by Roe Osborn

Mark the centerline of the opening. Using the dimensions and location indicated on the plans, a crew member measures over and marks the center of a window opening **(1)**. **Define the opening.** Working from the center point, he measures over and marks the edges of the rough opening **(2)**. **Mark jacks and kings.** He then lays out the jack and king studs on either side of the opening **(3)**.


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Precut and assemble the parts. The crew counts and cuts all the framing parts—including the jacks—for the house ahead of time. The jacks are then prenailed to the king studs for all the openings **(4)**, and headers are assembled to fit the thickness of the walls (in this case, 5 1/2 inches for 2x6 walls). **Nail in the kings and jacks.** The crew separates the plates and nails sets of kings and jacks on their layout marks **(5)**. **Fasten header to kings.** Next, the crew nails the header to the king studs **(6)**. Up to this point, window and door rough openings look the same. **Install sills.** For window ROs, the crew sets the cripples and sill in place, copying the cripple layout from the base plate onto the sill **(7)**. The crew nails through the sills to secure the cripples **(8)**. **Square frame and sheathe.** The crew takes diagonal measurements to square the wall frame **(9)** before nailing on a second top plate and sheathing. **Cut the openings.** A router cuts the sheathing around the opening **(10)** before the sheathing is nailed off.

For a more detailed discussion on rough openings, go to **jlconline.com/training-the-trades/framing-rough-openings**.

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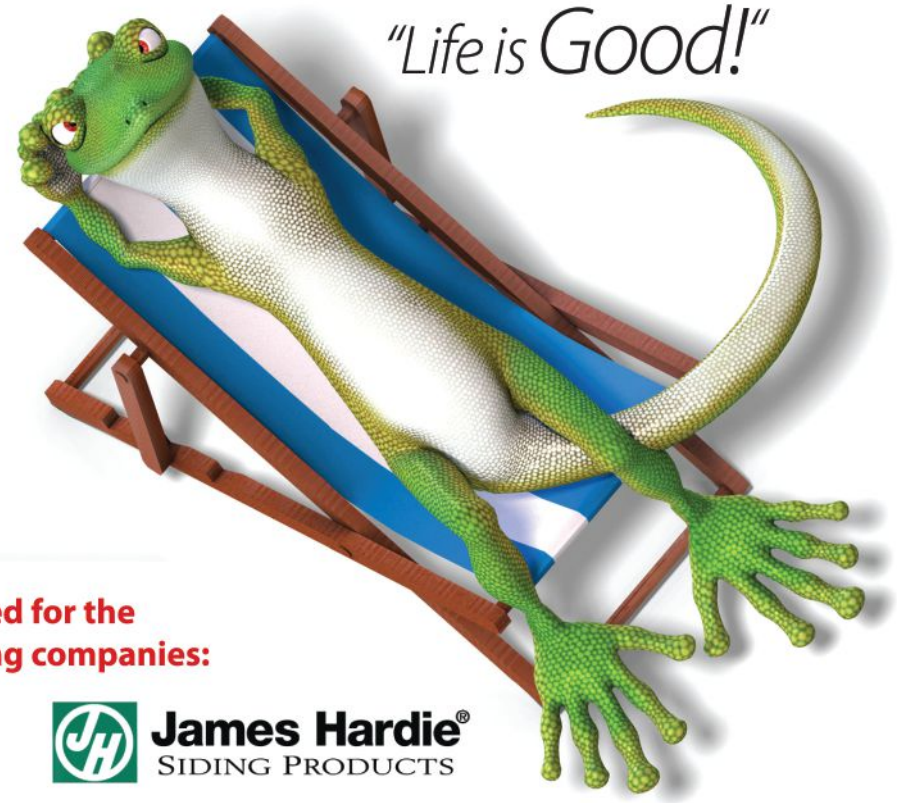

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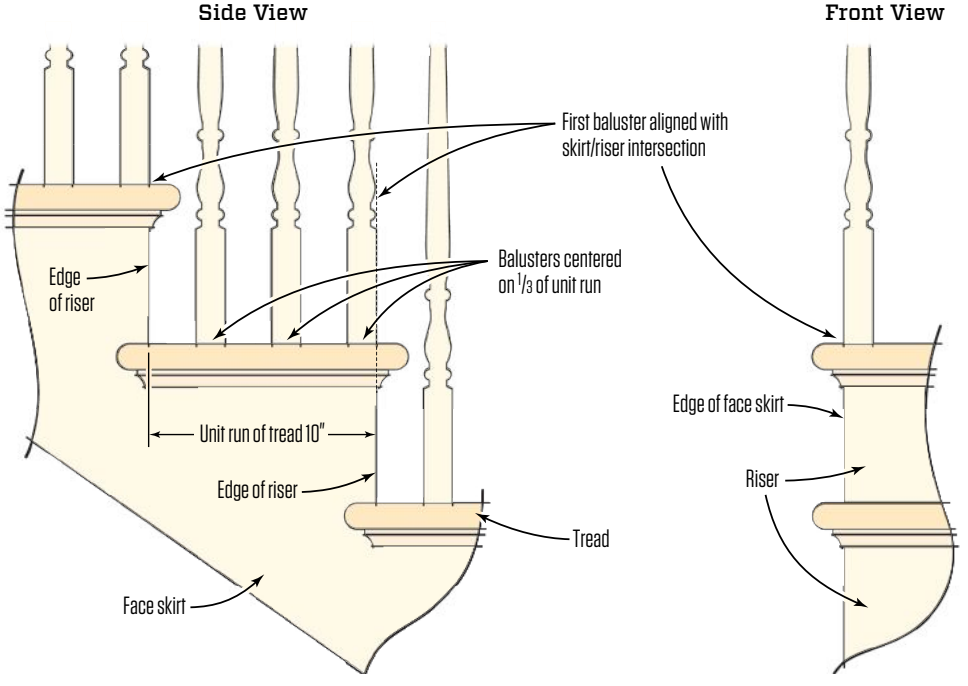
What is the rule of thumb for laying out balusters?

Jed Dixon, a master stair builder and presenter at JLC Live, from Foster, R.I., responds: In my stair building and repair work, I have looked at hundreds of traditional balustrades, built over the last 300 years in New England. I can tell you 99% of them use the same simple rules for spacing balusters, and those rules probably originated much earlier than colonial times—in the Renaissance, or maybe 2,000 years ago in classical Greece. Modern building codes have added a few rules, but these mesh well with the traditional ones.

The first rule is that the balusters should be spaced evenly: The on-center distance between balusters should be the same for the whole stairway (see Baluster Spacing, below). This distance is dictated by the unit run of the stair (the horizontal distance between the face of each riser and the one above or below), which is typically between 10 and 11 inches on residential stairs. The IRC requires a minimum 10-inch run per tread, but Massachusetts and several other states allow runs down to 9 inches, which will make for a safe and comfortable stair if it's designed correctly.

The distance between the baluster centers must be an even fraction of the run: 1/2, 1/3, or 1/4, depending on the number of balusters per tread. Generally, it looks better to have several balusters closer together, and code requires that no space between balusters be wider

Baluster Spacing



The baluster closest to the front of the stair sits directly over the miter between the face skirt and the riser. Divide the run of the tread by the number of balusters to find the exact on-center spacing.

Illustration by Tim Healey

than 4 inches. For a 10 1/2-inch run, the balusters would be spaced 3 1/2 inches on-center (one-third of 10 1/2 inches). For a 10-inch run, the spacing would be 3 1/3 inches (don't panic, your framing square has a 12th scale and 4/12 inch = 1/3 inch).

The location of the shortest baluster on each tread determines the location of the others. This baluster is always located with its front (downhill) face directly over the riser below and its outer face over the face of the face skirt—that is, the outer corner of the baluster should always be lined up directly over the point of the miter joint between the face skirt and the riser. This will always look right. If laid out properly, the longest (or rear) baluster on each tread will have the same spacing between it and the short baluster on the next tread up. It will look like you meant to do it that way. And, the centerline of the handrail will be one-half of a baluster in from the face skirt.

I have looked at hundreds of traditional balustrades, built over the last 300 years, and 99% of them used the same simple rules for spacing balusters.

Balusters on the landings (where the railing is level) should have close to the same spacing as the balusters on the stairs. But here you need to use your carpenter's eye as we think about negative space. In this instance, negative space is the shape made in the air between two turned balusters—like that famous optical illusion where two faces create the shape of a vase. You see it even if you don't notice it right away. Balusters should be close enough to each other that the negative space between them is apparent. At the top of a staircase, the stair rail and the landing rail usually meet at a newel post, which is much larger than a baluster. The negative space between the newel and the first baluster in the landing rail, and the space between the last landing baluster and the wall must be adjusted to look right. Here's how you do this using your eye.

Hold two landing balusters the same distance apart as the balusters on the stair (3 1/2 inches, plus or minus) and move them towards and away from the newel post until the negative space between the newel and the baluster closest to it is the same as (or a little smaller than) the space between the stair balusters. Mark the center of the baluster closest to the stair, and mark the same distance at the other end of the landing. Now divide the distance between these two marks by the on-center distance between two stair balusters to find the number of landing balusters. Use a construction calculator to divide the landing distance by the number of balusters for the exact on-center spacing.

Q What is the best way to calculate live loads for floor framing in a house?

A John Bologna, a structural engineer with Coastal Engineering Co., in Orleans, Mass., responds: The IRC defines live loads as "those loads produced by the use and occupancy of the building or other structure and do not include construction or environmental loads such as wind load, snow load, rain load, earthquake load, flood load or dead load." In simple terms, the live load for the floors in a home includes your client (the weight of your client's body and any other bodies in a room), furniture, appliances, and anything else a client puts on the floor.

Floor live-load requirements come directly out of the code books. Table R301.5 (or Table 5301.5 in the Massachusetts building code, in my jurisdiction) lists the minimum uniformly distributed live load for residential construction in a variety of situations. For one- and two-family dwellings, the code specifies a uniform live load of 40 pounds per square foot (40 psf) for "rooms other than sleeping rooms (bedrooms)" and decks. The code also specifies minimum uniform loads of 30 psf for sleeping rooms (which are unlikely to experience live loads as big as, say, the living room), 20 psf for uninhabited attic spaces, and 50 psf for "passenger vehicle garage" floors.

Note that some of the engineered-wood-product design software on the market uses the commercial code values. So if you use that software to calculate floor framing, the result will be a more conservative design that incorporates more-robust framing members.

The key phrase here is "minimum requirements." If you or your client wants to install special equipment, such as a large hot tub, that may be particularly heavy, it would be advisable to consult with an engineer to have the floor framing sized appropriately.

For long joist spans, deflection is often the primary factor controlling the design. Accounting for deflection can result in deeper sections (larger joists) to maintain code-prescribed deflection limits. And while the prescriptive building code does take deflection into consideration (as do canned programs used by lumber suppliers), other factors, such as floor vibration and long-term creep, must also be taken into consideration for larger joist spans. Creep is a permanent sag or deflection that can develop in floor framing members after having sustained weight on them for a long period of time. Similarly, large open rooms (with long joist spans) can have multiple uses that may create vibration concerns. A person sitting quietly may be annoyed by someone else's exercising activity on the same floor.

These more subtle, but equally important, issues are not spelled out in the code, however. If there is ever any question whether a particular design will be adequate for handling all the loads it needs to, consult an engineer.

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Reverse Board-And-Batten Siding

BY TED CUSHMAN

Since last fall, *JLC* has been following the work on a unique architect-designed custom home on Peaks Island, an off-shore neighborhood in the Portland, Maine, harbor. The building's unconventional form and its ambitious high-performance energy goals have posed one challenge after another for lead carpenter Mark Pollard and his crew at Thompson Johnson Woodworks. This month, we take a look at the home's "reverse board-and-batten" exterior, hand-crafted from locally milled 1x6 rough-sawn white cedar.

For a reverse board-and-batten cladding, the thin battens are nailed onto the wall first, and the wider boards are nailed over them, so the battens are behind the gaps **(1, 2)**. The method creates an ample space between the siding and the weather resistive barrier, for enhanced drying ability—a significant concern in this deep, superinsulated wall assembly **(3)**.

Photos by Mark Pollard

PERFORMANCE—AND LOOKS

Unlike conventional board-and-batten siding—where boards are fastened directly to the wall, and battens are nailed over the gap between the boards—with this technique, the narrow battens are applied first, and the wide boards are nailed on second.

"We were hashing out ideas in a design meeting with the architects [Portland-based Kaplan Thompson Architects], talking about types of siding," Pollard explains. "First it was vertical shiplap, then it was regular board and batten, and finally we decided on reverse board and batten because of the extra airflow that it would provide behind the siding."

By holding the wide boards an inch away from the wall, the battens would create air space behind the boards to help keep them dry and stable through seasonal weather changes. But Pollard adds, "The architects immediately liked the way the reverse method would create a little, 5/16-inch visual gap between the board edges, for shadow lines."

LAYOUT AND FASTENING

Right off the bat, however, the building's high-performance wall system created complications for the siding application. The fat assembly consists of an inner 2x4 stud wall that's sheathed with Huber Zip System oriented strand board (OSB) sealed at the joints with Zip tape. Outboard of this airtight box are fastened vertically run wood I-joists, with airtight, vapor-open WrapShield IT weather-resistive barrier membrane (vaproshield.com) stapled over the I-joists to create

cavities for dense-blown cellulose insulation.

The original idea was to apply horizontal 1x3 strapping over the WrapShield and nail the vertical battens and boards to the strapping. Unfortunately, however, horizontal strapping couldn't contain the insulation. In an early test on a dormer cheek, says Pollard, the insulation blower popped all the staples and blew the membrane off the I-joists, forcing the fiber into adjacent bays and pillowing out the wall surface. So the team had to backtrack and nail a vertical 1x3 over each I-joist to firmly secure the membrane to the wall, then attach the horizontal strapping over the vertical strapping, creating the grid shown here. "The horizontal strapping is really just there for nailing for the siding," says Pollard, "but combined with the vertical strapping, it did help create a bigger air gap for drainability and drying."

With that problem solved, nailing the siding in place was relatively straightforward. But there were a few time-consuming wrinkles, says Pollard. "We made a story pole for layout," he explains. "And where we had multiple windows in a run of wall, we didn't want to end up with a skinny little 1/2-inch piece of the 1x6 running down the side of a window. We were always trying to shoot for at least one-third of a board next to the window jambs. So in some places we had to thin down five or six courses from roughly 6 inches to 5 3/4 inches, to try to grow that last board that would land against the window. Kind of like you might do with clapboards or shingles—you adjust so you can hit the tops and bottoms of the windows. But we were doing it with the sides of the windows."

VARIABLE MATERIAL

Thickness of the boards also turned out to be an issue, Pollard says. "The lumber company milled this wood at an inch and a quarter," he explains, "but the pieces shrank differently. We had some that shrank down to 1 3/16 inches, and some that shrank down to an inch, depending on whether the piece was vertical grain, rift sawn, or plain sawn." The reverse battens were ripped from the same 1x6 material, says Pollard—"so you had to be careful which reverse battens you put next to each other, because you could kick the 1x6 pretty heavily at an angle, if you weren't paying attention." Tall walls compounded the thickness problem, says Pollard: "We had to pay attention to the thickness of the battens and the thickness of the boards as we stacked them on top of each other."

"The work went more slowly than we expected because of all the nailing," adds Pollard. "Each reverse batten gets one nail per course of horizontal 1x3, and we alternated sides as we went up. And then when you nail the 1x6 on, it's two nails every 16 inches, all the way up the wall—and you have to be careful, because you want

At window heads, the crew applied pre-bent flashing, supplied by the roofing company and made with the same heavy-gauge steel as the roof **(4)**. Nylon insect screening and Roof Saver ridge-vent material were installed between the vertical battens (behind the horizonal batten) **(5)** to protect the air inlet from bugs. Then the screen was wrapped around and stapled to the horizontal batten **(6)**.

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those nails to visually line up. I bought 70,000 stainless steel ring-shank siding nails, and we used just over 50,000 by the time we were halfway done. It's a shocking amount of nailing."

DETAILING THE OPENINGS

The rainscreen system requires a way for any wind-blown rain that penetrates behind the siding to drain out, and for air to enter at the bottom and exit at the top for drying. Openings have to allow good airflow and drainage, but without letting bugs in. This makes for a complicated detail above windows and penetrations. The roofing company had supplied some pre-bent coated steel flashing, says Pollard: "We used the steel roofing material, and it was too heavy for our brake to handle." But Pollard did site-bend the ends of the flashing pieces after cutting them to length.

To flash above windows (see photos, page 18), the crew taped each piece of flashing to the WrapShield membrane, then caulked the tape joint for good measure. Then they applied insect screen to the wall and nailed the vertical strapping over the screening. Next they placed a piece of Roof Saver ridge-vent material, cut to fit, between the battens, then installed a piece of horizontal strapping over the Roof Saver, and finally folded the screen material under the opening and up onto the horizontal batten. The result is a screen-protected drain opening and air inlet behind the horizontal strapping.

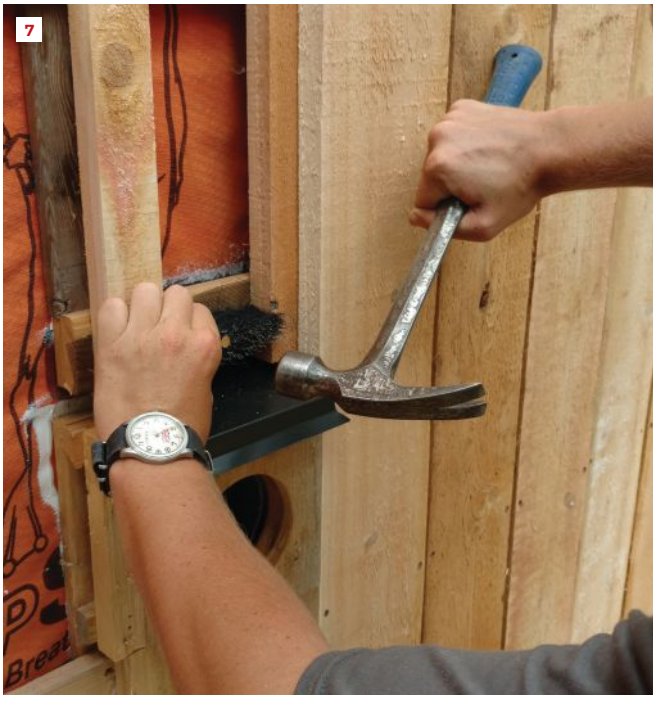
This still leaves another air opening to protect behind the full-width boards, between the reverse battens (right). At this gap, Pollard decided not to use screening, which might be visible through the small gap between boards. So the crew nailed small pieces of Roof Saver into the gaps, sized so that the material would get slightly compressed as the boards were nailed on.

None of these details, notes Pollard, were drawn on the architectural plans. But early on in the project, Pollard and his carpenters built a full-scale mockup of the whole wall assembly using the actual materials. The model included the floor-to-roof and roof-to-wall structural connections, and as the job progressed, the crew added siding details to the mockup.

CONNECTING TO THE SITE

As the project nears completion, the cladding system is serving an interesting design function: The rough material, applied in its distinctive way, is helping the building with its strikingly original forms to blend into its rustic setting on a back road on a wooded island. "At this point," says Pollard, "we can step back and look at it, and we're thinking, 'this is pretty cool.'"

Ted Cushman is a senior editor at JLC.



The reverse board-and-batten method creates a substantial air space behind the wood siding, allowing excellent seasonal drying potential. Air inlets behind the horizontal strapping are protected with screening. Gaps between the strapping are protected using Roof Saver vent material, but no screening **(7, 8)**, in order to keep screens from being visible at the spaces between boards.

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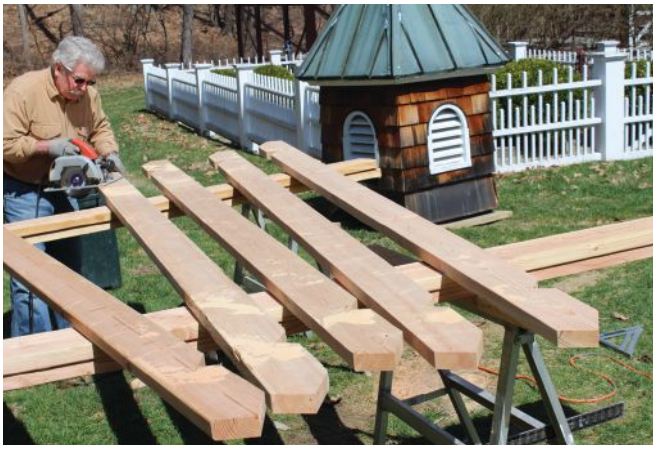

Fast Jack Rafter Layout and Cutting

BY DALE DIAMOND

Having been a builder for 45 years, I've learned a number of helpful framing tricks along the way. One such trick is a technique for framing hip roofs quickly—mainly, streamlining the process of laying out and cutting the jack rafters. My guess is that quite a few carpenters out there measure and install jack rafters individually after the hip rafters are placed. This is time-consuming and unnecessary. The following method will help increase your installation speed and reduce the amount of cutting and material waste when you are making jacks for a standard hip roof.

There are a couple of things to note up front. For one, you need to lay out the jack rafters on the plate at their proper centers so that you can determine their lengths ahead of time. You also need to verify the common-rafter length (I typically cut a couple of test commons and set them in place to make sure they fit). Once I've established the common rafter's length, I can set up a site bench and cut all the jacks and commons on the ground without a lot of measuring and head scratching.

Using a pattern made from a common rafter, I can quickly lay out all the jacks on my rafter stock. I trace and cut the birdsmouths and rafter tails on both ends of the rafter stock all at one time (see photo, top left). Then I make the hip plumb cuts, where one cut results in two jack rafters (see photo, center left). This system works whether you're building a small hip roof, like this one, or a monster roof with 40-foot-long hips and valleys.

A pool-house renovation I recently worked on gave me the opportunity to demonstrate this method on a small scale. My company added a second floor and hip roof to an existing one-story pool house. The hip roof is framed with 2x6 common and jack rafters on 16-inch centers and with 2x8 hips and ridge (see photo, bottom left). Starting out, I needed to adjust the run and length of the common rafters based on the thickness of the ridge (see illustrations on page 24). From there, we laid out and marked the rafter stock (see illustrations on pages 26 and 28).

Cutting the jacks. With the first group of 2x6s marked (one group includes enough material to frame one corner of the hip roof), we repeated the process on the remaining three groups, after which I was ready to cut all my stock. I lined up the 20 2x6s on my site bench

text continues on page 28

Photos and illustrations by Tim Healey

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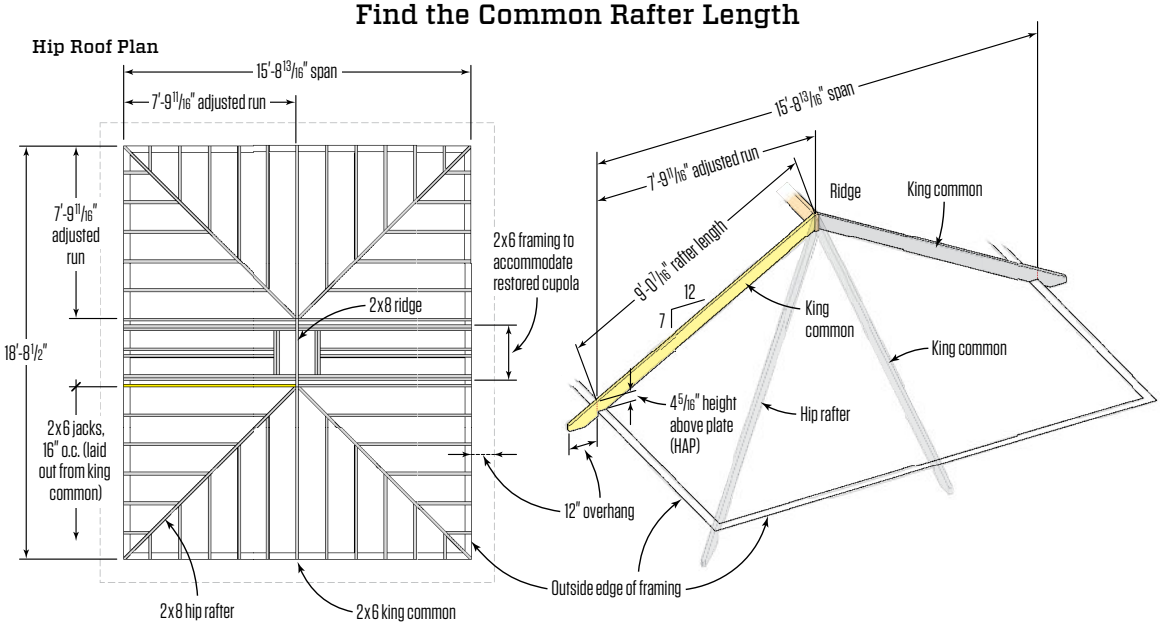
Find the Common Rafter Length



Determine Adjusted Run

15'-8 13/16" (span) – 1 1/2" (ridge thickness) = 15'-7 5/16" (adjusted overall run)

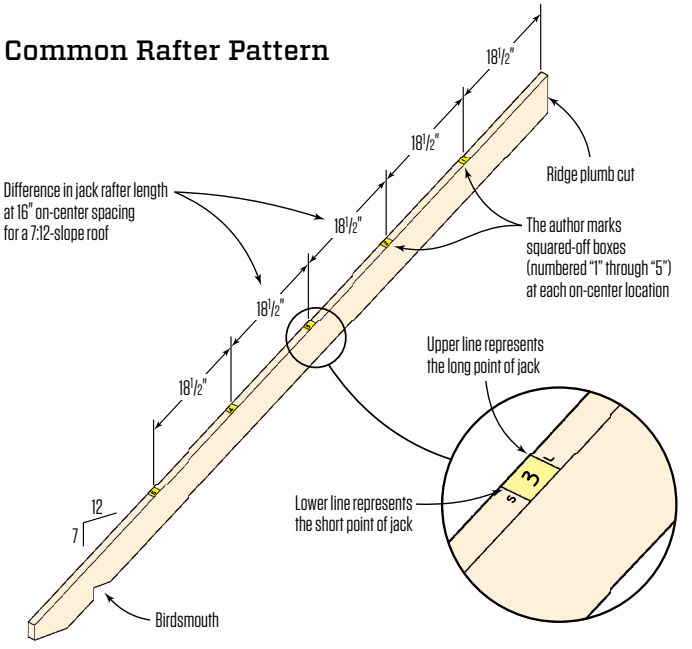
15'-7 5/16" ÷ 2 = 7'-9 11/16" (adjusted run)

Calculate the Common Rafter Length

On the Construction Master, punch in the following sequence:

7 Feet 9 Inch 11 / 16 Run 7 Inch Pitch Diag = 9'-0 7/16" (rafter length)

Common Rafter Pattern



After finding the adjusted common rafter length (see calculations, above), the author marks and cuts the ridge, birdsmouth, and rafter tail on a 12'-long 2x6 for his rafter pattern. Using the scale on a framing square, he finds that the difference in length between 16"-o.c. jacks for a 7:12-slope roof is 18 1/2". Starting at the lower end of the rafter, he marks 18 1/2" centers—18 1/2", 37", 55 1/2", and so on—along one edge of the pattern rafter. At each measurement, he marks the long and short points for the jacks (see inset, left), and then numbers each layout "1" through "5," for the five jacks that will make up one side of a corner of this hip roof.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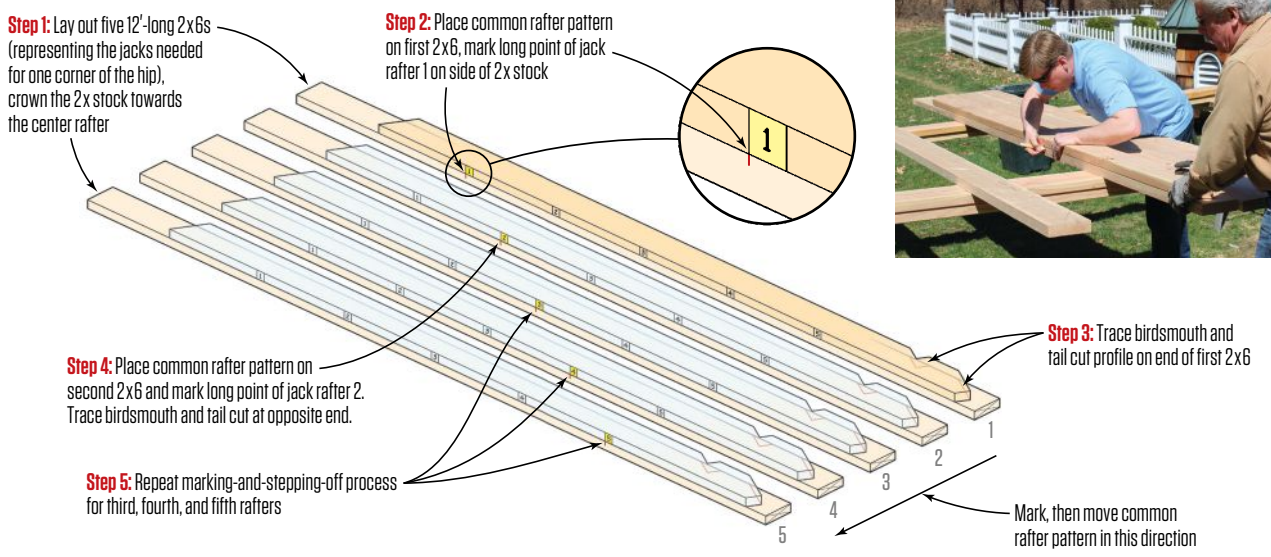
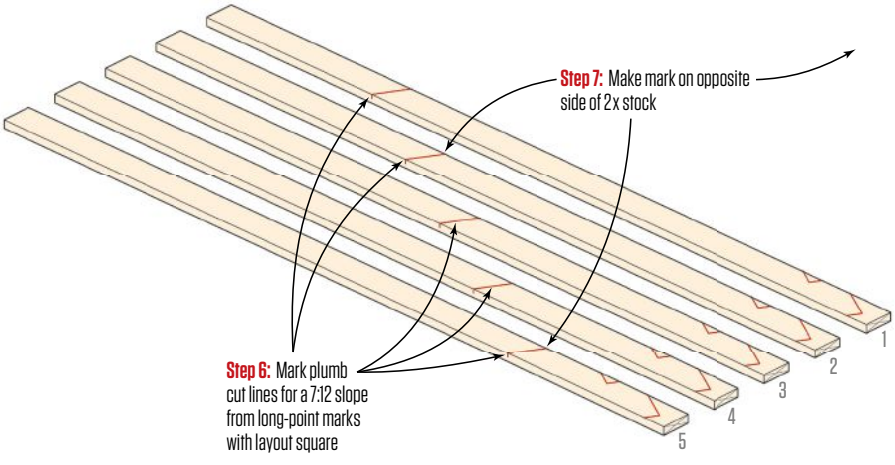
Mark 2x6 Stock With Rafter Pattern



The author and his son, Kyle, then lay out five 2x6s for the jacks for one corner of the hip. To minimize any bow in the rafters, they face the crowns of the stock towards the middle 2x6, the center rafter being the straightest one. Using the rafter pattern on the first piece of 2-by stock, Kyle marks the long point for the first jack rafter, while the author marks the birdsmouth and rafter tail. Moving down the line, they mark the remaining rafters: long point "2" on the second 2x6; long point "3" on the third, and so on. In the photo, Kyle Diamond marks long point "4" on the fourth 2-by, while the author traces the birdsmouth and tail cuts.

Mark Plumb Cut Lines



Holding a layout square at a 7:12 angle, the author draws lines representing the long-point plumb cuts where the jacks will meet the hip. He then carries those lines onto the opposite edge of the rafter stock to line up the rafter pattern for the next step of the layout process.

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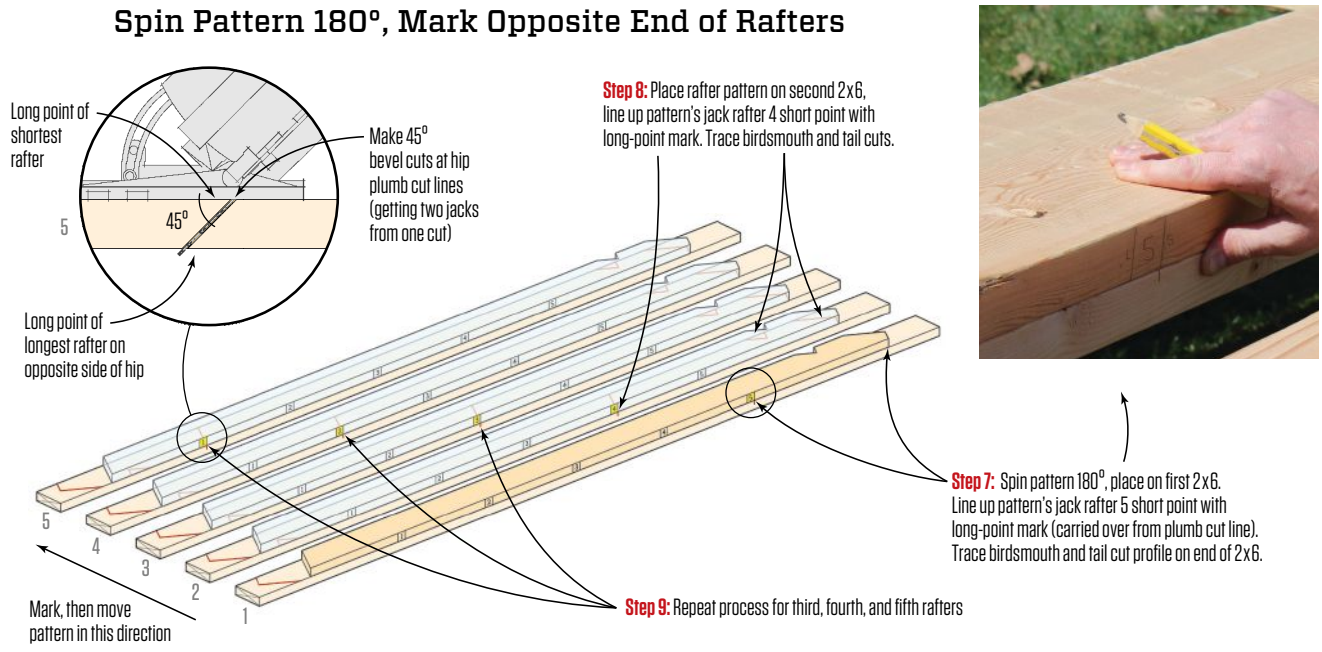

With the rafter pattern spun 180°, the team starts with the first 2x6 in the group. Kyle holds the pattern with the short point of jack rafter "5" aligned with the long-point mark carried over from the plumb cut line of jack rafter "1." The author then traces the birdsmouth and rafter tail on the opposite end of the stock. Working down the line of rafter stock, they line up and mark the remaining four rafters. With this method, each piece of stock yields two jack rafters with only one plumb cut needed for each pair.

(being careful to keep the four groups together) and cut all the birdsmouths and tails on one side, then on the opposite side. I made my 45° bevel cuts last, getting two jacks from one cut: From the first 2x6, I got the longest jack for one side of the hip and the shortest for the opposite side; from the second 2x6, the second-longest jack and the second-shortest, and so on, stacking the two sides of the hip in two separate piles.

If you have a crew, they can be setting the ridge and hip rafters while a guy down on the bench (in this case, me) is preparing jack rafters and supplying them all their pieces to fill in the gaps. On big roofs, I typically show up on site a few days earlier and start cutting so when my guys are ready to frame the roof, they have plenty of commons and jacks ready to go (see photo, left). Finally, as a cautionary note, if you miss any of the steps I outlined in this article, you will be out of luck. My advice is to start out on a small roof to get the hang of it. My hope is you'll find this fairly simple technique saves you a ton of time—and money—framing hips.

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

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STAY CONNECTED

BY TED CUSHMAN

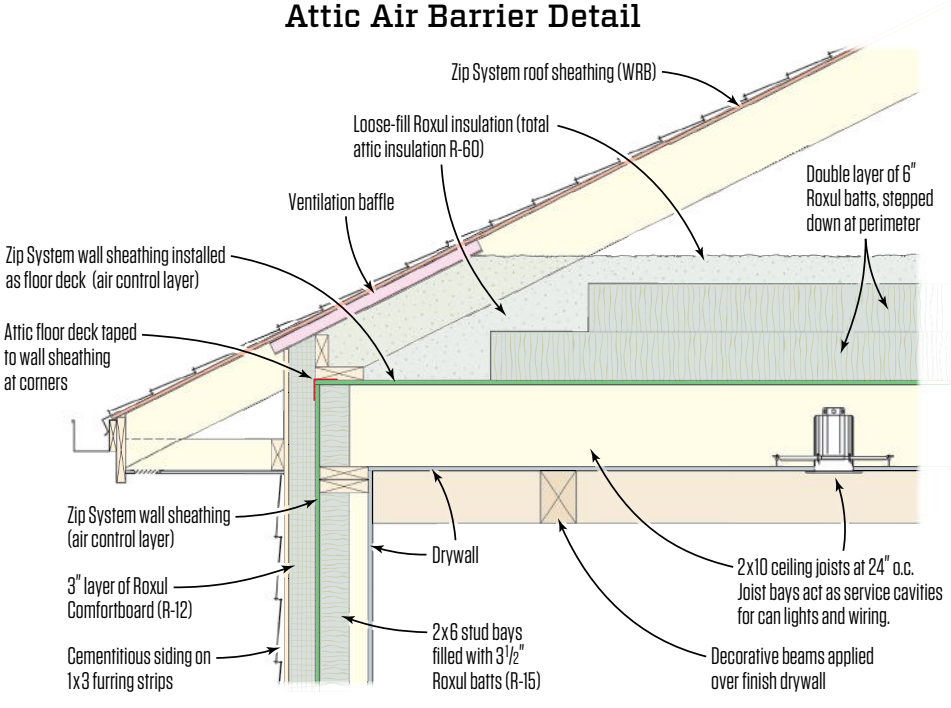
An Airtight Lid (the Easy Way)

Conventional vented attics are one of the most obvious places to increase insulation values: Once you're set up to blow fiber into the attic, piling the material a little deeper is easy.

Air-sealing is a different story, though. The drywall ceiling below a vented attic is usually perforated by ceiling light fixtures, bathroom vent fans, plumbing vents, and wiring penetrations at partition wall plates. When you're working from above, the attic floor can be one of the most complicated and laborious locations to air-seal in the entire house.

So while the air control layer and the thermal control layer for the whole envelope should, in principle, line up, putting that principle into practice in the attic can be a tedious, time-consuming pain in the neck—and, perhaps for that reason, is often accomplished imperfectly, at best.

Architect Chris Laumer-Giddens, of LG Squared, says he has a simpler way to build an airtight lid. Last year, Laumer-Giddens designed a 2,700-square-foot high-performance home in the western North Carolina mountains. To construct the ventilated attic for the house, builder Brett



The stick-framed ceiling assembly allows a continuous insulation layer that aligns perfectly with a fully sealed air barrier, isolating the living space below from the unconditioned, fully ventilated attic above.

Illustration by Tim Healey

The Zip System sheathing on the attic floor creates a tight air seal **(1)**. The stick-framed-attic volume is reserved for blown cellulose insulation, with no storage or equipment; here, the architect and builder discuss the ventilation strategy while they still have access to the space **(2)**. Beneath the attic floor, the 2x10 joist cavities provide a convenient service chase that easily holds recessed lighting fixtures inboard of the air barrier **(3)**. Continuous exterior insulation boosts the wall R-value **(4)**.

Murphy built a joist system on top of the second-story walls just as you might frame a second-story floor deck, using 2x10 lumber. Murphy decked the floor with Zip System sheathing, then stick-framed the roof above that solid platform (see photos, above).

The result is a near-perfect air barrier for the attic, with an ample service cavity below it for can lights and wiring. As a side benefit, Laumer-Giddens says, "During construction, the framers were almost giddy about how this platform made their job of stick-framing the roof so much easier."

The home's wall system integrates neatly into the attic floor (see Attic Air Barrier Detail, previous page) simply by taping the Zip System wall sheathing to the attic floor's Zip System deck. Outboard of the taped sheathing, the walls received a 3-inch (R-12) layer of Roxul rock wool; the stud bays are insulated with R-15 Roxul batts, for a wall system R-value of about R-27.

Laumer-Giddens specified R-60 Roxul insulation (a layer of batts topped with blown fiber) for the attic, but he says, "Once they got in there with the blower, I think they probably got closer to R-80." The near-perfect wall and lid air control layer helped the house score a blower-door test of 0.5 ACH50 before insulation and drywall. The final blower-door number was even better: 0.25 ACH50. Laumer-Giddens plans to perform another blower-door test in six months, to verify that the house is staying tight, with another follow-up test a year after that.

The home heats and cools with a single 2-ton ducted mini-split heat pump, with all ductwork kept within the conditioned space. And after living there through one full winter and most of a summer, the homeowner reports electric bills of less than $100 a month.

Ted Cushman is a senior editor at JLC.

Photos: 1 & 2, Noel Hardin; 3 & 4, Chris Laumer-Giddens

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BY MELANIE HODGDON

Hiring a Bookkeeper

Not long ago, a client and I were discussing his search for a bookkeeper for his company. He had considered his accountant (whom we eliminated because he was expensive and tax-preparation oriented and because he lacked knowledge about the special accounting needs of a contractor) and a friend who was trustworthy but lacked the discipline and temperament to be consistent and precise when entering data.

This client uses QuickBooks for his accounting, and his next (and logical) impulse was to look for a QuickBooks expert. Since I am a QuickBooks consultant, my warning against doing this might have seemed counterintuitive. But here's the reasoning, which applies to hiring *any* employee for any position: Unless the candidate is well-versed in carrying out tasks in a way that's appropriate for your type of company, the person's experience may not serve your best interests.

For example, a candidate may have 15 years of experience in QuickBooks, but that experience may have been in the context of retail companies, whose requirements for data entry are different from those of a contractor. Hiring such a person and turning him or her loose on your books without providing indoctrination in your company's special requirements would be a disaster. It's all but certain that person will provide inappropriate job costing and incorporate bookkeeping practices that don't meet your company's needs.

The problem is that self-proclaimed "experts" are likely to be hesitant to ask procedural questions. They have promoted themselves by claiming to know how to handle this stuff. The temptation will be to either treat your company's transactions in a manner similar to the way in which they led the last company's transactions, or create their own solutions without fully understanding the kind of reporting your company requires. Experts often feel that asking how to do something will erode confidence in their ability.

"But that's prideful and borderline delusional," my client remarked, and noted that he'd recently needed to fire an employee who refused to admit that he did not know how to install flashing correctly. Despite having been instructed verbally and provided with written instructions, the guy still did it wrong. In that case, since he'd been told how to perform a task correctly but persisted in doing it his way (incorrectly) and refused to acknowledge that his way didn't work, "prideful and delusional" seem accurate. This, however, is not the same as ignorance. If an employee doesn't know what he or she doesn't know, doing something "his or her way" instead of "the company way" is something you can work with. The person still may be trainable.

Consider how many contractors a few years ago didn't know much about the RRP regulations. They continued to scrape and sand lead-based paint the same way they had been doing for the past decade, letting it fall on the ground or blow into the neighbor's kids' sandbox without knowing they were now in violation. This wasn't pride; this was simply ignorance and is completely different from a contractor knowingly violating the rules because he thought he could get away with it.

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Be clear with new hires about not only what tasks they must perform but also how to do those tasks the "company way." This applies to entering data and fielding phone calls as much as it does to flashing a window or cleaning up paint chips.

When making any new hire, bear in mind that a person probably feels qualified to perform the tasks in the job description. It's your job to make it clear that a new hire not only needs to perform certain tasks but also needs to get them done in "the company way." This applies to entering data and fielding calls from new prospects as much as it does to flashing a window or cleaning up paint chips.

SOME HIRING TIPS

- **An open attitude** is more important than specific accounting skills or expertise in a given software program. Ask candidates what they enjoyed the most and least about their previous job. For example, if a candidate reports enjoying the challenge of handling many different tasks, or comments that repetitive tasks are boring, beware of hiring that person to perform the same tasks day in and day out.
- **Ask questions** about how candidates handled a challenge in their last position. Did they consult a software manual? Google an answer? Call up the last bookkeeper? Consult with other staff? Go straight to the owner? Make up their own solution? This will give you a sense of a candidate's commitment to finding a solution as well as his or her willingness to seek help. Remember, autonomy and self-motivation are great up to a point, but if these traits get in the way of seeking assistance when needed, you may wind up with some "creative" solutions that will impair your data file or fail to conform to generally accepted accounting principles (or your company's procedures).
- **Ask candidates** about the greatest contribution they made at their last job.
- **Invite candidates** to provide a "must have" list of training requirements that they would need from you in order to perform an excellent job. Details are important here because they reveal the candidates' expectations and allow you to gauge the degree of importance the candidates place on company procedures and culture.
- **Ask** whether candidates feel more energized or efficient when working alone or as part of a team. As a follow-up, find out who they consider to be their team members. Does the team include just the office staff? The owner? Production staff?
- **Ask** candidates to describe their perfect working conditions. Do they enjoy being in a large room with chatty co-workers? Can they handle ringing phones or noise from the shop next door? Do they like the radio on or want to be alone in an office with the door shut? If your office environment can't provide what they need to be effective, it's best to find that out before you hire them.

A trial period will give you the opportunity to provide specialized training (in the form of mentoring or documented procedures). Appropriate candidates should quickly learn the party line; those who persist in doing things their way despite training and correction need to be let go.

Melanie Hodgdon, president of Business Systems Management, provides management consulting and coaching for contractors.

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BY MARK PARLEE

How to Destroy a Wall In Two Easy Steps

I was recently called to a home in Grinnell, Iowa, to investigate a water stain on the interior drywall. The stain was a harmless-looking discoloration of the paint at the top of one wall, but it roughly lined up on the exterior with a roof-wall intersection that didn't have a kick-out flashing. It was easy to guess what was causing the problem. What wasn't clear was the extent of damage.

There was little evidence on the outside of the building of a significant problem **(1)**. The exterior cladding consisted of vinyl siding covering the second-story walls, and manufactured stone covering the first-floor walls. Both claddings are incredibly resilient. This particular stone was varicolored with highlights that completely hid any efflorescence (the leaching of minerals onto the surface of masonry) that would have been a sure sign of water problems. But I didn't need to see damage on the outside of the cladding to know that there could be damage behind it. Installing kick-out flashings poorly—or not installing them at all—is a common mistake that allows bulk water into the wall cavity. There was no question in my mind we had to open up the wall to investigate further.

As soon as we started to take apart the wall, we found a good-quality drainage mat over a weather barrier **(2)**. That was a good sign. In theory, this dimpled mat would create a capillary break to interrupt the flow of water through the porous masonry cladding and allow it to flow down through the drainage mat and out the bottom of the wall. Nevertheless, behind these products, the OSB sheathing was rotten **(3)**. This was not too surprising given the lack of a kick out to divert the water. Even with a good drainage plane, the amount of water draining off a roof can overwhelm a drainage system and soak the sheathing.

From the outside of the home, there was little damage evident, certainly nothing that indicated that this single section of wall would eventually require $4,000 to $6,000 in repairs.


3


4


5


6


7

In this case, the bottom channel on the vinyl siding above the roof was acting like a tiny gutter to collect water flowing down the wall and surgically inject it onto the top edge of the frieze board that divided the vinyl and manufactured-stone sections of the wall **(4)**. There was no Z-flashing on this frieze board, either, so chances were high that a significant amount of that water was draining to the back of the frieze and soaking the OSB from above. The drainage mat started below this frieze board, so it wasn't providing any help.

At this point, everything seemed predictable, and I was still hopeful at first that the damage would be fairly well contained, perhaps to just the area on the opposite side of the water stain. But as it turned out, there's more to this story than just missing kick-out flashing.

We continued to take the wall apart, stripping the stone back and hoping to come to the end of the rot **(5)**. No such luck. We opened up the entire wall without finding any solid sheathing **(6)**. The worst rot was at the base of the wall **(7)**, illustrating clearly why details matter.

A wonderful drainage mat turns out to be a complete waste of money if you leave out weeps at the base of the wall. There was nothing like that in this wall. By not creating a way for water to drain out the bottom of the drainage mat, the builder succeeded only in creating a larger reservoir (larger than the manufactured stone itself) to hold all the water that drained down the wall. That water then backed up, easily leaking through the overlaps in the drainage mat and weather barrier and soaking the OSB. Moreover, without a kick-out flashing, he succeeded in creating a tremendously large source of water to feed his reservoir.

The repair would not be complicated. We needed to tear out and replace all the rotten sheathing and replace all the same elements of the exterior cladding system. This time, however, we would include the two missing elements: a weep screed at the base of the wall, and a kick-out flashing at the base of the roof-wall intersection. In this case, the kick out would need to be installed behind the vinyl J-bead so any water running down that "mini gutter" would be diverted into the roof gutter.

Mark Parlee, a building-envelope consultant and builder in Urbandale, Iowa, specializes in exterior renovations and envelope solutions.

All photos by Mark Parlee

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Foundation Waterproofing That Works

An effective system—one that prevents a wet basement—relies on three key components

BY MATT RISINGER

One of the worst phone calls you can get as a builder is the one from a client calling to say he has water in the basement. We do everything we can before backfilling a foundation to avoid getting this call. Of course, an effective foundation waterproofing system costs more up-front. But compared with having to return to the site, excavate the entire foundation, and fix the problem, the up-front cost is a bargain. Add in the loss of reputation and all the hard feelings you're going to have with the client, and the cost of doing it right from the beginning is negligible.

In this article, I will focus on the three components of an effective foundation waterproofing system and discuss some of the products that I rely on for keeping basements dry.

BLACK GOO DOESN'T CUT IT

In the old days, the go-to foundation waterproofing was an asphalt-based, black, nasty goo. That material is a byproduct of oil refining and is actually not considered "waterproofing" but only "dampproofing." Asphalt goo can't block bulk water that builds up against a foundation; it can only prevent the moisture from damp soil from seeping into concrete. As soon as that moisture accumulates and saturates the soil, it builds hydrostatic pressure that can drive the water right through asphalt dampproofing.

Effective foundation waterproofing is more than just one product; it's a system with three critical components: a membrane to protect the concrete; a drainage mat to relieve hydrostatic pressure

Photos by Matt Risinger

and allow water to drain down, instead of in; and a French drain at the footing level to carry water to a daylight drain or to a sump pump.

FIRST LINE OF DEFENSE

In the order of building, the first component in the system is a true waterproofing material applied to the surface of the foundation walls. This can be a liquid-applied coating or a peel-and-stick membrane.

Liquid-applied membrane. Newer-generation liquid-applied materials that use SBR (styrene-butadiene rubber) are specifically designed for waterproofing concrete. They function as true waterproofing because they are completely insoluble in water and can resist hydrostatic pressure (although we do want to limit this pressure, as I'll explain further on). The material is spray-applied as a liquid, so it goes on as a continuous, monolithic membrane. At critical areas—transitions between the footer and the foundation wall, inside corners, or pipe penetrations—a liquid material perfectly conforms to surface variations without a lot of fancy origami.

There are a number of waterproofing products formulated for concrete walls. A builder friend of mine, Brian Long, swears by Poly Wall's Home Stretch Liquid, a synthetic rubber product that has been used in the commercial market for more than two decades but has only recently been introduced to the residential market.

The first step in applying this material is to inspect the surface of the walls and fill any large voids with mortar **(1)**. Smaller voids are OK; the rubber will fill them. But larger imperfections will fill unevenly and create a weak spot in the monolithic surface.

All through-wall penetrations **(2)** and the cold joint between the footing and the wall **(3)** are critical areas that need a heavy bead of sealant, such as Poly Wall's 2200 sealant, first. The sealant should be


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tooled to ensure good adhesion and complete coverage **(4)**.

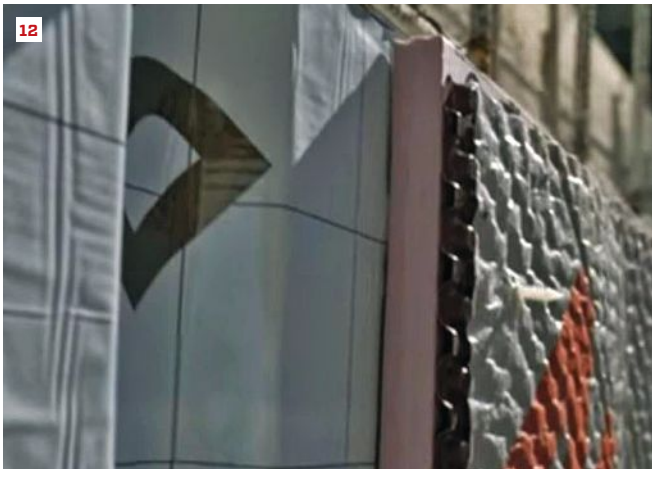
You can roll on a liquid-applied membrane, but Brian Long likes to spray it on the wall **(5)**. Spraying is faster and makes it easier to control the thickness. He has a crew member follow with a roller to even out the laps **(6)**.

The material is sprayed on to a 60-mil thickness **(7)**, which dries to a 30-mil, one-piece, no-seam finish. The crew uses a hydraulic Graco 733 sprayer and periodically checks the thickness as they work. One nice thing with the sprayers: You can leave material in the machine for up to two weeks, which gives you the ability to return to a single job on multiple days without a lot of heavy clean-up.

After the membrane is applied, Long's crew checks the surface of the membrane and deals with any imperfections, using the 2200 sealant to fill in any holes, pock mocks, or places there isn't complete coverage **(8)**. This step may seem incredibly picky. But again, compared with dealing with an unhappy client, it is time well-spent.

Peel-and-stick membranes offer an excellent waterproofing alternative. I have had good experiences with the Cosella-Dorken Delta system. It starts with ColdJoint Barrier—a 40-mil-thick membrane that is applied to the horizontal ledge of the footing and up the wall for about a foot to protect that critical footing joint **(9)**. The vertical leg of the ColdJoint Barrier is overlapped by the Delta-Thene, Cosella-Dorken's foundation wall membrane **(10)**, a 40-mil-thick peel-and-stick product that's about 3 feet wide. We run the membrane vertically. Like almost all membrane products applied over concrete, Delta-Thene and ColdJoint Barrier require that a primer be rolled on first. We then pull the backing off the membrane to apply it, creating an adhesive-to-adhesive bond that holds tenaciously.

Over the waterproofing membrane, we add an insulation layer. Here in Austin, we need only one inch of foam; in northern regions



you'd need more, of course. A nice feature of the Delta system is the plastic stab anchors it provides for installing the insulation. The anchors have a peel-and-stick adhesive that bonds them to the surface of the Delta-Thene **(11)**. With these in place, all we have to do is push the insulation on to hold it in place. We can use the same anchors to install the drainage mat. Most important is that we end up with no penetrations through the waterproofing membrane.

DRAIN DOWN

After applying a waterproofing to the foundation, a lot of builders think the job is done and move directly to backfilling. But by doing so, you are allowing water to back up directly against the membrane, where it might find an imperfection and create a leak.

The ideal way to solve this is to put a drain board over the membrane. The primary purpose of this drain board is to provide an air gap so that water running towards the foundation hits that gap and flows down to the footing drains. Think of the gap as a pressure relief valve. If there is an open gap, water pressure can't easily build up against the foundation.

Secondarily, the drain board protects the waterproofing membrane against rocks or road base or whatever you are using as a backfill material.

I've used Delta-Drain, a dimple mat from Cosella-Dorken. Like most drain boards, it's covered with a filter fabric that keeps soil from clogging the gap. The boards run vertically and are installed over the insulation using the same stab anchors mentioned above **(12)**.

Poly Wall's Arroyo drain board works well, too. It comes with a unique layout of dimples, with larger ones at the bottom of a 2-foot-wide starter course, and smaller dimples at the top of the section that mesh with the dimples of the next, 4-foot-wide course.

Long's crew installs the Arroyo product using a spray contact adhesive that they apply to the board's back **(13)** and to the wall. They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allow the adhesive to flash off, the way you would with a countertop adhesive, and then apply the board to the wall **(14)**. It sticks tenaciously, and there's no need for fasteners that would make penetrations through the water barrier. At corners, the crew scores the back to break cleanly and fold over the corner **(15)**. You don't want to cut the filter fabric anywhere. The fabric at edges runs long so you can stretch it over the course above or around a corner. You want to maintain an unbroken, uniform fabric surface to keep any sediment from getting in and clogging the spaces created by the dimples.

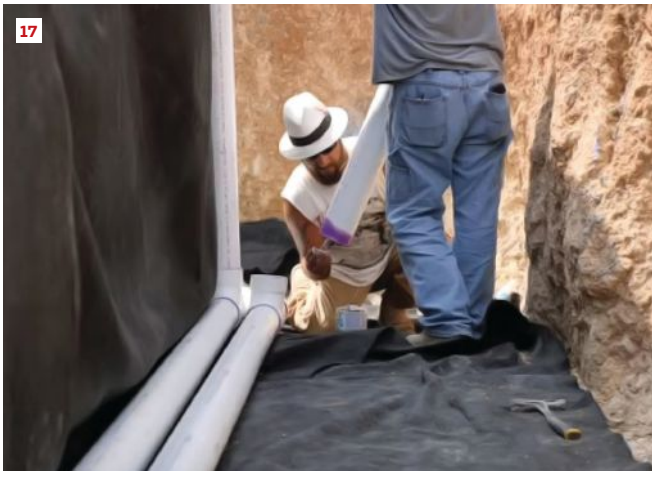
Arroyo drain boards run horizontally, so you can install them in lifts, backfilling as you go. This makes it easier on the crew, because they do not need to reach up the entire height of a tall wall.

The Arroyo system offers an outlet system **(16)** that works if you are not using a traditional French drain. The outlets tie right into the drain board and allow you to tie in a solid pipe to drain water out directly from the boards.

DRAIN OUT

Any foundation waterproofing system that protects the foundation from water and relieves hydrostatic pressure needs a third critical component: a way to drain out. We always install a traditional French drain system—a standard that Americans have been using for generations on houses. This consists of a drain pipe that is run in a bed of rock. We typically use 4-inch Schedule 40. We have found that Schedule 20 can collapse (and the corrugated black pipe seems essentially worthless), so it's worth going with the thicker-walled PVC pipe. The holes are predrilled and always face downward. The perimeter pipe is covered with a coarse gravel or septic rock that must be separated from the surrounding soil with filter fabric to prevent soil from clogging the rock.

A conventional footing drain uses a single pipe around the perimeter and a filter sock, but the sock limits the volume of stone that you can install to provide drainage.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Long takes the French drain to whole new level, using two pipes (see photo on page 43), each with a clean out that he installs at every corner **(17)**. If a problem ever occurs with the drain system, it will be easy to run a snake down to free up a clog.

Around the perimeter of the footing, Long pours gravel over the twin drain pipes into what he calls a "drainage burrito," starting with a wide piece of filter fabric running up the wall and onto the bottom of the excavation. He lays in the drain pipes and covers them with a healthy amount of septic rock. He then applies spray adhesive along one edge of the filter fabric **(18)** and pulls the fabric over the rock, adhering the edge to the fabric draped up the wall **(19)**. On top of this, he comes in with another layer of filter fabric and then covers that with another layer of filter fabric **(20)**. This double layer of rock and fabric ensures that he doesn't allow any sediment inside the drain; the house shown in the photos is in a part of Texas that has a fine caliche that is adept at finding its way inside a drain, so Long needed to be meticulous about how he detailed the fabric.

In many of the houses that I build, we run a second French drain around the inside of the footing as well. The inside drainage and the outside drainage are connected by short sections of Schedule 40 every 8 to 10 feet that run crosswise through the footing. This provides a nice failsafe: If one section of the drain fails, water can bypass to the interior or exterior path and still get out.

On a hilly site, it is usually easy to run the perimeter drain to daylight, but in most cases we run it to a sump pump. Sump pumps tend to fail during heavy rains from working overtime, however, or stop when the power goes out. Because that is not when you want to be without a working sump pump, we always include a secondary pump wired into the system with a battery backup.

Matt Risinger owns Risinger & Co., in Austin, Texas.


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Photo: Colorado Springs Fire Department

Living With Wildfire

Builders learn the lessons of life on the edge of the wilderness

BY TED CUSHMAN

When the Waldo Canyon wildfire roared into Colorado Springs in 2012, destroying a record 346 dwellings in a matter of hours, it was a disaster. But it wasn't exactly a surprise—at least, not to Colorado Springs Fire Marshal Brett Lacey.

Colorado Springs, Lacey told *JLC* in a conversation last month, has a long history with wildfire. In 1950, a fire that started in a slash pile created during construction of a golf course got out of control, killing 10 firefighters. In 2002, the so-called Hayman Fire, which burned for three weeks and destroyed 133 homes, "made a 19-mile run in one day," said Lacey. "It never hit the City of Colorado Springs, but it was hugely visible from the city, and ash was dropping down all over town."

After the Hayman Fire, Colorado Springs banned wood-shake roofs for new homes and re-roofs. And immediately after the Waldo Canyon fire, Lacey convened a task force including builders and homeowners to craft "Appendix K," an amendment to the city's fire code that required "Firewise" vegetation management techniques, as well as a number of fire-resistant construction details, for rebuilding in the city's Hillside Overlay zone (a previously existing zone that encompasses much of the burn area).

But then, just a year later, wildfire struck again: The so-called

Black Forest fire burned another 500 structures in wooded country just outside the city—a new record, but one that Lacey said won't stand. "I have a whole other section of town that is going to burn one day," Lacey said, "and we are going to suffer big losses, because they are older homes from the 1950s and 1940s, with heavy vegetation. It will be much less severe because of our mitigation efforts and because of the awareness, but we are still going to get hit pretty hard."

When that happens, said Lacey, the new Appendix K requirements will govern the rebuilding—just as they do today in the fire-ravaged neighborhood known as Mountain Shadows (now almost completely rebuilt), where the Waldo Canyon fire did its worst damage. In the meantime, the fire service is working with owners of existing homes throughout the vulnerable parts of town to tackle the risks created by underbrush and trees—or, as firefighters call them, "fuel."

HOW HOMES CATCH FIRE

Regular house fires have a few well-known typical causes. Cooking equipment started 46% of ordinary house fires between 2010 and 2015, according to National Fire Protection Association (NFPA) statistics; heating equipment started 16%, wiring and lighting started 9%, arson caused 8%, and smoking caused 5%.

Similarly, when wildfires set fire to homes, there are a few well-known ignition pathways. In the Waldo Canyon fire, according to Colorado Springs Fire Department investigators, 54% of structure ignitions were caused by windblown firebrands and embers. "Vegetation exposure"—that is, burning trees and brush near buildings—caused 22%. "Structural exposure"—that is, house-to-house fire transmission—caused 16%. Only 8% of the house fires were directly caused by the wildfire flame front itself.

Experts have seen a similar pattern in previous wildfires around the country. Typically, windblown embers—which can fly for a mile or more in a high wind—are the biggest danger to homes. Sometimes the embers land on a roof or collect in a gutter or valley, setting fire to accumulated leaves or pine needles. Sometimes they pile up at the base of a house wall, then ignite siding or the exposed bottom edge of sheathing. Sometimes, heat from burning trees or neighboring houses shatters windows, and embers blow into the house and set furniture or curtains on fire. And very typically, embers get sucked into soffit or gable-end roof vents, igniting the attic and burning the home from the top down.

While forest fires can produce a lot of flying embers, a house on fire actually produces far more, and for a longer period of time. In a conflagration like the Waldo Canyon fire in Mountain Shadows, every house that catches fire multiplies the risk to its neighbors. Conversely, every house that successfully resists ignition reduces the risk to other houses—not just next door, but for miles around. The measures put in place in Colorado Springs after the Waldo Canyon fire aim to ratchet down the domino effect so typical of major conflagrations, as fire departments run out of manpower and multiple structure fires begin to spread unchecked. The idea is to create not just resilient homes, but resilient neighborhoods—and to give firefighters a fighting chance at success.

New housing developments in the Colorado Springs wildland-urban interface (WUI) zone must feature "defensible space"—with sparse, pruned vegetation—to prevent the rapid spread of fire. In existing neighborhoods, the fire service is advising homeowners to maintain their properties in a similar way. Top, an arborist with Front Range Arborists clears an overhanging birch tree away from an older house. Bottom, arborist Jason Sharp educates a property owner about her choices.

Photo: Colorado Springs Fire Department

Appropriate pruning and thinning of trees and shrubs near a home helps firefighters suppress fire as the wildfire front approaches the structure. Above, a Colorado Springs firefighter successfully defends a house during the 2013 Black Forest fire, which destroyed more than 500 homes. The truck and crew worked for hours at this location, carefully rationing their limited water supply, but saving the home as the flames crept along the ground through the area.

Photo: Colorado Springs Fire Department

CREATING DEFENSIBLE SPACE

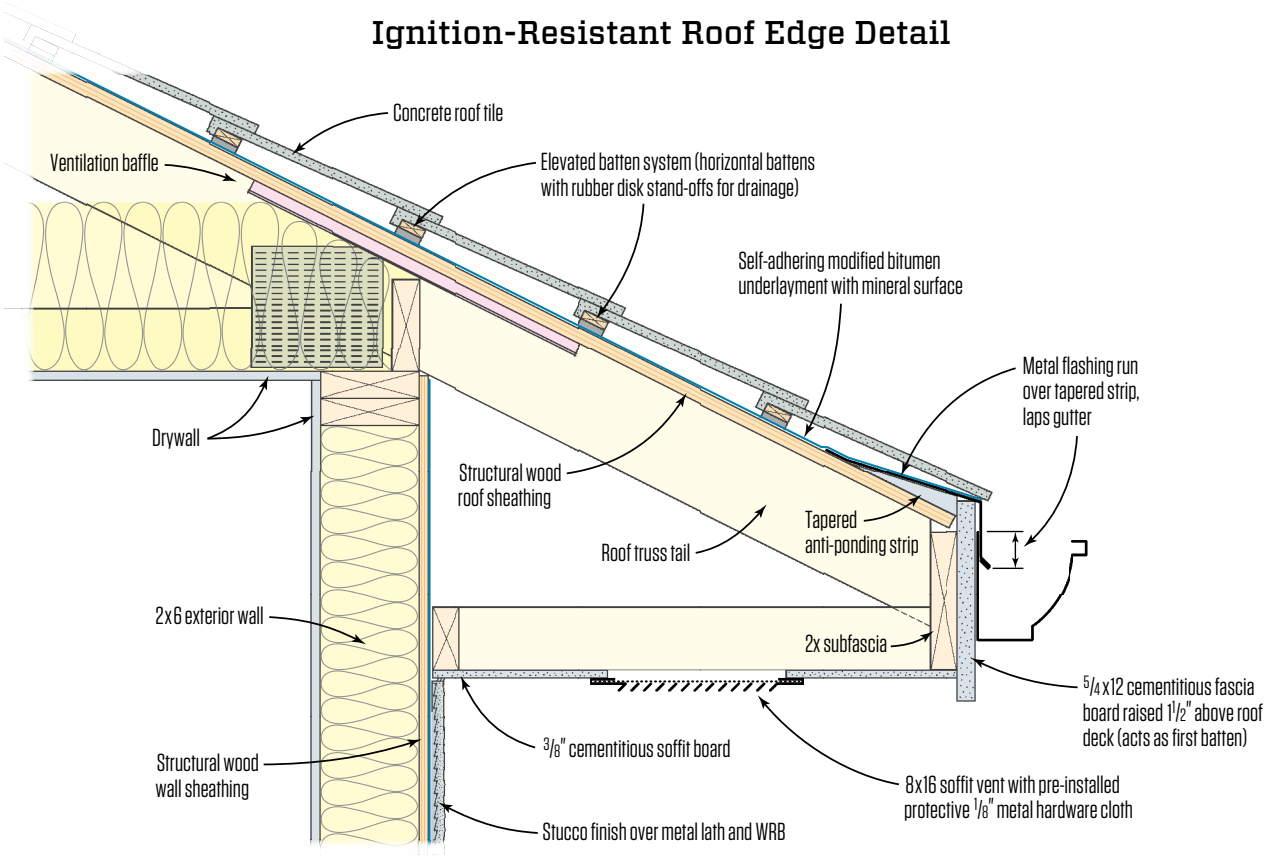
The Colorado Springs fire code's new Appendix K resembles other well-known standards for homes in wildfire country, such as the International Code Council's Wildland-Urban Interface Code, the National Fire Protection Association's NFPA 1142 (Reducing Structure Ignition Hazards from Wildland Fire), and Chapter 7a of California's state building code ("Materials and Construction Methods for Exterior Wildfire Exposure"). All those documents implement a two-pronged approach to reducing the risk of home ignition: They call for ignition-resistant building details for the house itself, along with measures to control natural fire hazards on the landscape surrounding the home.

Appendix K defines a "safety zone" of 30 feet around each home, where fire-prone local shrub and tree species are allowed only in small "patches or clusters," separated by mown grass or noncombustible materials such as gravel. Trees and shrubs aren't allowed at all within 15 feet of the house. Some large trees are allowed, but branches have to be trimmed back, away from roofs. These rules reflect the "lean and green" principle: Vegetation is kept thinned and pruned, and "ladder fuels" such as dead lower limbs that could let a ground fire climb up to the crown of a wooded area are removed.

This kind of "fuels management," as experts call the technique, creates "defensible space" around the house where firefighters can safely deploy to defend the building as a fire approaches. And with luck, thinning the landscape this way could even protect some homes from burning in a wildfire even if no firefighters were available to help.

The 30-foot radius of the safety zone (often called the "Home Ignition Zone") is based on research indicating that 30 feet is a safe distance between the wood wall of a house and the radiant heat of large flames. But the 30-foot number may not suit every situation, according to a National Institute of Science and Technology (NIST) analysis of the Waldo Canyon fire. If homes are burning close by, or if there's heavy vegetation on fire in steeply sloping terrain, 30 feet might not be enough distance to keep another building from catching fire—or to allow enough space for firefighters to safely operate.

Also, big forest fires on windy days can shower a home with hot embers even if flames never approach the house—especially if the fires also involve multiple wood-framed buildings. So an effective



In a big wildfire, strong winds may carry hot embers or even large flaming firebrands for long distances. Embers can be sucked into soffit vents or land in gutters, where accumulated pine needles or leaves may catch fire. The detail above reduces these risks; the soffit and fascia are noncombustible fiber cement, the roof is concrete tile, and metal roof flashing laps down into the metal gutter. The rough bottom surface of the tile allows moisture to weep out, but restricts the entry of flame and embers.

strategy against major wildfires has to include measures to protect the buildings themselves against ignition.

IGNITION-RESISTANT BUILDINGS

From the roof down, Appendix K, like other wildland-urban interface codes, specifies materials and assemblies that will reduce the odds of a building catching fire when exposed to the typical conditions created by a wildfire.

Roofs. Appendix K requires Class A roof systems. The Class A rating is based on laboratory testing of roof assemblies, in which a large criss-cross lattice of burning wood is placed on the roof covering and allowed to burn out. The material passes if the sheathing is not ignited. Clay tile, concrete tile, slate, and metal roofing typically comply, as do most fiberglass asphalt shingles.

Attic vents. Roof vents have to be screened with wire mesh or hardware cloth, with openings no larger than 1/8 inch. The 1/8-inch opening size is typical of all the well-known wildland-urban interface codes. According to wildfire expert Steven Quarles, who helped craft California's wildfire code before joining the Institute for Business and Home Safety (IBHS), an insurance industry think tank, 1/8 inch is a compromise. While the mesh may let small sparks through, it will hold out the bigger embers that carry the most heat. At the same time, the holes are big enough that they're less likely than finer mesh to become plugged with paint or dirt over many years in service.

Eaves and soffits. Soffits and fascia should be built with ignition-resistant material such as fiber cement or metal. Decorative features like false rafter tails are allowed to be made of wood or other combustible materials, but the fire service strongly urges builders to choose ignition-resistant options whenever possible.

Illustration by Tim Healey

Colorado Springs builder Andy Stauffer installs a screened vent in the soffit of a home near the city (top), then places an outlet vent in the home's roof (middle). At the roof edge (bottom), metal drip edge will extend down into the gutter.

Photos: Stauffer and Sons Inc.

Gutters. The big risk posed by gutters isn't the gutters themselves, but the flammable materials, such as leaves and pine needles, that accumulate in them and that can readily catch fire when windblown embers land there. When that happens, vinyl gutters typically melt and fall off, posing a risk of ignition at the base of the house. Metal gutters stay in place, which allows burning debris to ignite the exposed edges of roof sheathing.

Appendix K doesn't require debris screens over gutters, but the fire service cautions homeowners that gutters should be kept clear of combustible materials. Appendix K does require roof sheathing and framing to be protected against ignition by metal flashing at the roof's edge that extends down into the gutter. In the case of vinyl gutters, the rule requires noncombustible ground covering, such as stone, at the base of the wall where flaming gutters might fall.

Cladding and siding. Exterior cladding in the wildfire-prone area must be ignition-resistant. Approved materials include fiber cement, stucco, masonry, and manufactured stone. Natural wood, hardboard, and vinyl are prohibited.

Overhangs and projections. The exposed undersides of building projections such as bay windows are vulnerable to ignition from burning vegetation or accumulating embers. Appendix K requires these surfaces to be protected with the same type of material that is approved for wall cladding.

Exterior doors. Appendix K requires doors to be noncombustible or, if wood, to have solid cores at least 1 3/4 inches thick. Any glass in the door must be either tempered safety glass or multilayered glazing, with one exception: Front entry doors are allowed to incorporate decorative single-pane glass.

Windows. Windows must be dual-pane. Research has shown that dual-glazed windows can survive intense radiant heat in a wildfire (typically, outer panes crack and break while inner panes survive). Tempered glass has proven to be the best performer in practice, as well as in laboratory testing. Wildfire expert Steven Quarles points out that even before wildfire codes began to take effect, code has required tempered glass for certain windows, such as windows close to the floor or next to stairs. So most window companies have had no difficulty making dual-glazed tempered options available where needed to make a home ignition-resistant.

Decks. Brush and trees near a deck can readily set it on fire, as can combustible material such as firewood stored under a deck. Windblown embers can also ignite a deck, but in the Waldo Canyon fire and other fires, composite decking proved less likely to ignite than wood decking, which tends to split and crack and catch hot embers. Appendix K requires ignition-resistant or noncombustible material for decking, but allows wood framing for the deck structure.

Base of walls. Embers piling up against a house can set the exposed bottom edge of wall sheathing on fire, even if the cladding is noncombustible. Appendix K requires wall bases to be protected with fire caulking (or 1/8-inch wire hardware cloth, if weep holes are needed). Full-scale laboratory research at IBHS has shown that a 6-inch separation between combustible siding and the ground is enough clearance to sharply reduce the risk of fire from embers at the base of the wall.

Colorado Springs builder Andy Stauffer rebuilt almost two dozen houses after the wildfires in the Mountain Shadows and Black Forest communities. Above are two examples. Both homes have cultured stone and fiber-cement cladding systems and are set in sparsely planted landscapes with stone mulch. The top example's raised deck is framed with treated wood and decked with composite decking; the lower home has a concrete patio.

THE INDUSTRY ADJUSTS

The 2012 Waldo Canyon fire set off a minor building boom in Colorado Springs. Local builder Andy Stauffer (staufferandsons.com) rebuilt 11 houses there after that fire, and 10 after the Black Forest fire. But post-fire building code changes haven't affected Stauffer's methods much, if at all.

"What I could build after the fire is about what I was building before the fire," Stauffer told *JLC*. Virtually every house still gets a synthetic stone and stucco exterior, with fiber cement for lap siding details, soffits, and fascia. Durability and maintenance concerns motivate that choice, said Stauffer: "Clients say, 'Am I going to be up on a ladder painting this in five years?'"

By the same token, Class A fiberglass shingle roofs stand up better than wood shakes to Colorado's legendary hailstorms; better yet is concrete tile, which is easier to repair as well as more durable. And in the wake of the fire, said Stauffer, local lumberyards quickly began to stock soffit and roof vents with pre-installed protective metal hardware cloth.

"It was a combination of the clients wanting low maintenance, and the fire departments making reasonable suggestions that the market just picked right up on," said Stauffer. "People had their own reasons to do what the fire department was asking."

In 2013, when fire approached the Black Forest neighborhood where Stauffer lives, "we had to bug out," he said. "And we were sure we were going to lose our house." But a change in the wind spared Stauffer's house, "which was good," he said, "because from experience, I knew I would be working hard rebuilding other people's houses."

Ted Cushman is a senior editor at JLC.

Photos: Stauffer and Sons Inc.

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Wiring Receptacles and Switches

Your client's life may depend on the quality of your work

BY BEN GILES

Like every other trade involved with building a home, electricians rely on production methods to deliver dependable, high-quality work. But probably no other trade is as closely linked to the health and safety of the home and its occupants. While most of an electrician's work is concealed behind sleek device covers, one bad connection can threaten the existence of the home, as well as the lives of anyone inside. Because so much depends on electrical work being done properly, I recommend calling a licensed electrician for every electrical task—no matter how small or simple it may seem.

Approaching every phase of a project with the same consistent patterns of work is the key to my crew working quickly and efficiently while producing reliable, safe, and foolproof results. It also allows any member of the crew to jump in at any phase of a project and to know exactly what to expect when he or she reaches into an electrical box. Wiring receptacles and switches are great examples of our approach; let's begin with receptacles.

PREPPING THE CONDUCTORS

We typically do the finish wiring after the drywallers have finished hanging wallboard and, in most cases, after the walls and ceilings have been painted or at least primed. To minimize the possibility of damage to the wires as the board hangers zip cut around the boxes, we leave the wires coiled up and pushed as far

Photos by Roe Osborn

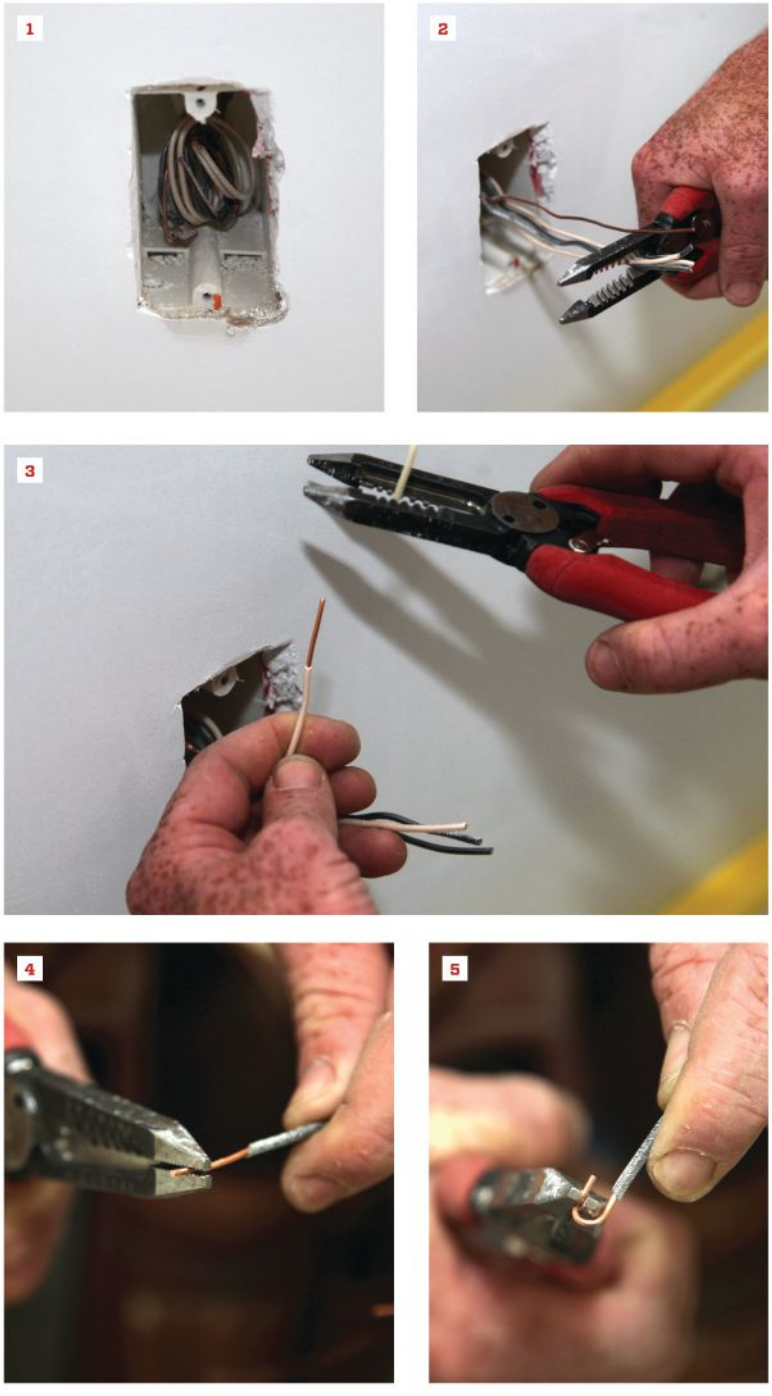
into the box as possible at the rough-in stage **(1)**. In new construction, we always wire the circuit-breaker panel after we've installed all of the devices, so we know the wires in the boxes are not live. If we're installing devices as part of a remodel or repair, we always begin by confirming that the electricity feeding the boxes that we're working on has been shut off.

There is always a bit of debris left in the boxes from hanging the wallboard; we simply "finger sweep" the biggest chunks out. Then we reach in and pull out the wires, unrolling them until they extend out straight from the box. Different crew members may leave different amounts of wire at rough-in, but at this point, we cut all the wires to a length of 8 to 10 inches, except for the ground wire (or conductor), which we leave a couple of inches longer than the rest **(2)**.

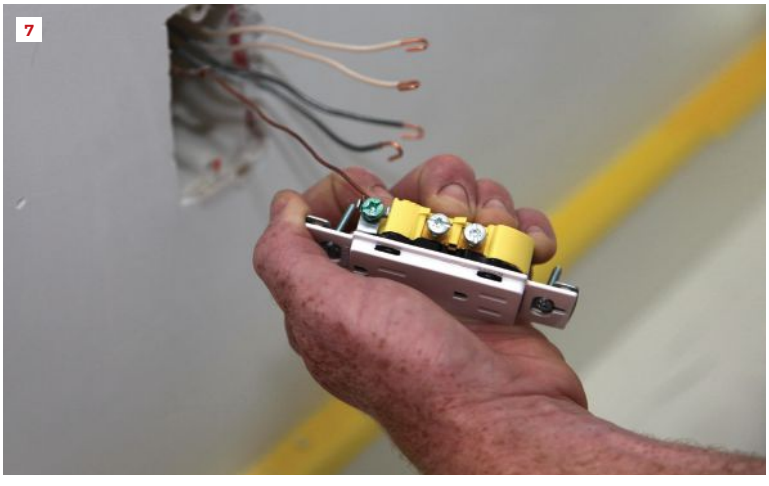
Next, we strip the ends of all the insulated conductors, exposing about 1 inch of bare copper **(3)**. My tool of choice for this task is a combination wire plier tool from Milwaukee that has a stripping feature for different gauges of wire and doubles as a pair of pliers for other tasks. I slip the wire into the appropriate hole for whatever gauge I'm working with, and the tool automatically cuts through the insulation without touching the copper conductor.

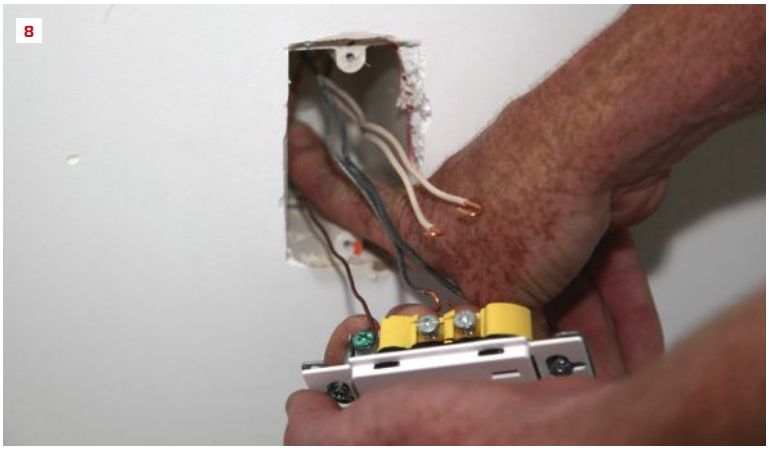
After stripping the ends, I curl, or loop, them. Using the pliers end of the combination tool, I grab the stripped conductor about 1/8 inch from the end **(4)** and rotate the pliers so that the copper curls around the jaws in a U-shape **(5)**. When this is done correctly, the end of the bare wire will be even with the end of the casing.

It is essential to curl the wires properly. Otherwise, if the end of the bare copper is curled beyond the insulation, the insulation can wind up under the terminal screw and interfere with the connection; and if the end of the curl is short of the insulation, too much bare conductor will be left exposed in back of the device, which increases the possibility for a short circuit. I've stripped and curled tens of thousands of conductors, so the process is second nature to me; however, I've seen it done incorrectly many times.



After rough-in, wires, or conductors, sit in the box, ready to be attached **(1)**. The author cuts the conductors, leaving the ground slightly longer **(2)**. Wire strippers remove an inch or so of insulation from each conductor **(3)**. To form a loop, grab the end of a conductor with pliers **(4)** and twist it into a U **(5)**, making sure the bare end is even with the end of the insulation.





The author attaches the ground conductor first. After slipping the loop around the grounding screw **(6)**, he catches the end of the wire on the metal tab next to the screw and rotates the device to close the loop **(7)** for a better connection. He then tucks the ground conductor into one of the back corners of the electrical box **(8)**.

CONNECTING THE CONDUCTORS

With the ends of the conductors curled properly, we're ready to attach them to a receptacle. When connecting conductors, I hold the receptacle across my left palm (I'm right-handed), with my fingers slightly bent in a loose fist and the back of the receptacle facing away from me. Holding the device in this manner keeps the screws accessible and keeps the device secure in my hand while I tighten the screws.

One of the first rules of electrical work is always to feed the conductor loops clockwise around the contact screws, which ensures that the loops close down around the screws as they are tightened. The first conductor I attach is the ground. On most receptacles, the green grounding screw is on a metal tab that branches out from the receptacle, so the ground conductor tends to be the most susceptible to loosening or becoming detached.

To help make sure that doesn't happen, I close the ground-conductor loop before tightening the screw. First, I slip the loop around the grounding screw and catch the free end of the loop on the little metal tab that extends up next to the screw **(6)**. While pulling the receptacle toward me to keep the loop against the shaft of the screw, I twist my wrist slightly to close the loop **(7)**. Then I tighten the screw with a regular screwdriver. I try to avoid using a mechanical driver that can overtorque the screw and weaken the conductor.

Next, I gently push the ground conductor along one side of the box and into a back corner **(8)**, putting the ground in its own area in the box. Pushing it in separately minimizes the chances for unintended contact between it and the other conductors in the box. The extra length that I left on the ground conductor when I cut the conductors makes this step easier.

Without changing the orientation of the receptacle in my hand, I slip the loops of the white neutral conductors around the silver-colored screws. With the regular contact screws, I do not try to close the loop as I did with the ground. I pull the device toward me so that the conductors are properly seated around the screw post, and I firmly but gently tighten the screws,

applying snug pressure with a regular screwdriver **(9)**. Then I turn the receptacle over and repeat the process with the black supply conductors around the brass screws on the other side **(10)**.

ATTACHING THE RECEPTACLE

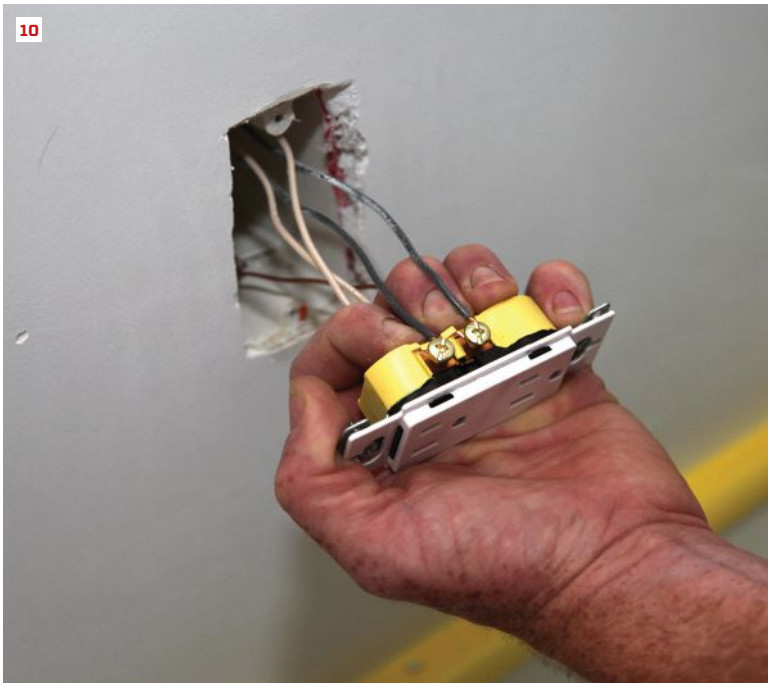
At this point, I've securely attached the conductors to the receptacle, and I'm holding the device 6 to 8 inches from the box, with all the conductors extended straight out. To put everything neatly into the box while placing the minimum amount of stress on the connections, I push the conductors down into a lower back corner of the box, away from where I had pushed the ground conductor **(11)**. The conductors are now all extending from the lower part of the box. Holding them against the bottom of the box with a finger, I rotate the receptacle into a vertical position with the other hand and lift it, which lets the wires fold gently around my fingers **(12)**.

Following this simple procedure ensures that all the conductors are tucked as far back into the outlet box as possible and are not bunched up against the back of the device. This minimizes the chance of a short circuit occurring when a bare conductor touches a screw on a device or another bare conductor in the box.

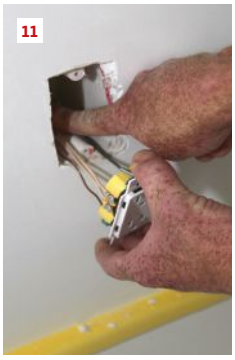
When the conductors are all tucked neatly into the box, I start the top attachment screw and drive it partway into the hole in the box. Then I drive the bottom screw most of the way into its hole **(13)**. As I make the final torque on each screw, I position the device so that the screws are centered on the slot. If the stud that the box is attached to has been installed straight and plumb, the cover plate should look like a properly hung picture. For this part of the process, I typically use a screw gun, taking care not to overtorque and strip out the screws.

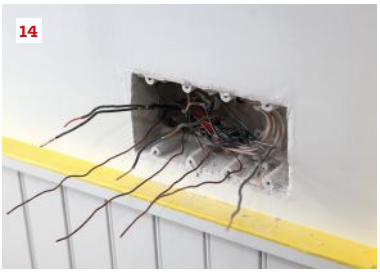
SWITCHING TO SWITCHES

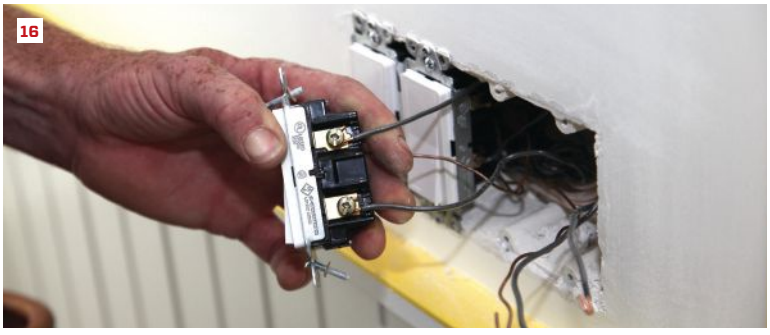
Because this article is focused on basic installation techniques, I will stick to single-pole switches, where just one switch operates the circuit. Three-way and four-way switches are a topic best dealt with on their own. My approach to wiring

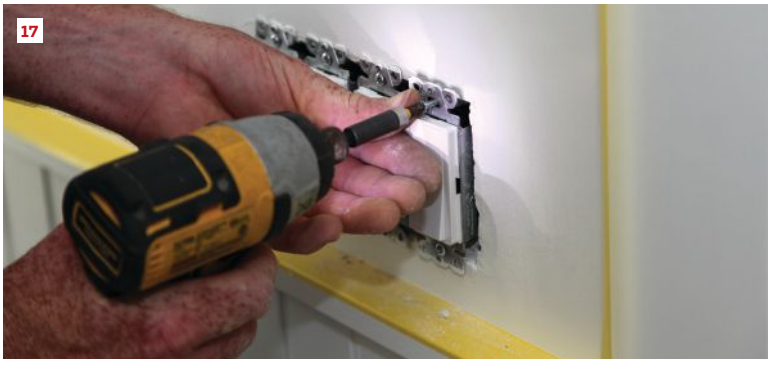


Holding the receptacle firmly in his hand, the author slips the loops for the neutral (white) conductors around the silver-colored screws and snugs the screws by hand **(9)**. After flipping the receptacle over to the opposite side, he slips the hot (black) conductors over the brass screws and snugs them down tight **(10)**.









The author pushes the conductors into a back corner of the box **(11)**, then folds them around his fingers **(12)** before attaching the receptacle **(13)**. Conductors are grouped in pairs for switches **(14)**. The ground attaches to one side **(15)**, and the load and supply conductors attach to screws on the other side **(16)**. Switches then screw into place in the box **(17)**.

single-pole switches is much the same as for receptacles, with the exception that the neutral conductors do not get attached to the device (they are wire-nutted together in the box at rough-in). Instead, a hot, or supply, conductor is attached along with a load conductor that runs to whatever is being switched.

By code, both of these conductors must be a "hot" color (anything but white), and it can be confusing if all the non-neutral conductors in a box are black—especially when there are multiple switches in the same box. However, we give ourselves a leg up at rough-in by stripping the ends of the hot conductors before curling up the wires and pushing them into the box. When it's time to install the switches, it's just a matter of pulling all of the conductors out of the box and separating the ones with the stripped ends from the rest.

Before I start stripping and curling the ends of the load conductors, I extend one hot conductor out for each switch in the box, keeping the hot conductors to the lower part of the box. Then I extend a ground and a load conductor for each switch, keeping them toward the upper part of the box **(14)**. When the conductors have been sorted, I strip and curl the ends the same as I did for the receptacles.

As with the receptacles, the first conductor I attach is the ground **(15)**. If the device has the ground screw mounted on a separate metal tab, I again close the loop before tightening the screw. With the devices in this project, the ground screws were mounted on the sides, so closing the loop was not necessary. After attaching the ground, I flip the device over and attach a supply conductor and a load conductor to the screws on that side **(16)**.

I attach each switch to the box as I finish attaching the conductors **(17)**. I try to center the attachment screw in the slot on the device. If there are multiple switches, I leave the attachment screws snug but slightly loose so that the devices can be adjusted side-to-side a tiny bit, if necessary, when the covers go on.

Ben Giles owns South Shore Electrical Contractors, in Wakefield, R.I.

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BY LAUREN SHANESY

1. A Wall Finish With a Soft Touch

Looking to provide a tactile experience with paint, Benjamin Moore has launched Century, its first "Soft Touch Matte" finish, which the company says feels like a soft leather glove. The paint's 75 color options draw inspiration from natural elements such as minerals, gems, spices, and plants. Century is made only in small batches and is available in a premixed gallon for $125 or in a 4-ounce sample for $10. benjaminmoore.com

2. An Extra-Low-Flow Toilet

The new Viper from Gerber is a two-piece, high-efficiency toilet with a 1.0-gallon-per-flush (gpf) rate. WaterSense-certified, the Viper saves even more water than recent 1.28-gpf toilet options, according to the company. The toilet has a 2-inch trapway for clog-free waste removal, a 3-inch flush valve for faster water flow and flushing power, and a Fluidmaster 400A fill valve for durable, long-lasting operation. The Viper is available in white and costs $300. gerberonline.com

3. Automated Indoor-Outdoor Living

Thermally insulated and impact-resistant, Ply Gem's 4880 Patio Door is available in two-, three-, and four-panel sliding and pocket configurations, with sliding multi-panel openings up to 8 feet high by 16 feet wide. The pocket-style door recesses into the wall for unrestricted access between indoors and outdoors. New for 2017, the door can be upgraded with an automated operating system that allows homeowners to control it from anywhere with the included remote or the DreamView app for smartphones. Price for the door varies based on configuration and color. plygem.com

4. A Durable Countertop With a Natural Look

Walker Zanger's newest surface material, Secolo Porcelain Slabs, combines the look of marble with the benefits of porcelain. Durable and dense, porcelain makes for a low-maintenance, stain- and scratch-proof countertop option. Porcelain is usually between 3mm and 6mm thick, but this product is 12mm thick (still thinner than natural stone), allowing Walker Zanger to produce slabs up to 126 inches by 63 inches for use as countertops. The line offers 12 colors, including surfaces that resemble cement and wood. Price varies by size and color. walkerzanger.com

5. A Contemporary Corner Window

The newest addition to Marvin Windows and Doors' Contemporary Studio line is a Contemporary Direct Glaze Corner Window. Its narrow jamb depth of $2\frac{3}{16}$ inches makes for a clean and uncluttered corner window that sits flush to a home's exterior. The window maximizes views with sizes up to 84 inches by 120 inches in vertical or horizontal orientations. The window became available in clad only at the end of August. Contact your local dealer for pricing. marvin.com

6. A Smart Solar Door Lock

The Brinks Home Security Array Deadbolt is a smart door lock that connects with WiFi to provide security and convenience. Since the system is cloud-based, the lock can be installed without adding a gateway hub or other additional equipment. Homeowners can control the lock remotely from a smartphone or smartwatch, or manually with the front touch keypad or a traditional key. The lock is powered by a battery system and a built-in solar panel. It will be available in the fall, for $250. arraylock.com

7. A Low-Maintenance Wood Look

Wolf Home Products has introduced the Wolf Signature line of cabinetry with the company's proprietary "SmartShield." SmartShield is a continuous, protective laminate wrap that emulates the look of painted wood while reportedly reducing the effects of moisture intrusion, delamination, and cracking that can occur with painted wood. Wolf Signature With SmartShield cabinets are available for "quick ship delivery" in one door style and four finishes, and as a special order in three additional door styles in four finishes. Wolf Signature cabinets also come in nine maple door styles in 13 finishes and two birch door styles in 10 finishes. Pricing varies. wolfhomeproducts.com

8. A Bath Suite to Fit Small Spaces

The Petite collection, part of Ronbow's Aravo line, is a line of vanity fixtures designed for a small bathroom. Measuring 18 inches wide by 14 inches deep, each vanity has extra elements like an LED mirror and a hairdryer holder. A ceramic sink top fits on top of the Petite vanity; the sink has a geometric beveled shape with a removable drain cover that's integrated into the floor of the sink to hide the drain. The Petite comes in two color combinations: glossy white with sandy oak, and glossy empire gray with smoked walnut. Pricing varies by fixture. ronbow.com

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9. A High-Intensity Sealant for Extreme Weather
Dap's new Extreme Stretch is a urethanized acrylic sealant that reportedly reduces cracking around windows, doors, siding, baseboards, molding, countertops, sinks, and more as homes shrink and expand with the weather. The company claims that the elastomeric sealant is waterproof, flexible, and durable, and that it provides stronger adhesion than the competition. The product is low in odor, cleans up with water, and is paint-ready in two hours. The price ranges from $5.50 to $6.50. dap.com

10. LED Light for Stone Countertop Surfaces
Nora Lighting's Bravo Frost LED 120V Linear Fixture is an undercabinet trim light that features a frosted lens and asymmetrical internal reflectors to deliver even illumination, making it ideal for polished countertops, such as granite and stone. The trim lighting is less than an inch deep, for a contemporary look, and comes in four lengths—12, 18, 24, and 32 inches. Each fixture has a self-contained electronic driver and produces 500 lumens at 7 watts per foot; units are linkable up to 400 watts (about 50 feet) and dimmable with an ELV dimmer. The extruded aluminum housing comes in either a bronze or a white finish. Pricing varies by size. noralighting.com

11. Jobsite Dust Management
Known for its Dust Barrier System, ZipWall has introduced the ZipWall Mat, a sticky mat that helps prevent tracking dust in and out of a work area. The adhesive surface of the mat is long enough for two steps and reportedly captures dust from shoes, casters, and wheels when placed directly outside the plastic dust barrier of the work zone. A ZipWall Mat Starter Kit can be purchased on the company's website for $92.50; the kit includes a pad of 30 adhesive sheets and a reusable, non-skid base. zipwall.com

12. A Smart Vapor Barrier
Moisture in the wall cavities of homes is inevitable, but builders can still choose products to combat mold build-up. CertainTeed's Smartbatt insulation with "MoistureSense" features an integrated vapor barrier that reacts when humidity is low or high and adjusts airflow accordingly. The company says that once installed, Smartbatt requires little maintenance and is ideal for high-moisture areas such as crawlspaces, basements, bathrooms, and laundry rooms. CertainTeed's website provides a price estimate calculator based on region. certainteed.com

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BY TIM UHLER

With an IP67 rating, this laser level is completely waterproof. The author added a temporary plywood cap for his own peace of mind, but it isn't necessary.

Photo: Tim Uhler

DeWalt 20V Max Green Rotary Laser

We bought our first rotary laser in 2004. Until that point, we had used a builders level while forming foundations or shooting control points on a building. Once we started using a rotary laser, however, we instantly realized its time-saving benefit.

When I saw the ads for the new green rotary laser from DeWalt, I wanted to see how it compared with the first level we'd purchased—particularly because this new laser is "built tough." I also wanted to try out a green laser because of its purported "better visibility," and I liked that this new version runs on DeWalt's 20V Max battery platform.

FEATURES

While green-beam lasers are three times more visible than red lasers, they have historically required more power, so battery runtime has traditionally been an issue. Having a green rotary laser that runs on a rechargeable battery platform means that we always have adequate power for it on hand. The unit's power LED will flash when the battery is running low; there is also an indicator on the battery itself.

This laser is rated to 1/16-inch accuracy at 100 feet, has a detector range of 1,500 feet, will self-level if it is within 5°, and has three scan modes: 15°, 45°, and 90°. We could usually see the laser outdoors, especially if we slowed down its rotation or put it in scan mode, which limits the beam's rotation. While shooting level to install some columns before framing a porch, we put it in 45° scan mode and could see the laser easily except when it was very bright outside.

This unit also has plumb dots that go up and down (when the unit is upright). The unit can be set on its side, making it possible to use for laying out square, as well. The "dual axis slope mode" means the unit can be set out of level or plumb to shoot slopes along the x-axis, say for laying pipe, or along the y-axis.

A remote control is included with the kit, and I used it frequently. It has the same controls as the unit itself, so it's easy to navigate and use. You can power the unit completely off from the remote (but not on, because of safety compliance). I like this feature because I don't have to waste time walking back to the unit if I'm done using it. I also like using the remote when I'm marking control points, because I can slow the rotation down from wherever I'm standing, making it easier for me to see the beam.

The kit also includes a detector, which increases the level's range from 150 feet to 1,500 feet and can be mounted to a grade stick. The detector beeps to indicate whether you're high or low but doesn't tell you how far off you actually are (for example, 1/4 inch), so you have to move slowly and watch the arrows until you get a steady beep.

BOTTOM LINE

This laser arrived when we were setting up a foundation in a giant puddle, while snow was falling on us. Needless to say, we wanted to get that footing raised to grade quickly. Without reading the instructions, I set up the laser, put a board over the top, and shot the grade. I discovered later that with an IP67 rating, the laser unit is dustproof and waterproof (note: the batteries do not have an IP67 rating).

I found the laser easy to use and accurate, and the remote works well. It feels well made and durable and certainly lives up to its "built-tough" moniker.

This is a tool that will save time and increase accuracy. The major bonus to this unit is that it can be seen in bright conditions (but not direct sunlight) more easily than a red laser, and it functions on a cordless battery platform. A minor nit-pick is that the plastic piece that slides into the bottom for the tripod attachment seems a little flimsy, so we had to treat it delicately. There's also no place to mount the remote on the unit itself, so if it's not in the case or in my pouch, it could get lost.

This kit comes with the laser, charger, detector, glasses, TSTAK storage case, tripod adapter, ceiling bracket, detector bracket, and target card. It is FlexVolt compatible. Cost: $1,300. dewalt.com

Tim Uhler is a lead carpenter for Pioneer Builders in Port Orchard, Wash. He is a contributing editor to JLC *and* Tools of the Trade.

Bosch Redesigns the Recip

The Bosch GSA18V-125 18V cordless reciprocating saw is designed to be more ergonomic than the saws you're used to. I used it briefly at a trade show last winter and was impressed by how smooth and powerful it felt. While I made only a couple of cuts with it, I got the impression that it's a contender as a replacement for a corded saw.

Bosch said that it repositioned the handle and nose and extended the handle's gripping surface to offer more leverage and better working angles while taking pressure off users' hands. I made cuts at waist-height, and in that position, the saw did feel comfortable. I wondered how it would fare when working overhead, though—and if the trigger would still be accessible should I try to hold the saw towards the handle's bottom.

With three orbital settings (0, 1, 2), a dial for setting the max speed, and a variable-speed trigger, you can fine-tune how aggressively the saw cuts. It produces 0–2,500 strokes per minute with a 1 1/4-inch stroke length and is outfitted with an oversized rafter hook, an adjustable shoe, and large blade-change mechanism that's operable even with gloved hands. The EC brushless motor is designed to be more efficient and last longer than previous 18V motors, and an internal counterbalance system reduces vibration. The saw's electronics offer overload protection separately for the battery and the motor to prevent overheating, and they monitor the load to maintain constant speed. Two LED lights—one on each side of the blade—illuminate the work surface.

Though the saw will run on any of Bosch's 18V batteries, Bosch recommends the Core18V platform for performance on par with a corded recip saw. The kit includes a Core18V Lithium-ion 6.3-Ah battery, an 18V Fast Charger, two 6-inch bi-metal blades, and a carrying case. Cost: $400 (kit); $300 (tool only). boschtools.com

Chris Ermides is a senior editor at JLC *and editor of* Tools of the Trade.

The new Bosch cordless recip saw, equipped with the new Bosch Core18V lithium ion battery, features cord-like power, a redesigned handle, large blade-change mechanism, and built-in electronics that monitor the load to maintain cutting speed.

A New Jobsite Table Saw

Hitachi's C10RJ 10-inch table saw is a complete departure from any table saw you've seen from the company in the past. At first glance, the roll-cage design looks similar to a compact saw, but its specs and features set it firmly in the jobsite saw category. The saw is stout (and heavy) with an aluminum top; with the initial startup, I could tell that it is a table saw to be taken seriously. It runs on a direct-drive 15-amp motor that has soft start and electric brake and produces a no-load speed of 4,500 rpm. Hitachi reports the saw can handle anything from framing lumber to hardwoods (in my initial testing, it cut through 2-by stock and 3/4-inch CDX with ease; I've yet to test it on hardwoods, but a full review is forthcoming).

Its rolling stand comes with 8-inch rubber all-terrain treaded wheels and folding legs; one of the legs includes an adjustable foot to aid in leveling the saw on uneven surfaces. The large rubber feet make for a solid base, but they pop off relatively easily so it's worth adding some epoxy to secure them. I question whether the stand will take the same amount of abuse as beefier aluminum stands and think the wheel mounts need some reinforcement (one side is bent already—the result of landing unevenly from a 6-inch drop).

The top measures 28 3/4 inches by 22 inches and has an integral outfeed arm that extends beyond the back of the saw for additional material support. In its closed position, the outfield arm sticks out far enough that it makes maneuvering in and out of doorways a little cumbersome; I removed it completely because even when it was fully extended, the gain seemed unremarkable (I feel this way about all integrated outfeed arms). The fence rides on telescoping arms that move similarly to DeWalt's rack-and-pinion fence (though not as finely tuned) and extend it to either side of the blade for a 35-inch capacity to the right and 22 inches when set on the left. The fence itself is solid and true and locks in the front and back of the arms; it has a nice flip-down feature for material support when extended beyond the table.

Bevel capacity for the blade ranges from 0° to 45° (the bevel adjustment knob rides on a rack-and-pinion assembly as well); the max depth of cut at 0° is 3 1/8 inches, and at 45° is 2 1/4 inches. It can take a dado stack up to 8 inches by 13/16 inch.

The C10RJ also includes overload protection with automatic shut off to prevent damage to the motor; an adjustable riving knife; built-in storage for the push stick, blade guard, anti-kickback pawls, and a 2 1/2-inch dust port for connecting to vacs and dust collectors along with other accessories. Additional features include blade alignment access from the table top and a quick-release, tool-less blade insert. The C10RJ also comes with a 10-inch 40-tooth carbide-tipped blade, T-style miter gauge, two blade wrenches and hex bar wrenches, and a folding stand. Further testing is necessary, but so far I have been impressed by the power, accuracy, and cut quality of the saw. Cost: $480. hitachipowertools.com —*C.E.*

The C10RJ features a roll-cage design, has a top that measures 28 3/4 inches by 22 inches, and can rip up to 35 inches to the right of the blade. It comes with a folding stand that collapses into a dolly-like cart. One of the rubber feet is adjustable so the saw can be set up securely on an uneven surface. A push-stick, miter gauge, blade wrench, and other tools are stored right on the saw.

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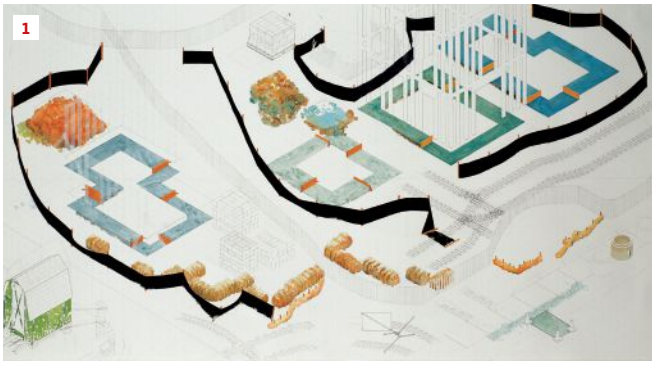
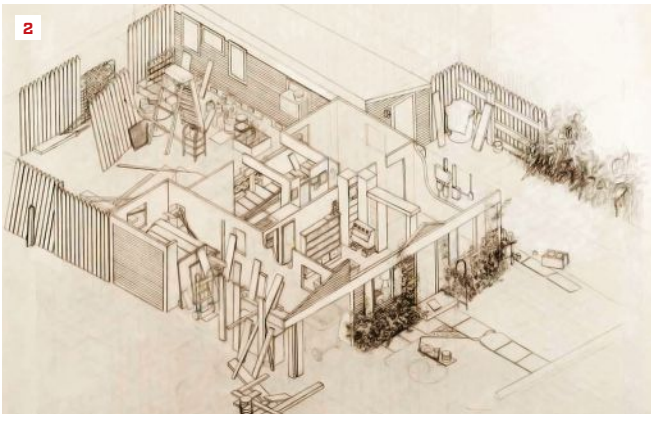
BY CLAYTON DEKORNE





Three works by Owen Buffington: South Street Construction Site **(1)**; Fayetteville Home, Ward 1, Zone 2, Precinct 9 **(2)**; Two New Southside Units **(3)**. See more at owen-buffington.squarespace.com.

Off the Grid

Trained originally as an urban planner and geographer, Owen Buffington has spent hours poring over maps, plat plans, and technical drawings. These idealized images, rendered against a grid of straight lines and right angles, are inseparable from the world in which we live. We rely on things accurately conforming to a grid in order to navigate, organize, and build our towns and cities. Yet real life—what we see in alleys and on jobsites, in particular—is a bit messier than the drawings we use to create those places, and it's this interplay between a world full of quirks and the flawless informational drawings we use to describe the world that intrigues Buffington.

In a recent exhibition at the University of Arkansas, Buffington offered representations of the back alleys and construction sites of Fayetteville, Ark., that he observed on his daily walks to and from work. He brings a draftsman's precision to these scenes, drawing them in an isometric perspective that gives the drawings a technical feel. But he scatters each drawing with casual details, and he seems to play with time, rendering some elements in ghostlike pencil lines to show materials and building elements from past and future phases of construction. Erased lines are intentionally left in place, underscoring that change is integral to real life. In one piece, black silt fences create a meandering calligraphy that follows the topography of the land, while stepped footings create tight geometric outlines **(1)**. Together, these interwoven shapes suggest there are competing grid works in play. Yet it's what falls off the grid—piles of dirt or broken blocks, tire tracks, graffiti, and weeds—that most interests Buffington.

In one pencil drawing of a home, he jumbles disparate features: inside with outside, spaces under construction with occupied rooms, landscaping with furniture **(2)**. The effect is strangely both serene and unsettling. It's M.C. Escher meets Eric Sloane in the modern world.

In a painting of two infill homes under construction, a rainscreen over Zip System sheathing documents the work of a savvy builder at work **(3)**. Buffington succeeds in bringing a stateliness to the unfinished project. Indeed, his reverence for the evolving process of building, as well as the deterioration of the built environment, makes the body of work as a whole as gratifying to builders as it is to geographers and artists—those of us who often exist off the grid socially in a changing, messy world.

Clayton DeKorne is the editor of JLC.

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