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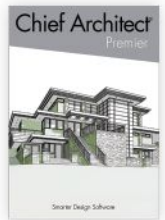


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On the cover: An installer with Ecologic Insulation sprays closed-cell spray foam insulation on the slab base of a home being built by WKP Construction in Jamestown, R.I. See the story on page 13. Photo by Wade Paquin.

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THE JOURNAL OF LIGHT CONSTRUCTION (ISSN 1056-828X), Volume 39, Number 4, is published 10 times per year (January, February, March, April, May, June, July/August, September, October, November/December) by Hanley Wood, 1152 15th St. NW, Suite 750, Washington, DC 20005. Annual subscription rate for qualified readers in the construction trades: \$39.95; nonqualified annual subscription rate: \$59.95. Frequency of all magazines subject to change without notice. Double issues may be published, which count as 2 issues. Publisher reserves the right to determine recipient qualification. Copyright 2021 by Hanley Wood. All rights reserved. Canada Post Registration #40612608/G.S.T. number: R-120931738. Canadian return address: IMEX, PO Box 25542, London, ON N6C 6B2. Periodicals postage paid at Washington, DC, and at additional mailing offices. POSTMASTER: Send address changes to JLC, Box 3530 Northbrook IL 60065-3530.



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Subscription rates for qualified readers:

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Sales tax will be added to total due if required by your state law.

Frequency of all magazines subject to change without notice. Double issues may be published, which count as 2 issues.

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The screenshot displays the JLC website interface. At the top, there's a navigation bar with 'General Contractors', 'Women', and 'Subscribe' links. The main header features the JLC logo and 'THE JOURNAL OF LIGHT CONSTRUCTION'. Below this, there are tabs for 'HOW TO', 'PROJECTS', 'PRODUCTS/TOOLS', 'BUSINESS', and 'FORUMS'. A featured article titled 'No More Gutter Cleaning' is highlighted, along with a 'CALL FOR ENTRIES' banner. A section titled 'Construction Skills' features an article 'FRAMING OVER A COMPLEX' with an accompanying image of construction workers. Below this, there are navigation links for 'FOUNDATIONS', 'FRAMING', 'EXTERIORS', 'ROOFING', 'ELECTRICAL', 'PLUMBING', 'HVAC', 'INSULATION', and 'INTERIORS'. A 'Building Resources' section includes articles like 'FACING FAILURE' and 'AIR SEALING THAT WORKS'. The bottom of the screenshot shows a 'JLC Field Guide' logo.

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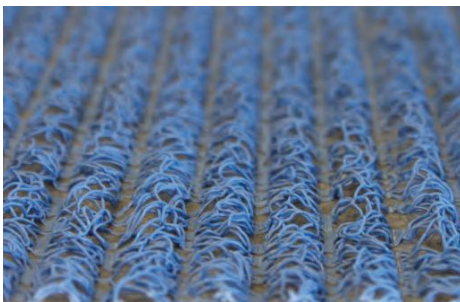
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Recently, there have been changes to building codes detailing the proper practices to efficiently move moisture: The air gap between the siding application and weather-resistive barrier should be no less than 3/16" (4.7mm) wide, or a space with a drainage efficiency of 90% or more, as measured in accordance with ASTM E2273, or Annex 2 of ASTM E2925, must be added to the exterior side of a weather-resistive barrier. By installing Mortairvent, this criteria is met, and both moisture drainage and ventilation are facilitated, eliminating any issues that may arise by using other products that **do not have rainscreen capabilities**, such as **drainable house wraps**.

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Aligning Cabinets With Plumbing Rough-ins

Confronted with the task of installing a sink or vanity cabinet, you may be tempted to speedily hack out a window in the cabinet's back to accommodate roughed-in plumbing protruding from the drywall, then slide it home. But I'm of a mind that the interior appearance of a cabinet matters almost as much as the exterior, therefore I take the time to accurately align cabinet cut-outs with the roughed-in piping (1).

The following is a simple method I use to accomplish a precise alignment.

Establishing a centerline. I start by determining the cabinet's centerline and marking it on the back of the case (2). Then I mark the cabinet's centerline on the wall in its final location. These two vertical centerlines serve as reference lines from which I'll measure to guarantee precise left-right positioning.

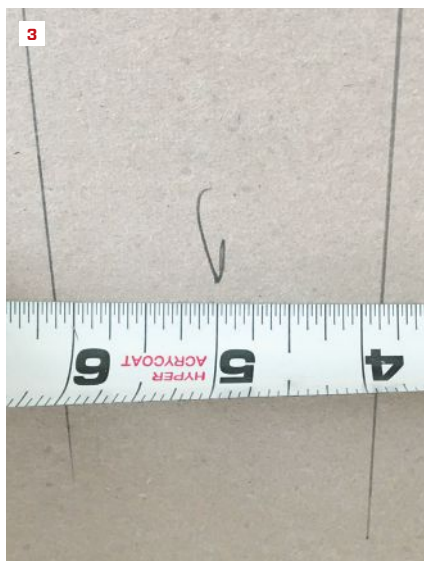
Next, I make a level line on the wall at the exact final height of the cabinet (minus the countertop thickness); I'll measure from this line to mark the wall with the horizontal centerlines of each protrusion.

With the cabinet's centerline and top horizontal laid out, I use a torpedo level to outline the sides of each protrusion, both vertically and horizontally, onto the wall. What I'm after is the centerline of each pipe, which I find by measuring between my lines (3). After marking the center, I use a torpedo level to draw a centerline (4).

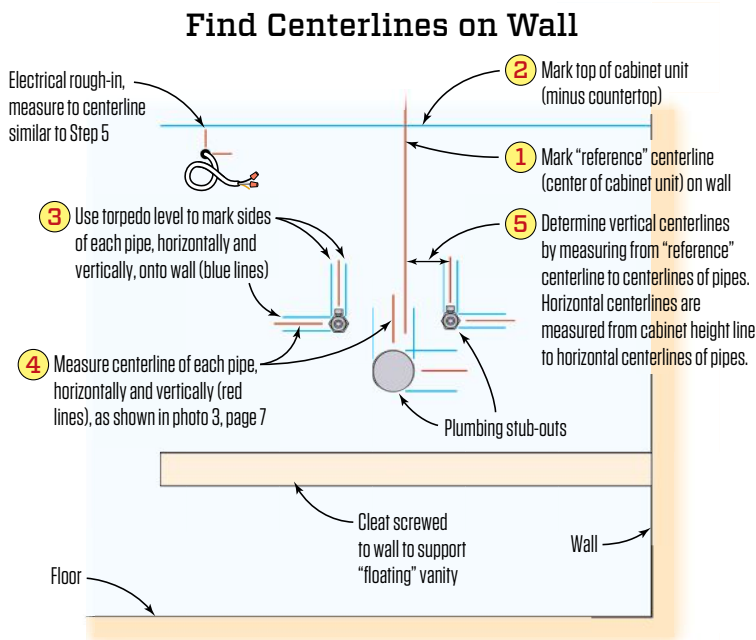
Now it's a fairly simple matter of measuring between the cabinet centerline and the individual centerlines of the pipes (5). For this, I move away from the hook on my tape and work from the 1-inch mark, commonly referred to as "burning the inch of the tape." Some say this invites error, but I believe this



Having aligned cabinet cut-outs with roughed-in plumbing, the author assembles a floating vanity (1). He starts by marking a centerline on the cabinet's back panel with a combo square (2), then he marks the centerline on the wall at its ultimate location.

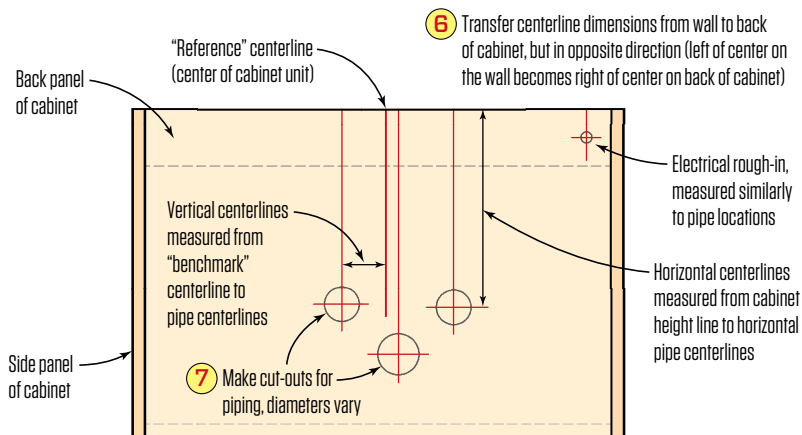


After marking the outer dimensions of the drainpipe on the wall with a torpedo level, the author finds the center (at the 5-inch mark) by lining up the same increment on either side of the 4- and 6-inch marks on a tape (3). Then he uses a torpedo level to draw the pipe's vertical centerline (4).



The existing conditions are precisely plotted on the wall (5). Layout marks include the cabinet's centerline, the top of the vanity, and plumbing and electrical centerlines (see illustration, above).

Transfer Centerline Dimensions to Cabinet



Layout information from the wall is transferred to vanity's back panel, but in the opposite direction (see illustration, above). Vertical centerlines of pipes are located by measuring from the reference, or benchmark, centerline. Horizontal centerlines are located by measuring from the cabinet height line. A hole saw, going partway through the back panel, is used to make the cut-outs (6).





increases accuracy when measuring. Either way, stay focused because every dimension you take from the wall has to be transferred to the back of the cabinet in the opposite direction; left-of-center on the wall becomes right-of-center on the cabinet back (6).

Cut-outs. When drilling through the back, I choose a sharp spade bit as close to the pipe diameter as is reasonable; for example, a 3/4-inch bit for a 1/2-inch supply-line pipe. For larger openings, such as for a 2-inch drainpipe, I use a hole saw (6). When drilling from the back of the cabinet, I stop short of punching through, letting just the tip of the pilot bit go through the back. Using the pilot bit hole as a guide, I complete the holes from inside the cabinet, thus avoiding tear-out around the opening (7). With cut-outs completed (8), the vanity cabinet is easily slid into place (9). Electrical boxes inside the cabinet are measured and cut similarly (10).

Working from the inside, the hole saw punches through the finish face (7). Here, the holes for the supply lines were cut larger to accommodate shut-off valves installed on the stub-outs; valves are typically installed after the cabinet installation (8).

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



The example vanity cabinet installed. A 1/2-inch hole was made to run power to an outlet on the side of the vanity (9). More typical, "tighter" 3/4-inch holes were cut for 1/2-inch supply-line pipes in another vanity unit (10). Also, an electrical box was cut inside the cabinet (electrical boxes are similarly measured, though cut-outs are made with a multi-tool or jigsaw).

Q What's the deal with fiberglass and carbon-fiber rebar? I learned about these composite rebar options recently when I heard a contractor mention that their cost is now comparable to standard steel rebar. But I'm not sure how accurate my source is, or when you would use one vs. the other. And where would epoxy-coated rebar fit into the mix?



Glass FRP rebar is available in different sizes and grades for different applications. Shown here is Owens Corning's #3 Pinkbar Fiberglass rebar, which the company says is well-suited for flatwork thanks to its corrosion resistance, light weight, and ease of handling. Higher-strength fiberglass rebar for structural applications is also available.

A Bill Palmer, editor of woc360.com, a Fellow of the American Concrete Institute, a licensed professional engineer, and former editor of *Concrete Construction*, responds: Carbon steel reinforcement has been used for more than a century to provide tensile strength to reinforced concrete. This extra reinforcement is necessary because the tensile strength of concrete (in direct tension) is only about 10% to 15% of its compressive strength, so 3,000-psi concrete might have tensile strength of only 300 psi, compared with grade 60 steel, which has tensile strength of 60,000 psi.

When a load is applied to a concrete beam, it deflects or bends, and the concrete in the top half of the beam goes into compression while the bottom half is in tension. Steel is placed near the bottom of the beam, and when the concrete surrounding the steel cracks—though you may be unable to even see the cracks—the steel provides the tensile strength.

But the downside of steel in concrete is that over time, moisture, chlorides, and oxygen penetrate the concrete and result in corrosion of the steel. If the corrosion is bad enough, then the concrete beam (or column or wall) loses its tensile or bending strength. This is especially a problem in structures that are exposed to deicing salts, like bridges or parking garages.

To protect the steel, epoxy-coated rebar was invented in the 1970s. Over the past 50 years, thousands of structures have been built using epoxy-coated bars, and the epoxy coating has been mostly successful at extending the time until corrosion starts. Recently, however, some state departments of transportation have banned the use of epoxy-coated rebar after finding many bridges where the coating had debonded from the steel. It only takes a small chip in the epoxy to allow corrosion to begin and spread beneath the coating.

There are, however, some alternative concrete reinforcing materials that can be used to prevent corrosion. Stainless steel rebar is available but quite expensive, and there is galvanized rebar. Another choice is materials that combine a polymer matrix with glass, carbon, or basalt fibers embedded—fiber-reinforced polymer (FRP). These materials can't corrode, they are much lighter than steel (about

one-third the weight), they don't get hot in the sun on the jobsite, and they are 4.5 times stronger in tension. And the newer bars have been designed with a gritty exterior so that they bond well to the concrete.

There are some drawbacks to FRP rebar, however. Glass-fiber bars currently cost 15% to 25% more than the equivalent steel reinforcing. Also, there are some questions about how well they perform in a fire—do they melt and lose strength? And there has been some concern about their long-term deflection or creep. The design questions have led to more conservative (and therefore more expensive) design of structural concrete elements. Another concern is that the bars can't be bent in the field but must be ordered bent from the factory.

But for light reinforcing in flatwork, where the main purpose is crack control, glass FRP rebar is quite competitive, even on a first-cost basis, and since it is so much lighter than steel, it reduces labor cost. And with its high strength, less reinforcement is needed. A couple of companies are making glass FRP rebar today. Owens Corning is promoting its glass-fiber Pinkbar (see photo, opposite page), while Neuvokas is manufacturing GatorBar in Michigan. GatorBar has both glass-fiber and basalt-fiber bars.

Buyer beware, though. Doug Gremel, with Owens Corning, says,

"It's easy to cut corners by using a less costly polyester resin that won't be as durable in the alkalinity of concrete as bars made with a better vinyl ester resin that has been shown to hold up in accelerated aging and real-time tests. There are lots of very inexpensive Chinese producers of glass fibers that sell at a fraction of the cost. This is a bit like the Chinese drywall problem, in my opinion, with some of these players."

Concerning the use of carbon fiber in FRP rebar, Gremel says, "Carbon bar remains, in my opinion, still in the exotic camp. It is clearly the best material and is used smartly and appropriately for structural strengthening of existing structures. Carbon FRP bars epoxied in shallow concrete grooves in the cover of structures, like a Band-Aid, give almost miraculous additional flexural and shear capacity to the member. However, carbon bars or carbon prestressing tendons remain at least 10 times more expensive than glass FRP bars and steel rebar."

Perhaps the best solution for structural concrete that will be subjected to deicing salts is hot-dipped galvanized rebar. Galvanized bars will resist corrosion for about four times longer than carbon steel bars and the price premium is only about 10%. Galvanized bars are readily available throughout the U.S.

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Spray Foam Under the Slab

BY WADE PAQUIN

For the past eight years or so, we have been using closed-cell spray foam insulation (CCSPF) underneath our basement slabs to provide both insulation and air sealing. We don't do this on every project, but on most of the homes we build or renovate extensively, we will spray a minimum of 2 inches of spray foam (yielding at least R-14) directly on top of a crushed stone base, and then we place our concrete slab on top of it.

I like this method because it is a quick and easy way to insulate under a slab. On a recent job, for example, we insulated a 2,200-square-foot slab in just a couple of hours. If we had done this with 2-inch-thick rigid board—properly cut and properly taped, especially around all the concrete columns on this job—we would have spent nearly two days on just the installation.

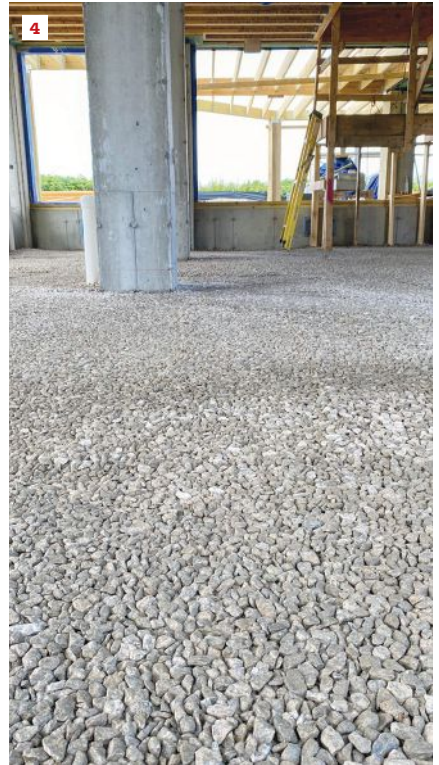
That said, on this particular project, the cost of labor vs. the higher material cost of using CCSPF was a wash. On other projects that are not as complex, the higher material cost does make the job more expensive, but we save a lot of time and aggravation. More importantly, there are a number of performance benefits that I like: The foam locks into the subbase to create a monolithic base; there are no seams, or joints, so it's a continuous air barrier; and closed-cell foam is impervious to water and air, so it's a great moisture and vapor barrier. One added benefit that a lot of people don't think about, but is important in some locations, is that it is a great radon blocker, too.

BASE FOR THE FOAM

I've learned over the years to apply the spray foam directly to a crushed stone base, instead of to a gravel base. The reason for this is that the stone base has voids between the

Two inches of closed-cell spray foam provides not only good insulation but also a superior air and water barrier. The author has found that spray foam works best when applied over a compacted crushed-stone base.

Photos by Wade Paquin



Elevation lines on this foundation wall show the layers of the typical basement slab for the large custom homes built by the author (2). Over the compacted gravel subbase, crushed stone is spread and compacted smooth (3, 4) before the foam is applied (5). Note the foam is brought up the wall (6) a good 12 to 16 inches to get it well above the slab surface to tie in with the wall insulation and ensure a continuous seal.



While this slab on an older project uses wire mesh, the author has gravitated towards using fiber-mesh reinforcement to simplify the pour. Both will provide good reinforcement but must be coupled with saw-cut control joints (after finishing) to avoid cracking. With a solid base, reinforcement, and proper curing, the author avoids any visible cracks in the slab surface.

aggregate pieces that allow the foam to penetrate. This accomplishes two things:

1. As the foam expands, it fills the voids in the stone base, keeping the insulation layer anchored down and creating a monolithic substrate.

2. The combination of the stone and its voids helps the SPF installer maintain a relatively flat, even 2-inch installation.

If we were to apply the foam to sand or dirt that has a top layer of particles, the tensile strength of the foam curing will lift and curl on the edges. Applying to crushed stone helps keep the foam flat, which in turn helps the installer maintain a fairly flat surface of foam.

CONTROL JOINTS

One practice we do, which is needed on all slabs regardless of whether or not, or how, they are insulated, is to cut control joints in the slab to relieve any stress cracking or hairline cracks in the slab surface. Spacing of the control joints varies by the shape of the slab, but in general, for a 4-inch slab, joints should be 8 to 12 feet apart. The National Ready Mix Concrete Association recommends that spacing should never exceed 15 feet.

We typically also use expansion joints around the perimeter along the wall (to isolate the walls from the slab) and wrap expansion joint material around any interior concrete columns.

CONCRETE

We like to use a 3,500-psi, or even a 4,000-psi, mix with fiber-mesh reinforcement. We have been moving to fiber mesh for a number of years, getting away from using wire-mesh reinforcement. The wire mesh works well, and we've used it often in our slabs, but we like the fiber mesh better. Without needing to install the wire mesh and all the extra chairs required, we significantly simplify the pour. (Depending on the slab, we may also install rebar, as required by engineering.) Fiber-mesh reinforcing is a lot easier and cleaner than wire, yet provides a strong concrete mix. Coupled with the base, the foam, and those control joints, you end up with a successful slab pour and good long-term performance.

I am often asked, "Can the foam support the weight of the concrete?" The answer is absolutely, yes. The CCSPF has a PSI of 28.5, which is more than sufficient. In fact, when the entire process is done correctly, it can be used under a garage slab. We have used this overall application in several garages—and with two vehicles on a slab, there hasn't been even so much as a hairline crack.

Wade Paquin runs WKP Construction, a custom home building and renovation firm based in Newport, R.I. Follow him on Instagram at @wkp_construction and on the BuildShowNetwork.com.



After stripping the old roofing, workers covered the roof deck with peel-and-stick membrane to keep the structure dry during the project (1). Workers reinforced 2x12 framing that had been sistered to the old rafters with rafter ties so the roof could safely be lifted with a crane (2). To provide a “foundation” for the new roof, they set up a braced and leveled LVL frame on the ground representing the tops of the structure’s walls (3).

Raising the Roof

BY ALAN SCHMIDT

Recently, we added a new master bedroom and bath to the upper level of the west wing of a vintage 150-year-old Vermont home, which had just been purchased by our clients. While the 22'-9" x 30' ell's foundation and first-floor framing were in fine condition, thanks to an extensive kitchen renovation project in 2009 (see “Replacing a Stone Foundation,” Mar/09), our clients had been instructed by their insurance agent to fix its slate roof when they had closed on the house. They also wanted to add shed dormers and move the knee walls out, thus increasing the footprint on the second floor and creating wall space for new windows for the master bedroom suite. All of the work would have to take place without disrupting the kitchen below.

Prepping the roof. The roof had been severely compromised due to the weight of slate sitting on roof framing that had been designed for cedar shakes. The slate had been installed directly over cedar shakes, in fact, so we started by removing both layers. Then we covered the roof sheathing with synthetic roofing underlayment to keep the space dry until we were ready to cut in the new shed dormers (1).

On the interior, we removed drywall and the dense-packed cellulose that had been used to insulate the walls and ceiling. This revealed hand-hewn 5x7 timber rafters, which had been reinforced at some point with sistered 2x12s. The rafters were pegged at the peak and nailed to the wall top plate on a roughly 3-foot-on-center layout (2). In order to cut in our clients’ proposed 21-foot-wide dormer on the south-facing side of the roof and 12-foot-wide dormer on the opposite, north-facing side, we would need to install a structural ridge to prevent the walls from bowing out even more than they already were.

With no interior walls available to post up midspan support for a structural ridge, it would be next to impossible to “cut” the large dormer on the south side and the shorter dormer on the north side into the roof without exposing the structure to weather. Leaving the sheathing intact and installing a dropped ridge underneath the rafters wasn’t an option either, because it would sacrifice much-needed headroom. And even if we could figure out these details without risking water damage to the kitchen below, we would still be left with the challenge of flattening, straightening, and resheathing what was left of the main pitch roof to accept standing seam roofing.

After sharing these discoveries with the client, I proposed the safest bet was to rebuild the entire roof system

Photos by Alan and David Schmidt



Workers tacked 2x6 plates to the LVLs and installed a double 1³/₄-inch-by-14-inch LVL structural ridge, then framed the new roof with 2x12 rafters (4). The dormer walls were framed with 2x6s (5). Zip panels were used to sheathe the walls and roof (6), while temporary T-shaped rafter ties were added to the framing to reinforce the roof system during the lift (7).

on the ground, then use a crane to remove the old roof and set the new one in place. Catamount Crane Co., run by Cole Goyette, a good friend of mine, would be my go-to for “the big move.”

Framing the new roof on the ground. I started by mapping the overall size of the exterior walls and shot the elevations of the existing top plates with a laser. Each eaves wall had roughly a 1¹/₂-inch bow, caused by the weight of the slate, with the plates dropping around 3 inches from east to west (away from the house) along their 30-foot span. With only 2 feet of balloon-framed stem wall extending above floor height, we knew we couldn’t do anything to fix the bow in the walls without disturbing the ceiling and kitchen below. The elevations, however, needed to be trued back up in order for the new roof to sit level.

With the bowed walls and the odd size of the old, rough-sawn lumber framing, it was difficult to determine if the structure was square, and—if not—just how far out-of-square it was. My solution

was to use a laser to plumb down from the “peak” of the rafters to the old subfloor at either end of the building and use those marks to snap a centerline representing the center of what would become the ridge. Verifying that back to the corners that mated up to the main house, we were within 1/4 inch of square over 20 feet. That was within the tolerances needed to build our new structure truly square and make adjustments later.

Next, we built a 22'-9" x 30' frame out of LVLs in the parking area to represent the structure’s footprint (3), propping it up so that it was level. After squaring it up, we checked all four sides with a string line to make sure they were straight. Then we plated the two eaves walls of the LVL frame with 2x6s, which would eventually become the upper plate of the double top plate that we would install to cap the balloon-framed walls (4).

On the existing roof, the old rafters terminated at the very outer edge of the single top plate, with the soffit and roof overhang simply



On the day of the lift, workers cut the old roof into three sections, which they had reinforced with truss-like framing prior to removal (8). The lifting straps were threaded through small openings cut into the roof sheathing at the ridge (9). With the roof removed and the balloon-framed gable end walls exposed, the structure was ready for its new roof (10).

applied from outside. Initially, I thought that the soffit, fascia, and roof crown were still worth saving, if possible. However, I also wanted the eaves to be structurally sound, with the new rafters overhanging the wall plates and birdsmouth seat cuts in the rafters.

The position of the ridge was dictated by where it mated up to the main house, while the new roof framing was restricted by the needed clearance for the height of an interior door, which could not change. We didn't want to disturb the siding on the main house, and we wanted to keep the already-sided gable wall on the addition largely intact. That meant that the ridge height and roof pitch of the old and new roofs had to match exactly.

We ended up with a 7.5/12 pitch, with a 6¹/₂-inch HAP cut in the birdsmouth. Because we planned on double top plates, we had to remove 9¹/₂ inches from the top of the existing walls in a level plane for the new roof structure to mate up to the old building.

For the structural ridge, we specified double 1³/₄-inch-by-14-inch

LVLs, with 2x12 rafters and roughly 7-foot-long collar ties to form the ceiling. We dropped the ceiling in the lower level to make room for a recessed cassette heat-pump head. The dormer walls were framed with 2x6s, with LVL headers in the window openings (5).

We sheathed the walls with 7/16-inch Zip System sheathing and used 5/8-inch Zip T&G panels to sheathe the roof (6). At the peak, we cut the final course of sheathing to size and Zip-taped the joints, but we fastened the panels to the framing with only a few screws in each panel. That allowed us to remove the screws and fold the panels back so that we could rig crane straps to the ridge.

We had decided—with Cole's (the crane operator) input—that the roof system could be picked up from four points along the ridge. Since neither end of the structure would have a gable wall for support, we framed a series of 16-foot-long temporary strongback T-shaped 2x6 rafter ties, screwing them to the rafter pairs at the gable ends and to the rafter pairs flanking the short shed dormer. To reinforce the

assemblies, we posted each rafter tie up to the ridge and installed pairs of diagonals. Finally, to help resist the force of the walls and eaves wanting to fold inward during hoisting, we installed a full-width LVL fastened on each side to doubled window king studs, plating the LVL with 2x6s (7).

Lifting day. To reinforce the old roof system, we had fastened rafter ties to roughly every other rafter pair with structural screws. These reinforced rafters become our lifting points, as the wooden pegs at the peaks offered minimal shear strength. With Cole's 70-ton crane on site, we divided the roof into three sections, cutting down the rafter bays from the peak all the way through the top plate with a reciprocating saw. Knowing that we would eventually have to remove 9½ inches of studs below the top plate, we also cut horizontally through the studs at the upper board sheathing break (8).

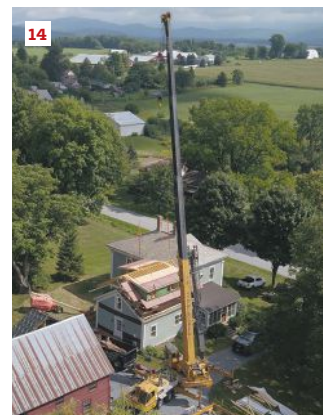
Next, we cut a small opening in the peak at the center of each section for the lifting strap to go through. Before lifting away each section, we installed a triple 2x6 beam underneath the section's supporting rafter ties. We also posted up from either end of the beam to the peak with 2x6s, effectively creating a pair of trusses that would support each roof section. Then we hooked the lifting strap to the beam and hoisted the roof away, section by section, relying on the small "windows" in the sheathing to guide the straps and keep the roof sections from rolling over (9).

With the roof out of the way and the wall framing exposed, we shot a laser line around the building and snapped out the new height needed for the existing studs to set the new roof system level. Then we cut the studs to the line with a 10¼-inch circular saw, creating our new level plane. Finally, we snapped a line on the board sheathing that was slightly below the height of the studs and cut to the line with a reciprocating saw. When making the seat cuts on the new roof rafters, we had cut secondary notches 3 inches below the seat cut to accommodate the sheathing.

The west-facing gable wall was now free-standing, but because it was balloon-framed, we felt comfortable leaving it loose for the time being while we nailed off the lower of the two top plates to the tops of the studs in preparation for the new roof (10).

Flying in the new roof. While the crew and I reinforced the new roof structure for hoisting, Cole unscrewed and folded back the finish course of Zip sheathing to expose the ridge and begin rigging his lifting straps. He hung a spreader bar off the crane's main hook with two 20-foot steel cables, then choked 40-foot-long straps to the ridge. The longer the strap (and therefore the shallower the angle between the lifting points on the ridge and the hooks on the steel cables), the less likely the straps would slide inward towards each other under the weight (11).

Because we had two different-sized dormers, the weight of the roof wasn't evenly distributed from side to side. So



Hung from a spreader bar, lifting straps were choked to the ridge at four reinforced locations (11). During the lift, a worker used a tag line to help position the suspended roof (12). A strap fastened to the large dormer and tensioned with a come-along kept the unbalanced structure level (13). Tucking the new roof's structural ridge under the main house eaves while fitting it into a beam pocket in the existing framing was tricky (14).



To match the new roof trim to the out-of-level ell, workers had to remove the existing soffit and fascia (15) and install a secondary frieze board molding detail, complete with new fascia, soffits, and crown molding (16, 17). The dormers were clad with gapped shiplap siding, and a new standing seam metal roof was installed (18). On the interior, new partitions were framed for closets and a master bathroom, and the wall cavities and rafter bays were sprayed with closed cell foam insulation (19).

a test pick was performed, during which we used another strap hooked to the long dormer and a come-along to balance out the heavy side (12, 13). At the same time, we adjusted the lifting straps so that the east side—the side mating up to the existing house—would be slightly lower than the west side, providing the geometry needed to tuck the ridge under the eaves of the main house while clearing the free-standing gable wall at the other end (14).

On the east side, we had framed the LVL ridge 4 inches long to allow us to post up to the ridge inside the interior wall of the main house. Unfortunately, the extended ridge became a bit of a headache, as we didn't have enough clearance between the east strap near the end of the LVL and the eaves above to join up to the main house without the strap hitting the eaves. Because the east side was lower, we were able to set it down temporarily, taking just enough weight off the strap to be able to slide it over to the other side of the rafter bay that it was rigged to. Then we picked the structure back

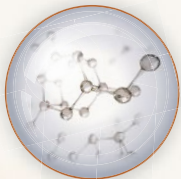
up and slid it over into its final position on top of the new plates. Once we nailed the plates together, we unhooked the straps, cut the sheathing to length against the main house, folded the roof sheathing back into place, nailed everything off, and taped all the joints with Zip tape. It was a long day, but now we were watertight (15).

Stitching the pieces back together. Due to the ell's out-of-level condition, we had to remove the existing soffit and fascia. To match the new trim with the old and hide the problem, we installed a secondary frieze board molding detail, complete with new fascia, soffits, and crown molding, finished off with a new standing seam metal roof (16, 17, 18).

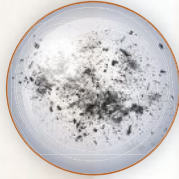
On the interior, after framing new interior partitions for closets and a master bath, we roughed-in new plumbing and electrical. Then we air-sealed and insulated the space with spray foam (19).

Alan Schmidt owns Belgian Woodworks and Building Co., in Lincoln, Vt.

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Building a Floating Staircase

BY GARY STRIEGLER

Problem-solving is a big part of my job as a home builder, and even after more than 40 years in the business, I'm still running into new problems to solve. Recently, for example, we were building a two-story home with a symmetrical front elevation and a staircase off the front entry. The stairs drawn on the floor plan showed three treads up to a lower landing, then a turn to follow the exterior wall for 10 treads to another landing, with a turn to three more treads that led up to a bridge across the two-story living room.

Because the stairs would run diagonally across one of the symmetrical windows beside the front door, the framing crew didn't frame that window opening. Of course, this wasn't a satisfactory solution for my client. But adjusting the stair location wasn't an option either, because it was locked in by the front door on the first floor and the second-story bridge. Instead, I had to solve this present-day issue by relying on an old, historic solution: Frame and install the window per the original plans to maintain the symmetry of the front elevation, and float the stairs about 10 inches off the wall (the run of one stair tread) to miss the window.

My client loved the idea, but my design solution presented a structural challenge because only one side of the upper landing would be attached to a wall. Not only would the landing have to carry the entire load for the main run of stringers—none of which would now be attached to a wall—but it would also need to support loads from the short run of stairs up to the bridge. That is a lot to ask from a landing with no visible means of support.

Layout. I first considered supporting the landing either with some sort of metal structure or with framing cantilevered back into the entry closet. But then I recalled some of the historic homes I've toured while on vacation over the years, several of which featured similar floating stairs. So I knew it could be done; all I had to do was figure out how those carpenters had managed to build their solid but unsupported staircases.

As I was working on the layout, I realized that the stringers for the unattached section of the stairs could work like a diagonal brace for the upper landing. If the stringers were rigid enough and none of my connections failed, the landing couldn't move. The same was true in reverse for the short upper run. So I decided to give this method a try, while keeping the option of cantilevering into the entry closet as a backup plan.

Photos by Gary Striegler and Mark Ganaway



To preserve the home's symmetrical fenestration, the stairs needed to be spaced away from the wall (1). The author began by marking the stair's vertical layout on a story pole, including each tread (2) and the landing elevations (3). Plenty of structural screws and construction adhesive were used to frame each landing (4).



OSB sheathing was glued and screwed to the inner faces of the short walls (5) supporting the landing platform, which was framed with 2x12s (6, 7). Workers then installed blocking and a temporary support ledger (8) for the upper landing (9), which was propped up and held level with temporary posts (10) while the LVL stair stringers were measured, cut, and installed (11).

I began by calculating the total number of treads needed for the stairs, which would determine the run for each section. We would be using 11½-inch-wide hardwood treads, so I figured 10 inches of run per tread to allow for a 1½-inch overhang.

Next, I plumbed down from the face of the bridge and marked the layout on the floor as accurately as I could, starting with the front of each riser. In my layout, I allowed for 48-inch-wide landings

and treads. With the 10-inch spacing off the wall, the starting tread moved farther out into the living room, which ended up allowing more room for a piece of furniture that would back up to the stairs.

Whenever I'm laying out stairs, I like to mark the layout on a story pole. This allows me to accurately record finish floor heights, landing locations, and the elevation of each tread. It becomes my blueprint for building the stairs.



The author used the story pole to mark the tread locations on the inside stringer (12). Because the inside and outside stringers were solid instead of notched, 2-by blocking was glued and screwed to the stringer to support the treads (13). Then the author transferred the tread layout to the outside stringer using a spirit level and a straight 2-by (14). The middle stringer was also cut from a 16-inch-wide LVL, which needed to be notched for the treads and risers (15).

Landing platforms connected by solid stringers. Since the home was fairly contemporary, I was able to design a staircase with housed treads instead of more traditional mitered returns, which meant that the two outside stringers wouldn't have to be notched. To provide strong diagonal bracing, we used 1 3/4-inch-by-16-inch LVLs for the stringers and made every connection with plenty of 2-by blocking, lots of construction adhesive, and structural screws.

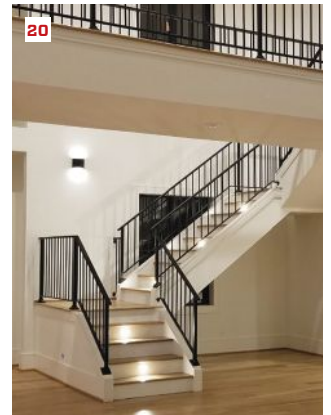
Solid stringers were important to the structural integrity of the assembly, but I also wanted to make sure that the bottom landing they attached to wouldn't move. We determined the height of the platform using the story pole, and during the landing's construction, we glued and screwed its support walls to the wood subfloor, then reinforced the landing with a layer of OSB glued and screwed inside the framing. We used 2x12s to build the landing platform, which we glued and screwed to the support walls. Finally, we glued and screwed 3/4-inch OSB sheathing to the framing for the platform top; in all, we used about three large tubes of construc-

tion adhesive in the landing's construction.

We also used 2x12s to build the platform for the floating upper landing, again using both construction adhesive and structural screws to strengthen the assembly. Before screwing the framed platform to the closet wall framing, we added plenty of blocking between studs on the flat for added attachment strength and reinforced the connection with construction adhesive. We installed a temporary ledger to the framing to help orient and level the platform and used a couple of temporary 2x4 legs to support the platform and hold its outside edge in position while we installed the stringers.

Next, we carefully measured the diagonal distance between the top edges of the upper and lower platforms and, based on the 7 5/8-inch rise and 10-inch run of the treads, laid out the upper and lower plumb cuts on the two outside stringers that run between landings. After double-checking their fit, we fastened the stringers to the upper and lower landings with glue and structural screws.

Using the horizontal layout I had marked on the floor, the



With the upper landing locked into position, the author laid out the inside stringer for the short run of stairs to the upper level (16). He glued and screwed the stringer to the framing (17), then installed additional blocking and the outside stringer (18). Temporary 2-by treads were installed to provide access to the upper level during construction (19). Inspired by tradition, the new stairs have a contemporary look as they float past the window (20).

vertical layout on my story pole, and a spirit level, I marked the stringers with the points where the top of each riser met the bottom of a stair tread and then marked horizontal lines for each stair tread. Next, I glued and screwed 2x4 cleats to the outer stringers at each location to support the stair treads.

The center stringer had to be notched, so I laid out the positions of each tread and riser on an LVL and made the sawtooth cuts. Before permanently attaching it, I tacked the stringer in place and double-checked the layout with a straightedge.

On the short, upper run of stairs, the left-hand stringer could be fastened to the wall framing, so I made sure it was well-attached with structural screws and plenty of construction adhesive. Otherwise, I just repeated the process from the middle run of stairs at the top and bottom. I always wait until close to the end of the job to install hardwood treads, so we cut temporary treads out of framing lumber.

One more step that we took to strengthen the stairs was to glue and screw a layer of 7/16-inch OSB to the bottom of the stringers,

prior to drywall. I've built several unsupported curved stairs and have found that this measure adds a lot of strength to the assembly, so I figured it had to help this stair too.

Finally, we pulled the temporary legs from the landing to test the stairs for strength. I was pretty sure we were going to be in good shape, but I sent two guys up to the landing and stood at the bottom looking for movement. It was as solid as any stair I have ever built.

An interesting note: Even though I had worked as a carpenter for more than 40 years before building my first unsupported stair, within a month of completing this staircase, I used some of the same principles on another job. It really is an amazing look, so I'm betting that I'll be building another one soon.

Gary Striegler, a JLC contributing editor, owns Craftsman Builders (craftsmanbuildersnwa.com), in Fayetteville, Ark., and teaches workshops at the Marc Adams School of Woodworking. Follow him on Instagram: @craftsmanbuilders.

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WHAT IS THIS CASE ABOUT?

Plaintiffs allege that due to fly-ash in the Siding formula, the Siding is prone to cracking, bowing, shrinking, warping, breakage, or gapping. Defendants contend that the Siding is not defective and performs well when installed properly. The Court has not made any determination as to the quality of the Siding.

WHO REPRESENTS YOU?

The Court has appointed six law firms to serve as Class Counsel on your behalf.

Lead Class Counsel plans to request attorneys' fees, costs, and expenses of up to \$4,000,000 in the aggregate, which will be paid from the Fund. These fees, costs, and expenses and service awards will be decided by the Court and will be paid by Defendants. The Court may award less than this amount. The payment of attorneys' fees, costs and expenses, and the service awards will not reduce the benefits to the Settlement Class.

WHAT DOES THE SETTLEMENT PROVIDE?

The Settlement covers claims for Qualifying Damage, evidenced by cracking, bowing, shrinkage, warping, breakage, or gapping in the Siding not caused by improper installation and, if available, evidence of the alleged property damage resulting from such failed Siding. Eligible claimants can choose between three compensation options: (1) a repair and replacement option that provides compensation for replacement siding and \$4.75/square foot for additional costs for installation, labor, painting, and other work on an elevation where Qualifying Damage exists on more than 30% of the elevation; (2) a quick cash option that provides \$4.25/square foot for areas exhibiting Qualifying Damage; or (3) a cash option that provides additional compensation for labor upon proof of repair. This option is only available for claims with Qualifying Damage that does not exceed 30% of an elevation. Under this option, eligible claimants receive \$4.25/square foot for areas exhibiting Qualifying Damage within 30 days of final approval of the claim, plus \$4.25/square foot for the remainder of the elevation within 30 days of submission of approved proof of replacement of the claimed area.

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The 80/20 Rule of Client Communications

The economist Vilfredo Pareto is credited with the Pareto Principle, also known as the “80/20 rule.” The story is he discovered that 20% of the pea pods in his garden produced 80% of the peas, and then applied that ratio to economics. In essence, it means that 80% of what is achieved comes from 20% of the effort made. The principle has been applied to finance, education, marriage, and fitness. For those of us running businesses in the construction trades, the 80/20 rule works with a variety of tools.

The tool I want to focus on here is communication. Communication is the 20% of effort that produces 80% of the desired results. It’s a simple concept, but not always pleasant, so not always easy. It means returning a prospect’s call, even in a heated market; returning a client’s call, even when you have to discuss a problem; identifying a client’s preferred method of communicating—email, text, or phone—and being accessible to answer the phone or return calls promptly.

I’ve separated myself from at least 80% of my competitors by returning calls within 24 hours. Many people have genuinely thanked me for returning their call; my reply is, “It’s my job.” I’m grateful to my competition for failing at such a simple, but important business practice—returning calls promptly—allowing me to score points in the homeowner’s decision-making process.

I return calls about projects even if I can’t pursue a job due to scheduling issues. I inform the homeowner we are not available; to create good will, or if a homeowner asks, I walk them through the remodeling or construction process: Select an architect, have zoning approved, have plans approved, conduct walk-throughs, gather quotes, and select a contractor. I’ve recommended architects (later letting the architect know I recommended them) and provided competitors’ contact information. Such calls provide dividends down the road—future projects or referrals to family, friends, or neighbors.

We sell remodeling service as a partnership emphasizing communication and accessibility, and we take it seriously. I’m on the job every day banging nails; I’m not sitting in an office. My partner and I decided long ago that if a client calls, I answer—unless, of course, I am lifting a beam into place. When necessary, I stop construction work at 11:30 a.m. and switch to administrative tasks—returning client calls, emails, or text messages being our priority. Being responsive and communicative makes dealing with clients and construction problems easier. Clients know there’s a problem, they know you’re working on it, they are getting updates, and they know when the issue has been resolved. This allows the client to direct their time towards work and family instead of spending time trying to contact you. The approach builds confidence in you; clients know you represent their interests.

Being responsive and communicative makes dealing with clients easier.

No doubt, clients can be difficult, occasionally exhibiting unpleasant personality traits. However, they are easier to deal with when they know you’re on the job every day and accessible. Most, I find, respect your evening and weekend time. If they don’t, you can inform them that calls after 5 p.m. will be returned the next day, and weekend calls on Monday. Outline your policy regarding personal time in a clause in your contract.

So, return calls promptly, and enter into a partnership with your client by being accessible and communicative and become a member of the 20% that gets 80% of the work.

Rob Corbo is a frequent contributor to JLC and a building contractor based in Elizabeth, N.J.

The screenshot shows the JLC website homepage. At the top left, there are links for "Coastal Contractor", "Videos", and "Subscribe". A box prompts users to "Get JLC news in your inbox!" with a "Click Here" link. The main header features the "JLC" logo, "THE JOURNAL OF LIGHT CONSTRUCTION", and a "MY TOOLBOX" button. A navigation bar includes "HOW TO", "PROJECTS", "PRODUCTS/TOOLS", "BUSINESS", "FORUMS", and a search icon. Below the navigation is a banner for "Ipe Oil" and "DeckWax". The main content area is titled "Construction Skills" and features an article "CONCRETE BASICS" with a photo of workers. Below the article is a numbered list from 1 to 9 and a category menu with options: FOUNDATIONS, FRAMING, EXTERIORS, ROOFING, ELECTRICAL, PLUMBING, HVAC, INSULATION, INTERIORS. The "Building Resources" section includes articles like "INSTALLING PREFINISHED STRIP FLOORING" and "RETHINKING WINDOW FLASHING". On the right, there are ads for "LENOX" and "LEAD ARMOR" and a section for "Construction Workforce" with a link for "Online Training Allowed for Lead Paint Recertification".

JLConline.com offers sound technical advice, practical how-to articles, expert hosted forums, as well as networking opportunities.

Managing Wood Movement

Wood is hygroscopic, meaning it exchanges moisture with the surrounding environment. When it absorbs moisture, wood swells, and when it releases moisture (dries), wood shrinks.

The moisture exchange between wood and air depends on the relative humidity (RH) and the temperature of the air, and the amount of water in the wood at any given time. The degree to which wood changes dimension is dependent on the structure of the wood, which varies by species.

Carpenters have essentially five ways to manage wood movement:

- The most important is to use dry wood and to condition it to near equilibrium moisture content. This requires an understanding of how to condition wood, and it helps if you actually measure the moisture content of the wood on site.
- Selecting a stable wood is also key; this becomes an issue when you opt for unusual or unfamiliar woods. Most of the usual suspects—including spruce-pine-fir and Douglas fir for framing; and white pine, poplar, white and red oak, maple, or cherry for trim—are familiar to carpenters for a reason: These woods tend to be fairly stable under normal environmental conditions. If you install these woods dry and well acclimated to your site, you have an excellent chance that movement will be minimized.
- Finishing the wood to seal the grain can also help, but protective coatings will only slow down dimensional changes in wood, not prevent them.
- The design of wood joints is important to accommodate cumulative movement in large pieces of wood and to manage the visuals, so to speak, so the natural movement of wood is not problematic.

■ The fifth way of controlling wood movement only works for wood used inside a building, but it is critical to wood's performance: controlling the temperature and relative humidity of the building environment. We'll touch on this here, but the topic of controlling the building environment is a much larger one that's handled in a broad range of other *JLC* articles.

CONDITIONING WOOD

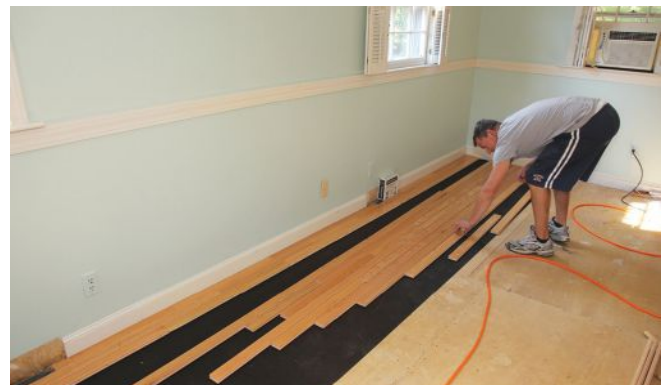
Wood should be installed at a moisture content (MC) as close as possible to the average moisture content it will experience in service. In theory, the lumber you buy has already been dried—preshrunk, if you will. Unless you're cutting your own wood and milling it into lumber, you don't need to dry lumber. But you do need to condition it on site.

Softwood lumber intended for framing is usually dried to an average moisture content of 15%, not to exceed 19%. Kiln-dried framing lumber often comes in lower, at around 12%. Finish-grade softwood is dried to a lower moisture content: 10% to 12% for many appearance-grade 1-by softwoods, to as low as 7% to 9% for furniture, cabinets, and millwork. Hardwood lumber for furniture, cabinets, and millwork is usually dried to 6% to 8% moisture content.

All these percentages are the targets for the moisture content of the lumber that leaves the mill. What you buy might be slightly higher or lower, depending on the climate conditions the lumber has acclimated to in the yard. In a humid climate, the wood will likely take on moisture, and in a drier climate, it might dry to a lower moisture content. But what matters is the climate conditions where it will be installed. Before installing any wood building materials, you

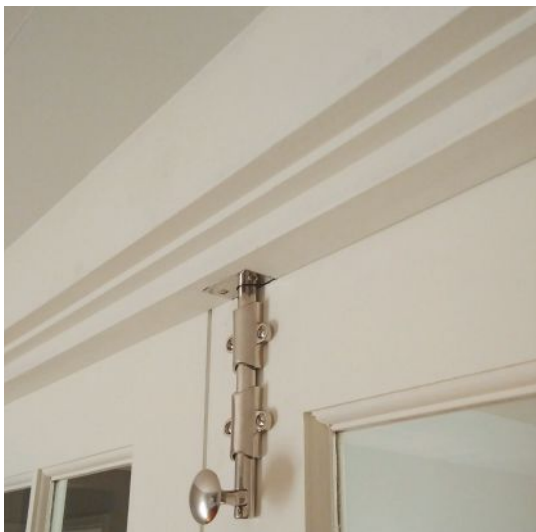
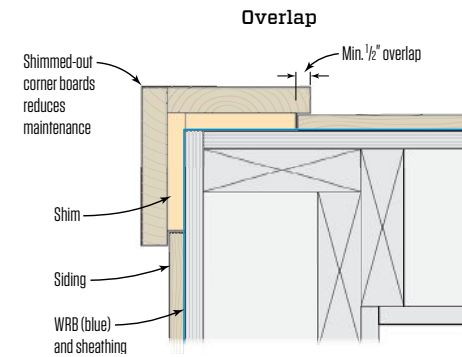
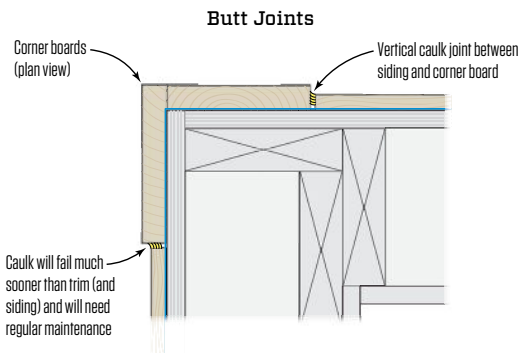


Wet framing and a short building cycle is a good recipe for nail pops, drywall cracks, and other callbacks.



Small dimensional changes in each floor board can add up to a larger change across the entire floor.

Corner Boards



Caulk between exterior corner boards and siding fails quickly (top). Avoid caulk entirely by packing out corner boards so they overlap the siding (center). The offset between the edges of trim boards, known as a reveal (bottom), is a classic way to hide slight dimensional changes, indoors or out.

need to allow them to acclimate to equilibrium moisture content (EMC), the moisture content when the wood is neither absorbing moisture or drying; instead, the wood is at a steady state relative to the surrounding temperature and humidity. This process of letting the wood acclimate to EMC is what we mean by conditioning wood.

Framing lumber can be installed at a higher moisture content than finish wood products—12% to 14% is a good target for framing lumber. Thoroughly air-dried framing stock will generally have a moisture content greater than 14% when it is delivered. That's OK, as long as the material is not carelessly handled at a yard or jobsite—no pallets dropped in the dirt or left out in the snow and rain. If lumber gets this kind of treatment, it will take up much more moisture and may not easily dry sufficiently in a normal building cycle.

Barring careless handling, the normal building cycle often works to a builder's advantage: After the building is dried in (sheathing and windows installed), the time it takes to rough-in wiring and plumbing holds off the installation of wall and ceiling finishes. If this time is about 30 days in warm, dry weather, conventional wisdom says that wet framing lumber should lose enough moisture so that any additional drying in place will be adequate to prevent callbacks ... except that doesn't always happen. Often, the schedule is pushed to much shorter cycle times. In cool, damp weather, or if the framing has been soaked on site, the conditioning period should be extended.

The only sure way to know if you will avoid a lot of nail pops, dry-wall cracks, and open trim miters is to check the moisture content of door and window headers and floor and ceiling joists with a moisture meter (see "Drying Wet Framing," Jun/13). The Forest Products Lab recommends checking about 10% of the framing as good practice. So, for example, if you have 50 joists, test at least five of them in various locations to get a good sense of the average moisture content.

When the framing approaches an average of 12% moisture content, interior finish and trim can normally be installed. Dehumidifiers and HVAC equipment will increase the rate of drying. For builders especially concerned about the performance of high-end finish materials, drying the home is critical to manage not just the moisture in the framing lumber but also all the moisture in curing concrete and masonry (see "Conditioning Homes," Nov/14).

Finish lumber requires careful planning. Materials should be delivered and installed only after HVAC has been installed so indoor conditions can be controlled.

Pay particular attention to the moisture content of wood flooring and wall or ceiling paneling. Small incremental changes in each board add up to big changes over the entire floor, wall, or ceiling.

Here is the procedure recommended by the Forest Products Lab for acclimating wood flooring and T&G panel products:

- Break open bundles and expose all sides of the material to the atmosphere inside the structure.
- Close up the house and increase the temperature to about 15°F above the outdoor temperature for about three days before laying the floor.
- If the house is not occupied immediately after the floor is laid, keep the house closed at night or during damp weather and supply some heat if necessary.

Illustration by Tim Healey; photo by Clay DeKorne

Deck Board Miters

Problems are more likely in thin wall and ceiling panels. Thicker flooring, as long as it is nailed off well, tends to have fewer problems except in particularly unstable wood types. If you don't follow this procedure for thinner T&G wood products, here is the sort of scenario that is not uncommon and is always unwelcome:

Say the outdoor relative humidity in January is around 80%. In those conditions, the EMC for wood will be in the 15% to 16% range. If you have T&G beveled wainscot delivered at 8% moisture content and store it in the garage, it's going to take on a lot of moisture and swell until it reaches EMC. If you then take it right from the garage and install it with that higher moisture content, it's going to shrink when it acclimates to the conditioned indoor air. At, say, 60% relative humidity, the EMC will be closer to 11%. This change will result in noticeable gaps between boards and likely lead to a callback.

This would be a typical scenario in Portland, Ore., in January. In Portland, Maine, in January, the relative humidity outdoors might be more like 66% with EMC in the 11% to 12% range. But the indoor relative humidity might be a lot drier, too: closer to 30% RH when EMC for wood will be around 6%. That's enough change to lead to a similar result: gaps between boards. Even if the indoor air is a more comfortable 45% RH, the change would be enough to crack the paint between board joints. The easy fix for all these scenarios is the same: Acclimate the wood to the indoor conditions. The indoor relative humidity might vary from 30% to 50% but the EMC will only vary from around 6% to 9%—a range that results in an acceptable level of dimensional change for most woods.

SELECTING STABLE WOODS

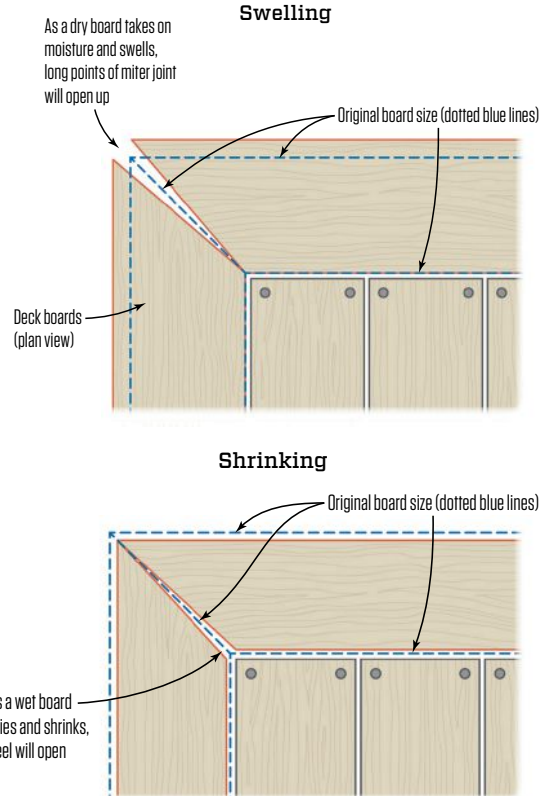
Not all woods move to the same degree. Wood shrinks (swells) most across the width of a board and very little in length (parallel to the grain). The shrinkage across the width of the board is greatest in the direction of the annual growth rings (tangentially, when flatsawn), and about half as much across the rings (radially, when quartersawn). The amount of shrinkage also varies according to the wood structure, so species is a strong deciding factor.

The table on the following page provides what is called the dimensional change coefficient for several species of wood. (For other species of wood, see the table in Chapter 13 of the Forest Products Laboratory *Wood Handbook*.) The species have been ordered from small to large by their dimensional change coefficients for flatsawn boards, which are more commonly available than quartersawn material. There are many factors that go into wood selection, and the dimensional change coefficient is only one characteristic that might affect a carpenter's decision to use a particular species.

Dimensional change coefficients allow for a quick estimation of how a board of a particular width will move with expected changes in moisture content using this formula:

width x MC change x dimensional change coefficient

For MC change, 3 is a good default value; it's typical for wood in most conditioned homes. The formula is only approximate, but it can be used for comparing species. For example, let's examine



As a dry board swells with moisture, the long points of a miter open (top). As a wet board dries, the heel opens (center). Decks are especially vulnerable, as they see a lot of water. Deck builder Lavrans Mathiesen embraces the fact the miter will move by leaving an intentional, "pillowed" gap (bottom).

how 5-inch-wide T&G ceiling paneling in ash and in hickory might perform in service:

Ash: $5" \times 3 \times 0.00274 = 0.0411"$ (just under $3/64"$ per board)
 Hickory: $5" \times 3 \times 0.00411 = 0.0611"$ (just under $1/16"$ per board)

Hickory would not be an especially good choice for wide boards in a T&G panel application. For narrower window casing or strip flooring, however, hickory can be a good choice, but you would want to be careful to condition it well (and be precise about it by measuring the moisture content) and use plenty of fasteners.

Without conditioning the lumber, you can't solve problems by choosing a more stable wood. With conditioned wood, you can get an approximate idea of how much a particular species will move in service; that can help you decide if you need to be more careful about the application or the way boards are joined.

JOINT DESIGN

How you join pieces of wood sometimes helps to resist movement. But most of the time, smart wood joinery simply hides movement.

Butt joints are perhaps the simplest way to join two pieces of wood, and for exterior trim, simple is often the best. Alignment is less of an issue with exterior trim; the important thing is to avoid joints opening up and allowing water to penetrate.

For example, with corner boards, fasten the outside corner joint well (ring-shank nails recommended), and then just place occasional nails in the middle of the face of each corner board. The goal is to keep the outside corner closed and allow the swelling and shrinking to show up at the edges near the siding. It's best if you can pack out the corner boards, rather than relying on a caulk joint between the siding and trim. Caulk will fail much sooner than the trim or siding and will need regular maintenance.

Beware especially wide boards for exterior use, as these will experience the most dimensional change. Fasten in the middle only and design the joints at the edges to move.

With exterior butt joints, it often works to leave them intentionally long rather than aiming for alignment at corners. On deck stairs, for example, it's common to run treads past the stringers an inch or more. But the same idea works for the risers, too: Run the riser a quarter inch or more past the stringer so any swelling or shrinking of the boards will go unnoticed.

Reveals. Most interior and exterior woodwork is, by convention, designed to accommodate some shrinkage. The reveals typical between casings and jambs are a prime example. The standard $1/8-$ to $1/4$ -inch offset creates a layered effect that is visually appealing in part because we have grown accustomed to these stepped layers and their shadow lines. But they serve another purpose: They hide the dimensional changes that are inevitable as boards expand and contract in width. If you're trying to align casings and jambs with a simple butt joint at the corner, even $1/32$ inch of expansion or contraction across the width of the casings would be a discernible misalignment.

Miters are an attractive way to join wood, but in most exterior applications, they stay tight only when the air temperature and

Dimensional Change Coefficients

Species	Quartersawn	Flatsawn
Teak, Indian (new growth)	0.00101	0.00186
Pine, eastern white	0.00071	0.00212
Redwood (new growth)	0.00101	0.00229
Cedar, western red	0.00111	0.00234
Douglas-fir, int. north	0.0013	0.00241
Cherry, black	0.00126	0.00248
Spruce, Engelmann	0.0013	0.00248
Pine, western white	0.00141	0.00259
Pine, southern yellow	0.00176	0.00263
Hemlock, western	0.00144	0.00274
Ash, white	0.00169	0.00274
Poplar	0.00158	0.00289
Marenti	0.00126	0.00289
Birch, yellow	0.00256	0.00338
Hard maple [sugar]	0.00165	0.00353
White Oak	0.0018	0.00365
Red Oak, northern	0.00158	0.00369
Hickory, true	0.00259	0.00411
Beech, American	0.0019	0.00431
Greenheart	0.0039	0.0043
Ipe	*	*

*Dimensional change coefficients (radial and tangential) for shrinking or swelling within moisture content limits of 6% to 14%

humidity match the day they were installed. When the weather changes, miters tend to open up and allow water to get in and cause rot. Indoors, if you are using unstable woods or especially wide boards, miters may not be the best choice.

As mentioned previously, when moisture content changes, wood expands or shrinks across the width of the board. This causes the miter to open at the toe (the long points of the cut) or the heel (the short points of the cut). Which part of the miter will open is directly related to the moisture content of the boards when they are installed (see illustration "Deck Board Miters," previous page). A dry board will expand as it takes on moisture, causing the long points to open up. A wet board will dry out, causing the heel to open up.

Exterior conditions are especially rough on miters. You can try to control these natural forces using biscuits, screws, or glue. These will work for a time, but chances are they'll eventually fail. Glues break, material splits, fasteners work loose. The biggest problem is when the two boards twist in opposite directions. This will make even a good miter look bad, with one tip of the miter lifting up and the other drooping down. As the boards deteriorate from weather and water works its way in, the joint will eventually fail.

Deck boards are particularly vulnerable to dimensional changes because of extreme in-service conditions—maximum UV light and water that lays on the boards and soaks in. Because miters in deck boards are usually difficult to keep tight, some builders steer clear of miters altogether, opting to weave deck boards at corners (see "No-Miter Method for Trimming Corners," May/17). Another approach is to intentionally gap the miter the same width that the deck boards are gapped. Deck builder Lavrans Mathiesen, of Portland, Ore., "pillows" the edges of each miter-cut board, rounding over the corners to give the joint a kind of Greene-and-Greene look. The detail embraces the fact that the joint is going to move; the gap conceals the change.

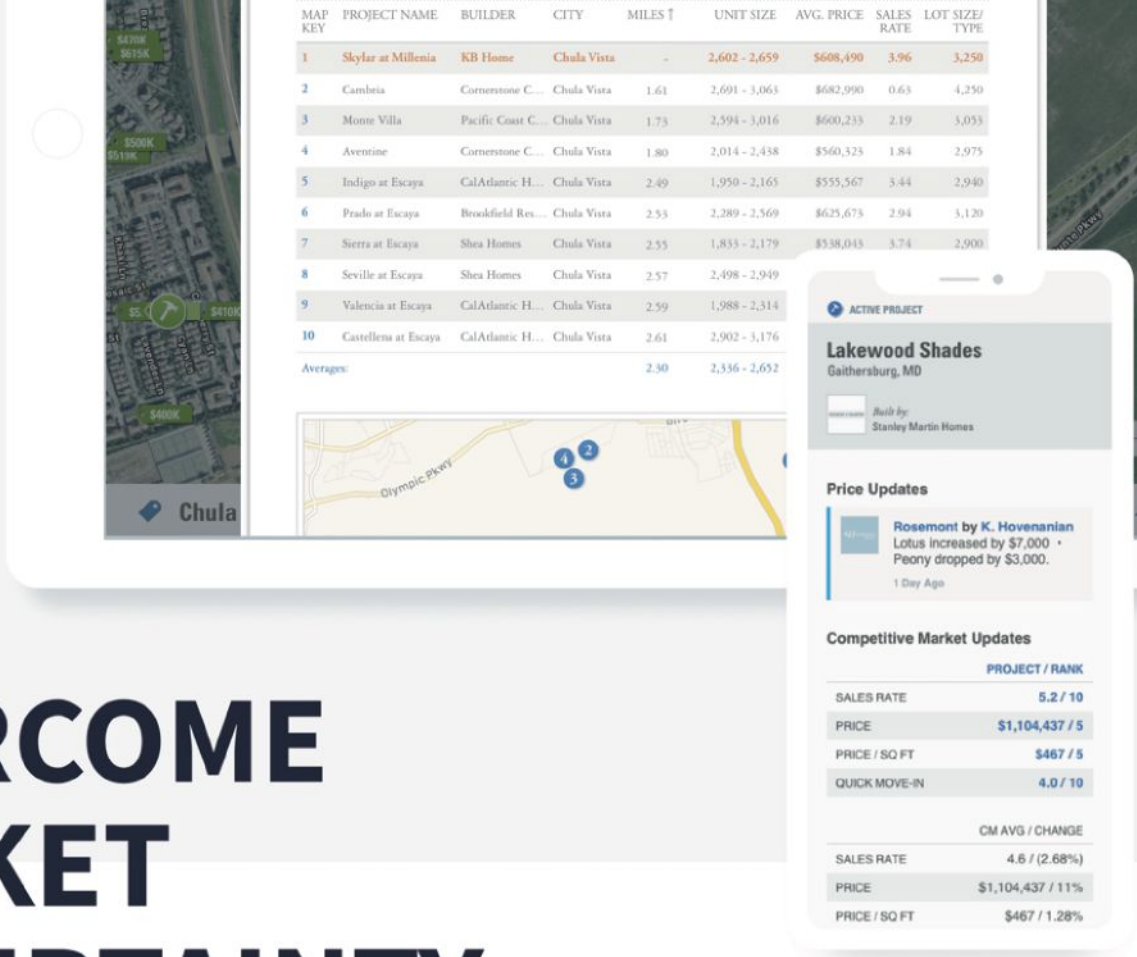


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EXTERIOR DOORS



Installing a Folding Glass Door

Doors that span whole walls require careful prep and precision

BY MIKE SLOGGATT

Doors and windows are getting bigger and bigger. As manufacturing technology advances, we are seeing new products that challenge our installation skills—the bi-fold exterior door is one example that's becoming popular in today's market. The first one I installed was 12 feet wide by 7 feet tall. Four contractors had declined the job before the homeowner found a colleague of mine, who called me and said he'd take the job if I worked with his crew on the install. I had the experience and the tools (at least, that's what he thought), so I had to step up to the challenge. After obtaining the manufacturer's instructions, I came up with a plan. The primary issue that the window salesman kept hammering me with was how precise our install had to be: plumb, level, and

square to within $\frac{1}{16}$ inch over 12 feet. That's not a problem if you prep carefully, which we did. That job went very well.

The installation covered in this article came up as a result of our success installing two Weather Shield folding doors without a hiccup. Afterward, David Hauser of Morningstar Doors and Windows in Farmingdale, N.Y., called me. A client had bought three 5-panel units, and he wanted to make sure the install went well. Though the contractor on the job was highly skilled, there are a few things that can go awry even with the most experienced installer. My job was to be an installation consultant and carpenter for a day to install the first unit, assisting the contractor and his crew so they could take over and complete the installation of the remaining two units.

Photos by Clay DeKorne

INSTALLING A FOLDING GLASS DOOR



Prep work begins with creating a sill pan with liquid-applied flashing (1). Here, the weather barrier needed to be added on one side of the opening (2) and flashed on the other (3). String lines run diagonally from corner to corner verify that the wall plane is flat (4). The doors hang from a trolley system; it comes assembled and wrapped on the top track (5) and must be left intact. Holes in the top jamb indicate the positions for lag bolts to secure the assembly to the header (6).

I checked out the job ahead of time to make sure I wasn't getting into a situation I might not want to be involved with, and to make a material list for the contractor so we would have everything needed for the install. Requirements included a dead-level floor, a sufficiently plumb wall, and a square rough opening, as well as a header with adequate strength to support the assembly. The header is critical since the weight of the entire door hangs from it on trolley wheels. On this project, a huge engineered beam spanned the 15-foot-wide opening. All looked good, so I scheduled the install date.

Sill pan. Before assembling the door, I wanted to install a completely waterproof sill pan. I'm not a great fan of metal pans in high-efficiency homes; since metal conducts heat so well, here in the Northeast they will often sweat on the inside in the dead of winter.

Instead, I used a liquid flashing from Benjamin Obdyke called HydroFlash LA. Prior to installing the liquid-applied sill pan, the carpenters had installed an ice-and-water membrane that dropped below the sill plate, and on the inside of the opening, they had installed a 3/4-inch board that was the same height as the hydronic heat board that would be applied later. This allowed us to liquid-flash up the sides of the frame opening and the edge of the 3/4-inch board, creating a complete back dam behind the door. Liquid-applied flashing creates a one-piece sill pan that is completely waterproof and easy for anyone to install without much fuss.

Normally, liquid flashing will cure in two to three hours, but in cold weather, it can take longer. In that case, it's best to do this prep a day before the install to give the HydroFlash plenty of time to cure.



The frame's upper corners are sealed with silicone before assembly (7). Once screwed together, this corner should be wrapped with a peel-and-stick flashing to ensure a tight water seal (8). Similarly, the threshold must be sealed and secured to the side jambs. Note the exposed end grain of the side jamb (9); the crew seals it with flashing to stave off any potential rot (10).

Complete WRB. I like to have a good seal around the opening so water can't get behind the weather barrier. One side of the door already had a loosely applied Hydrogap weather barrier, which we sealed down with a peel-and-stick flashing tape. The other side of the opening had not yet been covered, so I brought a roll of the newer self-adhering HydroGap SA to use there. I don't like folding ordinary housewrap into an opening because doing that creates a sneaky space behind the wrap that can transfer water and air behind the entire system. Using either a peel-and-stick flashing tape or a self-adhered housewrap eliminates this possibility. I am shooting for zero defects here—I sure don't want to come back to troubleshoot even the smallest leak.

Checking the opening. With the doors on site, we organized the

panels in the order of installation, as well as cleared the floor in front of the rough opening to allow for frame assembly. In preparation for the installation, we found the subfloor was about 1/8 inch high on one side. It turned out the sheathing was not fastened in the opening and some debris had gotten under the subfloor. That was a quick fix. Especially helpful for these installs is the biggest, most accurate level you can find. Mine is an 8-foot Stabila; on big runs, I use a laser. The 8-foot level settled in nicely after the correction.

We also cross-checked the large opening with a dry line, stretching it diagonally across from both sides to confirm that the opening wasn't cross-legged. (This is often the case when, for example, a dry-wall cart slams into the bottom of a wall during construction.) On a huge opening like this, the wall must be a perfect plane; if it's not,

INSTALLING A FOLDING GLASS DOOR



With the frame assembled, it is dry fit (11) and checked to make sure it will sit plumb in the opening (12). The crew then tips out the frame so the flange can be caulked (13). Even though the flange will be flashed with peel-and-stick, caulk is still required by the door maker. Once sealed, the frame is again checked for plumb in all directions (14) and the diagonals checked that they're equal (15, facing page), before the flange is screwed off.

the doors will never close correctly. Kudos to the framers here: It was within $\frac{1}{16}$ inch. It is critical to do this check and, if necessary, correct the problem before you hang the door.

Frame assembly. The trolley system that holds the glass panels comes preinstalled in the upper track. Do not take it apart. The sequence and direction are unique to the door. If you pull the trolley pieces out for some reason, you need put them back in correctly and in the proper order and direction, or you end up pulling out your hair. The head track is also predrilled by the door maker for many 4-inch stainless steel lag bolts. These lags must be driven into the header to support the door, which hangs from the trolley system.

The frame assembly goes together pretty easily. The upper and lower corners of the frame get a sealant before the frame is screwed together. I was a little concerned about the bottom of the jambs: The bottom track is installed between the two jambs, and the end grain of the jambs is exposed on the bottom. The jamb exterior is aluminum but the bottom that rests in the sill pan is wood. I have seen doors rot from this, and I wasn't sure if the wood was treat-

ed; therefore, out of an abundance of caution, we sealed up the end grain with flashing tape. The pan is a drainable assembly, so there was a slight chance water might make its way to that open grain. We did the same with the two outside corners, using flashing tape to seal up the corners on top, just in case.

The installation of the frame was straightforward. We did a dry fit first, and since our sill was dead level, the frame sat in the opening perfectly. A little nudge on one side and we checked for plumb, then cross-checked the frame to make sure it was perfectly square. Once satisfied, the contractor applied sealant behind the frame of the door where the fasteners would come through the flange of the door frame. This started a discussion about the need for sealant.

With all the taping and housewrap, what's the point of sealant? The No. 1 reason is the manufacturer's installation instructions call for it. If it is left out, and there is a warranty issue with the unit, the door maker can null the warranty. I leave no room for failure.

The installation instructions say to use a sealant that is compatible with all associated surfaces. I recommended OSI Quad Max. It's



The doors will ride on the top track, so it's critical the track is level and securely fastened to the header. For this, the crew sets up a rotary laser (16), then drills the header for the lag bolts (17) and drives the bolts home with an impact driver (18). Note that the holes in the top track are angled towards the framing; this slight angle must be maintained when pilot holes are drilled.

a Class-50 sealant compatible with just about everything out there (except my hands).

Securing the head. Once the frame was secured, it was time to set up the head jamb. The contractor set up a laser that we could aim at the parting strip on the top of the door. The instructions say to shim the head level, install the lags, and then remove the shims. It's very important to remove them or you'll never be able to adjust the door if the header or framing ever settle. We opted to run the lags in until the laser line hit our mark, avoiding shims altogether.

With all the lags in and the head laser straight, we could hang (literally) the doors. The panels are labeled in the order they are to be installed. It's fairly straightforward from here on: Install the doors on the predrilled and premortised hinges. We had plenty of hands on deck for this, and it was not too difficult to do. I had three glass cups in the truck but completely forgot to take them out; they would have made positioning the doors a little easier. I typically build a small platform outside the door just for the install to make it easier to work outside. The contractor didn't have time to set one up, so he

used some pallets to create a higher stage out of the mud. I prefer a nice, level, flat surface, especially when the doors are really big. One tool I recommend is a door jack; it allowed me to set the door to the perfect height, just using my foot, and align the hinges for the carpenter to install.

Fine-tuning. When all the door panels are hung in place, we slowly close the assembly, checking clearances as it closes. To align the doors perfectly, there are four adjustments in the frame that allow a lateral adjustment of the tops and, independently, the bottoms. Also, height adjustment is built into each of the top trolley hinges. The instructions called for a long #2 Phillips screwdriver, which makes adjustments easy. One note: If you find a trolley hits one of your lag bolts and prevents movement, make sure your lag is fully set. If it still hits, you need to lower the top hinge adjustments so they don't collide.

While it looks like a complicated installation, with careful planning, it goes smoothly. Once the doors were adjusted, my job was done. According to the laser, our frame was well within the 1/16-inch tolerance—probably closer to 1/32 inch.

INSTALLING A FOLDING GLASS DOOR



Each door panel is tilted to set the bottom guide into the track (19). The carrier hinge at the top is secured to the door with the supplied screws (20), and the bottom hinge secured to the door and guide at the bottom (21). A door jack helps set the door at the right elevation. When all the panels are installed, the author checks the alignment (22) and adjusts as needed, before the last steps: flashing the side jambs and, finally, the head flange (23).

Final steps. I left the crew to finish up the exterior trim head flashing and siding, as well as install the twin sister to the door we did together. The contractor emailed me to let me know the second install went off without a hitch without me. I knew they had the skills to install it; just having previous experience made it go a lot faster. Dave from Morningstar now gives his clients the option of

having me on site for the install, or they can hire the contractor that I work for part-time and I'll come along for the install. It's not so hard after all, especially when we read the instructions.

Mike Sloggatt has been remodeling old homes on Long Island, N.Y., for 42 years and is a frequent presenter at JLC Live.

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EXTERIORS



Repairing a Bungalow Balcony A beam replacement project with a Storybook ending

BY GERRET WIKOFF

Last year, I was contacted by homeowners seeking to repair an exterior entry staircase on their bungalow-style home in Los Angeles. Built in 1929, the house was designed by Benjamin W. Sherwood, one of the primary L.A.-based architects known for building Storybook-style cottages and bungalows popularized in the 1920s.

The wood-framed entry stairs were clad with stone veneer, which was popping off, and they connected the home's flagstone driveway to a raised first-floor entry, also clad with stone veneer. The first seven steps of the 14-step staircase were winder treads, while the remainder formed a straight run up to the entry. Adjacent to the entry, a 24-foot-long porch-style balcony ran the length of the bungalow's front façade above a garage.

Along with the failing stone veneer, the entry staircase's underlying wood framing had rotted, primarily at the stair-to-balcony

connection. More alarming, I noticed the adjacent balcony's floor beam was failing and that both the balcony and the roof above were sagging more than 2 inches. The homeowners mentioned that the bungalow's 54-inch-deep balcony originally had been supported by cantilevered 6x6 beams, and that it had been rebuilt in the 1970s by a previous owner. To prop up the balcony's cantilevered 6x6 beams and the roof above, a 6x12 glulam beam supported by two 6x6 posts on pier footings had been installed.

Over time, the replacement glulam beam had rotted to the point where the top half started to curl away from the house (1), causing a "hinge joint" to open up between the top of the posts and the decorative wood capitals original to the home's 1929 construction (2). The wood capitals were toenailed to the posts and to an existing—and still sound—6x8 beam, which supported the rafters.

In order to repair the rotted curved staircase, we would first have

REPAIRING A BUNGALOW BALCONY



Installed in the 1970s, the existing glulam had rotated outward due to rot (1), causing a “hinge joint” to open up between the top of the posts and the decorative wood capitals (2). A 30-ton jack was used to separate the beam from its saddle-bracket connector (3).



To provide level bearing for a temporary shoring to support the clay tile roof, sloped blocking was nailed into place (4). To remove the existing posts, workers cut the toenailed connection between the beam and the decorative capitals (5). The existing glulam was cut into sections prior to removal (6).

to replace the failing glulam floor beam.

Navigating the HPOZ. Although the client’s home was modest in both size and detailing (L.A.’s Storybooks are typically fanciful structures based on themes such as J.R.R. Tolkien’s “Hobbit House” and Disney’s “Snow White Cottage”), it was still considered a Sherwood Storybook, and therefore any planned remediation work would be subject to the rigors of a historical review board. More pointedly, the home is located in what the City of Los Angeles refers to as a Historic Preservation Overlay Zone (HPOZ).

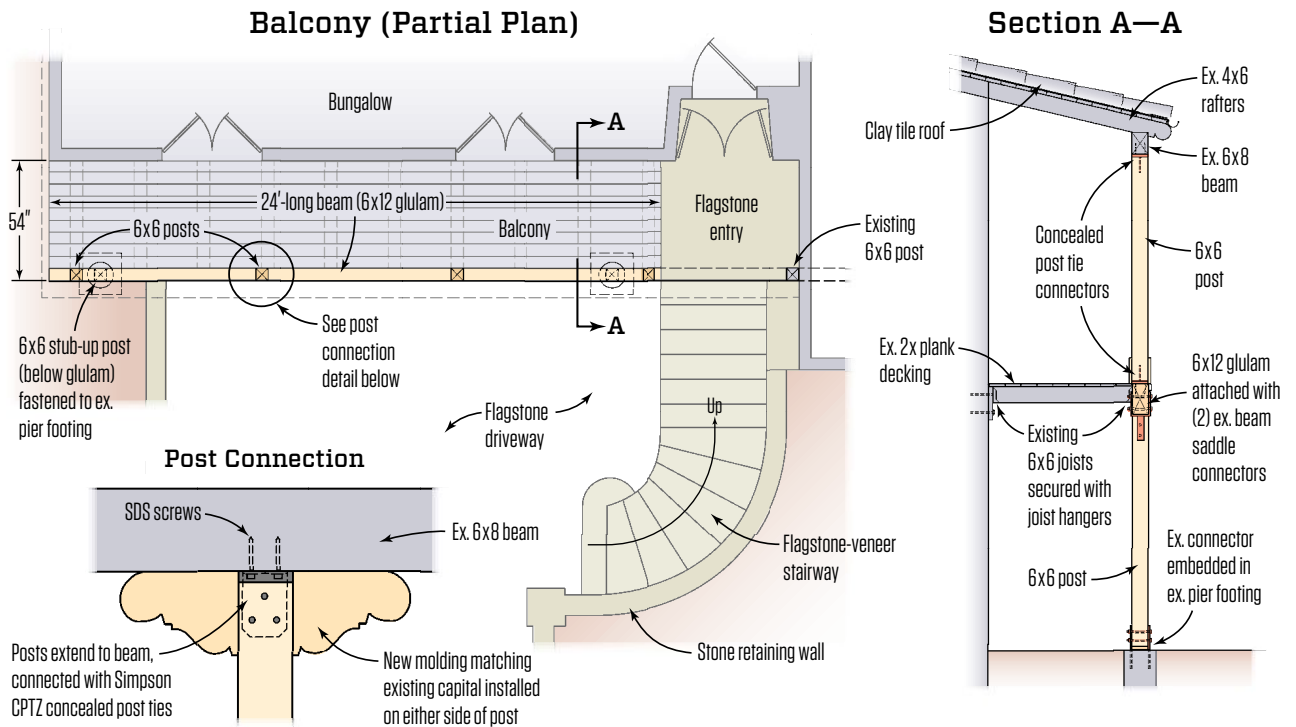
Adopted in 1979, the HPOZ ordinance is a zoning tool the city uses to protect and preserve single-family residential neighborhoods composed of historically significant structures. It’s fairly dogmatic about keeping homes located within a preservation zone period-correct, particularly the front elevations seen from the street. So, what would normally be a straightforward beam replacement became more difficult, given the provenance and location of the home.

Design. Having worked in overlay zones before, I knew we would not only be required to rebuild the stairs and balcony in the same shape and design, but we would also have to try to salvage as much of the original material as possible. I drew up the plans and reviewed them with a structural engineer, who determined we could replace the beam with one the same size (a 24-foot-long 6x12 glulam). Then he did the load and seismic calculations for the new beam, posts, post connections, and stair stringers.

BEAM REPLACEMENT

After the delivery truck dropped off new 6x6 Doug-fir posts and a new 24-foot-long glulam, it took the whole crew to lift the nearly 400-pound 6x12 beam off the truck by hand and carry it close to where it would be installed. We then dismantled the wrought-iron railings and put them aside.

Before we could safely remove and replace the rotted beam, we needed to support the balcony and its heavy clay tile roof. We started by building a temporary 2x4 wall to support the balcony’s existing 6x6 joists, which were 30 inches on-center and supported the balcony’s 2-by plank decking (see illustration, opposite page). Next, we removed the



existing 6x6 hangers connecting the joists to the glulam and began to jack the balcony and roof back to level, unbolting the two post saddles at each end of the glulam and using a 30-ton jack to raise the balcony and roof up 2-plus inches (3). We installed temporary posts, then removed two of the outer decking planks to make room for shoring and moved on to supporting the roof.

Supporting the roof. Rather than posting up each rafter, we ripped some 4x10 beam offcuts into wedges cut at an angle to match the roof slope. We nailed them to the bottom of the 4x6 rafters to create a level bearing surface for two temporary 12-foot-long 4x6 beams run perpendicular to the rafters (4). Then we nailed the two temporary beams to the wedges. Six steel shoring posts, run from grade to the underside of the 4x6s, were installed to support the roof. Then we used a reciprocating saw to cut the toenails holding the existing wood capitals and 6x6 posts in place and removed them (5). We had planned to reinstall the capitals per HPOZ requirements, but they were too rotted to salvage.



The new balcony-level 6x6 posts were slotted and bored to receive concealed post tie connectors (7). After the new 24-foot-long glulam was set in the beam saddles (8) and the posts installed, they were chamfered to match the original beams.

REPAIRING A BUNGALOW BALCONY



The new stairs were built with pressure-treated 2-by stock and PT plywood with compatible screws (9). Then the framing was sealed with a liquid-applied waterproofing and crack-prevention membrane (10).



Beam. We cut the existing 6x12 glulam into pieces (6) and placed the beam saddles aside. Next, we installed the two new 6x6 posts, attaching the bottom of the posts to the metal connectors embedded in the existing pier footings. We reinstalled the old beam saddles on the top of the posts, ready to receive the new beam, which we lifted into place and fastened to the saddles.

At the balcony level, we wanted the four new posts supporting the roof to look as original as possible, so we used Simpson Strong-Tie CPTZ concealed post ties to connect the post tops and bottoms to the beams. Using a beam saw, we sliced the posts to receive the concealed hardware, taking multiple passes to widen the kerfs so that the fins would fit. Then it was a matter of drilling three 1/2-inch holes for the pins (7).

We lag-screwed the base plates of the fasteners to the upper and lower beams, installed their cover plates, and slid the posts into their future home, sometimes with a little persuasion from a single jack hammer. Once the pins were driven into place, we disassembled the shoring jacks, took down the temporary 4x6 beams, and removed the wedges (8). All in all, that was eight hours of work for the six of us.

The next day, we reinstalled the deck planking, chamfered the new posts with a router, plugged the 1/2-inch pin holes at the concealed post anchors, and began to rebuild the staircase.



To prevent water intrusion, flashing that runs up the framing was sealed to the masonry (11). Then the stairs were papered and lathed with stucco wire on the stringers (12) and with rib lath underneath (13) prior to the application of a traditional two-coat stucco finish (14).

STAIR REPLACEMENT

We were required to match the new staircase as closely as possible to the original, which included reusing the wrought-iron rails and flagstone veneer. For the new stair carriage, we installed four pressure-treated 2x14 stringers for the straight run of stairs. To make the radius turn for the winder, we framed a series of platforms using PT material. We built a short wall midspan to cancel out any flex, then sheathed the treads and risers with 3/4-inch PT plywood (9).

The masonry sub wanted a second layer of plywood at the treads to make sure they wouldn't flex. Also, he suggested coating the stairs with a liquid-applied waterproofing and crack-prevention membrane by Red Guard (custombuildingproducts.com). He applied the membrane with a 3-inch paint roller, in two coats, then let it cure over the weekend (10). The following Monday, he applied thinset over the Red Guard on the treads and risers, then set the salvaged stone he was able to save, and new similar flagstone, on a layer of mortar troweled over the thinset.

On the staircase walls, the stucco sub installed a membrane base flashing, which ran up the framing and was sealed to the masonry to prevent water intrusion (11). The side walls were black-papered and lathed with stucco wire (12), while the underside of the stairs was lathed with rib lath (13). Conforming to 1920s construction, a traditional two-coat stucco finish consisting of a scratch and brown coat was applied (14); the brown coat was later painted (15).

Finishing up. Some of the original decorative capitals were unsalvageable. Also, to avoid re-creating a hinge joint, I had new capitals matching the existing made by a mill my lumberyard uses and fastened them on either side of the new posts with Timberlok screws (16).

To reinstall the wrought-iron railings, which originally had been assembled with screws that had since rusted, we had to weld the railings back together. In addition, the balusters had been individually screwed down to the glulam, which created a passage at each picket for water intrusion. Instead, our welder fabricated a new hammered steel plate for a bottom rail and welded the balusters to it, which reduced the number of screw holes per handrail section down to three. This choice was to make the new piece more period correct.

We installed a copper cap on top of the new glulam beam to keep water from soaking into it and rotting it out a second time. To avoid the possibility of galvanic corrosion, we placed peel-and-stick flashing (protecto wrap.com) between the new steel bottom rail and the copper flashing (17).

Gerret Wikoff is a builder-remodeler based in Los Angeles.



Wrought-iron railings are reinstalled (15) and new capitals are installed on either side of the new posts (16). A copper cap is installed on top of a new glulam beam to prevent water from soaking into it (17).



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RESEARCH

BY VINCENT SALANDRO



1

1. Energy-Efficient Skylight Insert

There is no need to replace existing skylights to install Crown Electrokinetics' DynamicTint Skylight Inserts. Inserts snap into existing frames—without fasteners or tools. Users can then control the level of tint to manage the amount of light and heat entering a room through the skylight. The company says the inserts can transition from clear to true black in seconds, can lower cooling costs, and can be configured to use either solar power or battery to power the tinting. Pricing starts at \$400. crownec.com



2

2. All-Encompassing Wood Entry Door System

TruStile's Wood Entry Door Systems encompass a selection of door, sidelight, and transom combinations. Contractors can choose a featured entry system, such as modern, traditional, coastal, or craftsman, or build a custom entry around one of TruStile's 500 door styles. Doors are available with hand-wipe finishes, glass inserts, and more than 60 profile options, as well as in a range of wood species and Tricoya, an engineered, exterior-grade MDF. Pricing varies based on materials, design, and features. trustile.com



3



4

3. Weather-Resistant Wall System

Hunter Panels' Xci Aegis Wall System pairs polyiso foam with structural sheathing, a glass facer, and a weather-resistive barrier (WRB). The new Xci panels are available with standard plywood or OSB (Xci NB) or fire-rated ply (Xci Ply and Xci Class A). These are fastened to framing and then the panels are covered with Xci VP-SA WRB—a vapor-open, self-adhering WRB—to protect seams and fastener penetrations. Contact a local distributor for pricing. hunterpanels.com

4. Tankless Gas Water Heater

Rinnai launched the I-Series Boiler, a tankless gas water heater with the ability for simultaneous usage for home heating and domestic hot-water production. The boiler has a bypass servo valve—which enables precise control of hot-water temperature—a 95% annual fuel utilization efficiency, and an outdoor reset that optimizes heating performance, according to Rinnai. It's available in both combi and heat-only models and comes standard with multi-zone heating control. Contact a local distributor for pricing. rinnai.us

Products

5. Moisture-Resistant Firestop Sealants

RWC's HoldRite HydroFlame 300 silicone firestop sealants are designed for areas subjected to high levels of moisture, such as bathrooms, water heater closets, and kitchens, or in areas where UL-listed W ratings are required. The self-leveling HydroFlame 300 is designed for floor applications while the caulk-grade HydroFlame 300 is designed for use on both floor and wall penetrations. Both products are quick-curing and both can be used with a variety of pipe types. Contact distributors for pricing. rwc.com

6. Natural Stone-Mimicking Tile

Made with natural materials of variable grain sizes that create a textural, blended surface, Crossville's Laminam In-Side porcelain tile panel mimics the look of deep-blue sandstone. Two color variations, gray and black, are available, in matte and flamed finishes. The panels, which come in 5.6mm-thick 1-meter-by-3-meter sheets, are suitable for interior wall and floor applications and can be installed with minimal grout lines and directly over existing tile or stone. Pricing for In-Side is \$13.95 per square foot. crossvilleinc.com

7. Fire-Retardant Subfloor Screw

Simpson Strong-Tie's Strong-Drive WSVF subfloor screw features a fire-retardant coating that provides corrosion resistance when used with fire-retardant-treated wood and wood-based materials that might otherwise compromise the performance of carbon-steel fasteners. According to Simpson, the WSVF provides a no-squeak, efficient connector for replacement projects with fire-resistant subfloor materials, and like other fasteners in the WSV line, the WSVF screw has a redesigned tip and thread pattern to provide easy starts, lower driving torque, and faster driving. Contact a local distributor for pricing. strongtie.com

8. Hammer Drill/Driver

Ridgid's 18V SubCompact Brushless 1/2-inch Hammer Drill/Driver is 30% lighter weight and 30% more compact, with optimized ergonomics, than comparable products, according to the manufacturer. A brushless motor delivers more runtime, power, and a longer motor life while a 1/2-inch single-sleeve ratcheting chuck holds bits tight and secure, according to Ridgid. The tool has an LED light and a 24-position clutch ring, and is compatible with all Ridgid 18V batteries, tools, and chargers. The bare tool retails for \$120, with chargers and batteries sold separately. ridgid.com

5



6



7



8



9



9. Reusable Face Masks

Klein Tools' reusable face mask is designed to offer users basic protections against nonharmful common airborne irritants. The mask, which is not NIOSH-approved, features adjustable head and neck straps and a nose clip to help achieve a proper fit and prevent fogging glasses, as well as exhalation valves that assist in anti-fogging and may increase the user's breathing comfort. The latex- and BPA-free face masks are washable and are sold with one filter and a storage bag for extra filters. Pricing starts at \$20; replacement filters, three to a pack, are sold separately for \$10. kleintools.com

10



10. Lightweight Quartz Slab Profile

Here's a new option for commercial and residential applications such as fireplaces, backsplashes, and shower and tub surrounds: lightweight 6mm quartz slab profiles from Cambria. The thin slabs work with mitered or reverse-mitered edge profiles only, or Z profiles for any exposed edges, according to Cambria. The company claims that surfaces can be safely disinfected and are nonabsorbent, scratch- and stain-resistant, and maintenance-free. Slabs are available in 10 designs in Cambria matte and high-gloss finishes; pricing varies based on design and finish. cambriausa.com

11



11. Low-Impact, Fire-Rated SPF

HandiFoam E84 Low GWP spray foam from ICP Building Solutions Group is nonflammable and uses a low global-warming-potential blowing agent. The new formulation reportedly achieves 30% greater adhesion compared with the previous ICP BSG formulation. After application, HandiFoam E84's color shifts from white to yellow as an indicator of a proper curing profile; the foam achieves a Class 1 fire rating at 2 1/2 inches. The ColorWise nozzle can be converted from a fan spray to a cone spray by snapping off the tip. icpgroup.com

12



12. Metal-Look Laminate Surfaces

Formica expanded its DecoMetal Laminate surface line for vertical applications with 13 new metal visuals. Design options now include printed solid metal, rolled steel, polished metal, brushed metal, stainless metal, and copper veil. The manufacturer says the surfacing is lightweight, easy to install and maintain, and best for vertical use. Material costs range from \$5 to \$15 per square foot, according to Formica. formica.com

A construction worker wearing a dark blue shirt and safety glasses is using a large orange and black JLC nailer on a wooden frame. The worker is wearing brown work gloves. The background shows a construction site with wooden studs and a red air hose. The entire scene is framed within a large circular graphic.

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TOOLS

OF THE TRADE

Skilsaw 10¹/₄-Inch Cordless Beam Saw

BY TIM UHLER

Until recently, the last power tool that we've had to plug into a 110V outlet was one of our 10¹/₄-inch beam saws, which see quite a bit of use on our framing jobs. Besides being useful for cutting headers, beam saws allow me to cut my wall plates two at a time so that they are identical, though I've had to put that practice on hold as we've moved more and more toward cordless tools. But now, with the introduction of Skilsaw's new Truehvl 10¹/₄-inch worm drive saw, we are 100% cordless with power tools and quickly cutting double plates again.

Features. This is a true 10¹/₄-inch wormdrive saw, designed from the ground up for a larger blade, with no need to be adapted with an add-on kit. For example, the blade brake—a must-have feature on any saw, but especially on one with a larger blade—works flawlessly. With a depth of cut of 3¹¹/₁₆ inches, the saw can easily cut through a 4x4 in a single pass, and it's a great saw to cut I-joists that are too wide for a 7¹/₄-inch saw. It can also cut bevels to 51 degrees.

My kit shipped with only one battery. For me, this isn't a problem, as I don't cut as much lumber using a saw like this as I do with a standard 7¹/₄-inch saw; in fact, I haven't managed to drain the battery yet in the few weeks or so that we've had the saw on our jobsites. I don't think I'll ever have a problem, since I can throw the battery on the charger at lunch, basically guaranteeing I'll never run out of juice.

Though the saw weighs close to 20 pounds, it doesn't feel unwieldy or heavy on my wrist. With the big battery attached under the rear handle, it is very well-balanced.

The upper guard is equipped with a dust port, which discharges most of the sawdust during a cut. I probably wouldn't ever feel the need to use dust collection with this saw, but not having sawdust all over my cutting area is not a bad thing. Even without a vacuum hooked up to the saw, most of the dust is directed out of the dust port and off to the side.

The saw comes with a rafter hook, which works fine on joists, though it took a little head-scratching to figure out how to get it to play nice with our sawhorses. Basically, the battery hanging off the back of the saw tends to get in the way, but it's not an issue worth griping about.

Another minor quibble is the button on the rear handle, which has to be pressed before the trigger will work. It was a slight hassle at first, but then I got used to it.

Power. There is a lot I could talk about when it comes to the general attributes and characteristics of wormdrive gears, but I think that would be a waste of time in this review. Let's put it this way: The first time I adapted a 7¹/₄-inch Skil worm drive to accept a



The Skilsaw Truehvl cordless wormdrive saw kit (model SPTH70M-11) offers a 3¹¹/₁₆-inch depth of cut at 90 degrees, and 2³/₄ inches at 45 degrees. The kit comes with a single 5.0-Ah lithium battery, a quick charger, and a 10¹/₄-inch blade.

10¹/₄-inch blade was in 2002. At the time, our electrician told me that the larger blade would cause us to burn up the motor; almost 20 years later, that saw is still going strong. Sure, we did burn up another saw,

Photos by Tim Uhler

but that one was on us (it's important to use a large-gauge cord with those saws).

The beauty of the cordless version of the saw is that you can't burn it up by using a cheap, light-gauge extension cord. In fact, you don't need any cord. If you price the 10¼-inch corded version of this saw with a good cord (which may need to be replaced yearly because of damage and nicks), it'll run you about \$400, plus another \$100 for the cord. So, for \$500 you can have a great corded saw—or you can spend the extra \$200 and get a great cordless version for \$700. That is a lot of money, but by not running a cord, you will make up that money quickly: no more tripped breakers, no trip hazard, and no rolling out and rolling up cords. It adds up quickly. Put another way, if I backed over our cordless Skilsaw with a forklift and destroyed it, I'd buy another one that same day. skilsaw.com

Tim Uhler is a lead carpenter for Pioneer Builders in Port Orchard, Wash.



The blade-left saw, which has an electric brake and a built-in dust port, can be tilted to make bevel cuts of up to 51 degrees (left). It also features a rafter hook, which the author found works fine on rafters, but not so much on sawhorses (right).

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BY CLAYTON DEKORNE

A Clear Understanding of American Trimwork

Few books about interior woodwork make sense of traditional design styles as well as *Traditional American Rooms* by Brent Hull and Christine G.H. Franke. The first 27 pages are worth the \$35 book price (from Amazon and others) for their concise encapsulation of the history of traditional architectural styles and lucid translation of the language of classical architecture. This language is what finish carpenters use to describe classical trim and period house styles, and what I, for one, haven't always used accurately. Any of us who ever refer to "colonial" house designs, or invoke Georgian and Federal style, or discuss the parts and pieces of the cornices, wainscot, and baseboard that we install, owe it to ourselves to read the informative explanations that Hull and Franke provide.

The history of the origins of classical architecture occupy only a few pages at the front of the book. It's an important introduction for trim carpenters to know. This is not a dry, academic treatment of history, but a succinct and direct tracing of the path from Vitruvius and Palladio—Roman authors who codified the classical orders—to the British architects who influenced Early American builders. For those, like myself, who have been hearing snippets of this history, it's a valuable synopsis. For me, it's the first time I've understood

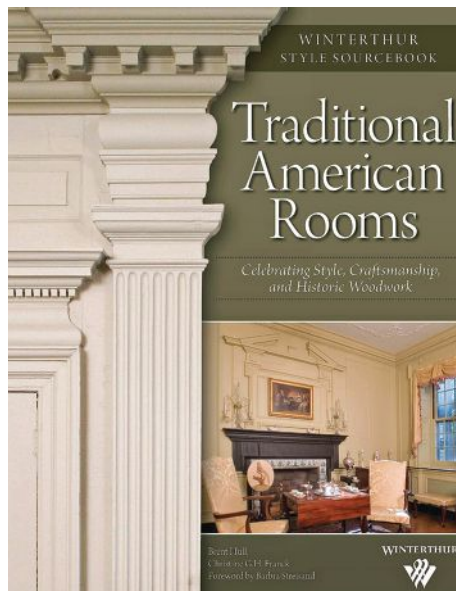
those Early American pattern books—the numerous Dover editions that many a carpenter has been inclined to pick up, such as Asher Benjamin's *American Builder's Companion* and William Ware's *The American Vignola*—that are fun to look at but not easy to apply to trimwork. This history addresses those, but even better than fitting them into the context of architectural history, Hull and Franke provide us with a simple, clear way to study the parts and pieces of a range of traditional American interiors.

After the 27 pages of introduction, *Traditional American Rooms* looks at each of the rooms in the vast museum mansion that is the Winterthur Museum outside Wilmington, Del. This is one of the buildings, along with Carpenters Hall and Independence Hall in Philadelphia, or the First Unitarian Church in Providence, R.I., that every carpenter should visit at least once to get a three-dimensional immersion into our traditional American building roots. The Winterthur estate was created by Henry Francis du Pont, who collected rooms, dismantling them from 17th- and 18th-century homes all along the East Coast and reassembling them in his sprawling 175-room ancestral home.

Hull and Franke look at a crisp selection of these rooms, providing photographs and section drawings of the various trim parts.

Their mission is tightly focused on demonstrating the classical language that they explain upfront, giving us a coherent understanding of how cornices, panels, and architraves in these select rooms are assembled and detailed. With parts numbered on photographs and corresponding drawings (see sample page at left), we are given a clear map to understand the terrain of the interior of the room, and once we get comfortable as readers with the terminology, quickly become well-versed not only in reading the room but also in comparing the styles in different rooms.

I found myself radically altering how I understood the more complex trimwork, so it no longer seems intimidating thinking of how it might be reproduced or adapted for a new space. This was a wonderful transformation in my thinking, and one that I hope many other carpenters can embrace.



The cover (above left) and a sample page explaining the parts of a classically designed wall (above right) from *Traditional American Rooms* by Brent Hull and Christine G.H. Franke. If you are to buy one book on traditional trimwork, this should be it.

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