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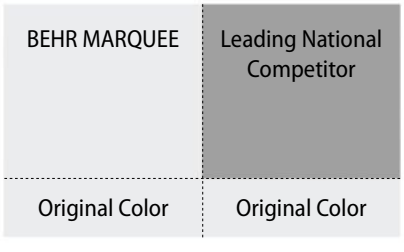

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Features

ON THE COVER: Tile installer Steve Griffin of Griffin Tile makes a diagonal cut through a stone tile on a wet saw for a project in East Orleans, Mass. See the story on page 41. Photo by Roe Osborn.

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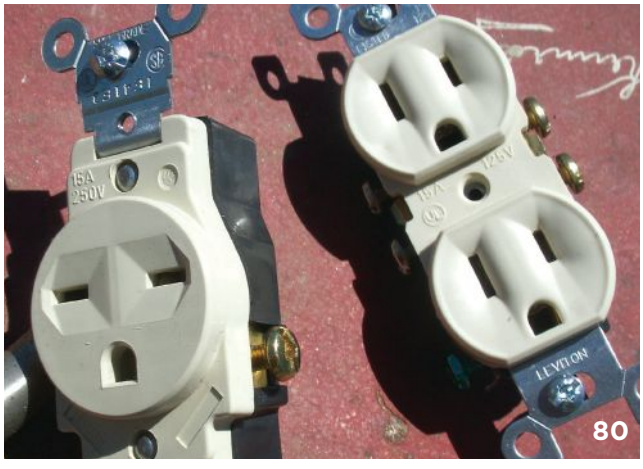

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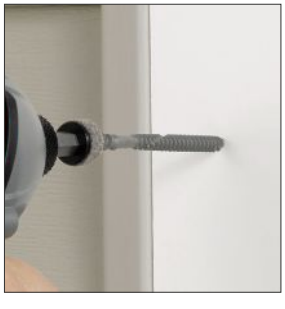

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From the JLC Forums

Hitting Bottom

A veteran stair builder describes a nasty fall in this April 2013 thread.

Stan Foster, Central Illinois

Lowest time in my stair-building career ... 16 days ago I literally hit bottom. I made the totally idiotic maneuver of going down a freshly interlocked stair section from the second floor to the first floor. The bottom half of the stair section wasn't nearly as secure as my neanderthal mind assumed, and it broke away, sending me free-falling past the first floor level and headed for the basement! I landed on a platform that was holding my stepladder level on the basement stairs.

All together, I free-fell 11 feet, landing on my left thigh and buttock, then another 5 feet down the stairway to the basement floor. The stair section ended up being stopped by my stepladder; otherwise it would have crushed me.

Miraculously, not a single bone broken or cracked, but I was severely bleeding inside my left leg. Soon everything started getting very bright, and the guys said I looked ashen and my pupils were dilated. Ended up in the hospital with 60/40 blood pressure. Three days of MRIs and blood transfusions, and I was released from the hospital.

I have had plenty of time to rehearse how to get this stuck stair section free and reset. I built a platform over the basement stairway and under the stair section, which was still stuck on my stepladder after 16 days. Today, with the help of seven guys — three upstairs pulling on nylon straps, and four underneath the stuck stair section — I told everyone to slowly load up pressure in the stairway while I used a 16-foot 2x6 on a short fulcrum to pry it loose. It popped loose, and was put back into place in less than a minute. The stair section was prefinished and did not have so much as a scratch.

I teared up as 16 days of painful recovery, and countless hours of thought about how to safely fix this stairway, came to a successful conclusion.

Finally, partial redemption for the most idiotic mistake in my stair-building career. I am thankful, as I should have had multiple broken bones, been crippled, or — had the stepladder not caught and stopped the stair section from falling onto me — even killed!

R James S, Peabody, Mass.

Glad to hear everything turned out well. Don't feel bad. I "walked down" a stairway (in my own house) that I had just removed in order to rebuild. Tore my rotator cuff and have had two surgeries to date and probably about 50% use of my right arm for the last 10 years. We all do dumb things at one time or another.

calvert, Dallas, Pa.

Stan, hope everything turns out well for you and the stairway as well.

My claim to stupid maneuvers was about 3½ years ago when I placed a wood extension ladder on an ice-covered tile porch while it was snowing. Only climbed up about 9 feet when the bottom slid out. I rode the ladder down, turning sideways and breaking three ribs upon landing on the wood rungs. Also ended up with a hemothorax [internal bleeding in the chest cavity] and spent Christmas in the hospital.

Even though I made a fairly quick and thorough recovery, I occasionally feel the rib issue if I lay on my right side.

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From the JLC Forums

21-Gauge Nailer/Pinner

This 2010 thread on 21-gauge finish nailers was revived recently and includes an update from the original poster.

Cdatrim, Northern Idaho

Wondering if anyone has [a 21-gauge nailer]. Installing prepainted trim and need more than a 23, but my 18 is a little much. Didn't know whether the 21 was worth the extra expense.

M Smith, Whittier, Calif.

I have the Omer 21ga. It's the best-made nail gun I have ever had. It is perfect for installing prefinished trim — I bought mine specifically for installing prefinished cove molding at the tread/riser overhang on my stair jobs. Nice compact body so you can get a good angle and keep the nail hole high. The model I have shoots up to $1^{3}/_{16}$-inch.

It shoots through anything without any trouble. It's my "go to" gun for the leading edge of all my casing work, and won't split the outside miters on MDF. Great for temp jigs/hold-downs, as it has enough holding power but doesn't fight you when you go to disassemble.

Uncommon nail size, so keep that in mind when you buy nails. I get mine from Woodcraft — they have both the slight-headed and headless in 21ga. They also sell a 21ga nail gun (import) for about 100 bucks; it looks and feels very nice actually, but I can't vouch for its performance as I have never used one on a job. I bought [the Omer] from nailzone.com several years ago and it's been well worth the investment.

Whiskytangofoxtrot, Memphis

I've used [the EZ-Fasten MBP30], and for the $ it can't be beat in 21ga. EZ-Fasten is extremely underrated as far as nailer/pinners go ... they are made "offshore," but who isn't? If you're using one every day, all day, buy the Omer. If you're just using it occasionally, check out the EZ-Fasten (as much as it pains me to pimp EZ-anything).

David Meiland, San Juan Island, Wash.

I shouldn't have clicked on this thread. Now I suddenly need another gun.

gfmoto

I have that Omer MG40 21ga. It is a great gun. I bought it for doing a prefinished stain-grade base job that had round corners. It holds much better than the 23ga guns and works great on MDF outside corners. The nails are expensive, but the packs I bought have lasted over 2 years. It shoots both headed and headless, but the driver makes the same hole for either type

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of fastener so I use the headed nails.

David Meiland

You just saved me from buying both types of nails.

Joe Adams, Houston

I wanted to revive this thread to see if anyone has more info on using 21-gauge versus 23-gauge pin nailers. I've got some stain-grade white-oak tapered columns to build and am trying to decide if I should invest in a bigger pinner or just use my brad nailer.

cdatrim

Joe, I ended up buying the Cadex 21ga, mainly for the extra nail-length capacity. Shoots up to 2 inches, but I usually only run 1¾ inch max. Awesome nailers. Have since sold my 23-gauge nailers since I never used them anymore.

Joe Adams

It seems like Cadex is the only game in town for a 21-gauge pinner. The only problem is they are not available anywhere in town!

GregBradley, Southern California

I have a little bit of info that might help. I borrowed a friend's Omer 21ga a couple years ago and was very impressed. The big limitation seemed to be that it only shot 1.5-inch pins or brads. The head on the 21ga brads, called "slight headed pins," was much smaller than on an 18ga brad. I did some research at the time and found a Cadex that also shoots pins or brads but up to 2 inches. That combined with my Grex P635 1⅜-inch 23ga seemed like a good combo. Once I saw the price on the Cadex, it was put on hold and there it sits as a "someday maybe" deal. The Cadex still sits on my wish list on Amazon.com but they do show in stock.

M Smith

Omer no longer makes the model I have but has replaced it with a model that shoots a longer (1⁹⁄₁₆-inch) nail — the body is much bigger and taller so I don't like it for that reason.

[Editor's note: Several online vendors carry the Omer MG40 21-Gauge Headed/Headless Pin Nailer — ½-inch to 1⁹⁄₁₆-inch — for about $290.]

Joe Adams

I revived this thread rather than start a new one. I've got the [Cadex CPB21.50 21 Gauge Headless Pinner/Brad Nailer (⅝-inch to 2-inch)] in my wish list at Amazon, but at $340 I'm reluctant to pull the trigger without some positive feedback.

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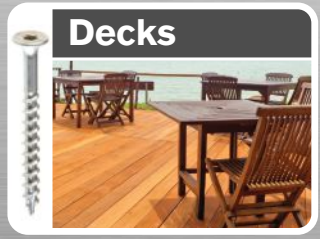

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Q&A

Q. Attaching Posts to a Rooftop Deck

How can I mount newel posts to a deck on a flat roof without cutting into the roof?

A. *Paul Nichter, a contractor in Islesboro, Maine, responds:* I've been building wood decks with safe railings over flat EPDM roofs on the rainy coast of Maine for over 15 years without compromising the waterproofing. I avoid the traditional method of bolting a 4x4 post deep into the framing, as it penetrates roof surfaces and increases the possibility of a leak long before either the decking or the roof membrane is worn out from age.

My approach to keeping water out while achieving good resistance to lateral forces is two-pronged and is based on the deck being built on sleepers above the roof.

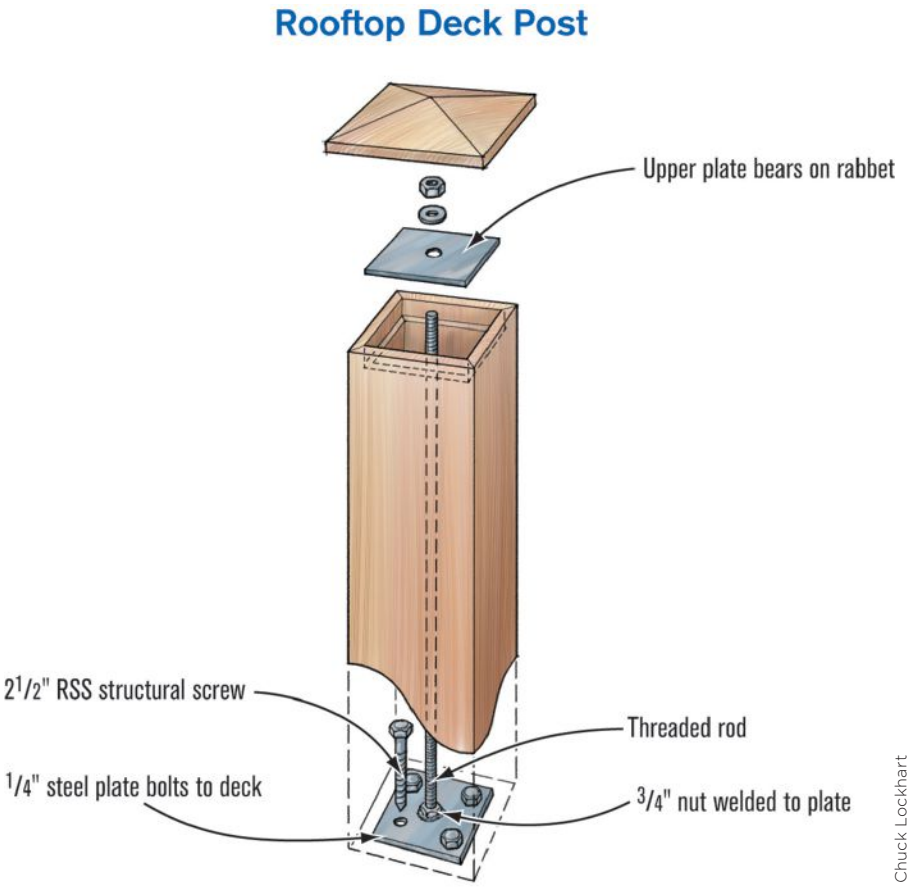
First, I design rooftop decks with corners every 6 feet to 12 feet to stabilize the railing. Lateral loads aren't borne by just one post; rather, the loads are shared with adjacent posts.

Second, I mount the posts with hardware that bolts to the top of the deck (see illustration). Each post is a hollow box that fits over a vertical threaded rod. The rod threads into a ¾-inch nut welded to the center of a ¼-inch-thick steel plate. I secure the plate to the deck with four 2½-inch RSS Structural Screws (800/263-0463, grkfasteners.com), but galvanized lags would work too. The screws or lags should be as long as possible without protruding from the bottom of the sleepers and putting holes in the roof membrane. It is essential to place 2x12 blocking on the flat between the sleepers at post locations so the lags will have something solid to bite into.

Once the plate and rod are installed, I stand the post in place. Usually, some scribing and fitting are needed to make it stand plumb without wobble or lean. Then I run a bead of construction adhesive on the bottom of the post and seat it on the deck surface.

A second piece of ¼-inch plate fits at the top of the post in a rabbet cut for that purpose. The threaded rod runs through a hole drilled in the plate, and the assembly is drawn tight with a nut. The nut tensions the threaded rod, compressing the post and creating a solid connection.

I've also used manufactured posts. One advantage of using them is that their makers have tested them for code compliance.



Chuck Lockhart

A threaded rod between one plate screwed to the framing and another plate at the top of the post firmly connects a hollow newel to a rooftop deck.

Q. Replace the Framing or Just Re-Skin?

I'm getting a lot of requests for deck remodels, and I'm not sure how to price the jobs, or whether it's a problem to reuse the existing frame. Do you have any guidelines or points to consider?

A. *Greg DiBernardo, a deck builder in Waldwick, N.J., responds:* At least half of my deck projects are "re-skins," where worn-out wood decking, railings, and staircases are removed, but the existing joists are left intact to be used as a base for new (usually synthetic) decking and railing.

For obvious reasons, if the clients are willing to pay for a complete demo and rebuild, the deck will be better for it. But a re-skin is a great lower-cost alternative, provided the existing framing is up to the task. If the clients are satisfied with the design of their existing deck, a re-skin can get them a renewed look quickly. Plus, I'll often change the shape by clipping a corner, adding a new staircase, or extending the existing deck.

Inspect the structure. While I'm taking measurements on the sales appointment, I make a careful inspection, looking for obvious signs of rot, mildew, or decay on the deck surface. More often than not, if the deck boards have begun to rot, the framing beneath them is also rotted. Simple things like a leaky gutter or downspout in a shady corner can destroy an isolated section of an otherwise structurally sound deck.

If I can access the underside of the deck, I'll poke and prod to identify framing that needs to be replaced. I'll also note the cause of the rot and add the cost of remediating it to my proposal. If the root of the problem is not corrected, failure down the road is guaranteed.

While I'm under there, I inspect the ledger to make sure it's flashed and fastened to the house properly; I make sure all joists have hangers and that any hangers present are in good condition; and I check for signs of rot between the layers of built-up girders. I also check built-up girders to ensure there's no separation between the 2x10s or 2x12s. If there is, I'll draw the layers together using TimberLok screws (800/518-3569, fastenmaster.com).

It's critical to have access under the deck to ascertain whether the framing is worth reusing. My rule of thumb is if the deck is too low for me to get underneath to inspect, the framing has to be demolished and rebuilt. Generally, the low-to-ground decks of yesteryear weren't built with airflow in mind. Most of the ones I've come across are examples of rot, mold, and decay. There's no point installing a modern synthetic decking product with a 25-year warranty over a frame that's past its prime.

> If the existing deck design and structure are sound, a re-skin can create a renewed look quickly.

Although my inspection is thorough, some issues may remain hidden until the decking and railings are removed. Therefore, I include a clause in my contract permitting me to replace framing members at a fixed cost as I deem necessary once I begin.

Removing the existing decking. Another important consideration is how the existing decking is attached to the joists. If the decking is nailed down perpendicular to the joists, it can be pried up with little damage to the joists. That goes for diagonally installed nailed decking, too, but it takes a bit longer.

Screwed-down decking, though, can be difficult to remove. Unscrewing each fastener usually doesn't work because the heads strip. Prying up the boards is difficult and can damage the joists.

The fastest way to remove screwed-down deck boards is to cut them on either side of the joists, letting the pieces of decking fall between the joists. The 1½-inch-long pieces of decking remaining on the joists can be removed with a pry bar, leaving the screws in place. The fastest way to remove the screws themselves is to cut them with a grinder equipped with a cut-off disk.

Most of the time, if a deck has screwed-down decking, I trash the entire deck. I cut the decking with a chainsaw run in between the joists; then I cut the joists, now with short pieces of decking attached to them, into manageable pieces to cart to the trash bin.

Replace the stairs. I always tear off existing staircases and rebuild them to my spec. I have never encountered a staircase I couldn't build stronger and safer. Most do not have the proper tread width to accommodate typical 5½-inch synthetic deck boards, with a ½-inch-thick riser and a 1-inch nosing.

I also make sure the old stairs landed on a solid surface, such as a concrete slab or pavers. If the existing stairs land on the ground, I include the cost for installing a 4-inch-thick concrete pad for my new staircase to sit on.

The Q&As in this month's column originally appeared in Professional Deck Builder *magazine.*

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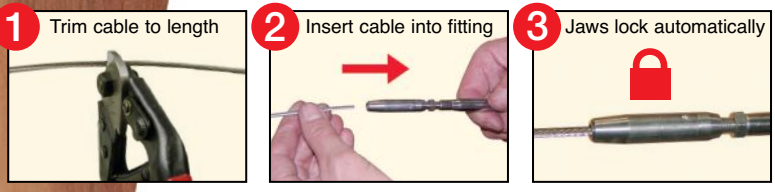

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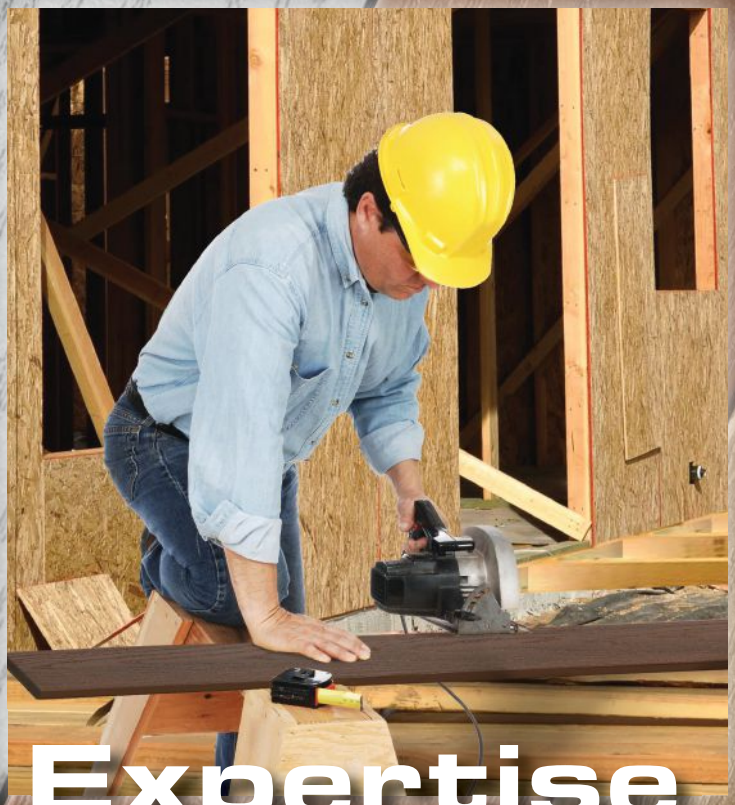

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Tips for Would-Be Remodelers

by Dennis Dixon

New-home construction activity has been on the rise lately, but for most of the past five years it was at historically low levels. As a result, many markets were flooded with well-intentioned builders who quickly discovered that new-construction experience doesn't neatly translate to remodeling, which has very different rules for business, estimating, and scheduling. It's akin to an accomplished New England custom-home builder moving to Santa Fe to build a 5,000-square-foot adobe — the finished product is the same, but just about everything needed to build it is different.

I know, because I learned the hard way that new construction and remodeling are not interchangeable. Remodeling requires more time for planning, estimating, and execution. Service and communication rule the roost. And the fact that the owner is living on the job site raises another set of accommodations and constraints.

So, how can a custom builder take on remodeling work and be successful? There's no substitute for experience, but here is a list of issues to keep in mind as you make the transition.

Markup and margin. These numbers are almost always higher for remodeling work. Experienced companies specializing in bath and kitchen remodeling mark up costs using a multiplier between 1.6 and 1.85, and consistently achieve margins between 30% and 40% or more. None of those companies do work at cost plus 15%.

Service. Interaction and communication with the homeowner is paramount. While some remodeling contractors are successful with a just-get-it-done approach, they're the exception. Remodeling projects are partnerships, and most homeowners want to be involved. That requires active, on-site supervision, which costs money. Home builders who want to do things on a remodel "the way we've always done them" won't last long.

Supervision. Remodeling projects are hands-on. Successful ones have a single point of reference for on-site supervision, management, oversight, and quality control — a lead carpenter, for example. The labor expense for this far exceeds that for supervision in new construction, but is necessary. Having someone on site to both supervise and perform work minimizes problems, because it preserves continuity. Even more important, having someone on site who has been part of all decisions — and knows what's behind the walls — can avert potential disaster.

Subcontracting. When home builders cost out trade-contractor work for a remodeling job, they typically base their estimate on the square-foot price of a comparable new-construction project. Using unit pricing for remodeling, however, often results in underpricing, because the scope of work cannot be as well-defined. For exam-

Ten Steps to Remodeling Success

1. Estimate accurately.
2. Prepare "Grade A" plans and specs.
3. Perform work on a time-and-materials basis. This will minimize your risk until you understand your costs.
4. Supervise the project. Pursue the work as if it were for your grandmother.
5. Recognize that remodeling and new construction are different. The materials are the same, but much of the homeowner interaction is different.
6. Do your homework. The owner will treat your opinions, directions, and recommendations as gospel. Choose your words carefully, communicate facts, and if you don't know, say so!
7. Understand that remodeling is expensive. The square-foot cost for remodeling compared with that of new construction will astound you. Your estimating and management approach should therefore be vastly different.
8. Be willing to learn, rethink your experience, and revamp your knowledge.
9. Under-promise and over-deliver. Quality and service should be your priorities.
10. Plan for the unexpected. In a remodeling project, nothing is ever as simple as it seems.

ple, a drywaller might hang only nine sheets of drywall for a kitchen remodel. But he will return to the job five times to tape, sand, and texture, and the work may also involve re-texturing adjacent areas or even entire adjacent rooms to get a uniform finish. For this kind of subcontracted work, it's better to bid as either cost-plus or time-and-materials. When hard bids are offered, they should always contain "cushion money" to allow for the additional labor to handle unanticipated circumstances.

Overhead costs. Prep work, planning, and deployment logistics for remodeling projects can be challenging. Many neighborhoods have strict rules — about work hours, parking, and placement of equipment, trash bins, and portable toilets — that can throw a wrench into job execution. Other concerns — daily cleanup, protection of areas not involved with the work, oversight of a homeowner's pets and prized rosebushes, along with security and safety — add labor costs and an element of unpredictability. Even the delivery, unloading, and storage of materials can be daunting. Expenses for these

Even the delivery and storage of materials can be daunting.

and other tasks that are not part of the actual production of the project are often surprisingly high, and an estimator who is unfamiliar with remodeling projects will underprice them.

Contract, plans, and specifications. Good paperwork minimizes disputes and misunderstandings — construction documents should spell out as much detail as reasonably possible and anticipate potential obstacles and variances. Preparing thorough paperwork for a remodeling project takes at least as much time and money as for new construction, and probably more. Inexperienced contractors will often short-change the process, despite the possibility that a couple of hours saved in document preparation could lead to thousands lost defending a dispute.

So let's test your knowledge. A potential client calls about a screen door that needs replacing. How much will this cost you? I don't have a punch line. Make sure your quote doesn't provide one, either.

Dennis Dixon *is a licensed general contractor in Flagstaff, Ariz., and a frequent contributor to* JLC.

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Bracing Walls for Wind

The good news: You can frame a wall without hiring an engineer. The bad news: Plan review may give you brain cramps.

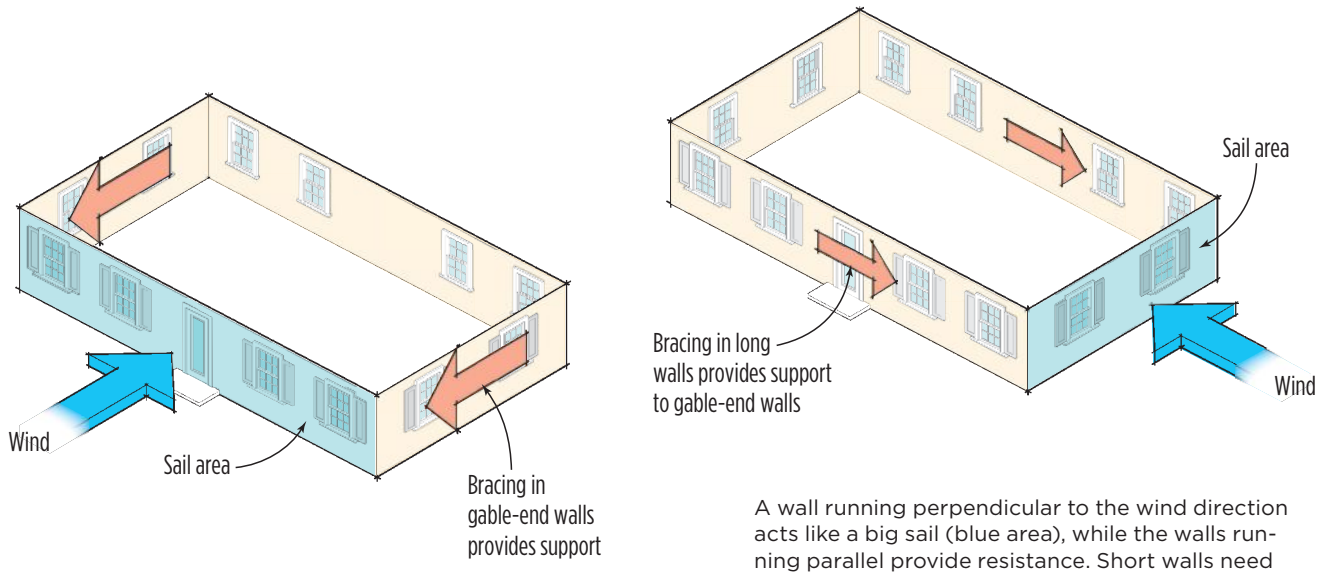
by Ted Cushman

The rules for bracing against wind pressures have gotten complicated. Way complicated. The 2006 IRC devoted a scant eight pages to wall bracing, and by 2009, that section of the code (R602.10) had ballooned to 30 pages. An effort to simplify the 2012 version still left Section R602.10 with 27 pages of wall bracing rules.

Those rules are limited in scope: The methods they prescribe are allowed only if the design wind speed is less than 110 mph and the building is three stories or less. For taller buildings or higher wind speeds, you'll need an engineer. But if you learn the ins and outs of the IRC wall bracing rules — complicated as they are — you should be able to build homes in most parts of the country without an engineer's help.

For this article, *JLC* spoke with Brian Foley, a building official with Fairfax County, Va. (population 1,118,602). Foley is a structural engineer who directs the engineering office at the Fairfax building department. He was also a member of the special International Code Council committee that updated and revised the wall bracing rules for the 2009 and 2012 editions of the IRC. (The publications available

Walls Act Like Sails in the Wind



A wall running perpendicular to the wind direction acts like a big sail (blue area), while the walls running parallel provide resistance. Short walls need enough bracing to resist the forces against the large "sail" area created by the longer wall (left), and vice versa.

from Fairfax County on wind bracing are as good as any you'll find on the topic: www.fairfaxcounty.gov/dpwes/publications/wind_bracing.) Virginia is far ahead of many states in adopting the new codes, and its experience in both coastal and inland terrain is giving builders in states that have yet to adopt the new code an early chance to learn hard-won lessons.

Wind vs. Seismic

Why did the IRC change the wall bracing rules after 2006? Simple, says Foley: If you're building in wind country and not in earthquake country, the old rules were wrong. The bracing rules in the 2003 IRC were brought in from the old Council of American Building Officials (CABO) One and Two Family Dwelling Code, and carried over into the 2006 IRC. "But all of the provisions in the 2003 and 2006 code were based on seismic loads only," says Foley. "And the way we analyze a structure for seismic is 180 degrees different from how you analyze a building for wind."

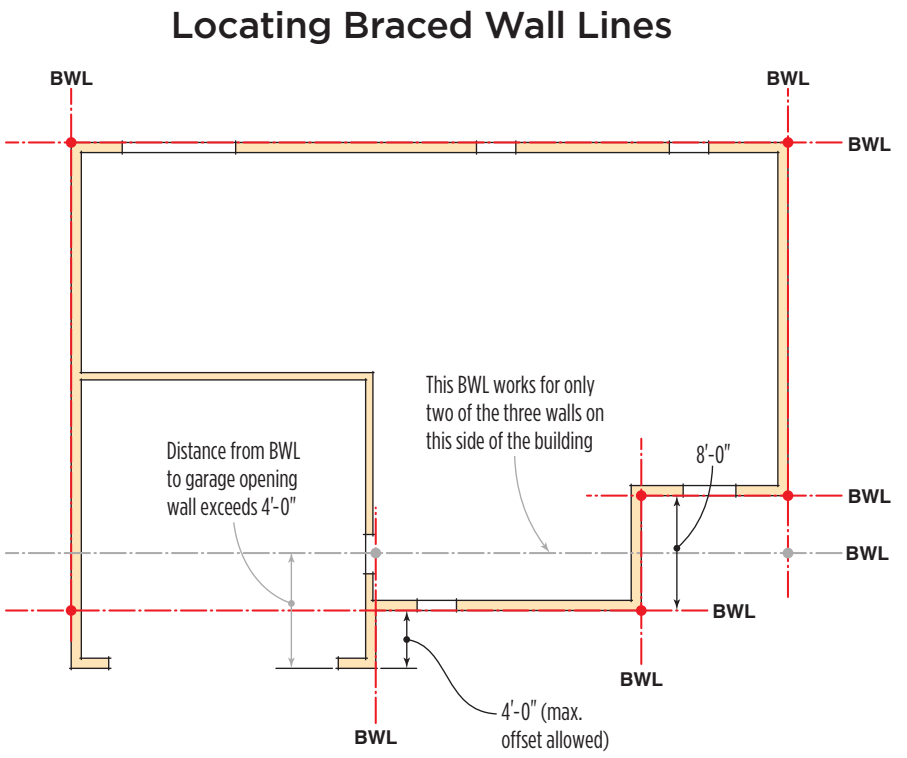
In earthquakes, Foley explains, the stress on a wall is caused by the mass of the wall reacting against the ground movement under the house — the earth moves, and the house, because of its inertia, wants to stay still. Because longer walls have more mass to react against the earth's motion, they experience greater forces in an earthquake, and need more bracing. Conversely, shorter walls have less mass, so they need less bracing — in an earthquake.

But a windstorm affects walls the opposite way, explains Foley. Walls that are facing the wind feel the wind pressure, but it's the walls parallel to the wind direction that do the work of resisting the force.

For example, take a typical colonial that's just a simple 25-by-50-foot box (see "Walls Act Like Sails in the Wind," above). When the wind blows against the 50-foot wall, it's the two short gable-end walls that have to handle the load; when the wind blows against the 25-foot wall, the bracing in the 50-foot walls comes into play. "With wind, the shorter wall has to resist more loads than the longer wall," says Foley. "And so shorter walls need more bracing than long walls in a wind situation — just the opposite of what they need for an earthquake." This means that builders who want to have a lot of glass on the short gable-end wall of a shoe-box-shaped building just might come up short in the bracing department.

So the new code has different bracing rules for seismic conditions and for wind conditions. But Foley says there's another reason the wall bracing rules needed updating: They just weren't keeping up with the times. The old code was based on historic behavior of traditional buildings — the traditional two-story colonial or one-story ranch, for example, with walls between each room. "But if today's plans don't include walls between the living room and the dining room, and there is no more foyer, and it's all a big open concept," Foley says, "then a lot of that rigidity that was the basis of the historical experience is gone."

A prime example is that the old code required a 4-foot braced panel at every corner and one every 25 feet on-center, and if you wanted a window at the corner, you had to hire an engineer. In the 2009 and later code versions, however, the requirement for a 4-foot solid wall section



A braced wall line (BWL) does not have to align with a wall on the building. The code allows a BWL within 4 feet on either side of a wall. In the floor plan shown here, the gray BWL would not work for the entire side of the building, because it would be too far from the garage-opening wall. But together, the two red BWLs would work.

at every corner is gone. Now, the nearest bracing panel can fall as far as 10 feet away from the corner (see "Locating Braced Wall Panels," page 36).

The Downside: Complexity

Builders were at the table when the rules were revised, and they influenced the result. In some ways, the latest code offers builders more flexibility than ever for creative modern designs — but at a price. While the old code was restrictive but simple, the new code is, Foley admits, "exceedingly complex."

In Foley's experience, engineers are no more likely than builders to get the answers right. He notes that the Fairfax County building department routinely rejects engineer-stamped plans as well as builder-submitted plans. That's one reason Foley teaches an eight-hour class on wall bracing and the IRC; his students include not just builders and architects, but also engineers and code officials. "A lot of engineers just sit in one of my classes and then they use the prescriptive requirements," he says. "It makes me wonder why on earth a builder would hire them to do that." Foley believes that there are a lot of smart builders who, once they sit through the training, are able to manipulate their design to accommodate some of the flexibility built into the code.

One reason the new IRC Section R602.10 is so long is that, in an effort to be inclusive, it covers a lot of wall bracing methods that most builders don't use. Specifically, it covers traditional let-in bracing, stucco walls, diagonal wood boards, hardboard panel siding, and structural fiberboard, along with two different approaches to using wood structural panels (plywood or OSB), plus a slew of special narrow-wall options developed by the structural panel industry. So if you're a builder who uses insulating foam sheathing with just a few pieces of OSB or some metal straps in each wall for bracing, you can use one or another approach in Section R602.10 to accomplish that. In fact, the code will let you combine different methods in one house or even in one wall — teaming up let-in bracing on one end of a braced wall line with OSB panels on the other end, for example.

But if you're a builder who believes that simpler is better, your best bet is to stick with OSB or plywood, especially if you need high capacity. Compared with the other traditional methods, wood structural panels can supply more bracing in fewer linear feet of wall. They're most effective when used as continuous sheathing across the whole wall (if you don't cover the entire wall with sheathing, you need wider braced-wall panels at the points where you do sheathe it).

As an introduction to the topic, we'll look at a case study to examine how the required bracing is calculated in varying wind conditions and with different building options (see "Calculating the Required Length of Bracing," pages 32–34). But first, to understand this case study, it's necessary to be clear on a few key concepts.

Braced Wall Lines

To specify the bracing in a wall of a house, you first have to establish what the code calls a "braced wall line" (BWL). The code definition is: "A straight line through the building plan that represents the location

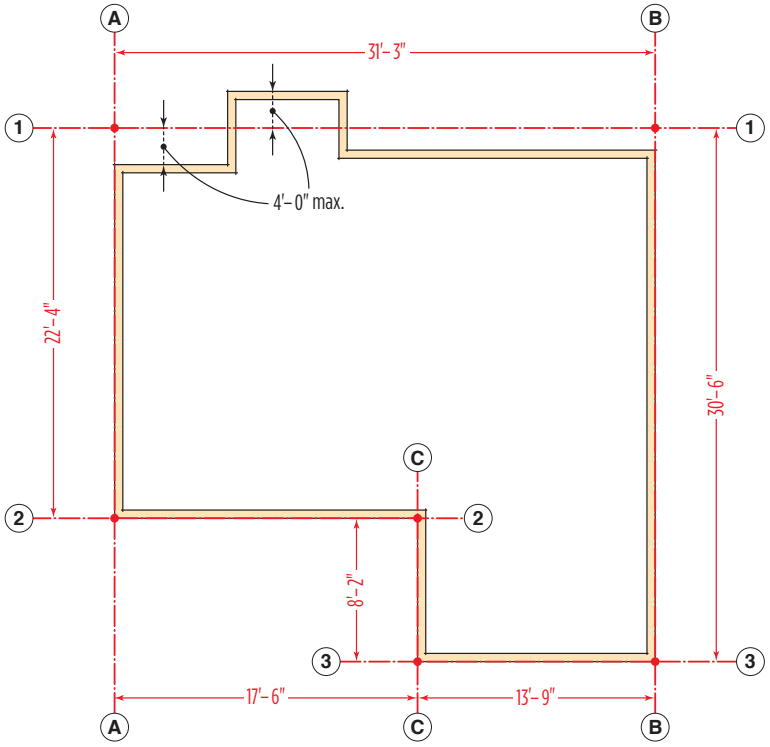
Calculating Average Spacing

When you're figuring the required bracing length, the spacing between braced wall lines is crucial to reading Table R602.10.3(1). But currently, the IRC 2012 does not tell us how to do this; it is up to your local building official, who may say it is the minimum length, the maximum length, or an average of the distances.

Consider the floor plan shown below. How far would you say braced wall line (BWL) A is from the next BWL running in the same direction? On one side (along BWL 1), it is 31′-3″ from B, but on the other end (along BWL 2), it is 17′-6″ from C.

The Virginia building code has adopted the averaging method of calculating the spacing so it is clear-cut for everyone. This is the method we applied in the examples on pages 32–34, and here are the results the method gives for the problem posed above:

- For 1, the distance to the "next" BWL is the average of 22′-4″ and 30′-6″ = 26′-5″
- For 2, it's an average of three distances: 22′-4″ (on the left end) and 8′-2″ and 22′-4″ (on the right end) = (22.3′ + 8.17′ + 22.3′)/3 = 17′-7″ (Note: Dimensions vary because of rounding and conversion from decimal feet to inches.)



BWL	Average Spacing (feet)
1	(22.3 + 30.5) / 2 = 26.4
2	(22.3 + 22.3 + 8.17) / 3 = 17.6
3	(8.17 + 30.5) / 2 = 19.4
A	(31.25 + 17.5) / 2 = 24.4
B	(31.25 + 13.75) / 2 = 22.5
C	(13.75 + 17.5 + 13.75) / 3 = 15

Note: Virginia code allows the spacing (distance from one braced wall line to the next) to be calculated as an average. This method may be allowed in the 2015 version of the IRC.

of the lateral resistance provided by the wall bracing." In other words, BWLs aren't the same as the actual walls; they are part of the plans, not part of the building. Actual walls do have to be close to the braced wall line, however. And in complicated plans, the locations you choose for the BWLs can affect whether your plan meets code or not, as you make choices about how to split the difference between pieces of wall that don't quite line up with each other. That's because a "braced wall *panel*" (or BWP, which is the physical bracing, as explained below) can be up to 4 feet away from the braced wall line it belongs to, but no more than that; otherwise, you can't include it as part of the required bracing (see "Locating Braced Wall Lines," previous page).

Spacing. Braced wall lines are allowed to be as far apart as 60 feet, but the spacing between parallel braced wall lines affects how much bracing they need (see "Calculating Average Spacing," above). Braced wall lines that are farther apart experience more racking load, so they require more bracing — which leaves less room in the wall for window and door openings. In practice, if a home's exterior walls are farther apart than 60 feet, you're going to need to rely on some bracing from interior partitions. On the other hand, when the outside house walls are closer together than 60 feet, you still may want to count the contribution of some interior walls in order to leave unbraced lengths of exterior wall available as openings for doors and windows.

Table R602.10.3(1)
Bracing Requirements Based On Wind Speed*

Exposure Category B
30-Foot Mean Roof Height
10-Foot Eaves-To-Ridge Height
10-Foot Wall Height
2 Braced Wall Lines

Basic Wind Speed (mph)	Story Location	Braced Wall Line Spacing (feet)	Minimum Total Length (Feet) of Braced Wall Panels Required Along Each Braced Wall Line: Method LIB	Method GB	Methods DWB, WSP, SFB, PBS, PCP, HPS, CS-SFB	Methods CS-WSP, CS-G, CS-PF
≤90		10′	3.5′	3.5′	2.0′	2.0′
		20	7.0	7.0	4.0	3.5
		30	9.5	9.5	5.5	5.0
		40	12.5	12.5	7.5	6.0
		50	15.5	15.5	9.0	7.5
		60	18.5	18.5	10.5	9.0
		10	7.0	7.0	4.0	3.5
		20	13.0	13.0	7.5	6.5
		30	18.5	18.5	10.5	9.0
		40	24.0	24.0	14.0	12.0
		50	29.5	29.5	17.0	14.5
		60	35.0	35.0	20.0	17.0
		10	NP	10.5	6.0	5.0
		20	NP	19.0	11.0	9.5
		30	NP	27.5	15.5	13.5
		40	NP	35.5	20.5	17.5
		50	NP	44.0	25.0	21.5
		60	NP	52.0	30.0	25.5

*Excerpt for 90-mph windspeed only

This excerpt from IRC Table R602.10.3(1) enables us to find required wall bracing lengths. For a given wind speed and building story, locate spacing of each BWL in the third column, then follow across to the column for the bracing method you are using. In the examples on pages 32–34, we are using the middle set of values (highlighted above), which apply to the first floor of a two-story house or the second floor of a three-story house, and pulling our bracing lengths from the last column, which covers continuous sheathing-wood structural panels (CS-WSP).

Adjustment factor. Defining additional braced wall lines carries with it an adjustment factor — you could call it a penalty. (This is one of four adjustments discussed on page 35.) If you split your braced wall panels across more lines, the total amount of bracing you need goes up. It's a hard concept to wrap your head around, but the upshot is this: Simpler houses are easier to brace than complicated houses, and simpler bracing solutions are more efficient than complicated ones. If you can accomplish all your bracing with just two walls in each direction, there's an advantage in doing it that way.

Even though a braced wall line is an idea and not part of the physical building, it *does* have to be part of the plans. The 2009 IRC says you have to show the braced wall lines on your drawings, and you also have to draw in the locations of each braced wall panel. You're going to want to think this stuff through early on in the design process. You don't want to thrash out a whole design idea with your clients, have them fall in love with the final version, and then find out you can't build that patio door or bay window into your west wall because it won't leave enough room for the bracing, or find out that the wall between your kitchen and laundry room just isn't where it structurally needs to be. It can take multiple passes through the design process, running one after another scenario, moving windows and relocating partitions, before you get a solution that gives you the floor plan, views, traffic, egress, and elevations you want, and that also satisfies the code's requirements for wall bracing.

Braced Wall Panels

While braced wall lines are theoretical lines on the plans, "braced wall *panels*" are the actual physical bracing within a built wall. The code defines a braced wall panel as "a full-height section of wall constructed to resist in-plane shear loads through interaction of framing members, sheathing material, and anchors." In physical reality, we're talking about a short section of framed wall with plates, studs, and some kind of bracing material for stiffness. Braced wall panels have to run the full height of the wall, from bottom plate to top plate, with no interruptions for windows or doors. They also have to be a minimum length along the wall, which varies depending on the method used. Weaker materials, such as gypsum board, or weaker methods, such as let-in bracing, require more linear feet of panel to achieve the required bracing.

A braced wall panel using OSB or plywood typically has to be at least 32 inches long if the wall is continuously sheathed and the headers of openings adjacent to the panel are not higher than 80 inches off the floor. If the sheathing is not continuous but employs intermittent OSB or plywood panels, each panel typically has to be at least 4 feet long to be counted. However, there's an exception even to that

continued on page 36

Calculating the Required Length of Bracing

The amount of bracing required is a function of the wind speed, the exposure, the story of the house, the spacing of the braced wall lines, and the bracing method used. In his training course, Foley teaches a method for calculating the required bracing length that he calls "Choose it, Adjust it, Compare it."

1. Choose it. Select required amount from Table R602.10.3(1).

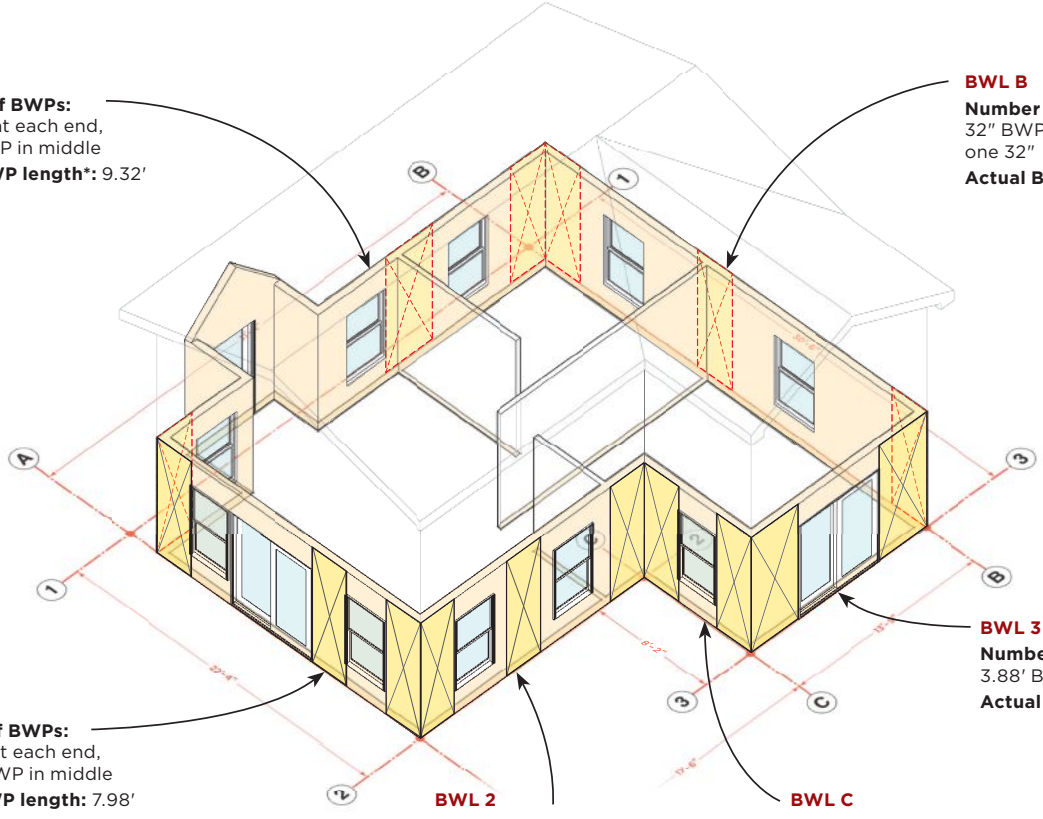
2. Adjust it. Multiply by adjustment factors.

3. Compare it. Actual BWP length must be greater than the required BWP length.

In the three examples below, we use Foley's method to find the required bracing for the first floor of the example house shown.

Step 1: Locate the braced wall lines (BWLs) on the plans. Remember, BWLs do not have to line up with actual walls. In this example, BWL 1 accommodates a few walls that are all within the 4′ maximum offset.

Step 2: Determine the spacing between the braced wall lines. The spacing is shown in column 1 of the results table. See "Calculating Average



* Actual BWP lengths are totals

Example 1

This base case assumes that the sample house is in Exposure B, with 8-foot walls and a shallow-pitched (3/12) intersecting roof. The adjusted BWP length is the result of multiplying the "Required bracing length" successively by each value in the four "Adjustment Factors" columns. For example, in the top line of the table at right, 8.1 x 1 x 0.85 x 0.9 x 1.3 = 8.06; the "Actual BWP length" takes on-center framing into account.

BWL	Avg. Spacing	Req'd bracing length (tabular value)	Adjustment Factors: Exposure B	Adjustment Factors: Eaves-to-ridge ht. (3.2 ft.)	Adjustment Factors: Wall ht. (8 ft.)	Adjustment Factors: No. BWL in same direction	Req'd BWP length (adjusted)	Actual BWP length
1	26.4′	8.1′	1	0.85	0.9	1.3	8.06′	9.32′
2	17.6	5.78	1	0.85	0.9	1.3	5.75	7.98
3	19.4	6.32	1	0.85	0.9	1.3	6.29	7.76
A	24.4	7.6	1	0.85	0.9	1.3	7.56	7.98
B	22.5	7.12	1	0.85	0.9	1.3	7.09	7.98
C	15.0	5.0	1	0.85	0.9	1.3	4.97	5.32

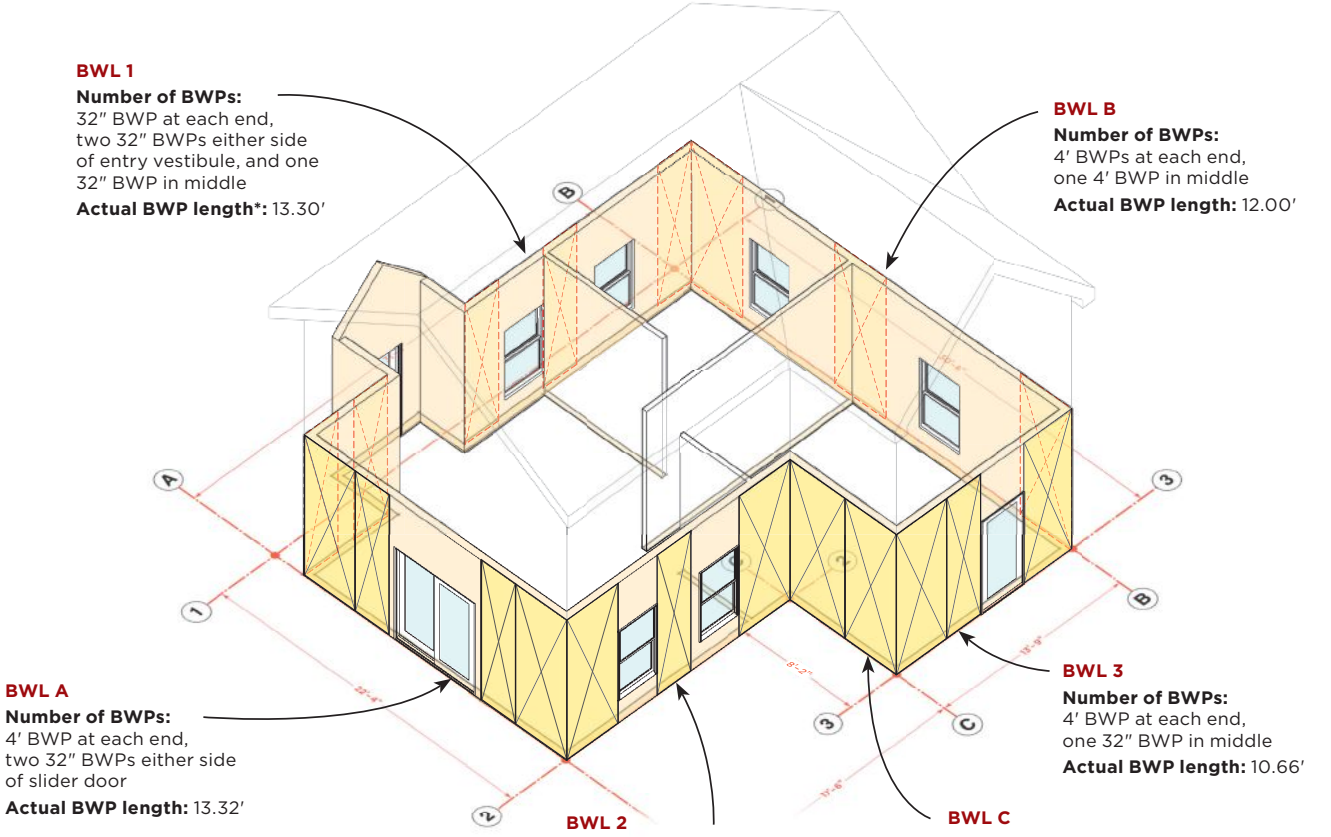
Bracing method: CS-WSP (except where noted); Wind speed: 90 mph; Number of stories: 2

Spacing," page 30, for a breakdown of how the BWL spacing was calculated.

Step 3: Look up the required bracing length in Table R602.10.3(1). (For help reading the table, see the excerpt on page 31.) Note that the results we list in column 2 of the chart in Example 1 are "interpolated" values: Because our actual spacing falls in between the spacing increments in Table R602.10.3(1), we calculated a number that lies proportionately between values in the Methods CS-WSP column.

Step 4: Adjust the required bracing using the appropriate adjustment factors. In Example 1, the house is located on an Exposure B site (no adjustment needed); the first-floor walls are 8 feet high (earning a slight credit of 0.9); and we have three BWLs running in the same direction both ways (requiring an adjustment of 1.3 to each BWL). The adjusted bracing length (last column) is reflected in the braced wall panels shown on the house.

[Note: To make these calculations using an interactive spreadsheet, search for "wind-bracing" at fairfax county.gov.]



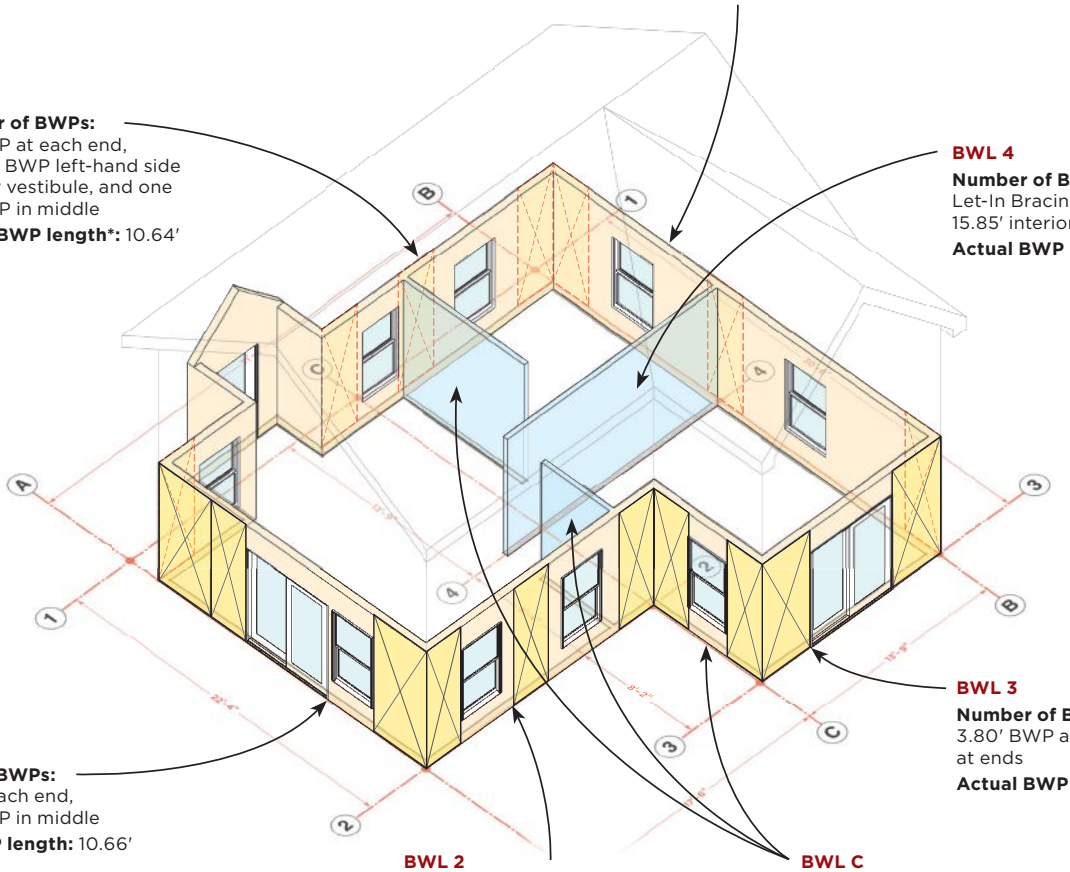
* Actual BWP lengths are totals

Example 2

In this example, we are exploring what happens to the same house if we relocate it on a more exposed site (Exposure C), raise the first-floor wall height to 11 feet, and make the intersecting gable roof steeper. The table lists the changes, and the illustration above graphically shows the reduction in the wall space available for windows and doors.

BWL	Avg. Spacing	Req'd bracing length (tabular value)	Adjustment Factors: Exposure C	Adjustment Factors: Eaves-to-ridge ht. (7 ft.)	Adjustment Factors: Wall ht. (11 ft.)	Adjustment Factors: No. BWL in same direction	Req'd BWP length (adjusted)	Actual BWP length
1	26.4'	8.1'	1.3	0.91	1.05	1.3	13.08'	13.3'
2	17.6	5.78	1.3	0.91	1.05	1.3	9.33	10.66
3	19.4	6.32	1.3	0.91	1.05	1.3	10.21	10.66
A	24.4	7.6	1.3	0.91	1.05	1.3	12.27	13.32
B	22.5	7.12	1.3	0.91	1.05	1.3	11.51	12.0
C	15.0	5.0	1.3	0.91	1.05	1.3	8.07	8.25

Bracing method: CS-WSP (except where noted); Wind speed: 90 mph; Number of stories: 2



* Actual BWP lengths are totals

Example 3

To make room for more windows and doors, we can extend BWL C and add BWL 4, which adds bracing on three interior walls. But we must include let-in metal bracing ("Method LIB" in Table R602.10.3[1]) in these interior walls before hanging drywall, then fasten the drywall to the required "GB" schedule. The location and building features for Example 3 are the same as in Example 2, but the distances between BWLs are shorter, reducing the required bracing lengths. We pick up a slight penalty for adding BWL 4, but compared with Example 2, we reduce the amount of bracing required, allowing us to return to the Example 1 window and door layout, except for one less window along BWL A.

BWL	Avg. Spacing	Req'd bracing length (tabular value)	Adjustment Factors				Req'd BWP length (adjusted)	Actual BWP length
			Exposure C	Eaves-to-ridge ht. (7 ft.)	Wall ht. (11 ft.)	No. BWL in same direction		
1	18.0′	5.9′	1.3	0.91	1.05	1.45	10.63′	10.64′
2	13.0	4.40	1.3	0.91	1.05	1.45	7.92	7.98
3	12.4	4.22	1.3	0.91	1.05	1.45	7.6	7.76
4*	13.0	8.8	1.3	0.91	1.05	1.45	15.85	15.85
A	17.5	5.75	1.3	0.91	1.05	1.3	9.29	10.66
B	13.75	4.62	1.3	0.91	1.05	1.3	7.47	7.98
C*	15.0	10.0	1.3	0.91	1.05	1.3	16.15	19.82

Bracing method: CS-WSP (except where noted); Wind speed: 90 mph; Number of stories: 2
* Let-In Bracing (LIB) method applied

Adjustment Factors

After finding the required bracing length in Table R602.10.3(1), you need to multiply that number by four adjustment factors. Included here are the factors for one- and two-story structures. For three-story buildings, refer to Table R602.10.3(2) in the IRC.

Adjustment: Exposure

	Exposure Category	Adjustment Factor
One-story structure	B	1.00
	C	1.20
	D	1.50
Two-story structure	B	1.00
	C	1.30
	D	1.60

Adjust for Exposure. The more exposure, the more bracing required. In Exposure B, where terrain, trees, or other buildings provide shelter from wind, the adjustment multiplier is 1 — no change. But in Exposure C (open grasslands or flat plains with few trees) or Exposure D (next to unobstructed open land such as a salt flat or a lake that freezes in winter), for a two-story building the required bracing length must be multiplied by 1.30 or 1.60, respectively.

Adjustment: Eaves-to-Ridge Height

	Eaves-to-Ridge Height	Adjustment Factor
Roof only	≤5 feet	0.70
	10 feet	1.00
	15 feet	1.30
	20 feet	1.60
Roof + 1 floor	≤5 feet	.85
	10 feet	1.00
	15 feet	1.15
	20 feet	1.30

Adjust for Eaves-to-Ridge Height. The more building there is above the floor you are bracing, the more wind pressure you will need to brace against. This includes both the floor above and the height of the roof, which adds to the "sail" area. Steeper roofs increase this sail area and therefore require more bracing.

Adjustment: Wall Height

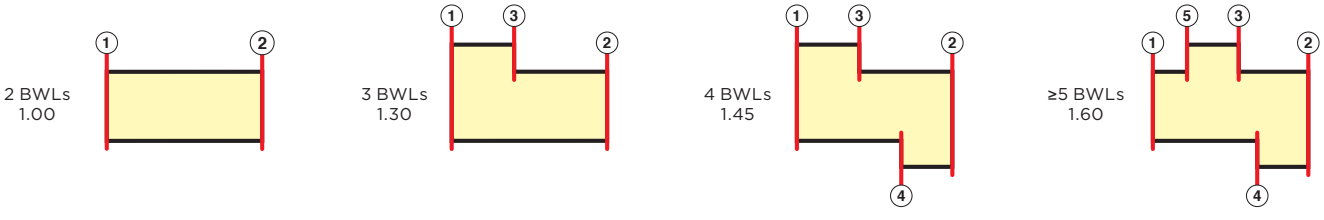
	Wall Height	Adjustment Factor
Any story	8 feet	0.90
	9 feet	0.95
	10 feet	1.00
	11 feet	1.05
	12 feet	1.10

Adjust for Wall Height. If you have 10-foot walls, your adjustment factor is 1 — no change. But for 11-foot walls, you have to multiply by 1.05, and for 12-foot walls, the multiplier is 1.10. The good news here is that you get to reduce the bracing if the walls are shorter than 10 feet: for 9-foot walls, you multiply by .95 (a reduction), and for 8-foot walls you multiply by .90.

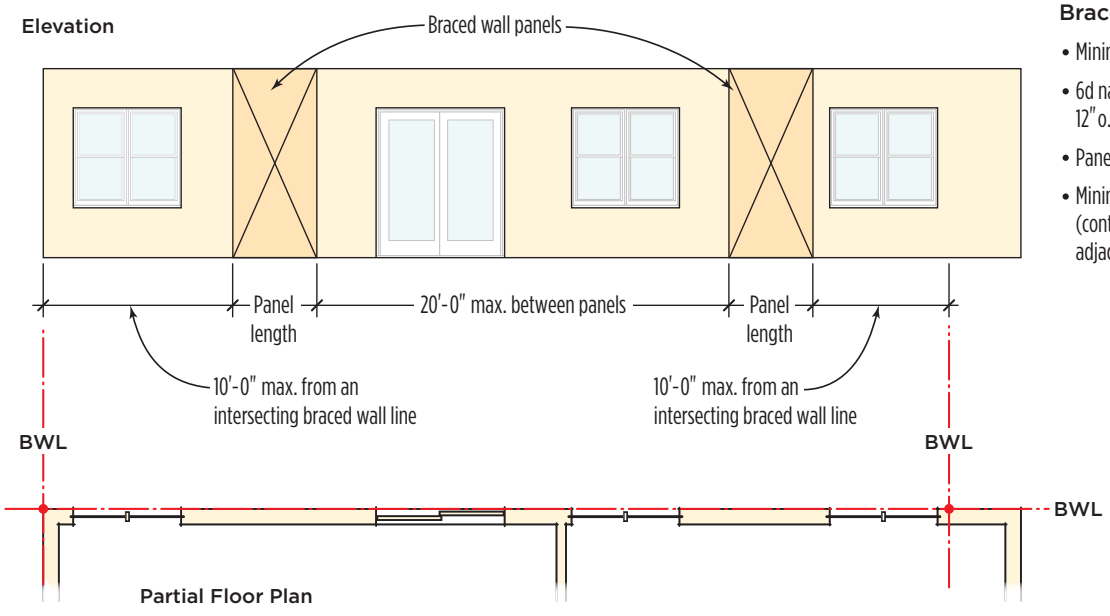
Adjustment: Number of Braced Wall Lines

	BWLs in Plan Direction	Adjustment Factor
Any story	2	1.00
	3	1.30
	4	1.45
	≥5	1.60

Adjust for Number of Braced Wall Lines. If you're resisting the wind force with just two outside walls, you stick to what came out of the table, plus the other adjustments already applied. But if you're using three, four, or five braced wall lines to pick up the load, you need to multiply by the appropriate number found in the table at left.



Locating Braced Wall Panels



Braced Wall Panel Specs:

- Minimum 3/8"-thick plywood or OSB
- 6d nails at 6" o.c. edges, 12" o.c. in field, typical
- Panel extends full height to wall plate
- Minimum 24" panel length (continuous sheathing only when adjacent openings ≤80")

To qualify as a braced wall panel (BWP), a section of sheathing cannot have any openings in it and must be fastened following the minimum specs shown above. BWPs must be spaced no more than 20 feet apart, and begin within 10 feet of each end of the intersecting braced wall lines (BWLs). In this example, the intersecting BWL on the left aligns with the corner, so the 10-foot maximum dimension coincides with the corner. On the right, however, the BWL is offset to the house interior, creating an allowable unbraced length of wall that is greater than 10 feet from the corner. If an intersecting BWL is offset toward the exterior of the house wall, the distance to the corner would be less than 10 feet.

continued from page 31

rule: Shorter intermittent panels can be included in the bracing total, but with a reduction factor applied. So while a 4-foot section of sheathed wall counts as 4 feet, you can also get "partial credit" for shorter sections: a 42-inch-long panel is worth 36 inches in your calculations, and a 36-inch panel is worth 27 inches. These reductions only apply, however, if the wall is no more than 8 feet tall; in taller walls, BWP lengths under 48 inches don't count at all.

Advanced Methods

If you do come up short on wall space in which to install braced panels, you still may not have to go to an engineer. The latest code editions have a few advanced methods built into them that might let you gain adequate bracing in a very short section of wall:

- The "alternate braced wall" (ABW) method uses short braced-wall elements that include hold-down straps or anchors placed at wall ends.
- Method PFH, "portal frame with hold-downs," is a way to build in bracing around wide window or door openings using very narrow wall sections with closely nailed sheathing.
- Method PFG ("portal frame at garage") accomplishes a similar feat with garage openings, where designs commonly don't allow enough length in the wall segments flanking the door opening to meet the minimum size for a braced wall panel.

All of these methods make up for the lack of wall length by using double studs, very close nailing, and strong anchorage at the base of the wall to create a strong, stiff structural element that resists racking.

As Brian Foley observes, there's no way anybody is going to master the ins and outs of this difficult code section by reading one article in a magazine. But that doesn't mean you can't ever learn it. Whether you take a class like Foley's all-day course or just do your own research and learn on the job, one house at a time, getting a good handle on the wall bracing rules is within reach for any capable builder. And once you do have it down, this part of the code offers you plenty of ways to build high-quality houses — and do it cost-effectively.

***Ted Cushman** is a freelance writer based in Peaks Island, Maine. He is editor of the* Coastal Contractor *newsletter and has been a regular contributor to* JLC *since 1993. Full worksheets detailing the examples on pages 32–34 can be found with this article at jlconline.com.*

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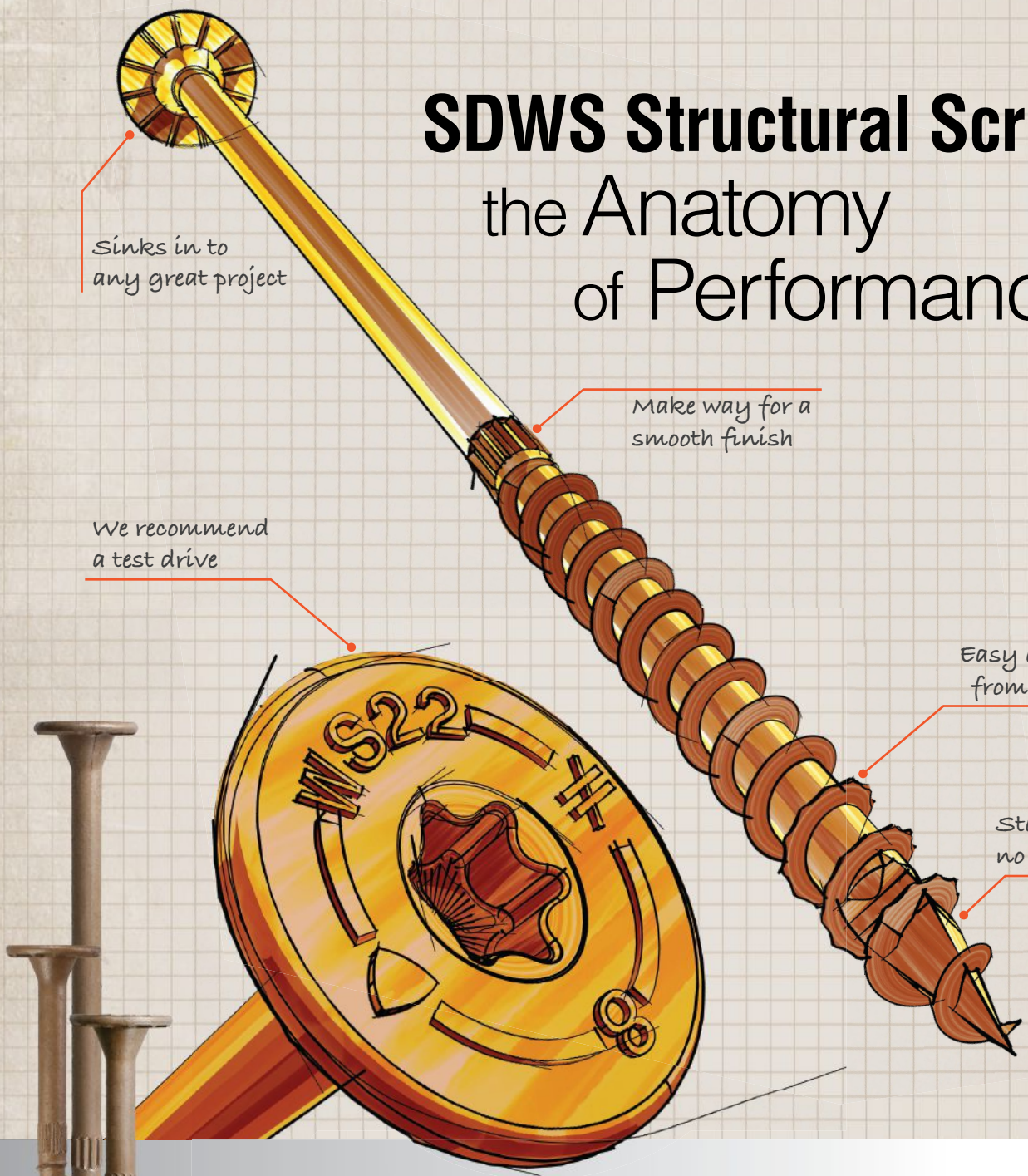

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Fast, Safe, and Accurate Tile Cutting

How to choose and use the right tool for the task

by Michael Byrne

Cutting and shaping tile properly can be one of the most challenging — yet rewarding — parts of any tiling project. Choosing the wrong tool for the job or using the right tool improperly can be both costly (in time and materials) and dangerous. As a tile installer with decades of experience, I will show you the tools I rely on to create the most professional-looking jobs. If you install tile only occasionally, you may not need all of the tools I discuss here. But if you are working every day on high-end tile installations, these tools will allow you to increase your productivity and your profits.

The Essential Wet Saw

A wet saw is a crucial tool for most ceramic and all stone tile installations, but features, performance, and durability can vary greatly among tools. I have four wet saws. The granddaddy of the group is over 65 years old, and I use it primarily for freehand cutting. I use a different one for large installations that require mostly straight cuts. The remaining two saws have a variety of features that make them very versatile, so I use them on my custom work.

A quality wet saw is expensive, but properly maintained, it can last for years. Proper maintenance includes cleaning the entire saw and flushing the water pump thoroughly after each day's use; oiling the sliding or rolling parts; and storing, transporting, setting up, and breaking down the tool with care. When operating a wet saw, keep an eye on the coolant water and replace it frequently. Once the water becomes thick with fine particles, it turns into an abrasive fluid that can reduce the pump's life significantly.

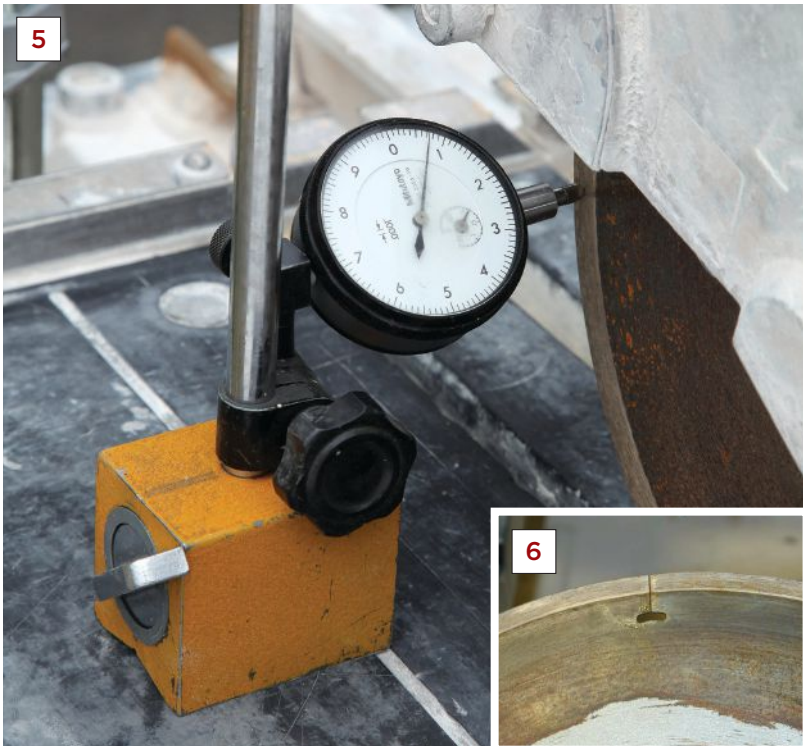
Wet-Saw Tune-Up

Before every major project, I check the wet saw to make sure it's set up properly. With all the handling the tool gets — like bouncing around in my truck on the way to and from a job — it's easy for things to get out of alignment. A quick check ensures that the tool is cutting perfectly.

SQUARE THE BLADE
Set the head of a combination square on the saw table and adjust the blade so that it is perfectly plumb to the table (1). Because this saw has a tilt-angle feature, I check the 45-degree setting (2). This tool also has a 22½-degree setting, but I seldom check it because I rarely need to make cuts at that angle.

CHECK BLADE TRACKING AND FENCE
Using the combination square, make sure the blade is parallel to the sliding table (3). Check at the beginning as well as the end of the table's travel. Then adjust the saw's fence so that it is square to the table and blade (4).

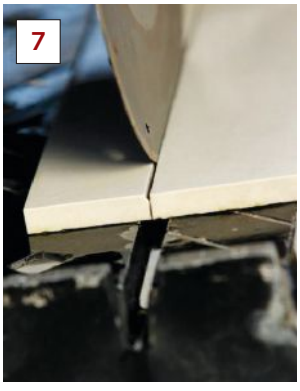
IS THE BLADE OK?
This tool, called a dial indicator, can measure very small amounts (in thousandths of an inch) of side-to-side movement in the blade as it rotates. I attach the tool to the saw's sliding table and then clamp the table itself to keep it completely stationary (5). Then I turn the blade slowly by hand while reading the face of the gauge. The pointer on the dial shows exactly where and how much the blade is moving. The blade will cut smoothly if side-to-side movement is less than five thousandths of an inch (.005 inch). Any movement greater than that and you risk breaking tiles. The blade can also distort if its rim overheats, which can happen when a regular blade is used to cut porcelain tile. Expansion slots on a porcelain wet-saw blade allow the blade's rim to expand without distorting the blade (6). If you don't have a dial indicator and tiles are splitting as the blade nears the end of the cut, unscrew the nut and washer to see if there is any grit on the spindle or clamping washers that could throw the blade out of plane. If the components are clean, the blade probably needs to be replaced.



Cutting With a Wet Saw

Once your saw is all set up and tweaked properly, you're ready to turn it on to check the flow of coolant water. First, make sure the pump is in good working condition and powerful enough to shoot a continuous stream of clean water on the blade. Better saws have two spouts — one for each side of the blade. Remember, if a wet-cutting blade is used without water or without enough water, the blade can be ruined in seconds. If the blade is continually bathed with water, the saw is ready for cutting.

When I need to cut a series of tiles the same size, I use an adjustable fence to ensure that each cut is identical, which is especially important if the cuts will be exposed once they are installed.



AVOIDING A BROKEN KERF

A common problem when cutting tiles is a broken kerf, which occurs when the tile breaks apart before the blade finishes a cut. This leaves a bump on one or both sides of the cut at the end of the kerf (7). This lip may not be a problem on a floor installation, but on wall installations where spacers are typically used, it can cause misalignment of the tiles. To maintain a completely smooth kerf, slow down the rate of feed as the blade exits the cut, and hold both sides of the tile firmly against the cutting table (8).

MODIFYING THE SAW FOR CUTTING GLASS TILE

Special wet-saw blades are available for cutting glass, but chatter from the saw table can still break the tiles. So can excessive heat where the blade meets the glass. Also, the wide kerf slots on the table don't offer adequate support, which can result in chipped edges along the cut.

To minimize these problems, I bolt a square piece of 1/2-inch plywood — large enough to fully support the glass tiles — to the table. Then I submerge a second coolant pump in the catch basin. I wrap this added hose with stainless-steel wire, which stiffens it, but is flexible enough for me to direct the flow of water precisely onto the edge of the blade (9). Finally, with the coolant water flowing, I make a shallow cut in the plywood. The resulting narrow kerf provides maximum support for the tile, with significantly less chipping and fewer broken tiles.

FREEHAND CUTTING WITH A WET SAW

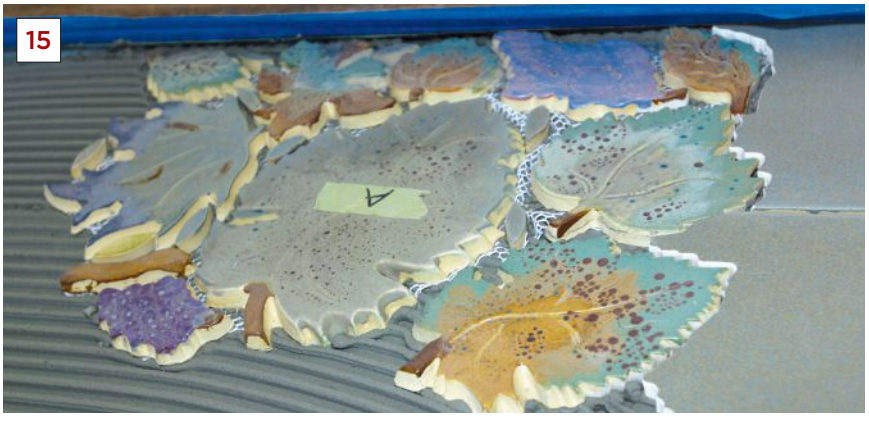
Though not recommended by saw manufacturers (to limit their liability), freehand cutting can extend the flexibility and usefulness of a wet saw. Doing it safely depends on the installer's steady hands resting firmly on the cutting table (10). Use both the edges and the sides of the blade for this type of cutting, and move the tile slightly side-to-side as you push it slowly into the blade. This movement widens the kerf and helps prevent the blade from pinching the tile and ripping it out of your hands, or — even worse — fracturing the rim of the blade and sending shrapnel flying into your face. Always use extreme caution, and always wear a full-face shield for any type of tile cutting.

IRREGULAR CURVED CUTS

I make any irregular tile cuts freehand. The first step is to make a series of straight cuts toward the mark (11, 12). Next, I make additional shorter cuts, gradually getting closer to the mark (13). Finally, when the cuts are about 1/8 inch away from the mark, I use the side of the blade to finish the cut (14). With all freehand cuts, I keep the plane of the tile aimed at the arbor so that the shoulder of the cut is square to the surface of the tile. If held lower, the cut edge tapers out, and the tile probably won't fit where it's supposed to go (15).

Keep in mind that the wet saw in these freehand cutting photos is over 65 years old and cannot straight cut tiles larger than 6 inches. Although it is not suitable for working with today's larger-size tiles, I still use it a lot for intricate freehand cutting. You can cut just about any shape you want with a wet saw simply by following the steps outlined above.

I should point out that freehand cutting causes irregular blade wear, and once a blade is used for this technique, it should not be used to make straight cuts. Generally, I use a blade for straight cutting until roughly a third of its cutting rim remains. I then use the remainder of the blade for freehand work. When the blade is no longer effective for freehand cutting, I still don't toss it; I extend its life by using what's left of the diamond rim to sharpen carbide-tipped drill bits.



COPED TILE CORNERS

When joining cove or trim tiles for an inside corner, most installers simply miter the adjoining tiles. But just as with wood joints, a coped corner can be neater and more attractive. To create a coped corner, I make the profile cut using the freehand technique (16, 17).

RING SAWS

There are several ring saws on the market that offer an alternative to freehand cutting. The same diamonds found on regular wet-saw blades are bonded to a hardened circular steel band or rod that cuts in the same way as a carpenter's band saw (18). Like the blades on other types of diamond saws, the ring saw's blade must be bathed in water, but rather than being sprayed with spouts or nozzles, it passes through a bath of water located below the cutting table. Some ring saws can cut porcelain tile and granite, but in my opinion, they are not well-suited for production cutting of these materials. I use a ring saw when I need to make a large number of irregular cuts in relatively soft materials, but for most irregular cutting, I prefer to use a conventional wet saw.

Cutting Tile With Other Tools

While the wet saws carry most of the tile-cutting burden, I use other power tools for cutting and shaping tile (19, clockwise from top): a coolant-through-spindle wet angle grinder; a diamond hole saw mounted in a slow-speed drill; a high-speed angle grinder with a dry-cutting diamond blade; and a small circular saw fitted with a dry-cutting diamond blade. The wet grinder is fitted with a typical polishing disc and has an adjustable water-supply tube that attaches to a standard garden hose or hose bib.

CIRCULAR SAW WITH A DIAMOND BLADE

When it comes to making diagonal cuts in large tiles, my wet saws often fall short. Larger-capacity wet saws are available, but they can cost $5,000 or more, and their massive size requires two people for transport and setup. Instead I clamp a straightedge to my work table and cut the tile with a small circular saw fitted with a diamond blade (20). This setup is a very low-cost alternative that's easy to transport and carry. I use the same saw to cut through grout joints when I'm replacing individual tiles, and to make tile rip-outs easier. The smooth action of the blade is not nearly as destructive to neighboring tiles as a hammer and chisel.

ANGLE GRINDER WITH A DIAMOND BLADE

Some shapes are just too impractical to cut on a conventional wet saw or a small circular saw. For very large cuts — such as the curve made on the 24-inch porcelain tile shown here — I use an angle grinder with a dry-cutting diamond blade. This is also what I use to cut through tiles and grout when I am ripping out an old installation. (I can use the grinder for cutting galvanized lath, rebar, and other materials, too, simply by switching to a wheel for cutting metal.)

When using the grinder to cut a tile — especially if the cut will show — I use a four-step process. First, I rough out the desired shape until the blade is 1/8 inch to 1/4 inch from the cut line (21). Next I cut away excess material until the blade is about 1/32 inch from the line. Then I cut exactly to the line (22). For the last step I use a tile rubbing stone or a belt sander (see photo 29, page 47) to smooth the cut and make a small finishing bevel.

CUTTING HOLES IN TILE

Hole saws are traditionally the best tools for cutting standard-size holes in any material, and there are many diamond-edge hole saws on the market for cutting holes in tile. The problem with the ones I've used is that the carbide-tip pilot bit is absolutely useless — especially when I'm trying to get a clean hole in porcelain tile. So I remove the pilot bit completely. To prevent the hole-saw bit from wandering, I make a guide from a piece of scrap plywood with holes matched to the size of the diamond bit.

Some diamond-core bits are advertised as dry-cutting — but even a dry bit can also be used with water. Bathing the tile and bit in water can extend the life of most bits 300% or more. To simplify wet cutting, I use a wet saw's catch basin.

First, to avoid damaging the basin, I place a piece of scrap 3/4-inch plywood in the bottom. Then I mark the holes' location on the face of the tile with an indelible pen. Next, I place the tile on the plywood shield and line up the plywood guide (23), making sure that the whole setup is under water. While pressing firmly down against the guide, I ease the bit into the face of the tile.

One complication is that the plywood guide inhibits the free flow of clean water. Therefore, I remove the plywood guide as soon as the bit creates a continuous circular kerf in the tile (24). This kerf will guide the bit the rest of the way through the tile.

ANOTHER WAY TO CUT HOLES IN TILE

As an alternative to wet-cutting holes — particularly useful when cutting holes in tiles that are already installed — I use a variable-speed router-type tool made by RotoZip (rotozip.com), fitted with the company's companion dry-cutting diamond hole saw (25). Rather than use a guide, I rely on a technique popular with stone fabricators. First I mark the position of the hole, then I introduce the bit into the face of the tile while holding the tool at an angle. As the bit eats into the tile, I gradually tilt the tool upward until the axis of the bit is square to the face of the tile. Now I can ease the bit through the body of the tile.

SCORE-AND-SNAP CUTTER

Power tools are not always necessary, especially when making straight cuts in porcelain tiles. Because this dense tile is difficult to cut with a traditional score-and-snap cutter, many installers switch to a wet saw. But cutting porcelain can be slow even with a specialty blade mounted on the wet saw. Plus, the material has to be completely dry before it can be installed. The extra time that this entails can really eat into an installer's profit.

With the right technique, the lowly snap cutter can produce clean cuts in porcelain tile with little or no breakage. Before scoring the tile, brush the scoring path with kerosene or very light oil (26), then score and snap. The oil lubricates the scoring wheel for a consistent and even score, so all that's left is to wipe off the residual kerosene or oil.

SHAPING THE EDGES OF TILE
Frequently, ceramic and stone tiles with bull-nosed edges aren't available, so I have to make my own. I begin by making multiple passes with a dry-cutting grinder to rough out the desired shape (27). Then, using progressively finer grit discs, I use a wet-grinder (28) — which shoots coolant directly through the spindle — to sand and polish the edge to its finished shape.

A BELT SANDER FOR SHAPING EDGES
One of the biggest time-savers in my tool kit is a bench-top belt sander fitted with a coarse-grit belt (29). I use this tool to finish any visible cut edges that won't be concealed with overhanging trim. Smoothing tile edges can be done by hand with a rubbing stone, but that takes time and energy. A belt sander can do the work in a matter of seconds.

Contributing editor ***Michael Byrne*** *is a tile setter and the moderator of the tile forum at jlconline.com.*

Cleanup

BEFORE YOU PACK UP YOUR SAW
Cutting tile with a wet saw generates a lot of fine particles that get circulated by the coolant pump along with the water. If these particles build up over time, they can shorten the life of the pump (30), so the catch basin should be cleaned regularly. Run the pump in a bucket of clean water to rinse it out after each use (31).

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The Maxlite BR30 (left) and BR40 replace incandescent lamps (65W and 90W, respectively) in standard Edison-type sockets. Both lamps are available in 2,700K and CRI80-plus (maxlite.com).

LED Lighting Essentials

Unlike incandescent bulbs, LEDs are high-tech electronic devices. Here's what you need to know to make the right choice

by Fernando Pagés Ruiz

How many contractors does it take to screw in an LED bulb? Well, just one, but only after a bit of head scratching. While new technology has made every aspect of our lives richer and more efficient, it has complicated simple things like choosing and changing a light bulb. Shopping for LED bulbs is like shopping for a smart phone — it can make you feel stupid, because there are so many choices and a lot of what you thought you knew about light bulbs doesn't apply to LEDs. In what follows, we'll look at the key concepts you need to learn to help your clients make the right decision.

Buying LED Lamps

Incandescent bulbs are fairly consistent. Despite differences in bulb shape and base, almost all incandescent bulbs of a particular wattage deliver the same quantity of light. And although manufacturers have introduced frosted and colored glass to create special effects, the quality of incandescent light is fairly reliable as well. With incandescents, you can mix brands, and it doesn't matter where or when you buy the bulbs.

LEDs are not so simple. Some characteristics are the same, bulb to bulb and brand to brand, but some are not. When asked what a contractor should focus on when venturing into LEDs, Jeff Dross, corporate director of education and industry trends for Kichler lighting, offered this caution: "Keep in mind that you're moving from the real simple architecture of the Edison bulb to a piece of electronics."

For now, while the public gets used to

Lumen-Watt Equivalence

Light Output (lumens)	Watts		
	LED	CFL	Incandescent
450	4–5	8–12	40
300–900	6–8	13–18	60
1,100–1,300	9–13	18–22	75–100
1,600–1,800	16–20	23–30	100
2,600–2,800	25–28	30–55	150

When buying an incandescent bulb, we look for wattage — which refers to energy consumption — and pay no attention to lumens, the measure of how much light the bulb produces. With LEDs, however, which use very little energy, lumens are the common unit of measure. To use this chart, match the wattage of the incandescent you want to replace to the LED that corresponds to the lumens the incandescent produces.

Cost Comparison: LEDs vs. CFL vs. Incandescent

	LED	CFL	Incandescent
Light bulb projected lifespan[1]	50,000 hrs	10,000 hrs	1,200 hrs
Watts per bulb (equiv. 60 watts)	10	14	60
Cost per bulb[2]	$35.95	$3.95	$1.25
Kwh used over 50,000 hrs	300–500	700	3,000
Cost of electricity (@ 10¢ per kwh)[3]	$50	$70	$300
Bulbs needed for 50k hours of use[4]	1	5	42
Equivalent 50k hours bulb expense[5]	$35.95	$19.75	$52.50
Total cost for 50k hours	$85.95	$89.75	$352.50

Energy Savings over 50,000 hours, assuming 25 bulbs per household:

	LED	CFL	Incandescent
Total cost for 25 bulbs	$2,143.75	$2,243.75	$8,812.50
Savings to household by switching from incandescent	$6,668.75	$6,568.75	0

[1]Lifespan is projected because of the time required to test.
[2]Cost per bulb is based on an average for a 60-watt equivalent LED bulb.
[3] Cost of electricity varies by location.
[4]Bulb breakage not considered. Incandescent bulbs and CFL bulbs break more easily than LEDs, increasing their cost of use.
[5]Most LEDs come with a minimum 2-year guarantee. Any defective LED bulb will usually fail within this time.

Although LEDs and CFLs are less expensive than incandescents in the long run, high initial cost makes replacing all of a home's lamps impractical for most homeowners. Because of their long life, LEDs are a good choice for any fixture that operates for three or more hours daily, or for hard-to-reach fixtures where changing the bulb is difficult. ***This table was adapted from Eartheasy (eartheasy.com).***

them, LEDs are mostly defined in terms of their "equivalence" to incandescent bulbs — even though they perform very differently (see "Lumen-Watt Equivalence," top left). For example, while everyone knows what to expect from a 40-watt or 100-watt incandescent bulb, very few people know that the amount of light these lamps produce ranges from about 400 lumens to about 1,600 lumens. We are accustomed to thinking of the brightness of a bulb in terms of the wattage it draws. But the power consumption of LEDs is so low it is almost irrelevant, which makes it all the more important to understand light output in terms of lumens.

Base and shape. LEDs come in a variety of sizes and shapes, but the most affordable at the moment cost between $10 and $15 per bulb (see "Cost Comparison," left center), mimic the traditional A19 or PAR shape, and fit the ever-present Edison screw base (see photo, previous page). That said, you will also find many LED brands offering the MR16 shape with a bi-pin base, as well as LEDs made to fit a range of bi-pin sockets between GU4 and GU10. You can also find LEDs in fluorescent-style tubes of several diameters and lengths, as well as in floodlights, recessed can lights, puck lights, undercabinet lighting, and more.

Dimmers. Many LED lamps work with conventional dimmers, although not as effectively as incandescent bulbs. Because LEDs require so little energy to function (typically 3 to 5 volts), they need a transformer to ratchet down the current. This is one reason LEDs don't dim like incandescent lights, which run at standard line voltage. Dimming an incandescent light not only reduces lumens, it changes the color temperature, which goes from 3,000K or 2,700K to a yellow/orange 1,400K–1,200K. ("Color temperature" is counterintuitive in the sense that higher color temperatures produce "cooler" white light and lower temperatures produce "warmer" yellow light; see "Color Temperature Scale," page 52). But when

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an LED dims, it does not change color; only the amount of light changes. Because U.S. consumers have grown accustomed to the color shift that happens with incandescents, LED manufacturers have developed color-shift technology to replicate it. This technology is available in either the lamps or the LED-compatible dimmers, both of which are currently expensive options.

Mixing brands. You don't want to mix and match two LED brands in a single circuit any more than you would mix and match two brands of "weathered wood" roof shingles. Two lamps with the same lumens (or watt equivalency) may have different color temperature, color quality, and light dispersion characteristics. This can create unusual effects and change the way colors are perceived. Most of the relevant information is printed on the lamp, the lamp packaging, or the manufacturer's spec sheet (see "Lighting Facts Label," page 56).

Selective Replacement

Jeff Dross recommends treading slowly into the future of lighting. If a homeowner has good CFLs and doesn't mind the light quality, there's no need to replace every fixture in a house with LEDs, he says. But for certain applications, LEDs work very well. "Think about where you're using the most light most of the time," Dross says. "This is where they would make sense economically ... Choose lights that burn a minimum of three to six hours a day."

Another good candidate for conversion to LED are light fixtures in remote locations, such as recessed cans along the ridge of a 20-foot-high cathedral ceiling (or anywhere an extension ladder would be required to change the bulbs).

New applications. The small size and extremely low voltage requirements of LEDs have designers thinking about putting these lamps in places where lights have never been. LED tape, for example, is now less expensive and more reliable than the incumbent technology, and is an excellent choice for accent lighting or to outline stairs, doorways, or toe-kicks (see photo on page 54, bottom left).

Once you are no longer bound by traditional lighting concepts, you will find that

Color Temperature Scale

Because we typically associate "temperature" with heat production, color temperature (CT) can be confusing. On the CT scale, which expresses electromagnetic radiation in degrees Kelvin (K), higher values apply to "cool" bluish white light, while lower values apply to the "warm" yellowish light of incandescents.

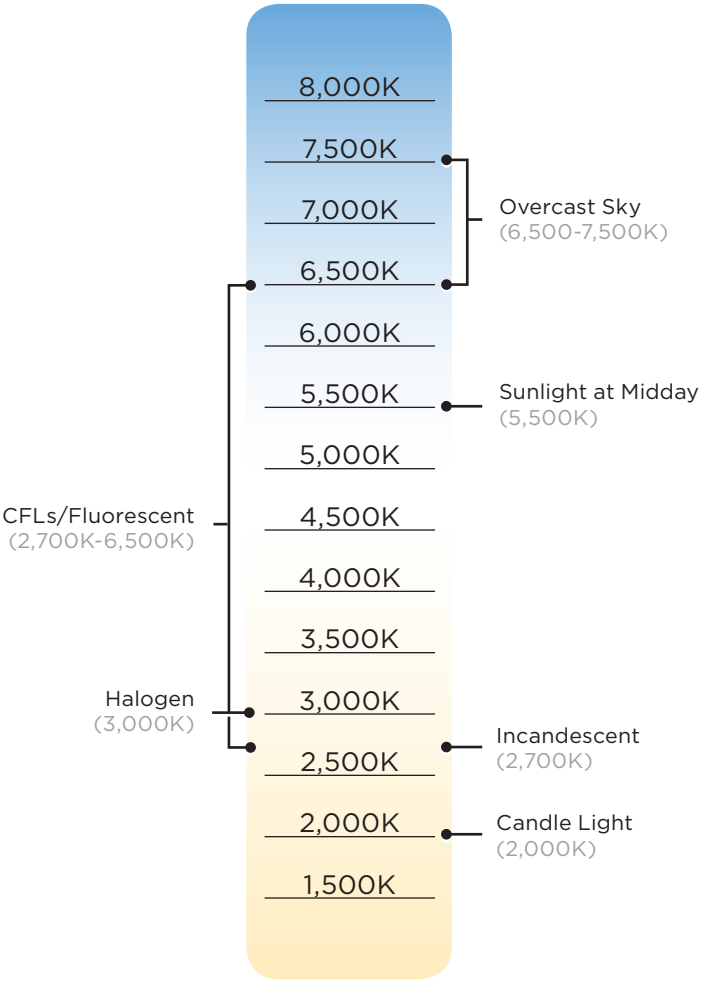
A related measure called the color rendering index (CRI) assesses how faithfully a lamp reproduces colors compared with natural light. Look for a CRI of at least 75, which is the Energy Star minimum. But many LEDs are available in CRI 85 or higher, which will generally provide very good-quality lighting.

6,400K Overcast Daylight

5,500K Daylight

4,100 Cool White

2,700K Warm White



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TivoTape from Tivoli (tivolilighting.com) is a low-voltage indoor-outdoor light strip with an adhesive backing. It's sold in lengths up to 16 feet and can be cut in the field. The LEDs are fully dimmable and come in a variety of light temperatures, including four whites and red, yellow, blue, and green.

there is a growing assortment of lighting applications for LEDs that would be impractical or impossible with incandescent lamps. These include lighting that responds immediately to changes in the environment — that dims, for example, when someone turns on the TV; medical lighting, such as light-emitting blankets for babies with jaundice; and fixtures for high-humidity environments, such as spa lighting and landscape applications.

Unlike tungsten filament lighting, LEDs come with solid-state circuitry that can take a stiff bump, even when warm, so they are a good choice for vibration- and impact-resistant lighting. LEDs can also withstand cold to about -40°F, but they do not work well in hot environments. In fact, many lamps require a minimum amount of air circulation and come with a warning to avoid enclosed fixtures. That means you won't find LED oven lighting anytime soon.

Stars Wars lighting. Thus far LEDs have been subject to Haitz's Law, which forecasts a tenfold drop in price every decade coupled with a 20-fold increase in performance. Recently, for instance, Philips announced a breakthrough bulb that produces a record 200 lumens per watt (lm/W) of warm, high-quality light. By comparison, the highest efficiency bulbs commercially available today deliver about half that efficiency (100 lm/W), and a regular incandescent bulb scarcely delivers 15 lm/W. Philips says the 200 lm/W LED will hit the market in 2015.

Some of the characteristics that make shopping more complicated for an LED than for an ordinary incandescent also provide clues as to what we can expect from this technology in years to come. For example, the variation in color temperature and light quality that makes it necessary to buy bulbs in batches has the benefit of allowing a single bulb to provide a range of lighting options far beyond what a conventional dimmer could supply. With simple computer controls, a single LED lamp like the IP-addressable Philips Hue (see photo, above) can provide a range of color temperatures from candlelight to daylight in all the colors of the rainbow. And someday soon, lamps will tune to each other — so we won't have to worry about mixing bulbs — and will respond to environmental changes or lighting profile programs, in much the same way that smart thermostats do today.

The Hue from Philips (meethue.com) is a home lighting system that includes proprietary LED lamps capable of displaying 16 million color variations. The lamps are controlled through a base unit that connects to an existing wireless network and can be operated via any iOS or Android device, or through a Web-based application. The system enables users to schedule lighting tied to behavior patterns, and includes a feature called "geofencing," which can adjust lighting based on detection of a mobile device carried by a homeowner approaching or leaving the home.

On the cutting edge are organic and polymer LEDs (OLEDs and PLEDs, respectively), which consist of sheets of carbon or polymer-based compounds that glow when a current is applied. While not yet commercially available on a practical scale, OLEDs and PLEDs will make the surface-mount ceiling fixture a thing of the past. Instead, you'll apply a thin film to a wall or ceiling that will glow in whatever color you like, providing highly efficient, inexpensive light.

Fernando Pagés Ruiz *is a developer and former home builder who lives in Boulder, Colo.*

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Lighting Facts Label

Since January 1, 2012, the FTC has required manufacturers to display a "Lighting Facts Label" on the packaging for medium screw-base LEDs (see example at right). It contains information about brightness, cost, life expectancy, energy used, and color temperature, and is intended to help consumers compare lighting products.

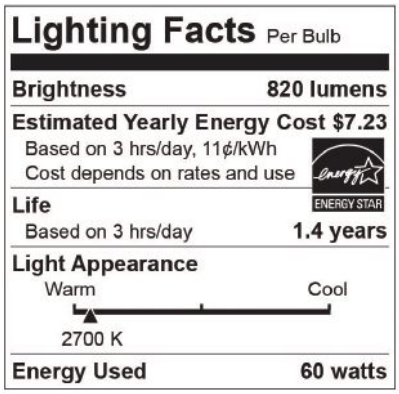
A similar label developed by the DOE applies to all solid-state lighting, not just screw-base LEDs (see example below). Unlike the FTC label, which is mandatory but does not require data verification testing, participation in the DOE labeling program is voluntary, but manufacturers must provide test results to verify performance claims. The DOE label includes most of the information on the FTC label plus the lamp's color accuracy, overall efficiency, and test compliance.

To avoid confusion, the DOE does not encourage use of its label on any product packaging bearing the FTC label, but the DOE label does appear on participating manufacturer specification sheets. Performance data for specific lighting products can also be found at lightingfacts.com/products.

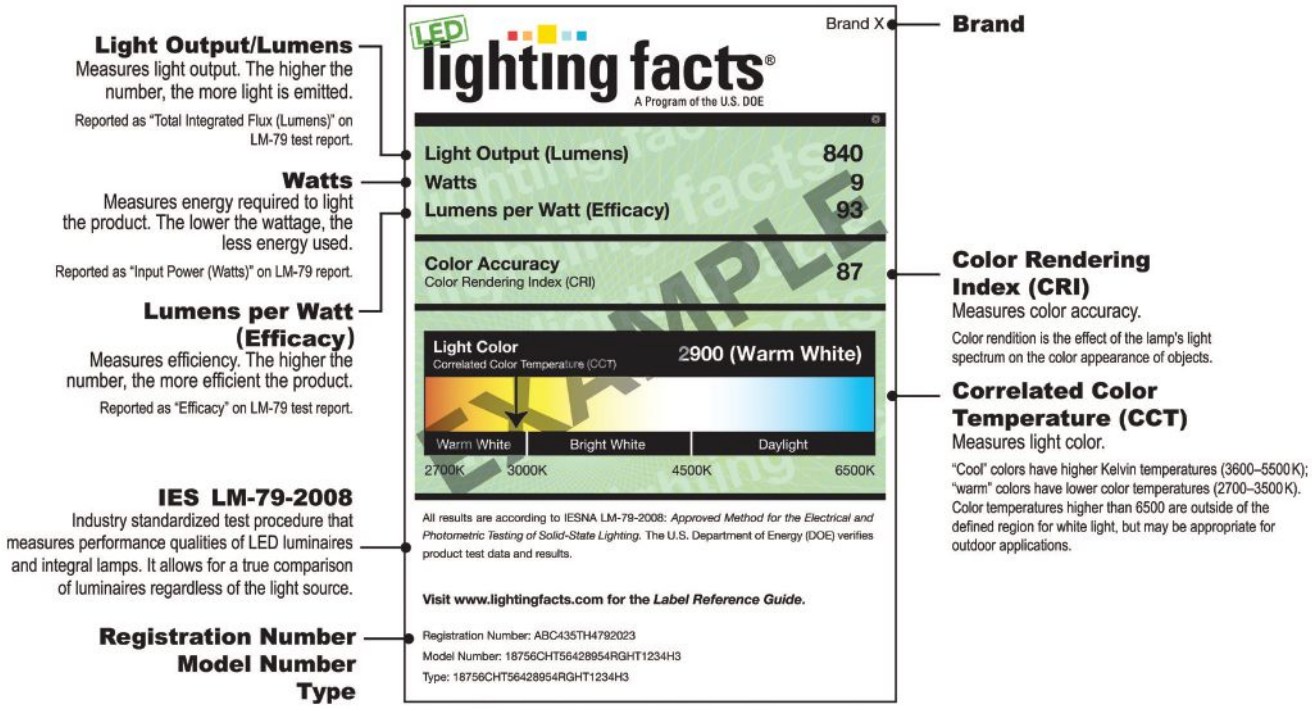
Labels with the EnergyStar logo also meet the following requirements:

- Brightness equal to or greater than incandescent or fluorescent lighting, and light well-distributed over the area lighted by the fixture;
- Output that remains constant over time, decreasing only toward the end of the rated lifetime. The minimum lifetime is 25,000 hours, often expressed as 22 years of use for three hours per day;
- Color quality that ensures that the light appears clear and consistent over time;
- Efficiency as good as or better than that of fluorescent lighting.

FTC Label



DOE Label



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From the street, the remodeled building looks much like it did in 1842 (inset), but it's a lot more comfortable to work in and easier to maintain.

A Historic Building Gets an Energy Upgrade

Satisfying the commissions while bringing an 1840s building up to 21st-century energy-efficiency standards presented a challenge

by Andrew Borgese

A Historic Building Gets an Energy Upgrade

Back in 1842, when Captain Thomas Davis built a classic Greek Revival house in the seaport of Woods Hole, Mass., homes were heated with wood or coal, and whale-oil lamps lit the inside spaces. Insulation was rarely considered a building component. Fast-forward a century and a half. Davis' former residence still sits prominently on a hill overlooking Vineyard Sound and historic Woods Hole, but over the years its many owners have used it for many different purposes. Most recently, NPR station WGBH purchased the building as a home for local affiliate WCAI.

Compromise, Not Conflict

When WGBH took over the building in 2009, it was clad with asbestos shingles (**see Figure 1**) and the asphalt roof was failing. The walls and roof had little or no insulation, most of the exterior trim needed replacing, the two brick chimneys were crumbling, and the original double-hung windows were in poor condition. In short, the building had serious structural and energy-efficiency problems, as well as a lack of wheelchair accessibility. But its location within a historic district meant that any work done to the exterior of the building had to be approved by the local Historic Districts Commission.

Historic-preservation and energy-efficiency advocates often find themselves in conflict when it comes to renovation issues. On one side are purists who believe that altering any part of a historic building is sacrilegious; on the other, energy conservationists who believe that reducing energy use should take precedence over all else. However, as the designers for this project, we were able to find common ground between the two camps — the desire to extend the useful life of existing buildings for as long as possible — and that became our starting point.

We began by researching the building's history. The Woods Hole Historical Collection and Museum shared several archival photos of the original structure, giving us glimpses of details that had been lost over time, including a front porch with an ornate entry door. These photos also confirmed the original exterior trim details. We prepared a plan that honored these historic elements while incorporating features that would improve the home's longevity, ease of maintenance, and operating efficiency.

Figure 1. Before the renovation, the building was essentially sound, but the years had not been kind to it. Asbestos shingles covered the walls (left), and much of the trim had deteriorated beyond saving. As the exterior layers were peeled back, any of the original cyprus trim that still had life was set aside to be reinstalled later (above).

We presented our plan to two different commissions: the Historic Commission, which had to approve the work done to the exterior of the building, and the Community Preservation Commission, which was helping to fund the renovation. Altogether we attended a half-dozen meetings. To qualify for funding, the work also had to be done within the Secretary of the Interior's Standards for Rehabilitation (cr.nps.gov).

A New Old-Looking Exterior

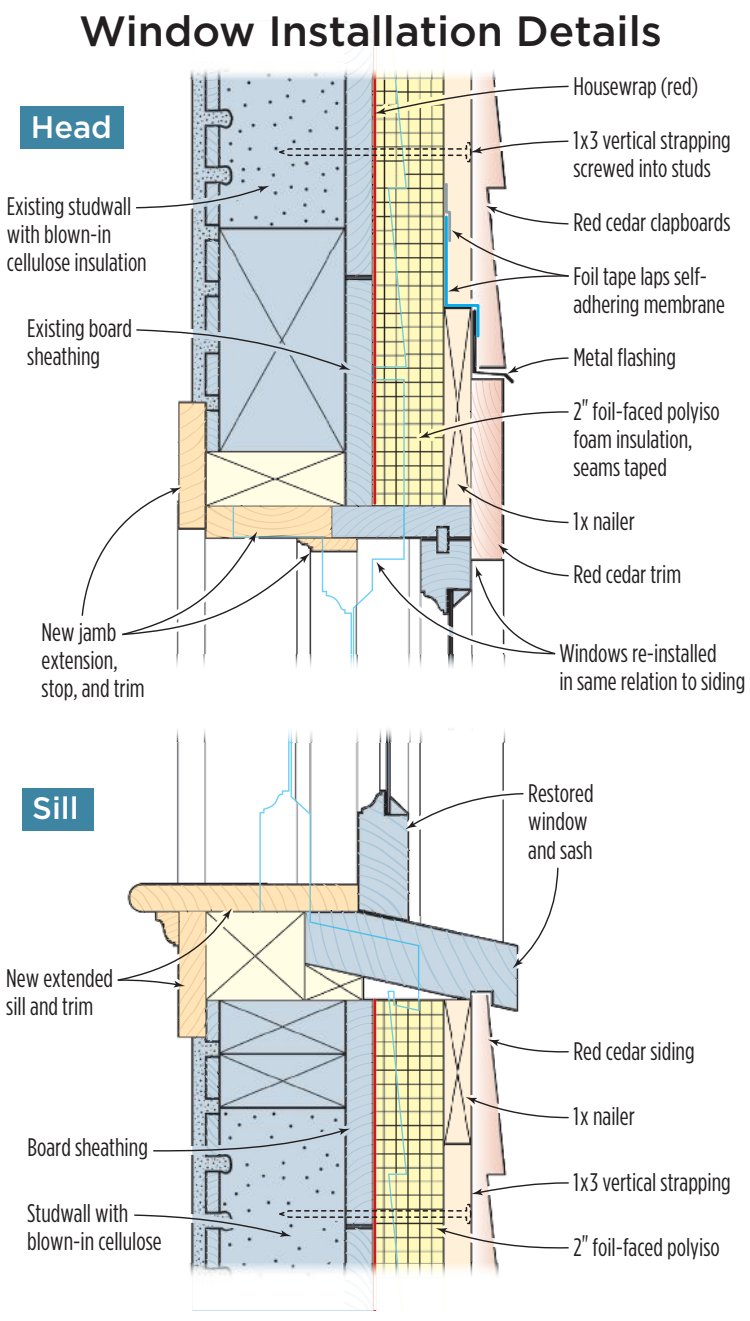
Both commissions were primarily concerned with the outside of the building — how it would look and what materials would be used to make it look that way. The outer shell was also where we would have the greatest impact on raising energy efficiency.

The Standards for Rehabilitation require that materials be repaired and reused wherever possible, so as the outer layers of the building were peeled back, we set aside any such material. Once the original board sheathing was exposed, we were able to fill the empty stud cavities and rafter bays with dense-packed cellulose insulation from the outside. Next we wrapped the walls and roof with a layer of 2-inch foil-faced polyisocyanurate foam insulation, taping the seams to complete the air and moisture barrier and provide a thermal boundary (**Figure 2**).

On the walls, we installed vertical strapping over the foam and put 1-by nailers around the windows and doors to serve as backing for the trim and siding. We added a strip of Cor-A-Vent (coravent.com) along the bottom and top of each wall to create a vented air space behind the new red cedar beveled siding. To attach the new red cedar roof, we screwed 5/8-inch Zip System (zip system.com) roof sheathing over the foam according to the manufacturer's instructions, providing a continuous nail base for the shingles (**Figure 3, next page**).

The extra layers of foam and nailers

Figure 2. Before the nailing strips went on, cellulose insulation was blown into the walls; housewrap was attached to the original sheathing (above) to keep the cellulose from leaking out. Then the walls were wrapped with foil-faced foam and the seams taped. Vertical strapping was screwed through the foam and into the framing to attach the siding and trim (left). Extra stock was later added around window and door openings for nailers. Vent strips were installed at the top and bottom of each wall for drainage and to allow air to flow freely behind the clapboards (bottom).



Reinstalling the windows. To match the original building façade, the restored windows were mounted flush with the furring strips. This required jamb extensions (top) and deeper sills (above) to accommodate the thicker wall.

added about 5½ inches to the overall width and length of the building and 2½ inches to the height, changes that both commissions found acceptable as long as we faithfully reproduced the eaves, rake, and return details (**Figure 4**). The original trim on the building was cyprus, and we repaired and reused what was salvageable. We used red cedar for any replacement trim, a choice that was cost-effective and met the commissions' requirements. (Neither synthetic trim nor non-wood siding was an acceptable option.)

One area where the commissions left no room for compromise was the windows. They insisted that we reuse every window deemed original. And they insisted that the windows be re-installed in the same relation to the siding as on the original building (see illustration, left). Therefore, all original windows were taken off site and painstakingly restored before being reinstalled. Non-original windows were replaced with new units that closely matched the originals. Though single-glazed, the restored windows were much more airtight than they had been previously, and interior storm panels improved their performance even more.

The only requirement the commissions had for inside the building was that we work within the Standards for Rehabilitation guidelines. We connected the three levels with a new code-compliant stairway and turned the walkout basement into usable space (see "Parking and Accessibility," facing page). We also reinforced the structure with metal connectors where they were needed and added beams in strategic places.

Figure 3. Plywood sheathing, screwed through the foam insulation on the roof and into the rafters, provided continuous nailing for the red cedar roof shingles. The seams were taped per the manufacturer's instructions, and a mesh drainage layer went between the sheathing and the shingles.

Improved Performance

The new insulation raised the R-values in the walls and roof from practically nothing to over 30. More importantly, we created a much tighter envelope with almost no thermal bridging. Blower-door tests done before and after the renovation confirmed that air-infiltration levels were down to a third of what they had been. The budget did not allow for the entire mechanical system to be replaced, so we upgraded to much more efficient condensers on the hvac units. These improvements have translated into a significant reduction in utility costs — and have made the building much more comfortable to work in.

The last element of this project was reconstructing the porch and formal entry door that we'd discovered in the old photographs. Through the successful collaboration of historic and energy interests, the entire building today looks more like it did in 1842 than it has in generations, even as it exceeds the latest energy-code requirements.

Andrew Borgese *is founding principal of Integrata Architecture and Construction (integrata-ac.com) in Falmouth, Mass.*

Figure 4. When the trim went back on the building, original detailing was followed as closely as possible based on archival photos and the trim that was removed (above). Metal connectors and beams were added where the old structure needed strengthening (left).

Parking and Accessibility

Local zoning required minimum on-site parking, and code required that the newly renovated lower level be wheelchair-accessible. An inside elevator was not feasible, so a new exterior stairway was built from the parking area behind the building at the main level, with a ramp and an electronic chair lift that follows the site topography.

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Kirei, 619/236-9924, kireiusa.com.

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Weyerhaeuser, 888/453-8358, woodbywy.com.

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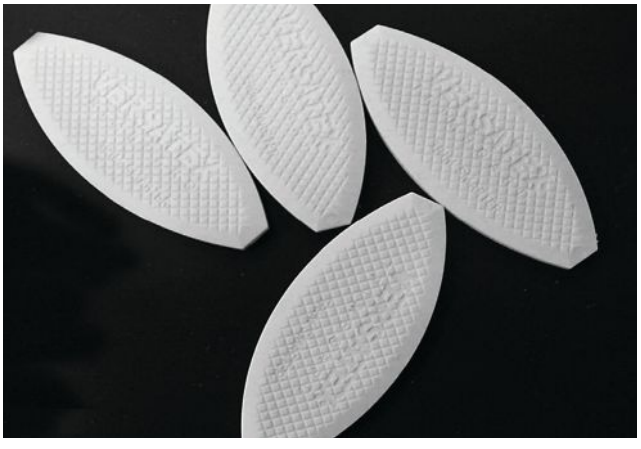
Screw Products, 877/844-8880, deck-lok.com.



Pass the Biscuits

Versatex has added *#20 Plastic Biscuits* to its lineup of exterior trim products. Made for joining PVC trim boards, the biscuits are installed using a standard biscuit joiner. They're sold in boxes of 25 or 250 and work best with a PVC-compatible adhesive, whether the manufacturer's Weld-On product or another solvent-based adhesive. Cost is 45 cents per biscuit.

Versatex, 724/857-1111, versatex.com.

Products

Backlit LED

The TerraLux *Decorative LED* is a 4-watt replacement flood for the golfball-sized 20-watt MR16 halogen. The typical LED doesn't look as nice in a pendant fixture as a conventional halogen bulb, mostly because it doesn't cast the same sort of multidirectional glow; but the designers of the TerraLux have addressed this problem by putting small LED light sources on fins at the side of the bulb. Light output and temperature are equivalent to the MR16, according to the company. Cost is $30 per bulb.

TerraLux, 303/442-4960, terraluxillumination.com.

Stud-Bay Windows

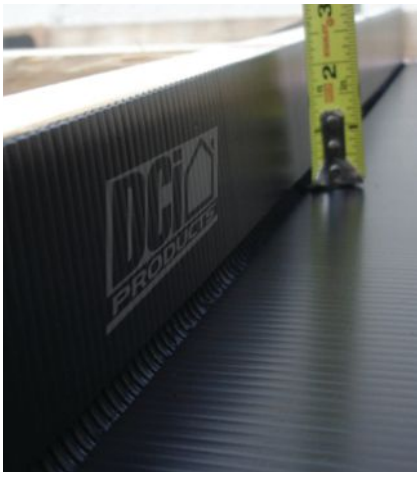
Geometrics Windows fit into 16-inch stud bays. They're made from ASA (a fade-resistant polymer used as cap stock for decking products) and come in 27-inch and 36-inch heights, with tops that are rectangular ($250), full-radius "Cathedral" ($300), or half-radius "Eyebrow" ($280). They can be installed in various configurations and have interlocking flanges; exterior casings must be trimmed and have cutting guides on the back. The 7/8-inch-thick low-E glazing has a U-value of .29.

Geometrics Windows, 855/809-7179, geometricswindows.com.

Brick-Mold Flange

A lot of guys "flash" brick-mold doors and windows by running a bead of caulk down the back. *Straight Flash VF* (for "versatile flange") is configured to serve as a real flashing flange. This self-adhered Tyvek flashing membrane has perforated release paper on both sides; you peel off half of one side, stick it to the back of the brick mold, peel off the same half of the opposite side, then put the door or window in the opening. A 6-inch by 125-foot roll costs $160.

Dupont, 800/448-9835, dupont.com.



Strong Foam Baffle

Smart Baffle rigid insulation is made from 4-mm-thick corrugated plastic. It comes in versions for 16-inch and 24-inch framing and is shipped as a flat panel with bendable flanges that are stapled to the rafters or trusses. According to the company, the product can support spray-foam expanding insulation without buckling, and can be installed before or after the roof sheathing. A 3-foot-long piece costs about $4 for the 16-inch version and $5.25 for the 24-inch version.

DCI Products, 800/622-4455, dciproducts.com.

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Products

Easy Dome

A recessed ceiling dome can add an elegant touch to an entry or dining room. Domes are usually framed from site-cut plywood strips, a job that takes time and skill — but the *Universal Dome Kit* requires less of both. The installer need only frame the rectangular ceiling box (and a dome beam, if necessary); the kit comes with curved MDF pieces for framing the dome. A stock kit sized for a 5-foot by 5-foot ceiling box sells for $300; custom sizes are also available.

Archways & Ceilings, 877/303-2263, archwaysandceilings.com.

Slab Repair

Abatron's *BestBond Crack Repair* liquid epoxy concrete-repair compound is applied with a standard caulk gun. Because it will slump when applied on walls, it's recommended for horizontal applications, like cracks in garage or basement floors. It dries to a hard plastic, so it shouldn't be used where a flexible joint is needed. A 16-ounce tube fills 10 to 15 linear feet of a 1/4-inch by 1/4-inch crack and costs $13.

Abatron, 800/445-1754, abatron.com.

Long-Term Efficiency

Rinnai's *Ultra Series* condensing tankless water heater has an energy factor of .96. The secondary heat exchanger is at the bottom so condensate can't leak onto other components. "We're following the boiler world, which uses this design for long-term reliability," the product manager told us. Since the Ultra's logic circuit can be wired to a recirculating pump, the pump and heater run only when the loop needs to be warmed. Cost: $1,830.

Rinnai, 800/621-9419, rinnai.us.

High-Tech Thermostat

Programming heating and cooling schedules is easy with the *Comfort Sync* thermostat, says the maker. It can be operated over the Internet with a computer, smart phone, or tablet, and features a high-definition touch screen, a one-touch "Away" mode for energy savings, and maintenance and repair alerts. It comes in several colors and patterns and costs around $225, not including installation.

Allied Air Enterprises, 800/448-5872, armstrongair.com.

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Are You Getting the Most Out of Your Multi-Tool?

Joe “The Pro” Sainz
Host: bethepro.com

A multi-tool is a great addition to any pro’s tool box. Any single tool that can sand, cut, grind and scrape is a time saver on the job. But are you getting the most out of this handy tool?

I get great feedback on the Bosch blades from fellow contractors using them in a variety of materials: “I use the blades for undercutting jambs, cutting existing trim off in really odd spots where the new has to blend in... it also works wonders for cutouts in vinyl siding where snips can crack it,” Jeff Kirk, journeyman carpenter, Halifax, Canada.

“I use my multi-tool to correct defects in polished concrete table tops and granite furniture. The diamond blade can aggressively or lightly sand rough chipped edges in granite,” Gerald Taylor, concrete artist, El Dorado, Ark.

Bosch multi-tool blades have won a ton of industry awards, last up to four times longer than other blades and deliver the speed and power you need — with less vibration. They won *Fine Homebuilding’s* “best overall” in a shootout. And thanks to the OIS™ interface, Bosch blades work with any professional multi-tool to deliver max power with max performance.

Why mess around with second best? Multi-tool blades from Bosch give you best-in-class performance every time. **Better Accessories. Better Results.**

OIS

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Oscillating Interface System (OIS) is a trademark of Robert Bosch GmbH. *Based on internal testing.

Festool TS 55 REQ Track Saw

by Gary Striegler

TS 55 REQ Specs

Saw weight: about 10 pounds (with cord and blade)

Amps: 10

Rpm: 2,000 to 5,200

Maximum cutting depth on track (in inches): $1\frac{15}{16}$ at 0°, $1\frac{7}{16}$ at 45°

Bevel: –1° to 47°

Price: $585 (including 55-inch track and case)

Festool
888/337-8600
festoolusa.com

Weigh In!

Think you're a good candidate to test a new tool? Want to share a tool-related testimonial, gripe, usage tip, or news flash? Take a minute and contact us at JLCTools@hanleywood.com or 707/951-9471.

My crew and I specialize in interior finish, and we build plenty of custom cabinets and closets. For years, we cut most of our sheet goods in the shop, using a table saw with a big outfeed table for ripping long panels and a vertical panel saw for crosscutting and short rips. In a pinch, we broke down panels on site with a portable table saw — an awkward two-man job that seldom produced clean cuts.

When we started using DeWalt's plunge-cutting model DWS520 TrackSaw system about three years ago, it was a revelation. Mark your cut line on a properly supported panel, place the aluminum track so the anti-splinter strip along the edge aligns with the marks, engage the saw with the track, plunge, and complete the square or bevel cut. Rubber friction strips prevent the track from slipping on most materials, but optional clamps easily secure it when necessary. The saw hooks to a vacuum to extract most of the dust.

Armed with a 59-inch and 102-inch track, we can now safely and quickly make perfect splinter-free crosscuts and rips almost every time with one person, on site or in the shop. We also use the TrackSaw to cut door bottoms, tapered jamb extensions, and pie-shaped stair treads, and to rip straight edges on solid lumber. I've sold my vertical panel saw, and we now use my table saws mostly for repetitive ripping of solid lumber.

Gary Striegler

When *JLC* asked if I'd like to try the new Festool TS 55 REQ track saw (which is replacing Festool's TS 55 EQ), I didn't hesitate. The basic kit includes a 48-tooth crosscut blade, a splinter guard that reduces tear-out, a Systainer case, a 55-inch track, and a limit stop for the track. Festool also sent a 28-tooth blade for fine ripping, a 106-inch track, two track clamps, and connectors that allow you to join two or more tracks to form longer ones.

Highlights

I love Festool's spring-loaded depth stop; to change the cutting depth, you just press it in and slide it up or down the scale. The stop is also micro-adjustable so you can synchronize it with resharpened saw blades. The scale is metric, but you can cover it with a peel-and-stick imperial scale that comes with the kit.

The saw's plunging action is exceptionally smooth (though to be fair I'm judging the new saw against my 3-year-old DeWalt). When you plunge, the redesigned spring-loaded riving knife drops below the base of the saw before the saw blade does, which is supposed to make it easier to complete a long cut with a short track. We tried that, and it worked okay but didn't give us the usual perfect cut. The saw can bevel from –1 to 47 degrees for added flexibility.

One thing Festool owners brag about is dust collection, and Festool improved the

new saw's dust channel to make it even better. Despite using my tired old Porter-Cable and Fein vacuums, I still captured almost all of the dust. When I used the saw without a vacuum, it threw the dust well away from me, which I also appreciated.

Swapping blades couldn't be easier. You just set the maximum cutting depth, lift the "Fast Fix" lever on top of the handle, plunge the blade until it clicks into the locked position, and use the blade wrench that stores in the handle. The spindle locks automatically.

Festool's track connectors and track clamps work well, but your boards have to be at least 5¼ inches wide to use the clamps. My DeWalt tracks can clamp to boards as narrow as 3½ inches, which is better for the work I do. Also, you can only cut along one edge of Festool's tracks, while you can cut along either edge of my DeWalt tracks. If you happen to damage an edge (which, based on my experience, seems inevitable), DeWalt gives you an extra one.

The Bottom Line

If I were starting from scratch and wanted a track saw for crosscutting panels, trimming door bottoms, and short rips, I'd buy the basic Festool TS 55 REQ kit with the 55-inch track. It costs about $85 more than the equivalent DeWalt kit, but it's hard to beat Festool's ease of use and exceptional dust control. For the work we do, though, I prefer the convenience of the short and long track, and Festool's version currently costs about $230 more than DeWalt's. That alone would be a deal-breaker for me.

Both brands offer various track lengths along with track connectors, so there are plenty of other combinations that might work better for you.

***Gary Striegler** is a builder in Fayetteville, Ark.*

To adjust the cutting depth, you simply press the green spring-loaded depth stop and slide it up or down the scale. The scale shows the cutting depth with and without the track. It's metric, but a peel-and-stick imperial scale comes with the kit.

Work Vans

Touring a cluster of Nissan NV Cargo vans at a recent trade show reminded me that a variety of inviting models are now available for builders and remodelers. Nissan's high-roof NV2500 HD, for example, measures 6 feet 3 inches from floor to ceiling, so most of us could walk inside without crouching. It can haul 4x8 sheet goods, two standard pallets, or 10-foot pipes, and the rear opening is wide enough to load with a forklift. Six D-rings in the floor make it easy to secure the load. There are also plenty of attachment points for shelves, racks, and bins; three cargo-area overhead work lights; and two optional 120-volt power outlets for charging power tools. The cabin is a mobile office, with a lockable center console that provides an extendable work surface and can store a laptop. There's even a side drawer beneath the driver's seat. Then again, the rig is 8 feet 9 inches tall, which means it could squeeze through my local McDonald's drive-thru but wouldn't fit into the average parking garage.

The NV2500 HD is just one of many makes and models mentioned in the recent "Van Buying Advice" and "Thinking About Getting a Van" threads in the Tools & Equipment Forum at jlconline.com. Feel free to chime in. — *Bruce Greenlaw*

Recycle Your Batteries

In case you haven't noticed, it's easy to recycle cordless-tool batteries in the U.S. and Canada, free of charge. For a list of your local drop-off points, just visit call2recycle.org or call 877/273-2925 and enter your zip code. I tried it, and although the population of my rural county is just 30,000, I learned and verified that I have eight options within 10 miles of my house, ranging from Home Depot to our school district office. — *B.G.*

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RotoZip RotoSaw

by Josh Overlin

SS355-10 Specs

Weight: 2.5 pounds (including cord)

Amps: 5.5

Rpm: 30,000

Price: $70

RotoZip
877/768-6947
rotozip.com

As a drywall contractor, I depend on drywall routers for quickly cutting around window and door openings, electrical boxes, and ducts with the drywall tacked in place. Maybe my corrosive coastal environment is partly to blame, but my drywall routers rarely last longer than six months. So I was excited to try the new model SS355 RotoZip RotoSaw to see if it would raise the bar. According to RotoZip, it's the right tool for professional drywallers.

Inline grip. I liked the feel of the tool right away. You can hold the barrel with one hand while gripping the tool almost like a drywall screw gun with the other, so your thumb and forefinger wrap around the end of the motor housing. Most of the time, that dual grip gave me the best control. The tool had ample power, and the exhaust vents did a good job of blowing drywall dust away from my face. Other features include a slide-on/bump-off switch and a rubber loop on the cord that holds the collet wrench.

The outcome. After about six months of use, the RotoZip seized up. But I learned some things I didn't know about the one-year warranty. First, if the tool breaks down under warranty, you can send it to the RotoZip service center and receive a new one with a new warranty that runs up to an additional year. Second, if the tool breaks down after the warranty expires, you can send it in and receive a reconditioned replacement with a new one-year warranty at a reduced price. (You can also buy a reconditioned one — with the warranty — at homedepot.com for $40.)

I also learned a tip from RotoZip customer service: Blow out the vents periodically with compressed air and the tool will last longer. I'll have to try that.

Josh Overlin *owns Chetco Drywall in Brookings, Ore.*

Smart Driver

You won't find a variable-speed trigger or a forward/reverse switch on DeWalt's new variable-speed reversible 8V MAX Gyroscopic Screwdriver (DCF680). Instead, the tool uses "gyroscopic technology" to sense the motion of your gripping hand. After pressing the trigger, you simply twist the tool clockwise for forward or counterclockwise for reverse. The farther you twist in either direction — from top-dead-center to 35 degrees — the faster the speed (until you top out at 430 rpm). A lock-off prevents accidental activation. The 1.1-pound tool also has a two-position inline/pistol grip, a 1/4-inch quick-change hex chuck for 1-inch bit tips, an LED headlight, and a battery gauge. DeWalt product manager Jim Watson tells us the tool is ideal for light-duty install and maintenance — like mounting cabinet hardware or accessing electrical panels — with enough power to fully sink a 1 5/8-inch wood screw into pine. Kits will be available in August and cost $90 with one battery or $100 with two. — *B.G.*

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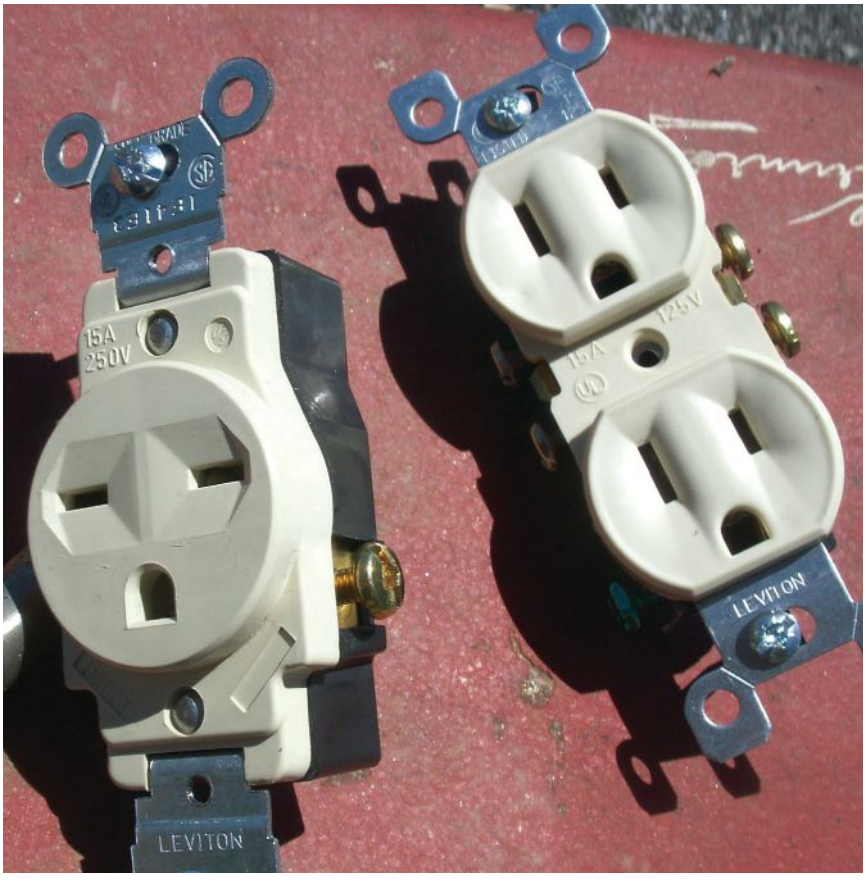
Face Time

A long-standing architectural rule holds that a structure's facade should never, under any circumstances, look like a face. It's easy to see why. A front elevation with windows for eyes and a chimney for a nose is such a distraction that it overwhelms any other design elements with the bad luck to be lounging around nearby.

Worse, there's no chance a blunder of that sort will go unnoticed, because it turns out that humans are unusually good at finding faces. This is partly the result of a phenomenon known to psychologists as pareidolia, which is the human tendency to look for — and find — familiar patterns in masses of random sensory data. That's why some readers of a certain age will remember spending hours hunched over a record player, eagerly deciphering the imagined lyrics to the Kingsmen's version of "Louie Louie."

But it also appears that faces are something of a special case. Studies show that people have a strong tendency to interpret something as simple as two dots above a line as a face. Why this is, no one knows — though some researchers speculate that the trait evolved because failing to react to a real face carries more risk than seeing occasional faces that aren't really there. "There's no easy way to test that hypothesis," says University of Chicago social psychologist Nicholas Epsley. "But we know that humans are hypersensitive to faces from infancy. It's something we're born with."

To see hundreds of examples of such coincidental faces, visit facesinplaces.blogspot.com. — *Jon Vara*



Left: Safety experts argue that receptacles should be installed with the ground prong on top to prevent dropped metal objects from making simultaneous contact with the hot and neutral prongs of a partially inserted plug. But ask any electrician: Homeowners strongly prefer their outlet faces — whether squinting in the bright sun (far left) or surprised (near left) — turned right-side up. **Above:** While this modest garage does have a certain good-natured charm, its owner might have done better to hire a more experienced architect.

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