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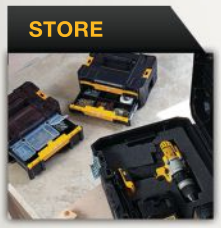

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Contents

December 2012 • Vol. 31 • No. 3

Tim Uhler

Features

35 Fall Protection for Roof Work
You'll need a written plan, proper training, and the right equipment to comply with OSHA safety rules.
by Andrew Wormer

41 18-Volt Cordless Circular Saws
The best models have good runtime and cut dense material without slowing down.
by Michael Springer

49 Getting Oil Results With Waterborne Finishes
Premium latex paints are easier to work with than traditional oils and can look just as good.
by Scott Burt

55 Strengthening an Old Roof
New LVL framing straightens and stiffens an underbuilt timber frame.
by Gary Morrison

58 30 Years of *JLC*
Three decades of stories about what works, what doesn't, and why.
by *JLC* staff

ON THE COVER: Kyle Davis of Pioneer Builders wears a safety harness while sheathing a roof in Kitsap County, Wash. See the story on page 35. Photo by Tim Uhler.

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Contents


NOAA

16

25

65

71

Departments

14 Letters
A reader shares his preconstruction agreement

16 Hurricane Sandy: Aftermath
Along the battered Northeast coast, contractors assess the damage — and get to work

21 Q&A
Cutting holes in sheathing; reusing loose-fill cellulose

25 On the Job
Frost-protected shallow garage slab

31 Business
A weekly review can protect your cash flow

65 Products
Copper tub; lead cleaner; bamboo countertop; crawlspace liner; high-performance windows; ceramic flooring; more

69 Toolbox
Senco JoistPro metal-connector nailers

71 Toolbits
Fish tape; tool lanyard; floor protection; torpedo level

72 Backfill
Feudal Japan's chirping floors

70 Advertising Index

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Letters

Construction Consulting Agreement

I read Dennis Dixon's article on personal service contracts ("Getting Paid for Preconstruction Advice," *Business,* 10/12) with a lot of interest. I have been using a similar vehicle, which I call a construction consulting agreement (CCA), for at least 25 years, with great success. In fact, of the 70-plus estates we have built in Silicon Valley, almost all have been initiated with a CCA. Here are the highlights of our agreement:

- Instead of charging by the hour, we charge a percentage, which is almost always 1.0 percent of the final budget on which the construction contract is based.
- We sometimes charge a deposit of $1,000, but lately I have been waiving this, and because there is no cash outlay, clients seem more willing to sign.
- We bill 50 percent of the amount due at completion of preliminary budget submittal, and the balance at final budget submittal.
- The entire amount is offset against our builder's fee if we are chosen to build the project.

This agreement is usually agreed to when the architect is hired, although we have begun the process at all stages of design. Many times the client comes to us first, and we help our clients find an architect that fits them. Then a team is formed consisting of the owner, the architect, and us. We attend all design meetings and offer value engineering and construction advice as the plans are developed and drawn. While this is a lot of hours, it gives us the opportunity to get to know the client really well, and it allows trust to be built between the team members.

Best case for us is we get hired to build the house at the end of the design process (in which case our CCA fees are applied to the deposit). This is what happens about 95 percent of the time. Sometimes the clients are on the fence about our final budget — but knowing they will have to write us a check anyway, even if they don't hire us to build the home, often nudges them toward selecting us.

Worst case is we do not get hired and the client writes us a check for 0.5 percent of the budget, after already having paid us 0.5 percent for the preliminary budget. We had clients write us checks a few years ago for $24,675 when they hired another builder after being in design for about a year. While it did not feel good to lose the job, we did get paid well for our time.

Though I have greatly refined this process over the years, the original idea was not mine. It came from an article I read decades ago that turned into a book written by David Gerstel called *Running a Successful Construction Company.* In it, he proposed the concept of "price planning," which is what our approach is based on.

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Hurricane Sandy: Aftermath

Along the battered Northeast coast, contractors assess the damage — and get to work

by Ted Cushman

For storm watchers, 2012 was a quiet year — almost. The hurricane season had been active but harmless; plenty of big storms formed, but they all stayed out at sea.

Then came Sandy.

Officially only a Category 2 or 3 hurricane, Sandy was an exceptional case: Sucked into a low-pressure trough moving through the central U.S., Sandy morphed into a one-of-a-kind "superstorm." Its high winds spread to cover an unprecedented expanse (even as they dropped below hurricane strength) and pushed a tidal surge capable of dealing far more damage than wind alone could do.

The warnings were stern. Tropical weather expert Jeff Masters predicted that Sandy would be a billion-dollar disaster. Ordering evacuations of New York City's low-lying "Zone A" neighborhoods, Mayor Michael Bloomberg said, "If you refuse to evacuate, you are putting not only yourself at risk, but also the first responders who would have to help you." New Jersey Governor Chris Christie was blunt: Defying the orders, he said, would be "both stupid and selfish."

As always, some people viewed the warnings as an excess of caution. A Brooklyn remodeler *JLC* talked to before the storm said, "The media always hypes these things." But Sandy lived up to its hype — and then some. The surge flooded tunnels between Manhattan and Brooklyn, put subway lines out of commission, and knocked out power to lower Manhattan. Barrier-island communities in New Jersey were hammered, with boardwalks, homes, and bridges washed away. Long Island's south shore went dark. Dozens of residents stranded on Fire Island changed their minds and asked to evacuate — after it was too late for authorities to help. The Queens neighborhood of Breezy Point — itself home to many first responders — caught fire at the height of the flood. Hampered by waist-high water and without hydrant pressure, firefighters had all they could do to rescue trapped residents. A hundred houses burned.

The low-lying Brooklyn neighborhood of Gerritsen Beach was officially in the "B Zone," not under evacuation orders. That didn't matter to Sandy. A surge wave washed down streets there, trapping res-

Nate Dorr

Nate Dorr

Nate Dorr

In Brooklyn and Queens, beachfront houses were totaled by surge flooding, basements and first floors were flooded, and cars were swept away.

Eric Borden

NOAA

Eric Borden

Mark Olson, USAF

New Jersey took the direct impact of Sandy at landfall. The storm surge cut through the barrier island at Mantaloking, and undermined or swept away houses at Seaside Heights, Normandy Beach, and all along the shore.

FEMA

FEMA

Along the Connecticut shore, the storm surge on the Long Island Sound destroyed shorefront houses.

idents. In the aftermath, a resident told reporters, "I found fish in my basement. Fish from the sea."

JLC readers and authors found themselves in the direct path of the storm. In Toms River, N.J., builder Eric Borden helped elderly clients evacuate as the storm approached. At landfall, Borden says, "We took the Barnegat Bay through the back of my house." Borden moved in with his daughter, running the house off a generator, and buckled down to the huge task of repairing his beachfront community. "Every house I've built in the last 15 years has been damaged," he says.

In Levittown on Long Island, N.Y., contractor Mike Sloggatt lost power but stayed high and dry. But a friend's house was flooded. "I called him to check and he said, 'I think we're okay,'" Sloggatt recounts. "Then he saw the wave come up the street and he said, 'Wait a minute. We're not okay.' I told him, 'Get over here.' I think he'll be staying with us for a

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while, because his house is ruined." In the days after the storm, Sloggatt was in a new world with no power, no fuel, and spotty communication. "We have no phones, no Internet, no TV," he said. "We don't know what the outside world knows."

Long Island remodeler Sal Ferro runs Alure, one of the nation's largest remodeling companies, in densely populated Nassau County. Two of Ferro's employees lost their homes in the storm. Ferro was busy before the storm. But in the aftermath, he says, he knows his existing business will take a hit. He's pivoting toward insurance work — not his company's bread and butter, but a niche in which they do have experience. "It's not an adversarial thing," he says. "It's about, how can we work together to fix things." Insurance work will probably be less profitable than his regular business, he says. "Cash flow is everything in remodeling. With insurance, it can take time to get paid. That's going to be a problem." But making money in the storm's aftermath is not his top concern. Many of the losses in his area won't be insured, he knows. "We have to rebuild our whole community," he says. "We're going to have to work together. And we're going to need help."

Long Island remains in worse shape than New Jersey or the Connecticut coastline, where most damage occurred in prosperous second-home shore towns. Weeks after the storm, tens of thousands of Long Island electric customers were still blacked out. But even Long Island's problems pale by comparison with hard-hit low-income neighborhoods in the New York City boroughs of Staten Island, Brooklyn, and Queens, where volunteer groups have been working to augment an official response that residents say is barely adequate — if that. Upstate New York remodeler Rick Stacy was called up with New York's Naval Militia to support National Guard operations in New York City. Days after the storm, he says, "we had to help a 90-year-old woman down 12 flights of stairs. She had been alone for 10 days with no lights, no water, and no heat."

This coverage of the Hurricane Sandy aftermath is adapted from twice-monthly special issues of the Coastal Connection *newsletter, which is written by* JLC *contributing editor Ted Cushman. Look for continuing coverage of the Hurricane Sandy recovery and rebuilding in future issues and at jlconline.com. To subscribe to the* Coastal Connection *newsletter, go to coastalcontractor.net.*

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Q&A

Q. Cutting Holes in Sheathing

Are there any code restrictions on cutting outlet boxes into the sheathing of an interior alternate braced wall panel?

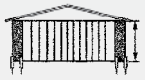
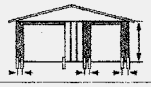
A. *JLC staff responds:* The IRC, in Section R602.10 (which covers braced wall lines), does not make specific reference to holes in any type of a braced wall panel. But there are some real structural limitations to cutting holes in the sheathing that provides bracing on these types of structural walls, and the decision to pierce the sheathing plane should be approached with real caution.

Braced wall lines are required on just about every building to provide resistance to wind and gravity loads, as well as to high-wind loading and seismic forces in areas where these more extreme conditions exist (see "Wall Bracing and the IRC," *Coastal Contractor* magazine, July/August 2006). There are many ways to provide the required bracing (see IRC Table R602.10, below). The specific type of braced wall panel in question — referred to as an Alternate Braced Wall, or Method ABW in Section R602.10.3.2 — is one alternative to a wider 48-inch braced wall panel. Method ABW relies on sheathing, fastened to a specific schedule, to transfer loads to required hold-downs. Any significant hole in the panel would interrupt the load path across the sheathing to the hold-down. The very definition of a braced wall panel speaks to the continuity of an uninterrupted panel. To count toward the total bracing requirement, a sheathed segment has to be tall enough to cover the full wall height and wide enough to satisfy minimum strength requirements. Clearly, windows and door openings (really big holes, in other words) are not allowed in a braced wall panel. But are *any* holes acceptable? If so, how big?

A strict reading of Section R602.10 could lead to the conclusion that no holes are acceptable. But general guidance from the APA/Engineered Wood Association suggests that small holes carefully placed will not have an adverse effect on bracing. APA's Merritt Kline advises that it is best not to drill any holes in the sheathing of any of the IRC braced wall panel types. However, he says that a 7/8-inch or smaller hole is probably okay. With a small hole, it would be possible to use a direct-mount shallow box for light fixtures. Or you could fir the wall out for shallow outlets and switch boxes. Holes should be placed near the center of the wall width and away from the panel nailing, Kline says.

Although APA does not recommend drilling holes larger than 7/8 inch into sheathed braced wall panels, limited tests conducted by the association indicate that small holes up to 3 1/2 inches may have little effect on the performance of bracing methods (see APA Report T2004-54, "The Effect of Construction Tolerances and Constructability on the APA Portal Frame Design"). On the strength of this report, it is conceivable you could convince your local building official to allow single duplex outlets and switches, sparingly placed. Ultimately, though, the decision rests with the local building department, so check with them before the electrician grabs his recip saw.

TABLE R602.10.2
INTERMITTENT BRACING METHODS

METHOD	MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA
LIB	Let-in-bracing	1 × 4 wood or approved metal straps at 45° to 60° angles for maximum 16″ stud spacing		Wood: 2-8d nails per stud including top and bottom plate metal: per manufacturer
DWB	Diagonal wood boards	3/4″ (1″ nominal) for maximum 24″ stud spacing		2-8d (2 1/2″ × 0.113″) nails or 2 staples, 1 3/4″ per stud
HPS	Hardboard panel siding	7/16″ For maximum 16″ stud spacing		with length to accommodate 1 1/2″ penetration into studs at 4″ spacing (panel edges), at 8″ spacing (intermediate supports)
ABW	Alternate braced wall	See Section R602.10.3.2		See Section R602.10.3.2
PFH	Intermittent portal frame	See Section R602.10.3.3		See Section R602.10.3.3
PFG	Intermittent portal frame at garage	See Section R602.10.3.4		See Section R602.10.3.4

This table from the IRC specifies requirements for various methods of bracing walls based on the type and thickness of the bracing material, the configuration of the structure, and the need for sheathing to transfer seismic or high-wind loads to hold-downs.

Q. Reusing Loose-Fill Cellulose

A blower-door test on an older home I'm renovating shows a need for some serious air-sealing. Unfortunately, a previous owner

blew about a foot of loose cellulose into the attic without first addressing any of the usual sources of air leaks. Rather than shoveling cellulose out of the way and patching the leaks we can find — possibly missing some problem areas — I'm thinking of having an insulation sub vacuum up all the existing material, then seal the area with a flash layer of closed-cell foam. If we go that route, is there some way to re-use the original cellulose, or would that be more trouble than it's worth?

A. *Jonathan Tauer, an insulation contractor in Florence, Mass., responds:* There's no problem with vacuuming up and reusing existing cellulose, as long as it's not mixed with lumber scraps, old plaster, or other debris. Insulation suppliers can provide vacuum bags large enough to hold several cubic yards of loose cellulose. The easiest way to fill them is to call in a contractor with a truck set up to install spray cellulose, which ordinarily includes a powerful vacuum used to suck scrubbed-off excess material back into the hopper for re-use. By reconfiguring the output, it can easily be adapted to fill bags instead. Another option is to rent a gasoline-powered impeller vacuum, which is something like a shop vac on steroids. Once the attic has been cleaned out, you can apply the flash coat of foam and blow the cellulose back on top of it.

But unless the attic floor is extremely leaky over much of its surface, that may not be the most cost-effective approach. You can find and seal many leaks from inside the living space by methodically working your way around it with a smoke pencil while running a blower door. Some problem areas — like vents, chimneys, light fixtures, and partitions — will have to be sealed from within the attic, and that will require some shoveling and sweeping. Such work is no one's idea of a good time, but because vacuuming out and replacing the cellulose is likely to cost $1,500 or more, air-sealing may be a smarter use of resources. The key is to test before, during, and after the sealing process to be sure you've actually solved the problem.

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On the Job

Frost-Protected Shallow Garage Slab

by Andy Engel

Three years ago, I built a detached garage with an apartment above. Of course, "garage" is a euphemism for "shop." With a limited budget, I wasn't planning to hire other contractors and I wanted ways to save both labor and money, starting with the foundation. Living in Connecticut, I've long been jealous of builders in the South, where the shallow frostline allows for building on slabs with thickened edges. Here, I was looking at excavating the perimeter down to at least 42 inches below grade, pouring a footing, laying a concrete block wall to above grade, then evenly compacting the backfill before even thinking about the slab. That's a lot of work and material, and a lot of excavation spoils to dispose of. There had to be a better way.

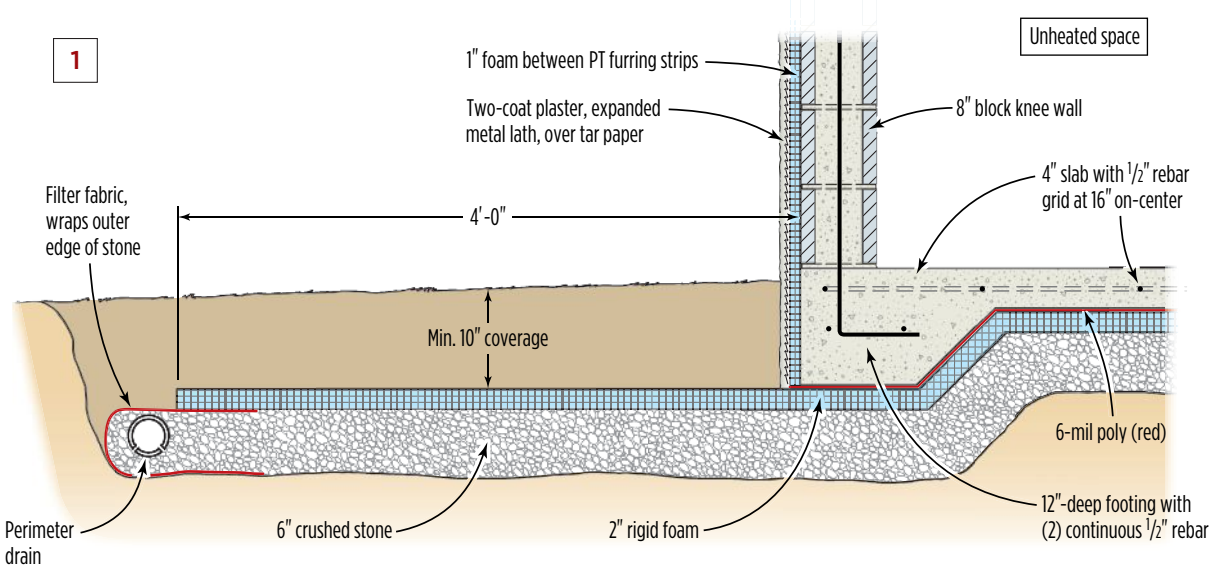
An Easier Alternative Foundation

Section R403.3 of the 2009 IRC provides details for a "frost-protected shallow footing." Instead of digging down below the frostline, you insulate below the edge of the slab and out from the building a certain distance with rigid foam. The distance depends on your climate. The foam captures the interior heat from the building and the earth's geothermal heat, preventing the ground from freezing below the footing. The catch was that the IRC's method applies only to heated buildings, and my garage/shop would not be constantly heated. However, the details in the IRC come from ASCE Standard 32-01, which also details how a frost-protected shallow footing can be used under an unheated structure **(1)**. I showed the standard to my local building official, and he greenlighted the detail right away. In short, I had to insulate under the slab (which I planned to do anyway) and the footings and 4 feet beyond the perimeter of the building with 2-inch rigid foam. The foam needed to be laid over a 6-inch-deep layer of crushed stone for drainage, then covered with at least 10 inches of soil.

With a backhoe, I stripped the topsoil and excavated 18 inches below the projected finish grade from where the inside of the thickened slab would be to about 6 feet beyond the outside of the building. This excavation sloped to the sides for drainage, and about 1/8 inch per foot toward the front of the garage so the slab would drain

Footing Detail

1



toward the doors. At the perimeter, the slab would be 12 inches thick and 12 inches wide, then angle up to the standard 4-inch depth. I left 8 inches of the original soil undisturbed inside the garage to support the main slab, then trenched for and installed the underslab plumbing and conduit. I also dug holes for a 16-inch-deep masonry chimney footing, and for three 12-inch-deep footings to support point loads from a center beam. The area of the footings is based on the 2,880-psf bearing capacity of the foam.

Once the utilities passed inspection, I backfilled and compacted all the disturbed areas, then spread a 6-inch-thick layer of ¾-inch crushed stone everywhere, which I also compacted **(2)**. While spreading the stone, I was careful to maintain the slopes I'd built into the excavation, checking the elevation every 10 feet. Filter fabric wraps the outer edge of the stone and a perimeter drain of 4-inch perforated-pipe, which leads to daylight. I laid the foam over the gravel, guided by strings and batter boards. The foam underlies everything, including the footings for the point loads. To keep it from blowing in the wind, I weighed the foam down with rocks, lumber, and whatever else was at hand.

Standard Concrete Work

The forms were a piece of cake. I could have used 2x12s, but green 5/4x12 rough-sawn poplar from a local sawmill was cheaper. I ripped 5/4x4 whalers from the wider stock, and braced the forms back to stakes **(3)**. The forms were level side-to-side, but sloped ⅛ inch per foot forward. After spreading a layer of 6-mil poly over the foam inside the garage and stapling it to the inside of the forms, I laid out the required rebar and called for an inspection.

The concrete work was no different than any other slab I've ever done — a sleepless night followed by a hard day's work **(4)**. I used 3,500-psi concrete with fiber. Because it was a hot day, I ordered the concrete with retarder so there'd be more time to finish it. I covered the finished slab with poly, kept it wet for a couple of weeks, and finally saw-cut it into quarters.

The framed garage walls are supported on an 8-inch block knee wall **(5)**. I shimmed the first course level by using 4-inch solid block near the front and 2-inch block in the middle, and by varying the thickness of the mortar joint as the taper narrowed toward the back. The outside of the block is flush with the slab. Every 16 inches, I fastened 1-inch-thick pressure-treated furring strips to the block and filled in between with 1-inch foam, which extends down to the foundation foam. I covered the furring strips and foam with tar paper and expanded metal lath, then finished up with a two-coat portland cement plaster. The final step was backfilling. The garage has survived three New England winters with no masonry cracks, and it's as plumb and level as the day it was built.

Andy Engel *is the editor of* Professional Deck Builder *magazine and a former contractor.*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WEDNESDAY, FEBRUARY 20, 2013

5:00 – 7:00 PM
Welcome Reception

THURSDAY, FEBRUARY 21, 2013

7:00 – 8:00 AM
Breakfast

8:00 – 9:15 AM
The Face of Competition
Sam Geist, Geist + Associates, Inc.

Competition everywhere has never been greater than it is right now. But what kind of effect is it having on your organization? Marketing/sales guru and onetime retail business owner Sam Geist shows you how to use competitors' strategies to the advantage of your business, and how to loyalize customers by creating a memorable service niche—ultimately setting you apart in today's competitive environment.

9:30 – 10:45 AM
Selling Relevant
Jaynie L. Smith, Smart Advantage, Inc.

It's easy to assume that you know what your customers want when it comes to product and service levels. But what you think of as your strengths might not leave an impression with prospects. Best-selling author Jaynie L. Smith will show you how to figure out which of those strengths mean anything to your prospects and how to make those strengths relevant to the customers you're trying to reach.

11:00 AM – 12:00 PM
The Magic Question
Hal Becker, The Becker Group, Inc.

Speaker, writer and sometime drummer Hal Becker draws on his own experience as Xerox's #1 salesperson, to tell you why great salespeople don't have to ask for referrals, how to use trial closes in place of closing, why selling and dating are the same and all about Snow White and the Seven Objections. You'll also learn why the magic question is everything, and how to ask it.

12:00 – 1:00 PM
Lunch

1:15 – 2:15 PM
How To Manage People, Not Paper
Hal Becker, The Becker Group, Inc.

Some of your salespeople are good, some mediocre, but all operate as individuals, squabbling over leads and commissions. If you had a sales team rather than salespeople, you could boost your sales without having to hire or spend more on marketing to generate leads. Hal Becker's six step approach will introduce you to coaching and management principles used by the world's top training companies such as IBM, Xerox and Proctor & Gamble.

2:30 – 3:45 PM
Super Panel
Charles Gindele, Dial One Window Replacement; Scott Siegal, Maggio Roofing and Certified Contractors Network; Brian Elias, 1-800 Hansons; George Faerber, Bee Window and Bring Me Your Leads

Four company owners who are leaders in the home improvement industry address four different subjects that can help your company compete including: Red Carpet Customer Service, Social Media Marketing, Online Marketing and Financial Metrics that make a difference to your company.

4:00 – 4:45 PM
Super Panel Breakouts

Your chance to ask questions of our four industry superpanelists—breakouts will each be 10 minutes in length.

6:00 – 7:00 PM
Reception

7:00 – 9:00 PM
Dinner featuring the Replacement Contractor Service Excellence Awards

Join us for dinner as we celebrate the winners of the Replacement Contractor Service Excellence Awards. All conference attendees who agree to the free assessment conducted by GuildQuality will be eligible for the award. Don't miss it!

FRIDAY, FEBRUARY 22, 2013

7:00 – 8:00 AM
Breakfast

8:00 – 9:15 AM
Put Social Media To Work For Your Company
Andrew Davis, Tippingpoint Labs

Social media gives you the ability to scale your everyday interactions with clients, customers and prospects to close business faster and keep the pipeline full. In this whirlwind presentation, you'll be inspired to start using the digital world to do what you've always done: build relationships that grow your business.

9:15 – 10:30 AM
Find Your Ideal Customer
Seymour Turner, Hanley Wood

In today's world, huge amounts of information are available about every house and every consumer. Learn how to access and use this data to identify specific neighborhoods, consumer segments and physical attributes that have the optimal characteristics to make them the most likely properties to do a variety of remodeling and replacement projects. Each attendee will receive a free local market report including heat maps of local remodeling activity to get them one step closer to market domination.

10:45 AM – 12:00 PM
Have It All, Don't Do It All
Ellen Rohr, Bare Bones Biz

Whether you're a large, mid-sized or smaller company, if you want to be a competitive force in your market you need the enthused participation of your employees. Ellen Rohr, a speaker with hands-on knowledge when it comes to running a contracting company, will show you the financial metrics you can share with your employees and how to use that information to inspire, motivate and create a sales-focused culture.

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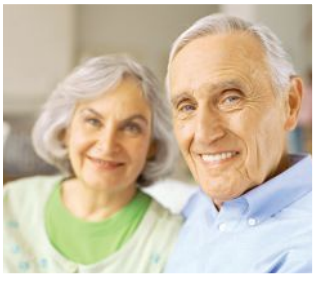

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A Weekly Review Can Protect Your Cash Flow

by Dennis Gehman

When a small builder or remodeler gets into financial trouble, more often than not the cause is insufficient cash flow. You can get away with managing cash flow by the seat of your pants if you're a solo operator doing one job at a time, but the more employees you hire and the more jobs you take on, the more you need systems to help you track critical numbers.

As the owner of a remodeling firm, I'm involved enough in day-to-day operations that I have a good idea of potential problem areas. Even so, with 12 field employees doing large, complex projects, I find it is crucial to be disciplined about reviewing the actual numbers. Every month, I check the balance sheet, the profit-and-loss (P&L) statement, and the job status reports. By the time I get them, however, there are seldom any surprises because I also get a weekly update that I call a "Key Data Report," or KDR (shown below). It's basically a snapshot of the business that helps me predict whether we will have sufficient money and manpower in the coming weeks.

	Key Data Report: September 24, 2012			
		Previous Week	Previous Month	Year to Date
1	New leads	7	32	423
2	Value of contracts	$27,661	$178,321	$1,745,618
3	Value of work completed	$48,754		
4	Backlog	$267,314		
5	Production days	38		
6	Vacation days	1		
7	Holidays	0		
8	Productivity ratio	4.96:1	5.06:1	5.12:1
9	Current ratio	2:1		
10	Line of credit balance	$0		
11	Checking account balance	$67,418		
12	Money market balance	$122,322		
13	A/R, current	$38,723		
14	A/R, 30+ days	$0		
15	A/P	$33,129		

Since I'm not naturally drawn to analytics (I confess to being a seat-of-the-pants guy), my office staff generates the report for me. Every week, the employee in charge of marketing gives his numbers to the bookkeeper (my wife, Glenda), who adds the financial numbers and puts everything into an Excel spreadsheet that she emails to me by Tuesday at noon. The two of them probably spend 15 minutes putting the document together, and then it takes me only five minutes to review, but that minimal effort helps alert me to problems.

The most important information I get from the KDR is whether we had enough cash flow the previous week, and whether we will have enough cash over the next few months. It also tells me whether we will have enough manpower to get the work done, and helps me decide what to do about it if we don't. For example, there have been times when we had so much work I wanted to hire an additional carpenter, but since the report indicated our sales leads were lower than normal, I knew we might have trouble keeping that new hire busy in the future. That led me to offer overtime to current staff instead.

Using the Key Data Report

The value gained from the numbers on the KDR more than justifies the small amount of time required to assemble and review them. Unlike the monthly balance sheet and P&L statement, which only tell me what happened in the past, the KDR helps me see ahead. Here's a line-by-line breakdown of how I use it.

1	New leads	7	32	423

The first line shows the raw number of leads. I also get a separate weekly marketing report that breaks the leads out into repeats and referrals, but I've found that multiplying the raw number by our closing rate offers an accurate prediction of future contracts. While closing rates do vary by lead type and salesman, I use the company's average closing rate — currently 20 percent, although it's been as high as 25 percent and as low as 12 percent. (These numbers may sound low, but again, they include all lead types.)

		Previous Week	Previous Month	Year to Date
2	Value of contracts	$27,661	$178,321	$1,745,618

Knowing the value of new contracts signed in the previous week and month, as well as for the year to date, helps me predict what our cash position will be in the coming months.

3	Value of work completed	$48,754

The value of work we've completed is calculated on an accrual or percentage-of-completion basis. This is the amount of work we billed for during the previous week.

4	Backlog	$267,314

The backlog is the dollar value of the work we have under contract but haven't started yet. I divide it by my crews' average weekly production — about $40,000 — to predict how many weeks or months we will be busy.

5	Production days	38
6	Vacation days	1
7	Holidays	0

Our production staff works four 10-hour days a week. When all 12 employees work a full four-day week, that's 48 production days; a lower number on line 5 (as in the KDR shown here) tells me someone was out, while a higher number indicates overtime work. If three employees were out for some reason, that might explain a completed-work amount (line 3) that's below expectations. In most cases we can simply readjust schedules, but if we're up against a deadline, I will offer overtime.

8	Productivity ratio	4.96:1	5.06:1	5.12:1

About 10 years ago we hired a management consultant to review our company systems. His background was in manufacturing, and he introduced us to the concept of the productivity ratio. We learned that in order to hit our target net profit, we needed to bring in five dollars of gross revenue for every dollar we paid our salaried field employees, a ratio of 5:1.

If the ratio falls below that, we look for ways to make adjustments. I can usually find the problems by looking at job-cost reports or after-action reviews. (When each project is done, the key people get together to review numbers and look for lessons that can be applied to future jobs.) Since the ratio takes all of our activities into account, the problem could be a range of things. For instance, we might have been blindsided by a materials price increase or our crews might need further training on a specific task we thought they had mastered. (We do most tasks in-house, including mechanicals and drywall.)

We also look at the projected productivity ratio when we are estimating a project. On projects with high labor and low material costs, we need to use a higher markup to obtain a 5:1 ratio.

9	Current ratio	2:1

The current ratio compares cash-on-hand to current liabilities, including this month's payroll, utilities, and materials invoices, as well as debt payments due (but only in the current month). A 1:1 ratio indicates that we will break even, so we obviously want a higher number, preferably 2:1. A low ratio is a warning flag that I need to take a closer look at big-picture cash flow.

10	Line of credit balance	$0

The interest rate on our line of credit is ½ percent above prime, plus there's a $75 transaction fee, so we don't touch it unless absolutely necessary. If we have borrowed against this, something has gone awry and I look for the cause. It could be anything from an overdue invoice to a job that has fallen behind the payment schedule because of unforeseen delays.

11	Checking account balance	$67,418
12	Money market balance	$122,322

We keep excess cash in a money market because we earn at least some interest on it, compared with no interest on our checking account. The account is set up so we can make a deposit today and a withdrawal tomorrow without penalty. If payroll is due this week and we don't have any receipts coming in until next week, we'll make a short-term withdrawal from this account. We draw this account down completely before touching the line of credit.

13	A/R, current	$38,723

This is the dollar amount of the outstanding invoices that we expect to be paid to us in the coming 30 days.

14	A/R, 30+ days	$0

If this line is anything other than zero, I know it's time to pick up the phone. That only happens occasionally, usually when a lot of change orders drive up the price of a project. In most cases, I can work out a payment plan with the client.

15	A/P	$33,129

We obviously want payables to be less than the amount in our checking account (line 11). If it's not, I know that we will likely need to tap into the money market, and perhaps the line of credit.

Dennis Gehman *is president of Gehman Custom Remodeling in Harleysville, Pa.*

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Fall Protection for Roof Work

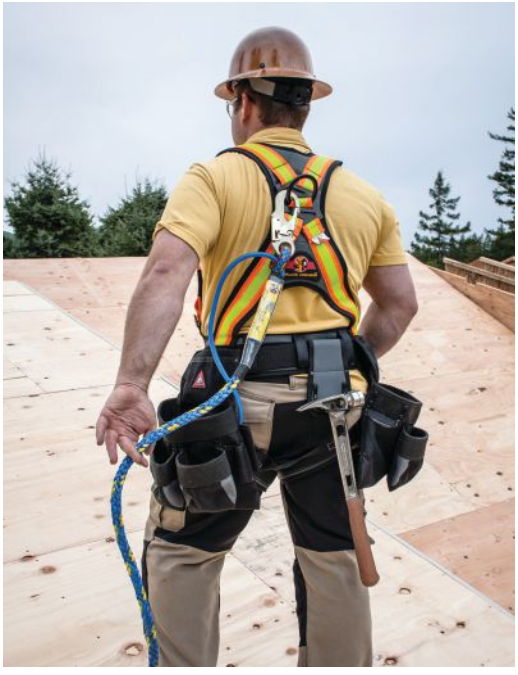
by Andrew Wormer

Dave Molloy

You'll need a written plan, proper training, and the right equipment to comply with OSHA safety rules

Once every few issues, a *JLC* reader takes exception to the misused ladders, unsafe scaffolding, and sketchy fall protection sometimes depicted in our photos. "You are doing contractors and tradesmen a disservice and making yourselves look foolish when you let this stuff through," wrote one reader recently, a union roofer from the Chicago area.

So I contacted this reader — who asked to remain anonymous — to find out how his company tackles fall protection. To get some other perspectives on the subject, I also talked to several contractors about how they keep their roofing employees safe and productive while complying with OSHA fall protection guidelines. In addition, I've attended safety seminars, navigated through OSHA's extensive online resources, and contacted OSHA for guidance on specific issues — all in an attempt to gain a better understanding of the rules. What I've discovered is that while OSHA compliance can be tricky, working safely high above the ground isn't that difficult if you have the right attitude and the right equipment.



Tim Uhler

Dave Molloy

Figure 1. The full body harness at left (superanchor.com) has multiple D-rings, integral tool bags, and a hammer holder, and comes in different sizes. Here it's connected to Super Anchor's X-Line, which combines a 50-foot safety line with a pneumatic air hose. The harness included with the Compliance-in-a-Can kit (right) offers fewer features but is also OSHA-compliant.

Ladder Safety

- Using an aluminum ladder in close proximity to power lines is an OSHA violation. Try to replace old metal ladders with fiberglass models, and maintain OSHA clearances — 10 feet away for up to a 50 kV line — between any type of ladder and energized power lines.
- Using a folding A-frame type stepladder in the folded position is an OSHA violation.
- When an extension ladder is being used to provide access to a landing, it must extend at least 3 feet above the landing.
- When using a ladder to get from one level to another, make sure the ladder is tied off with a wire or rope or some other kind of attachment.
- A step or ladder is needed to change levels that are as low as 2 feet high. If you need a bucket to step up, then you need a ladder.
- Follow the 4:1 rule: For every 4 feet between the ground and the top of the ladder, offset the base of the ladder by one foot. The base of a 12-foot-high ladder should be placed 3 feet away from the wall.
- Don't use a ladder in place of any type of plank.

The Basics

By now, most builders know that OSHA's interim fall-protection guidelines have been replaced with stricter safety rules (see "OSHA Moves to Limit Alternative Fall Protection," *JLC Report,* 3/11). Any employee working more than 6 feet above ground — or above a lower level — needs to be protected from falls by one of several OSHA-approved methods (see "OSHA Fall Protection Requirements," facing page). This article focuses on roof work, but fall protection is also usually needed when installing floor joists, framing walls and roofs, and installing millwork and siding, and in all cases it involves similar techniques and equipment.

For contractors like Dave Molloy, who owns a roofing company that does both commercial and residential work in the Cincinnati area, the phase-out of the interim guidelines has meant changes in the ways his residential crews operate. "Under the old rules, we could simply

set up our roof jacks and still be OSHA-compliant," he says. "Now we also have to install anchors and use safety lines and harnesses, even though we still need the roof jacks to work safely." Molloy estimates that the new measures increase the labor costs of his average residential job by 5 percent to 10 percent.

Harness. Often, the most simple and cost-effective way to work safely high above the ground is to wear a harness that is securely attached to a safety line (**see Figure 1**). Even if you're a sole proprietor and are not subject to OSHA rules, a harness is a good insurance policy that you can carry around in your truck. Molloy supplies his workers with DBI/Sala's Compliance-in-a-Can (dbi-sala-safety.com), a $120 kit that includes 50 feet of $^{5}/_{8}$-inch lifeline with a snap hook and a reusable roof anchor bracket along with the full-body harness.

Most basic harnesses have a single back-mounted D-ring, but the union roofer I spoke with prefers a harness equipped with multiple D-rings. For certain tasks, he says, he uses the rope to hold himself in place on the roof as he works, and it's hard to do that with a back-mounted D-ring.

Sometimes a worker wants a harness that has different features or a better fit than the model offered by his company. In such cases, many employers — including Molloy — will pay part of the cost of the upgrade. According to the union roofer, you'll quickly appreciate the difference between a $75 harness and a $300 harness if you ever do fall off a roof. But if you need only occasional fall protection, you may prefer a basic harness, which will weigh less and fit better under a toolbelt.

Anchors. OSHA rules require that a single-attachment-point anchor be strong enough to support a 5,000-pound load in any direction (**Figure 2**). On a reroofing job, that means that temporary anchors can't be attached to just the sheathing, but need to be nailed through the sheathing into framing.

Permanent anchors — some of which

Tim Uhler

Figure 2. Anchors need to be strong enough to support 5,000-pound loads, so they must be securely fastened to framing.

OSHA Fall-Protection Requirements

All residential builders and subcontractors subject to OSHA rules now have to comply with 29 CFR 1926.501(b)(13), which requires conventional fall-protection systems like guardrails, safety nets, or personal fall-arrest systems whenever an employee is working 6 feet or more above the ground or a lower level.

Written safety manual. Companies must also have a written safety plan that identifies the person responsible for implementing the company's safety policies. The plan should explain procedures for training, enforcement, and accident investigation, and company expectations on how those procedures are to be implemented. The plan should also contain site-specific information on the types of work done by the company (such as roof truss installation or roofing).

Training. Employers are required to train their workers on how to use the company's fall-protection equipment, which would be in addition to any OSHA general 10-hour or 30-hour safety courses.

Equipment. Companies must supply and maintain certain types of personal protective equipment (PPE), such as harnesses, ropes, and scaffolding.

Documentation. Employers have to maintain training records and monitor compliance, as well as document retraining efforts when there are changes in the fall-protection system or in the type of work performed by the company.

To learn more about fall protection and find sample fall-protection plans, go to osha.gov and nahb.org.

Dave Molloy

can support multiple workers — are also available and would appear to be a sensible safety upgrade, especially in new construction where the framing is exposed and the strength of the connection can be verified. But installing permanent anchors raises questions of liability. For instance, who's responsible for maintaining and inspecting the anchors — the building owner, the GC, or the sub who installed them?

Finding a good anchoring point can be tricky. When installing roof trusses, for example, you can't just attach an anchor to the first truss and then use a rope-and-harness system to install the remaining trusses. A single truss isn't designed to handle out-of-plane loads — the kind of

Tim Uhler

Tim Uhler

Figure 3. A rope grab is needed to match the length of the safety line to job-site conditions. The mechanical rope grab in the top photo (A) must be manually operated. A nonmechanical Prusik knot rope grab (B), an attachment familiar to climbers, tightens its grip only when the line is tensioned. A self-retracting lifeline (C) eliminates the need for a rope grab but tends to tug on the harness, making it most suitable for work done very near the anchor point.

load that might occur when a worker who is wearing a harness that is attached to the truss falls — without bracing and sheathing. Studies have shown that lateral loads created by the falling worker can either fracture the bottom truss chord or cause the metal truss-wall connectors to fail. In either case, the truss could collapse or break away from the structure.

There are ways to avoid this problem. For example, anchors can be attached to truss sections (typically four trusses) that have been assembled and sheathed on the ground, then lifted into place with a crane. Another option is to attach the safety line to an engineered spreader that distributes the force of the fall-arrest system across several braced (but still unsheathed) trusses. Of course, many builders choose to install trusses while working from scaffolding or ladders, limiting the need for harnesses altogether.

Safety line. The weak point in most fall-arrest systems is the connection between the harness and the anchor point — not because the connection isn't strong enough, but because many workers "forget" to tie off or clip in. According to Molloy, this is the most common safety violation and the one most likely to trigger an inspection during an OSHA drive-by. Like anchors, safety lines must have a breaking strength of 5,000 pounds; many are also equipped with some sort of shock absorber or deceleration device and quick-release harness safety clips.

Another common violation in roofing work is using a safety line that is too long. It doesn't do much good to be tied off to a rope that won't stop you before you hit the ground.

To avoid this problem, safety lines are typically attached to harnesses with a lanyard equipped with a rope grab, which allows workers to easily adjust the attachment point. Most rope grabs are mechanical devices; some are operated manually and some work automatically, like a clutch. They allow free movement as long as the worker is moving slowly, but grab automatically during a fall or sudden movement (**Figure 3**).

When OSHA Shows Up

Any number of situations can trigger an OSHA inspection, including an accident, a tip from a competitor, an employee complaint, or a special emphasis program. OSHA inspectors may drive by a job site if they see a crane boom in the air, and stop work if they see an example of imminent danger — a worker who isn't tied off, for example. To help with OSHA compliance and prepare for a possible inspection, many companies hire private safety trainers that perform regular training sessions and "inspections" that mimic OSHA procedures.

Control the site visit. During an actual inspection, the job foreman should confirm the inspector's credentials, then notify the company office (if necessary) of the visit. To make sure additional violations don't occur directly in front of the inspector while everybody is waiting for the company's safety rep to arrive, employees should stop working immediately and leave the working area (but not the job site).

Cooperate — and take notes. During employee interviews, the inspector will try to find out if suspected violations are one-time occurrences or standard operating procedure (which would constitute a willful and ongoing violation). Employees have the right to decline to be interviewed, but company policy can't prohibit an employee from talking to OSHA during an inspection. As the inspector walks around the job site asking questions and taking photos, the company rep should accompany him with his or her own camera, taking notes and photos to prepare for later meetings with OSHA.

Fix violations immediately. Some problems are easily fixed, such as a ladder that isn't tied off or that doesn't extend far enough above the roof edge. These can — and should — be addressed during the inspection to demonstrate the company's willingness to comply with regulations.

Keep job sites neat and clean. First impressions set the tone for any inspection. Part of the daily routine should be to make sure materials are neatly stacked and organized, warning flags and guardrails are in place, and safety equipment is in working order and set up properly.

Passive Fall Protection

Harnesses aren't always necessary up on the roof. On low-slope (less than 4:12 pitch) roofs, for example, OSHA allows the use of warning lines set 6 feet from the rakes and eaves. Because this approach also requires a safety monitor — a worker whose only task is to keep an eye on the warning line — it's not really a workable option for most small residential crews.

Guardrails. Roof jacks can be used on roof pitches between 4:12 and 8:12, but harnesses are also needed unless the roof jacks have integral guardrails (**Figure 4, next page**). Safety harnesses are required on roof pitches steeper than 8:12. Remember too that workers within 6 feet of a rake edge need fall protection. Rake edge guards are available to meet this requirement, but technically you'll still need to be roped off to install them.

Guardrail systems are a reasonable option for flashing repairs and similar work where movement is limited. But roofers work fast, installing 10 or more squares of shingles per man per day on some roofs. As the union roofer I spoke with noted, a contractor couldn't afford to buy all of the guard-equipped roof jacks that a commercial crew would need — much less

Dave Molloy

Figure 4. Roof jacks fitted with integral guardrails can be used instead of safety harnesses in certain situations, such as for flashing and repair work.

Andrew Wormer

Figure 5. Harnesses may not be needed when there is fully planked staging up to the eaves of a house with guardrails installed as shown. But workers on the cross-gable still need fall protection, because they would be within 6 feet of an unguarded roof edge.

spare the time to install them and move them around.

Scaffolding. On one job site I visited recently, the GC (who was also the roofing contractor) used pipe staging to build a continuous work platform underneath the eaves (**Figure 5**). The top sections of the scaffolding were fully planked, and his crew installed guardrails around the perimeter of the work platform. A similar OSHA-compliant work area could also be assembled with exterior bracket scaffolds, which bolt through the wall framing.

This approach brings the roof eaves down to ground level in OSHA's eyes and — except for work along the rake — eliminates the need for safety lines and harnesses. The investment in staging sections and planks is significant, of course, but for a builder who is also trimming windows and eaves and installing siding, the increase in productivity may be worth the cost.

Behavior Modification

Dave Molloy says that the most challenging part of his safety program is getting workers to buy into it. To help with OSHA compliance, he shares a safety person with five other Cincinnati roofing companies. This person conducts weekly safety meetings with his crews and trains key employees so that they have the authority to write warnings when a worker forgets a harness or fails to wear a hard hat. Workers are suspended after two written warnings and terminated after three warnings during any 60-day period.

In the end, the goal is job-site safety and not OSHA compliance. "It's tough to modify behavior," says Molloy. "If one of my roofers forgets his tools, he can just borrow what he needs from someone else. But what I have to keep reminding them is that when someone forgets a harness, it shuts down the job site."

***Andrew Wormer** is a* JLC *senior editor.*

18-Volt Cordless Circular Saws

by Michael Springer

The best models have good runtime and cut dense material without slowing down

I last tested cordless circular saws for Tools of the Trade five years ago. The story back then was that the introduction of lithium-ion technology had helped battery-operated saws become more useful on the job site, but there were not many standout tools in the 18-volt class. The higher voltage (28- and 36-volt) saws were the way to go when cutting framing material; the smaller tools seemed better-suited to trimwork and other light duties.

Today, the category as a whole has improved greatly. Except for our favorite 18-volt model in the last test (Makita BSS610), the saws tested here are new designs.

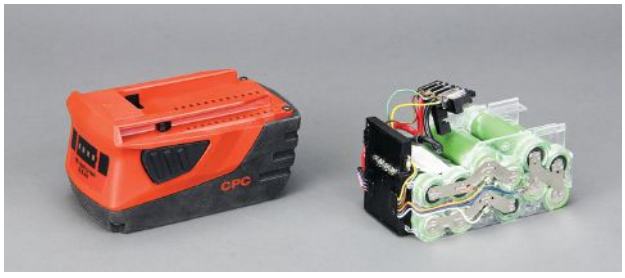
All but one of the kits shipped with their brand's highest amp-hour (Ah) lithium-ion batteries. The Bosch arrived with 2.6-Ah batteries, but we tested it with 3.0-Ah batteries to be consistent with the other tools, which we tested with the best batteries available at that time. DeWalt makes two 18-volt saws; the more recent model takes slide packs, and the earlier model takes tower-style batteries. The earlier tool comes with a lithium-ion pack but can be used

Battery Voltage Explained

The full-size battery packs that come with most cordless circular saws contain ten 3.6-volt lithium-ion cells. The cells are wired in series (connected end-to-end, as in a flashlight) in strings of five, and then wired to each other in parallel. Battery voltages are additive when cells are wired in series, so each group of five produces 18 volts (5 x 3.6 volts = 18 volts). When cells or groups of cells are wired in parallel, the amp-hour (Ah) ratings are additive but the voltages are not, so connecting two 18-volt strings of 1.5-Ah cells in parallel produces an 18-volt 3.0-Ah battery pack. — *David Frane*

Like other full-size 18-volt packs, the Makita LXT battery has 10 cells.

DeWalt calls its new slide-mount system the 20V Max to distinguish it from the earlier 18-volt XRP tool system (which had tower-style batteries). In fact, though, the new system is also 18 volts, with five-cell compact and 10-cell full-size batteries.



Hilti's tools in the 18-volt size range are actually 21.6 volts; instead of five cells per string there are six (6 x 3.6 volts = 21.6 volts). The company's compact batteries have six cells and its full-size batteries have 12.

with the brand's very popular nicad batteries, so I tested it with both. Hilti's battery pack contains extra cells, so it's actually a 21.6-volt tool; I included it because it's the same size as an 18-volt model.

All the tools in this test have 6½-inch blades, 50-degree maximum bevel angles, and electric blade brakes. Every manufacturer supplies its own blade, so to even the playing field I equipped every saw with an 18-tooth Irwin Marathon blade.

Blade-Left Design

Except for the Ridgid, the saws I tested are blade-left models — a curious trait when you consider that corded sidewinders typically have blades on the right. This aspect of the saws makes them handle a lot differently and takes some getting used to. A right-handed user gets a clearer view of the blade — and a face full of sawdust. And the weight of the saw sits on the "drop" side of the material being cut, so it requires more careful balancing to make short or shave cuts without tilting the blade.

Basic Features

All the saws have a comfortable grip with rubber-coated rear handles, but operating the trigger-lock safety on the Bosch is awkward. While the other tools have a release lever that you push straight down on, the Bosch has a button that you press. That requires moving your thumb, which loosens your grip on the tool slightly.

Saw stability is important, too. On most circ saws, the connection between the motor and base is in line with the blade housing; pushing down on the handle tends to tilt the motor, binding the blade and robbing the tool of precious battery power. This is less likely to happen when the connection point is in line with the handle. Only the Hitachi has this configuration, though several other saws were just as stable (see spec boxes starting on page 46).

I liked some of the extras on these saws: Five models had battery fuel gauges and three had headlights.

Performance Features

Certain features — common to every saw — have a major impact on performance. Here are four that, depending on how well they work, can make the difference between a good saw and a great one.

Guard. The guard should operate smoothly at all blade depths and cutting angles; the shallower the blade is set, the better the guard usually works. Hang-ups that require holding the guard open with one hand are a nuisance, especially when you're using the saw with one hand and holding the material steady with the other.

Depth and bevel. It should be easy to accurately set the depth-of-cut and bevel angle. Large levers or knobs with a sturdy locking feel are preferable to smaller ones, and precisely engraved markings in one-degree increments on the bevel quadrant help when dialing in the exact angle needed.

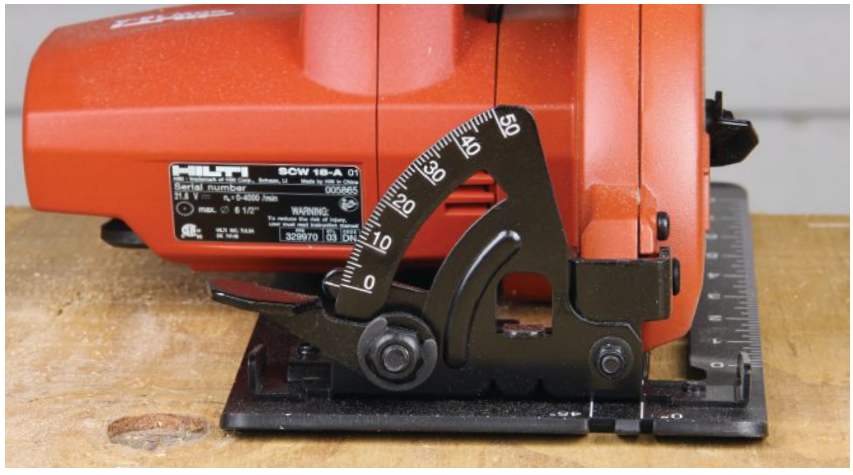
Cut-line marker. For fast and accurate cutting, the marks on the front of the saw base should be perfectly aligned with the actual blade kerf for both 90- and 45-degree bevel cuts. Since the saw's body-to-base connection cannot be adjusted, inaccuracies in these notches are best corrected with a little filing. For the greatest accuracy, mark the exact width of your blade in ink just behind the notch; that way, you can easily cut to either side of a marked cut line.

Blade visibility. It's not always possible to see the cut-line marker from all cutting positions, so you have to be able to see the blade. Because I tested mostly blade-left models, I found the blades to be well-exposed (during right-handed use) — but a few of the tools have top guards or guard-retraction levers that are low enough to obstruct the view of the cut when the saw is set to its maximum cutting depth.

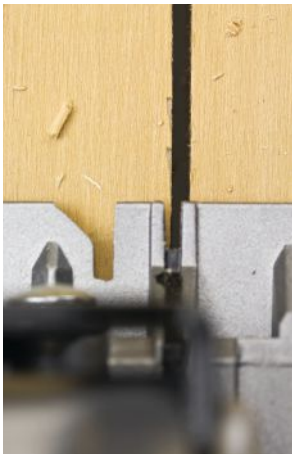
Performance Testing

With cordless circ saws, it ultimately comes down to power and runtime. Every one of these tools can cut trim and sheet

The Makita saw has a built-in light that is activated when the trigger is depressed slightly; the Hitachi and Ridgid are similarly equipped.



Contrasting colors and graduations one degree apart make the quadrant on the saw above easier to set and read than the quadrant on the more basic model at left.



The author checked the accuracy of the cut-line markers by cutting with the baseplate against a framing square (above) and then pulling the saw back to see if the cut-line marker aligned with the kerf. The cut-line marker on the saw at near right is off by almost half the width of the kerf, but the one on the saw at far right is dead-on.

goods. They can cut dense framing materials, too — though in some cases you have to cut slowly to get through. When pushed hard in dense composite material, a few of the tools stalled so frequently they were hardly worth using. Only a handful proved capable of cutting everything on site without either slowing down or requiring a lot of babying.

As for runtime, batteries had better pack enough juice for at least half a day's work. And even then, the kits with only one battery will have to be charged while you're eating lunch. Don't expect to replace a corded saw at the cut station of a framing job with one of these saws — but with the best able to crosscut 68 sheets of OSB on a single charge, you may be surprised at how much a battery-powered saw can do.

Power test. Power is even more important than runtime. No one wants to use a tool that struggles to do the job. To get a sense of the tools' relative power, I timed how long they took to do the same amount of work; the more powerful the tool, the less time it took. The main test involved cutting across 4 feet of industrial particleboard (chosen for its uniformity and high density). I began with $^{3}/_{4}$-inch material —

To ensure accurate timing during the main power test, the author built a crosscutting guide with embedded micro-switches at either end wired to an electronic stopwatch (above). The stopwatch started when the saw hit the first switch and stopped when it hit the second (right).

and when that didn't challenge the saws, I created a 1 3/8-inch test blank by adding a layer of 5/8-inch particleboard.

For precise cut times I used a homemade timing device. It consisted of two microswitches that I'd embedded 45 inches apart in a straightedge and wired to an electronic stopwatch. The stopwatch started when the saw base hit the first switch and stopped when it hit the second. The 45-inch spacing allowed me to measure cutting speed under load with the blade fully engaged, which eliminated variations caused by the blade entering or exiting the material.

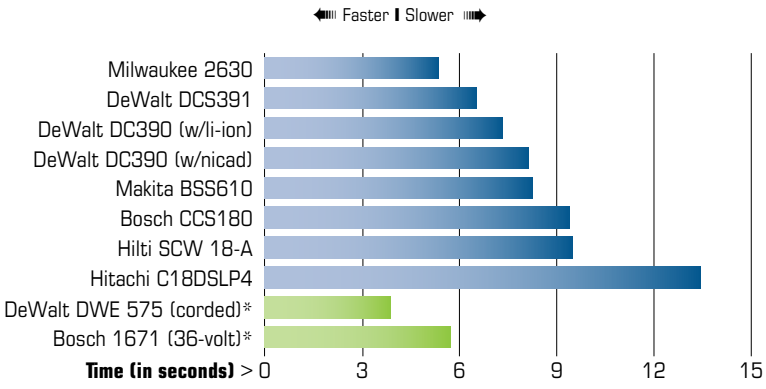
I pushed the saws as fast as they could go without excessive straining or shuddering. If I went too fast, they stalled — the blade stopped with the motor engaged, or internal circuitry cut power to the motor to prevent it from burning out. Whatever the cause, it forced me to slow down. A few of the saws stalled so easily in the material, I could record only one or two uninterrupted times in a dozen tries. The best saws cut smoothly every time, slowing when pushed harder but never stalling (for power and runtime test results, see charts at right).

The last time I tested cordless circ saws, I timed how long it took to cut through homemade 2x12 LSL (a four-layer stack of 7/16-inch OSB 11 1/4 inches wide). I repeated that test with these saws to see how they compared with previous models. In the earlier test, some 18-volt saws could not make it through this material. Now even the weakest 18-volt models struggled through, and the strongest sailed through faster than the best 36-volt models.

Runtime test. I tested runtime by counting the number of cuts it took to deplete each tool's batteries. I made the cuts across the 4-foot side of doubled-up 7/16-inch OSB, with each cut counting as 8 linear feet. To avoid overheating, I made them at a moderate pace in groups of 10 before resting the saw. All but the Ridgid were able to make that many cuts without overheating.

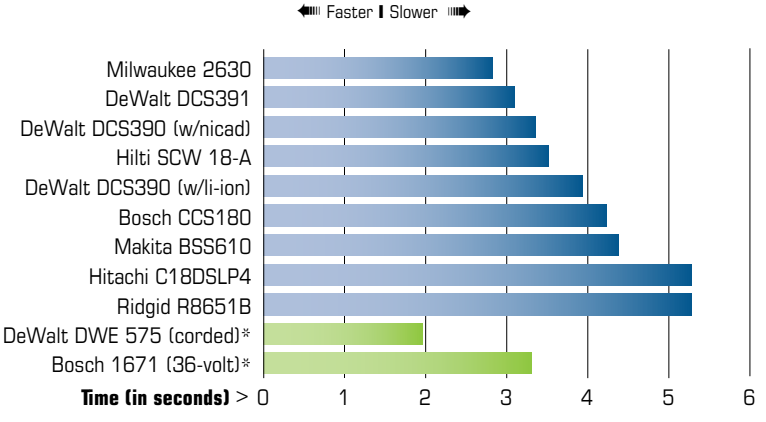
Performance Test Results

Time to cut 45 inches in 1⅜-inch particleboard



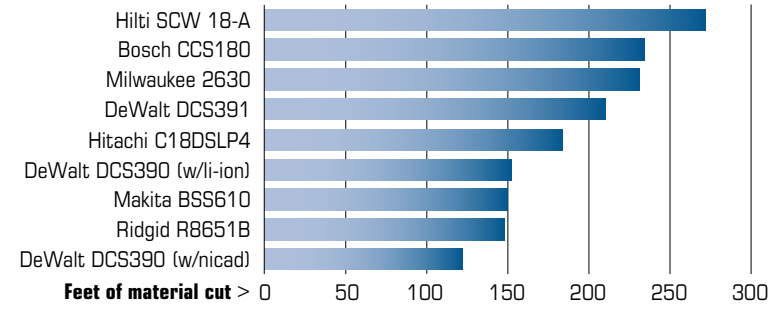
*The DeWalt DWE 575 is corded and the Bosch 1671 is a 36-volt model. They were timed for purposes of comparison and are not part of the test.
The Ridgid R8651B is not shown because it could not complete the test.

Time to crosscut 1¾-inch by 11¼-inch LSL



*The DeWalt DWE 575 is corded and the Bosch 1671 is a 36-volt model. They were timed for purposes of comparison and are not part of the test.

Linear feet of 7/16-inch OSB cut per charge



Bottom Line

There are still a lot of saws in the 18-volt category that are too weak and slow to cut all framing materials reliably, but the standouts can hold their own against bigger and heavier 36-volt models. They may even bump corded saws out of the hands of builders on occasions when a day's worth of gas would be burned to power saws with a generator.

The Milwaukee saw is clearly the best of the bunch, with winning times in both power tests that eclipsed even the champion 36-volt saw, and with excellent runtime. The DeWalt DCS391 ranks second, placing just behind the winner in both power tests, and with very good runtime.

The DeWalt DCS390, the Bosch, and the Hilti occupy the next tier down and stand out in different ways. The DeWalt placed third in the power tests, and the Hilti and the Bosch led in runtime.

Makita's saw rated just above both the Hilti and the Bosch in power, but its lower runtime bumps it down a notch. Still, its ample power, compact size, and great features make it a solid trim saw.

The Hitachi saw is relatively weak, though it posted a good runtime, and the Ridgid, despite many nice features, is held back by its tendency to stall.

***Michael Springer** is the former executive editor of* Tools of the Trade *magazine, which is where this article first appeared. He covers the tool industry from Longmont, Colo.*

Thanks to Irwin for supplying the saw blades used in this test.

BOSCH CCS180K

Battery: 18 volts, 2.6 Ah (tested with 3.0-Ah battery)
Rpm: 3,900
Max cut at 90° and 45°: $2\frac{1}{16}$ inches, $1\frac{11}{16}$ inches
Weight (by author): 8.28 pounds (w/3.0-Ah battery)
Kit includes: tool, one 2.6-Ah battery, charger
Web price: $290 (kit); $100 (bare tool)
Country of origin: China
Pro: Battery stores securely in tool in safety position with no electrical connection; excellent runtime; average power in testing
Con: Less-comfortable button-type trigger-lock release; included (2.6-Ah) battery has no fuel gauge; with 3.0-Ah battery, gauge is not visible when pack is on the tool

- ✔ Excellent guard action
- ✔ Very good cut-line markers
- ✔ Good bevel setting with raised marks every 5°
- ✔ Good blade visibility
- ✔ Fair motor-to-base stability

DEWALT DCS390L

Battery: 18 volts, 2.0 Ah (also accepts 2.2-Ah nicad)
Rpm: 3,700
Max cut at 90° and 45°: $2\frac{3}{16}$ inches, $1\frac{11}{16}$ inches
Weight (by author): 8.34 pounds (8.96 w/nicad)
Kit includes: tool, battery, charger, large plastic case
Web price: $245 (kit); $120 (bare tool)
Country of origin: Mexico
Pro: Flexible-fuel tool takes tower-type li-ion or nicad batteries; shares base and guard-assembly design with highly rated DCS391; very good power in testing
Con: Uncomfortable trigger design with sharp-edged finger recess; heavy when used with nicad battery; no battery fuel gauge

- ✔ Good guard action
- ✔ Very good cut-line markers
- ✔ Very good bevel setting with engraved marks every 1°
- ✔ Very good blade visibility
- ✔ Very good motor-to-base stability

DEWALT DCS391L1

Battery: 18 volts (20 volts max), 3.0 Ah
Rpm: 3,700
Max cut at 90° and 45°: $2\frac{3}{16}$ inches, $1\frac{11}{16}$ inches
Weight (by author): 8.33 pounds
Kit includes: tool, one battery, charger, large plastic case
Web price: $230 (kit); $100 (bare tool)
Country of origin: Mexico
Pro: Includes battery fuel gauge; shares base and guard-assembly design with highly rated DCS390; excellent power in testing; better-than-average runtime
Con: Tool name — 20V Max — is confusing, since this is in fact an 18-volt tool

- ✔ Good guard action
- ✔ Very good cut-line markers
- ✔ Very good bevel setting with engraved marks every 1°
- ✔ Very good blade visibility
- ✔ Very good motor-to-base stability

HILTI SCW 18-A CPC

Battery: 21.6 volts, 3.3 Ah (also available with 2.6-Ah batteries)
Rpm: 4,000
Max cut at 90° and 45°: $2\frac{1}{4}$ inches, $1\frac{11}{16}$ inches
Weight (by author): 8.60 pounds
Kit includes: tool, two batteries, charger, large fabric duffel
Web price: $460 (kit); $200 (bare tool)
Country of origin: China
Pro: High-quality features include battery fuel gauge, precise bevel quadrant, metal locking levers, and large stable base; battery stores securely in tool in safety position with no electrical connection; comes with two batteries; best runtime of any saw tested
Con: Stalled often in power testing

- ✔ Very good blade guard action
- ✔ Excellent cut-line markers
- ✔ Excellent bevel setting with engraved marks every 1°
- ✔ Very good blade visibility
- ✔ Very good motor-to-base stability

HITACHI C18DSLP4

Battery: 18 volts, 3.0 Ah
Rpm: 3,400
Max cut at 90° and 45°: $2\frac{1}{4}$ inches, $1\frac{5}{8}$ inches
Weight (by author): 7.68 pounds
Sold as bare tool; includes loose blade wrench and small rip fence
Web price: $135 (bare tool only)
Country of origin: China
Pro: Fuel gauge built into tool body; incandescent headlight; only tool with body and base attached in line with the handles for extra stability
Con: Only tool whose blade wrench doesn't store on the tool; angled edge along left side of base difficult to guide along a square or straightedge; stalled often in power testing

- ✔ Good guard action
- ✔ Excellent cut-line markers
- ✔ Poor bevel setting with engraved marks every 5°
- ✔ Very good blade visibility
- ✔ Very good motor-to-base stability

MAKITA BSS610

Battery: 18 volts, 3.0 Ah
Rpm: 3,700
Max cut at 90° and 45°: 2 1/4 inches, 1 5/8 inches
Weight (by author): 7.56 pounds
Kit includes: tool, two batteries, charger, large plastic case, small rip fence
Web price: $340 (kit); $150 (bare tool)
Country of origin: China
Pro: LED headlight; adjustable 45° bevel stop; comes with two batteries; good power in testing — slowed but never stalled
Con: No battery fuel gauge; less-than-average runtime

- ✔ Excellent guard action
- ✔ Fair cut-line markers
- ✔ Good bevel setting with raised marks every 5° and stop at 45°
- ✔ Good blade visibility
- ✔ Good motor-to-base stability

MILWAUKEE 2630-22

Battery: 18 volts, 3.0 Ah
Rpm: 3,500
Max cut at 90° and 45°: 2 1/8 inches, 1 5/8 inches
Weight (by author): 9.06 pounds
Kit includes: tool, two batteries, charger, fabric duffel, large rip fence
Web price: $370 (kit); $125 (bare tool)
Country of origin: China
Pro: High-quality features include battery fuel gauge, precise bevel quadrant, and extra-large stable base; comes with two batteries; excellent runtime; excellent power in testing — cut faster than every other cordless model
Con: Heaviest 18-volt saw tested (though 1.7 pounds lighter than the average 7 1/4-inch corded model)

- ✔ Good guard action
- ✔ Excellent cut-line markers
- ✔ Excellent bevel setting with engraved marks every 1°
- ✔ Good blade visibility
- ✔ Good motor-to-base stability

RIDGID R8651B

Battery: Fits brand's 18-volt slide-pack batteries — tested with 3.0 Ah
Rpm: 5,000
Max cut at 90° and 45°: 2 1/8 inches, 1 3/4 inches
Weight (by author): 7.82 pounds
Sold as bare tool
Web price: $100 (bare tool only)
Country of origin: China
Pro: Blade-right model operates like a standard sidewinder saw; high-quality features include battery fuel gauge, precise bevel quadrant, LED headlight with secondary grip switch
Con: Stalled almost constantly in power testing; only tool that could not complete first circuit of runtime test; less-than-average runtime

- ✔ Good guard action
- ✔ Poor cut-line markers
- ✔ Very good bevel setting with painted marks every 1° and stops at 15°, 22.5°, 30°, and 45°
- ✔ Excellent blade visibility
- ✔ Very good motor-to-base stability

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- Shrinkproof and crackproof guarantee
- Superior adhesion, flexibility and durability
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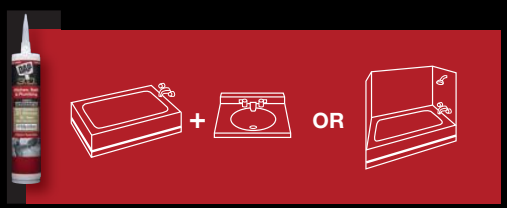
Use the chart to determine how much caulk you will need for your project. Numbers in black express how many linear feet a 12 FL. OZ. tube of caulk will fill based on the joint width and depth.

	Joint Width			
Joint Depth	⅛"	¼"	⅜"	½"
⅛"	96'	48'	36'	24'
¼"	48'	24'	18'	12'
⅜"	32'	16'	12'	8'
½"	24'	12'	9'	6'

One cartridge seals approximately



1-10.1 FL. OZ. cartridge covers approximately 56 linear feet at a 3⁄16" bead size.

For joint depths exceeding ½" deep, use DAP® Caulk Backer Rod.

How much paint do I need?

1 gallon of paint = approx. 350–400 sq. ft. of primed drywall.

How to paint like a pro

1. Determine how much paint you need, and have mixed at one time to ensure color consistency. One gallon covers approx. 350–400 sq. ft. of primed drywall.
2. Wipe down walls, use painter's tape to mask molding, remove switch plates and hardware, and use drop cloths to cover furniture and floors.
3. Keep doors and windows open to allow for ventilation while applying products.
4. Apply appropriate primer where necessary. Use DAP® spackling products to fill holes, and use a paintable caulk such as DAP® 3.0™ Window, Door, Trim & Siding Sealant to seal gaps.
5. Apply paint using good quality rollers and brushes. Following manufacturer's directions, store remaining paint in original container.
6. Clean brushes & rollers. Dispose of paint following local recycling center hazardous waste guidelines.

Getting Oil Results With Waterborne Finishes

Premium latex paints are easier to work with than traditional oils and can look just as good

by Scott Burt

Most experienced painters know about "oil rage," a psychological phenomenon that can occur after days and weeks of dealing with oil-based paint on a long job. At times I've literally had to walk away because the process became so stressful.

However, now that traditional oil-based paints are slowly bowing out of the marketplace — mostly because of tougher VOC regulations — there is one trait I'll miss about them: their remarkable consistency in finish. Whether brushed, rolled, or sprayed, they level flawlessly, leaving behind a beautiful hard-cured film with a soft sheen. Fortunately, very similar results are possible with today's premium water-based paints, which aren't the shiny, plastic-looking latexes of 10 or even five years ago. Now the custom builders and high-end clients I work for can't tell the difference between my oil-based and water-based finishes.

I like water-based paints because they're healthier for me, my employees, my clients, and the environment. They also have better color retention — they don't fade over time like oils — and they can better handle seasonal wood movement. But we've had to change the way we approach a typical painting job to get the most out of these products, by adopting new techniques and using different brushes, rollers, and sprayers. It wasn't easy giving up my badger-hair brush, but it was the only way I was going to get a satisfying finish on poplar with waterbornes.

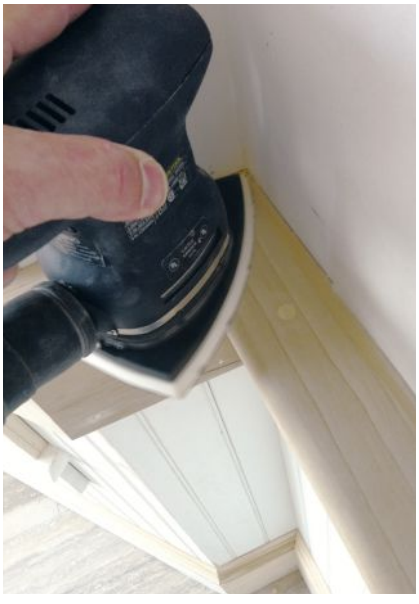


Figure 1. The author sands new trimwork with 120-grit paper before filling holes and priming. Good dust collection streamlines the process.

Oil and Water

Waterborne paints don't contain the VOC-producing chemicals that promote penetration in oil-based paints; instead, they're designed to bind to the substrate's surface. The water in the paint is simply a vehicle that delivers the binders, resins, and pigments and then quickly evaporates, leaving those ingredients to tack, cure, and harden to form a sheen.

If a coating doesn't penetrate wood grain, it has to be able to bind to it like crazy, and the new waterbornes do that in spades. Crusty waterborne films are so sticky they can take the bristles right out of a brush during cleanup. As a result, synthetic bristles are now designed so that they release paint better during both application and cleanup, and the epoxies holding the bristles to the ferrule band are stronger.

Because waterborne paints dry significantly faster than their oil-based counterparts, it's harder to keep a wet edge and lay down an even coat. And when wet paint is pulled onto an already-dry surface, unevenness in the sheen of the finish coat — or flashing — can occur.

Complicating matters, waterbornes are much more sensitive than oils to temperature and humidity during application. Keeping a wet edge becomes even trickier when it's warmer than 77°F or the relative humidity is less than 50 percent (the conditions under which the drying times for most paints are calculated). We much prefer painting on cool and rainy days, when drying times are slower and it's easier to get a good finish.

Because these differences may be overlooked, waterborne finishes are often incorrectly applied. One of the first things we learned is that you can't use the same brushing techniques you use with oil. So what do we do when the paint is faster than we are? It's counterintuitive, but we slow down. These paints are unforgiving and will win if you try to race them. Instead of trying to keep an entire piece wet while working with it, you need to break it down into workable sections.

If we're painting a door, for example, we paint the panels, then the rails, then the stiles, working the entire piece from the inside out and from top to bottom. To avoid flashing where two elements join, we have to be precise and treat each element as a separate component, since even a small overlap will be noticeable. On the other hand, we can stop painting at a logical break in the sequence, take lunch, and resume painting later without affecting the final finish.

Once laid out and leveled, a waterborne paint quickly dries to the touch as it cures; it won't sit there in a clammy state collecting dust for 24 hours the way oil paints will. Dust contamination can be a real problem when painting trim and cabinets, where finish quality is critical; using waterborne paints reduces this risk considerably.

Faster drying times, of course, make it easier to meet project schedules. In the past, when we were building entirely oil-based three- and four-coat systems, we were limited in the number of steps we could complete in a single day. Now we

The Moisture Content Myth

One of the biggest myths about waterborne primers and paints is that they mess with the moisture content of the wood they are put on. But the product is designed to bind to the surface, not penetrate it; the water quickly evaporates into the atmosphere once it has delivered the paint ingredients to the substrate. To demonstrate this, check the moisture content of a piece of raw wood with a moisture meter, then take a cup of water and brush it onto the surface. This may raise the grain a little bit, but if you check the moisture content again, you'll see it hasn't changed. Wood has to be either submerged or under constant exposure to high moisture levels to significantly change its moisture content.

can take raw trim through several stages — filling nail holes, priming, light sanding, caulking, and even applying the first coat — in a single day. And we can do so while working closer to the carpenters on the project.

Prep

With newly installed carpentry, we start by finish-sanding with 120-grit paper to smooth out joints, ease edges, and remove mill glaze (**see Figure 1**). We used to spend a lot of time hand-sanding, but this phase of the job is a lot faster and cleaner now that we use Festool gear with dust extraction (888/337-8600, festoolusa.com) for 90 percent of our prep and between-coat sanding.

The Festool finish sander we use most often — the DTS 400 — has a triangular pad that makes it easy to get into corners. We also use Festool's Granat paper, a fast-cutting aluminum oxide and ceramic hybrid that's made for sanding painted surfaces and doesn't load up or leave swirls. For detailed profiles like crowns, coves, and scotia moldings, we use Festool's LS 130 linear sander, which can be fitted with different sanding-pad profiles. We have a CT 26 vacuum, which is HEPA-rated, so we can also use it on our occasional RRP jobs.

After initial sanding, we fill the fastener holes with Zar Wood Patch (800/845-5227, ugl.com), a heavy-bodied latex filler, puttying the holes until they are overfilled. After an hour or two of drying time, we come back and sand again with 120- or 150-grit paper.

Before we switched to Festool equipment, we filled holes with lightweight vinyl spackle and took extra time in the filling to try to minimize tedious hand-sanding. The process was still hard on the hands, though, especially on big jobs, where eight hours of sanding would leave us covered with a sickening amount of dust. Now that we're power-sanding with dust extraction, we can apply fillers that dry faster and harder than the lightweight fillers yet

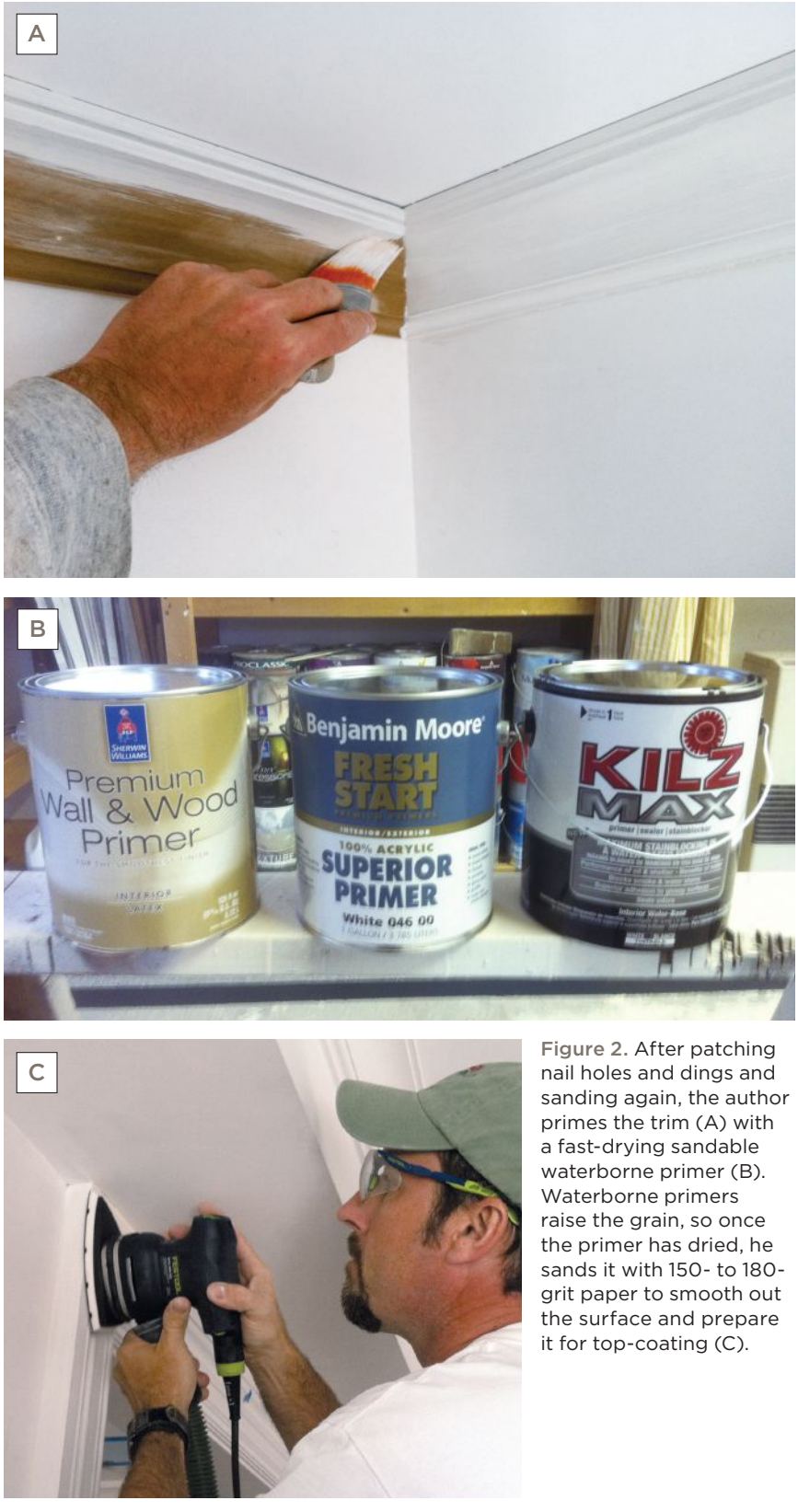


Figure 2. After patching nail holes and dings and sanding again, the author primes the trim (A) with a fast-drying sandable waterborne primer (B). Waterborne primers raise the grain, so once the primer has dried, he sands it with 150- to 180-grit paper to smooth out the surface and prepare it for top-coating (C).

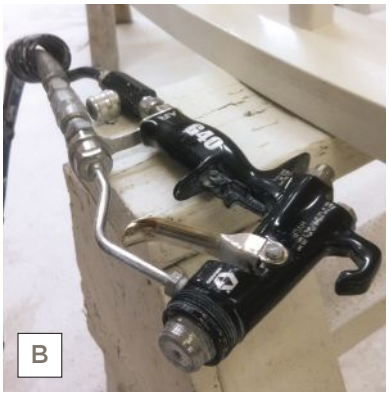


Figure 3. For production spraying of heavy-bodied waterborne trim paints, the author uses Graco's Finish Pro 395 (A) air-assisted airless sprayer. The G40 gun that comes with the Graco rig (B) is HVLP-rated; it minimizes overspray and gives good control over the fan pattern at the tip of the gun (C).

finish up a lot faster, without giving us sore arms or a head-to-foot coating of dust.

Though a small percentage of them will dimple, usually we try to fill nail holes before priming. The dimpled holes are easy to spot once the primer dries, and can be skim-coated with quick-drying spackle. Before painting, we lightly sand these holes smooth with 180- or 220-grit paper.

Priming

In interior work, the primer's function is to seal the grain and bond well to the wood substrate (**Figure 2, previous page**). It also provides a sandable base coat so that the top coat can glide over it with little resistance, which is critical with faster-drying paints. Some manufacturers offer hybrid water-based paint/primers, but we don't use them because they don't eliminate the need for multiple top coats on most projects.

To speed up our between-coat cosmetic work and our finish sequence, we generally use fast-drying water-based primers when working with water-based paints (though water-based top coats can also be used over thick-bodied — and slow-drying — alkyd primers). Two of our favorite primer-and-paint combinations for trimwork are Sherwin-Williams Wall & Wood primer top-coated with S-W Cashmere acrylic latex in a medium-luster finish (800/474-3794, sherwin-williams.com), and Benjamin Moore 046 Fresh Start all-purpose primer top-coated with BM's 314 Waterborne Satin Impervo (866/708-9180, benjaminmoore.com).

Most all-purpose primers don't block stains well, so if there are knots or stains from tannin or grain bleeding, we seal them up first with three spot-coats of Zinsser BIN shellac-based primer (847/367-7700, rustoleum.com). We apply the BIN with a throwaway chip brush, lightly sand after the third coat, then brush on (or sometimes spray) the primer.

Since water-based primers typically raise the grain of the wood slightly, it's

important to finish-sand after the prime coat has dried. We use 150- to 180-grit paper to remove grain and any visible brush strokes or other imperfections. If we're sanding by hand, we vacuum and wipe the trim down with a damp cloth; if we're sanding with our Festool equipment, we can then go straight to paint.

With preprimed material, some spot priming is usually required to feather back any factory primer that was sanded out during prep. We also inspect and correct cosmetic flaws exposed by the prime coat, such as dimpled fastener holes. Then we caulk gaps with DAP Alex Plus (800/543-3840, dap.com), an acrylic latex caulk fortified with just enough silicone to give it flex, so it resists cracking.

Top Coat

When we were working with oil-based paints, we would shut down an entire floor of a house with plastic Zip Walls during the final coat to keep other subcontractors out and protect against dust, which can continue to settle on the paint for as long as 24 hours after the final coat has been applied. Even with that protection, we'd still usually have to buff the finish a little. Since water-based paints dry so quickly, we don't mind when other subs are working in the next room, even if they're cutting trim or sanding drywall, as long as we can seal off our work area for an hour or so.

As with oils, we sometimes brush, sometimes spray, and sometimes roll water-based top coats, depending on the project.

Brushing. Using the right brush to minimize the number of strokes and bristle marks in the finish is one of the keys to success with waterborne paints. "Lay it out clean, then leave it" is the best advice. Natural China bristle brushes will shed and fall apart if you try to use them with water-based paints. For that reason, we've switched to the new generation of synthetic filament brushes, which are specifically designed to pick up and release heavier-bodied, faster-drying waterborne primers and paints, including low-VOC formulas.

For trimwork, we've had good luck with soft-bristled Purdy Nylox Elasco (800/547-0780, purdy.com) and Wooster Chinex FTP (800/392-7246, woosterbrush.com) brushes. Unlike cheaper versions, which have stiff, hollow, uniformly sized filaments, quality brushes have solid (for strength) round filaments that taper from the base to the tip, mimicking the shape and action of natural bristles. While a cheap brush is typically assembled and then trimmed to size, a good brush receives a blend of filament lengths and tapers (tailored to how the brush will be used) before it is assembled. Since coarse tips tend to leave more prominent brush marks, the filament tips on a good brush are usually flagged (sliced) or tipped (narrowed to a point). A quality brush is also easier to clean and rebounds well from daily use, despite getting caked up at times by the fast-drying paints we work with.

When it's hot or very dry, we use Floetrol (954/929-3905, owatrol.com), a paint additive that extends open time. We follow the manufacturer's thinning recommendations, adding Floetrol until the paint doesn't drag, which makes it easier to lay out an even coat that levels out nicely.

Spraying. High-volume low-pressure (HVLP) rigs are great for oil-based trim finish spraying, but many don't work as well with the heavier viscosity and temperature sensitivity of water-based paints. Instead, we use air-assisted airless sprayers — either our Graco Finish Pro 395 (800/334-6955, graco.com) or our Titan MultiFinish 440 (800/526-5362, titantool.com). These rigs are essentially traditional airless piston pumps except that they're also powered by an air compressor and have a separate air hose that mixes air with the paint where it emerges from the tip. With an air-assisted airless sprayer, the fan of paint hits the surface at significantly lower pressures than with conventional airless sprayers, greatly reducing

Figure 4. Graco's ProShot 18-volt cordless sprayer works well with waterborne primers and paints and is easy to clean afterward. It holds just a quart, though, so the author reserves it for smaller jobs.

Figure 5. Whether brushing, spraying, or rolling, the author strains all waterbornes — even freshly opened gallons — before using them.

Figure 6. Waterborne trim paints tack up in less than an hour, reducing the risk of dust contamination (A). When properly applied, they produce a smooth cabinet-grade finish with a satin sheen (B, C).

overspray and bounceback. Both our rigs came equipped with high-transfer efficiency HVLP-rated guns, which enhance the performance of these systems (**Figure 3, page 52**).

On smaller jobs or when a truly fine HVLP finish is required, we use our Apollo 1050VR HVLP sprayer. This unit has a five-stage turbine for atomizing higher-viscosity coatings like latex. And to spray a few doors or a stack of shelving, we use our Graco 18-volt ProShot cordless sprayer, which lays down a very nice finish and cleans up easily afterward (**Figure 4, previous page**).

Sprayer manufacturers often recommend additives to reduce wear on sprayer pumps, guns, and tips. Penetrol is the preferred lubricant for oil paints, but for waterbornes (which are more abrasive) we use Floetrol or XIM Latex X-Tender (800/262-8469, ximbonder.com). Before application, we strain our "slicked-up" mixture through a net (**Figure 5, previous page**). We also set aside a pour-off can where trim paint batches go at the end of the day; when the can gets full, we strain the paint again and use it as a main batch.

One of the tricks when spraying waterbornes is not to get greedy and spray too much at once. We use a "tack coat" approach, where we keep building thin layers with multiple passes of the gun. This results in the best adhesion, and if done in workable sequences where no layer dries before the next is added, all the layers lay down together as a single even coat.

Rolling. When spraying is impractical, we often roll larger surfaces (such as cabinet or entry-door panels) using foam or short-nap velour rollers. Rolled waterbornes can be backbrushed, but it's not necessary. Backbrushing changes the texture of the finish, so we either roll and backbrush or roll only, but never both.

Final Coat

After we've applied the first coat, we lightly sand everything with 180- to 220-grit paper. On those rare occasions when we're not using our Festool equipment, we vacuum again and wipe down the finish with a damp tack cloth. (We're always careful to follow the manufacturer's recommended drying times before sanding and recoating.)

If we've masked off, we remove the tape as soon as possible, moving slowly and evenly as we pull it at an angle away from the finish edge. If the paint finish is particularly heavy, scoring with a sharp blade can help, but this is risky business in inexperienced hands. For masking, we use ProMask Plus (800/474-8273, intertapepolymer.com) and FrogTape (877/376-8273, frogtape.com) painter's tape.

Waterborne satins can be buffed quite effectively to smooth out the finish, but we seldom do this anymore (**Figure 6**). The process isn't as necessary as it was with oil-based paints, because of the lower risk of airborne contamination.

Scott Burt *owns and operates Topcoat Finishes in Jericho, Vt.*

Strengthening an Old Roof

by Gary Morrison

New LVL framing straightens and stiffens an underbuilt timber frame

As a remodeler on Boston's North Shore, I work on my share of older homes. But few are as old as one of my recent projects, which involved extensive structural repairs to a farmhouse originally built in 1723, with a "new" wing off the back dating to the early 1800s (**see Figure 1, next page**).

One fairly minor but challenging part of the job called for beefing up the roof framing in the original attic. It consisted of hand-hewn 6x6 rafters on about 8-foot centers, with unevenly sized but much smaller purlins running the width of each bay and mortised into the rafters on either side. The original pine roof boards ran vertically from the ridge to the eaves, and were fastened to the purlins with wrought-iron nails.

Sistered Rafters for Strong Connections

There was little sign of rot or insect damage, and the rafters were straight and in good condition. The purlins, though, were another story: Too widely spaced and obviously undersized for the span, they were sagging by an inch and a half or more at their midpoints. After a little head-scratching, I worked out a method of adding some new LVL purlins without disturbing the relatively new architectural shingle roof or tearing out any of the historic original framing or boards.

Rather than trying to fasten the new purlins directly to the uneven hand-hewn framing, we sistered the existing rafters with 2-inch by 7¼-inch LVLs so we could easily tie everything together with joist

Figure 1. Though still intact after nearly 300 years, the framing of the gable roof needed reinforcement to eliminate a long-term sag of the roof deck between the widely spaced rafters.

Figure 2. The original undersized purlins were small-dimensioned pieces of timber hewn flat on two sides, with some of the bark left on. Their ends were carefully cut free of the rafters, creating space to insert LVL sisters.

hangers. Fitting the sisters was fairly slow going, because we had to cut both ends of each of the original purlins free of the rafters, using a short LVL offcut as a Sawzall blade guide (**Figure 2**).

Once we'd chopped out the narrow pieces of waste between the cut ends and the rafter, we slid the LVL into position, with its upper edge just touching the underside of the roof sheathing and the lower edge extending an inch or so below the bottom of the rafter. We fastened it to the rafter with 6-inch LedgerLok screws placed about 12 inches apart in a staggered pattern. Now that they were disconnected from the rafters, the original purlins no longer carried any of the roof loads, but merely functioned as battens to hold the roof boards in the same plane. I had worried that this might worsen the sag in the boards — at least until we could get the new purlins in place — but a few quick measurements put this fear to rest. (Fortunately it was mid-summer, so there were no unexpected snow loads to worry about.)

New Purlins and a Straighter Roof

After sistering each side-by-side rafter pair, we fitted new LVL purlins between them on approximately 2-foot centers, adjusting the placement as needed to avoid the original purlins. Space in the blazing hot attic was tight, making this an awkward task. Once each new purlin was in place, we used a pair of bottle jacks to drive it home just tightly enough to overcome the sag in the original boards (**Figure 3**). We tacked the purlins in position with a couple of nails before fastening them permanently with joist hangers. (Although conventional framing lumber would likely have been strong enough and would certainly have saved some money, at this point I was glad I'd chosen to play it safe with LVLs: Their uniform size and absence of crown made it much easier to judge when things were flat and straight.)

Figure 3. Bottle jacks and scraps of blocking were used to press the new LVL purlins against the roof boards (above left). A level cut at the base of each LVL sister sits flat against the existing timber plate. Working down the roof one rafter bay at a time, the crew temporarily secured each new purlin with a single nail at each end (above) before fastening the assembly permanently with joist hangers (left).

Since there was no way to gain access to the roof deck from above without tearing off the existing roof, we couldn't drive fasteners down through the roof boards and into the new purlins. I knew future snow loads would tend to push the boards more tightly against the framing, so I considered going without any fasteners at all in this area. In the end, though, caution won out. I came up with an indirect fastening method that involved screwing 1½-inch by 1½-inch lumber strips to the side of each LVL, with additional screws — sized to stop short of the roofing underlayment when driven home — passing through them from below and into the roof boards (**Figure 4**).

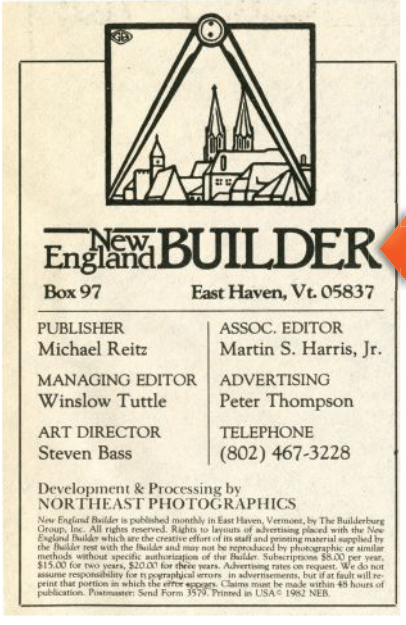
Figure 4. A 1½-inch by 1½-inch nailer fastened alternately to the purlins and the roof boards stiffens the assembly against racking without penetrating the existing roof shingles.

Gary Morrison *is a residential remodeler in Beverly, Mass.*

What Works, What Doesn't, and Why

30 Years of *JLC*

Founder Mike Reitz's vision was for a publication that provided straight talk, concise information, and a minimum of self-promotion and fluff. Here's a look back at all the ways *JLC* delivered.



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1982

- First issue of *New England Builder (NEB)* arrives – eight b&w pages of tabloid newsprint
- Vinyl windows nowhere to be found in *NEB* window market coverage
- OSB declared "America's most exciting new building material" by advertiser
- A plastic handle on a circular saw? Cheap junk!
- *NEB* takes on energy issues, like moisture problems from increased insulation and the role of roof ventilation
- Truss uplift explained
- Reader letter describes *NEB* as "meaty" but not "pretty"

'83

- *NEB* columnist recommends "giant" 5-MB hard drive (only $2,500!) and green- or amber-screened "monitor"
- Poorly installed vapor barriers spawning mold and lawsuits
- Tyvek ad claims 33% reduction in heat loss
- Health risks are associated with pressure-treated plywood
- *NEB* report on new fiberglass asphalt shingles concludes that they are cheaper than organic, but you get what you pay for

'84

- Wood I-beams emerge as alternative to lumber joists
- Canada Housing reports 10,000 cases of moisture problems in existing housing stock
- Ice & Water Shield self-adhering underlayment membrane debuts in lumberyards
- Typical purchase of first-time home buyer: 1,650-square-foot existing home for $65,642
- Annual remodeling spending: $63 billion

- Insurance costs rise, some builders dropped
- Hardiplank siding makes U.S. debut
- Owens Corning patents pink for its insulation
- BOCA bans lead solder in supply plumbing; federal ban to take effect in 1988
- Experts report problems with wood siding installed over rigid foam, ants chewing through foam, reduced R-values in aged foam
- Competitors challenge DuPont Corian's dominance in solid surfacing

- OSHA requires material hazard warnings; wood exempted because its hazards are "well-known"
- Chlordane banned — termites rejoice
- Reader praises vinyl replacement windows as energy-efficient and maintenance free
- 87% of builders using pneumatic nailers; 83% using cordless tools
- Research report predicts severe worker shortage by 2000
- Impact fees add $18,000 to new-home cost in California
- Annual remodeling spending: $100 billion
- *NEB* gives Impulse cordless nailer the thumbs up, despite nearly $900 price tag

- Borates emerge as nontoxic alternative pest treatment
- Mac users chafe at perceived PC bias in *JLC*
- Licensing required for Chicago remodelers
- Author says code is wrong: Don't vent the crawlspace
- Radon regs in Jersey; asbestos encapsulation better than removal
- Insulating concrete forms appear
- Hardboard-siding feature sparks industry-association defense
- Lead-safe paint removal featured
- Recession a reality in New England
- CFC-free expandable sealing foams available

'85 '86 '87 '88 '89 '90

- Phenolic foam insulation has high R-value, but crumbles easily
- Power nailers promise to save 25% to 50% nailing time
- We're still waiting: GE forecasts Smart Home controls in 50% of all homes by 1990
- Consumer survey ranks energy efficiency as #1 consideration when buying a home
- Is solar energy finally catching on?
- Reagan administration ends solar tax credits
- Debate on airtight drywall, poly vapor barriers rages for months in *Letters*

- A young Joe Lstiburek recommends an air space behind siding to prevent peeling paint (not yet called "rainscreen siding")
- Lumber quality declines, engineered lumber products gain ground
- More moisture problems, this time in tight houses and crawlspaces
- Wood roofs banned in Southern California
- Low-flow toilets appear
- Marvin introduces argon gas; vinyl windows capture 25% of replacement market
- "What good are computers?" builder asks
- Congress contemplates removing lead paint from public housing

- S&L collapses, sky does not fall
- Low-VOC paint regs spread east from California
- Harvesting younger trees leads to more lumber defects
- Letters raise concerns about safety of CCA-treated wood
- Hitachi creates new category with first sliding-compound miter saw
- Reader recommends self-sticking "rubberized asphalt" for flashing
- Most expensive housing: Orange County, Calif., where median house price is $182,364; national median: $120,000
- Spray cellulose goes mainstream
- Reader survey finds that average owner salaries range from $10 an hour for small rural businesses to $30 an hour or more for larger urban or suburban contractors; the median wage for a lead carpenter, $14.50 an hour
- Builders report more moisture problems as houses get tighter
- Siding stats put plywood on top, followed by hardboard, brick, and vinyl

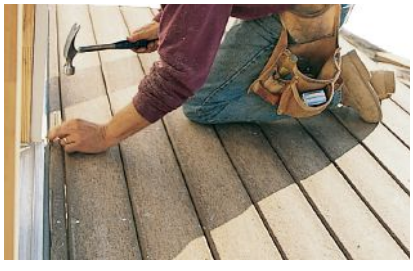
- Crawlspace venting debate continues; unvented cathedral roof debate heats up
- Structural design values of dimension lumber downgraded
- Duct tape no longer recommended for sealing ducts
- BOCA adopts 7-11 stair rule, sky does not fall
- Terminix says use of foundation foam voids its warranty
- ▼ First "sick building syndrome" suit settled out of court

- Child scalding lawsuit highlights temperature-balancing faucet controls
- Lumber price takes roller-coaster ride
- OSHA announces worker protections from exposure to lead paint
- Finger-jointed studs replace crooked 2x4s
- Panasonic quiet fans gain U.S. foothold
- Nails favored over staples for shingles, says Asphalt Roofing Manufacturers Association
- Floods in Midwest make federal disaster areas of 534 counties in nine states
- Desperate builders hiring unskilled workers
- ▼ New LSL rim board comes ripped to width, saves labor

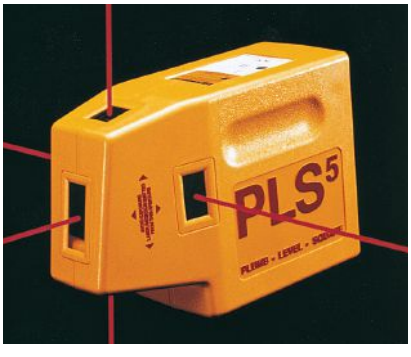
- OSHA issues new fall-protection standard, plans to focus on smaller job sites
- Congress cuts OSHA budget 15%
- Japan looks to U.S. builders, wood-frame construction, after Kobe quake
- World Wide Web keyword search on "construction" turns up 15 hits
- Plastic vent pipes fail
- CABO adopts EPA radon standard, allows shallow frost-protected foundations
- Vinyl the most common siding choice
- Energy-efficient lighting law takes effect
- ▼ 14.4-volt tools are state of the art

'91 '92 '93 '94 '95 '96

- ▲ Hurricane Andrew is most expensive natural disaster in U.S. history
- "Green" building trend spreads
- Lumber prices reach record highs
- Teardowns become common on West Coast
- "Home Depot or Home Despot?" remodelers ask
- EIFS performance challenged; industry association blames installers
- Icynene insulation comes down from Canada
- Construction Master III features calculation of rafter lengths, angles

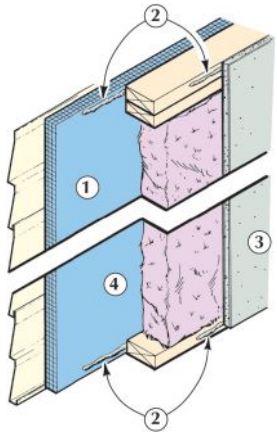


- ▲ Trex leads way in new plastic-wood composite market
- Taping windows, doors, and sheathing seams is cheaper than wrapping the whole house, but what about the drainage plane?
- Low-flow legislation takes effect, plunger sales expected to rise
- Engineers say structural sheathing could have prevented damage in L.A. quake
- *JLC* finds most asphalt shingles do not meet ASTM tear standards
- Masonite pulls hardboard from Fla.
- Denver HBA & OSHA negotiate common-sense safety rules
- ACQ Preserve, arsenic-free PT wood, comes to market
- How tight is too tight?



- ▲ Self-leveling laser shines beams along x, y, and z axes
- EIFS failures hit North Carolina
- USG stops making barrier EIFS, leaves water-managed system on market
- L-P settles Inner Seal siding class-action suit
- More hardboard suits brought against several brands
- OSHA hits 22-year low in inspections; construction injuries at all-time low
- OSB performs as well as plywood — if it stays dry
- Faucet makers remove lead from brass fittings for California market

- Liability insurance cost rises; largest carrier drops EIFS coverage
- Housewrap research finds potential problems behind wood siding
- Construction defects litigation awards millions to owners of poorly built California condos
- Environmental groups call for phase-out of CCA-treated wood
- Potable PEX plumbing gains acceptance
- ▼ Mixed-climate moisture control is complicated, drying potential to the interior/exterior studied



- Industry braces for Y2K
- Amid downturn warnings, construction booms
- Contractors responsible for reporting lead hazards to clients, says Congress
- Cat-V is wiring of the future, experts say
- EIFS industry association recommends use of water-managed systems
- Stanley introduces FatMax tape rule
- *Time* magazine includes vinyl siding in "100 Worst Ideas of the Century"
- Fast pace of construction, combined with unskilled labor, blamed for record 93 deaths of construction workers in California
- NARI predicts remodeling to hit $135 billion
- ▼ Formosan termites arrive from China

Milestones

1983 Mortgage rates drop to 10% from 1982 high of more than 15%

1984 Arsonist torches office next door to *NEB*; *NEB*'s circulation list reduced to ash; plea to readers prompts 200 farsighted contractors to pay $100 for lifetime subscriptions

1986 Fragile solar industry decimated by end of tax credits

1986 *NEB* adds tagline: "The Journal of Light Construction"

1989 *NEB* changes name to *The Journal of Light Construction*

1989 Loma Prieta earthquake strikes south of San Francisco

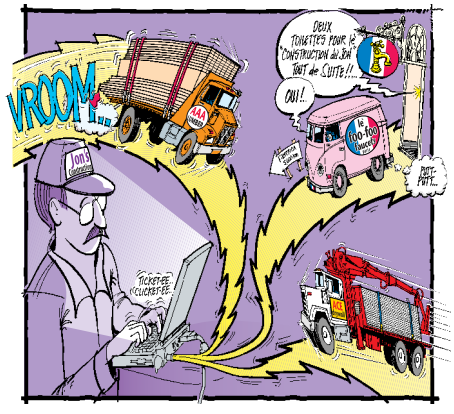
1990 Seven states require low-flows in new construction

1991 Fires sweep Oakland, Calif.

'97 '98 '99 '00 '01

- ▲ OSHA approves Western-style hard hats
- Cowboy is only job worse than construction, says survey of 10,000 high schoolers
- Toxic mold plagues homeowners, delights media and litigators
- Fiber-cement siding enters mainstream
- Whole-house ICF construction featured
- Housewrap-versus-felt debate heats up
- EIFS manufacturer agrees to $20 million settlement in North Carolina; more to follow
- Drywall dust declared hazardous
- Humorist Dave Barry spawns search for the best low-flow bowl
- As-is ruling in California protects builders from latent defects
- CABO limits rigid foam in ground contact

- Y2K arrives, sky does not fall
- I-joists claim 30% of floor-framing market; steel framing grows
- Low-flow toilets improving, says study of U.S. households
- Americans drive to Canada to import outlawed big-flush toilets
- Crawlspaces once again in *Letters* debate
- Some GCs use temp workers to address labor shortage
- California Poria fungus seems straight out of Hollywood
- Cement-bonded roof-shingle failures reported
- NFPA declines to work with ICC on uniform codes
- AdvanTech OSB subflooring gains acceptance
- Average price of home in Palo Alto: $974,237

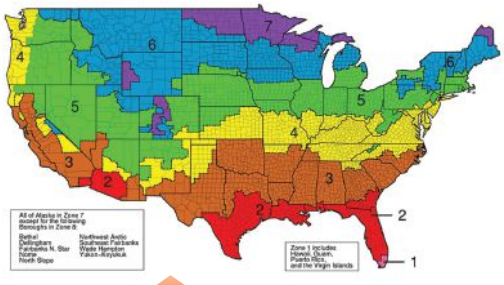


- ▲ 75% using e-mail and Internet in their business, says reader survey
- Wood-industry observers cite reasons to expect lumber quality improvements
- Lumber prices hit bottom
- Maryland becomes 39th state to require home-builder licensing
- CCA phase-out announced
- Fiber-cement cutting tools appear, dust and dull blades a thing of the past
- Mold lawsuits bankrupt big builder; "stachybotrys" becomes household word
- GFCI receptacles failing widely

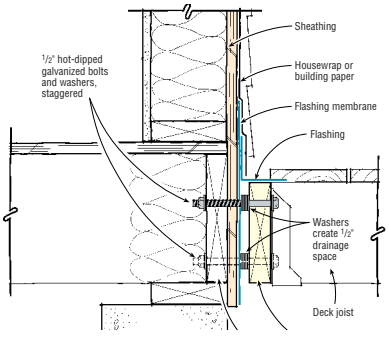
- 9/11 ripple effects still felt throughout economy
- Survey says home buyers value timely completion more than quality of workmanship and materials
- Americans spend 9.8 hours a week online
- Deck disasters spotlight faulty connections
- Still waiting: Smart wiring grows but no boom
- NAHB economist argues national housing bubble is a practical impossibility
- Bob the Builder replaces Barney the purple dinosaur as cartoon role model for many children
- ▼ Cellular PVC trim hits lumberyards

- Construction employment growth outpaces U.S. job growth base rate 2-to-1
- San Diego County mandates fire-resistant envelope, 100-foot brush-free buffer zone around building
- New Jersey proposes a "McMansion tax" targeting high-end real estate transactions
- U.S. cement shortage due to China's Three Gorges Dam project and prep for Olympics
- Storm-resistant window code expands along eastern seaboard
- Institute of Medicine finds no evidence that mold causes cancer, fatigue, or neurological problems
- Hurricanes Charley, Frances, Ivan, and Jeanne and Tropical Storm Bonnie make landfall in Florida
- "Success With Spanish-Speaking Employees" prompts heated debate in *Letters*

- Lithium-ion technology marks new cordless era
- FEMA tells New Orleans to raise houses 3 feet
- Mississippi raises home-repair fraud to a felony
- U.S. Home Construction Index down 40%+ compared to a year earlier
- Texas declared moldiest state in the country, followed by Florida, Oklahoma, and South Carolina
- Katrina water damage not covered by insurance, judge rules
- PA court strikes down ordinance requiring fire sprinklers in all new-construction and renovation projects
- Insurance companies raise rates, deductibles for coastal windstorm policies
- Severe springtime storms and tornadoes throughout U.S. Midwest; Tennessee Valley hit hardest
- Asphalt shingle life debated in *Letters;* color more important factor than ventilation
- ▼ IECC releases new, eight-zone climate map



'02 '03 '04 '05 '06 '07



- ▲ Multiple fatal deck collapses occur; Virginia Tech engineers investigate deck-ledger attachment failures
- Wood-treatment substitutes found to rapidly corrode steel connectors
- Coastal builders can't find windows that pass code's new impact tests
- 401 tornados reported from May 4 to May 11, with 48 deaths
- Study concludes that escalating claims led carriers to dump CGL
- Wildfires in California burn 750,000 acres, destroy 3,645 homes, kill 22 people
- APA tornado report recommends rafter-to-plate connectors, closer anchor-bolt spacing, stronger walls at garage doors

- ▲ Hurricane Katrina devastates parts of Louisiana, Mississippi, and Alabama, capping five-storm hurricane season that is most active in history
- Virginia Tech tests rail-post connections for wooden decks
- Harvard study predicts housing boom lasting into the next decade
- California court rules immigration status does not affect workers' comp
- Triple-glazed window debuts in *Products*
- IRC allows unvented attics; asphalt roofing manufacturers are opposed
- California's Title 24 curtails recessed incandescent fixtures in kitchens, track lighting, and low-voltage cable lighting
- Low-VOC regs kick in

- ▲ Housing sector slashes jobs; foreclosures rise 90% from previous year
- "I don't want to be too sophisticated here, but '07 is going to suck, all 12 months" — big builder CEO
- Credit crunch more serious threat to U.S. economy than terrorism
- Dow Jones closes above 14,000 for first time July 19
- "Renovation parties" save homeowners money, but alcohol and ineptitude create myriad problems
- AFCIs required by NEC
- Energy bill requires 25% to 30% less energy use in new light bulbs by 2014
- USGBC releases LEED for homes
- NAHB and ICC jointly develop first residential green building code

- October 11, 2008: Sky falls. Dow Jones has worst week in 112-year history, with $8.4 trillion in paper losses from market high
- Arizona, Tennessee laws penalize companies for knowingly employing undocumented workers
- U.S. gas prices peak in July at $4.11, drop to $1.72 in November
- Atlanta HBA offers counseling to members dealing with stress caused by extended building slump
- Granite countertops may emit radon
- Recession declared retroactively to December 2007
- IRC adopts residential-sprinkler requirement
- EPA publishes long-awaited Lead Renovation, Repair, and Painting (RRP) rule

- EPA delays enforcement of RRP, waffles on HEPA vacuum specs
- "Cash for Caulkers" (Home Star) bill passes House, dies on way to Senate
- Last-minute Senate amendment to Obamacare would penalize small construction companies — sky may fall but not yet
- Carpentry jobs decline 17%, 1.3 million jobs lost
- $8,000 first-time home-buyer tax credit ends
- SawStop's flesh-detecting technology at center of injury lawsuit; table-saw industry rattled
- State legislators splash water on residential-sprinkler codes
- Stimulus energy tax credits end
- *JLC* author uses infrared camera to find moisture problems as well as energy leaks

Milestones

1994 *JLC* shrinks, adds color and semi-gloss paper

1995 *JLC* Live conference and expo launches in Cambridge, Mass., hotel

1996 International Code Council forms, first step toward a unified code

1996 *JLC* launches online forum

2000 International Code published

2004 ASHRAE publishes IAQ standard

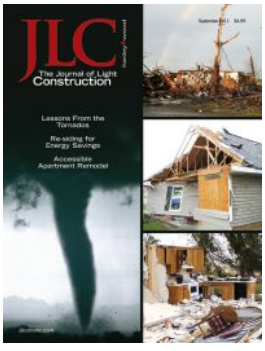
2005 *The Journal of Light Construction* logo changes to *JLC*

2007 1.8% drop in median existing home price marks first decline in 40 years

2010 There's an app for that

'08 '09 '10 '11 '12

- Home-performance contracting goes mainstream
- Chinese drywall implicated in sick-building syndrome, lawsuits heat up
- Stimulus package promotes energy-efficiency of existing homes
- IECC reduces new home's energy use 12% to 20% from 2006 levels
- NAHB membership declines from a peak of 256,000 in May 2007 to 190,000 in August 2009
- Dow Jones falls to 6,440 in March; rallies to 8,500 by May



- Tornado devastates Joplin, Mo., kills 158
- OSHA reverts to more restrictive fall protection standard — sky falls but is saved by harness
- Widespread low-flow toilet adoption leads to sludge buildup, foul odors in San Francisco
- U.S. household energy use is same as 30 years ago, despite increased energy efficiency
- YouTube leads EPA to cite first RRP violator
- EPA abandons independent testing in RRP lead-clearance requirement
- Consumer Product Safety Commission considers requiring SawStop-type safety devices on all table saws
- New code requirements for tornado safe rooms kick in as demand spikes

- 1,100-mile-wide Hurricane Sandy affects 24 U.S. states; damage estimated at $62 billion
- Harvard forecasts sharp upturn in remodeling activity in 4Q 2012
- Randyslist.com turns tables on Angie's List by rating clients
- Gen-Yers become larger buying group than their parents
- With 3 billion views a day, YouTube emerges as marketing tool for remodelers
- RRP opt-out clause debated
- Contractor quits home-performance training, convinced clients will choose Disney World vacation over insulating the attic
- Home Depot's 3Q gains hint at housing-market recovery, though the company closes all stores in China
- NEC expands AFCI requirements to include bedroom circuits of existing dwellings

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The Blueprint for Safety: Wind Mitigation Course on Hanley Wood University

Hanley Wood University announces the launch of a new online course, The Blueprint for Safety: Wind Mitigation, from the International Code Council (ICC). Developed to assist in all steps/codes for properly retrofitting an existing home to prevent wind damage, this course details critical home areas that should be evaluated and makes appropriate code-based recommendations for critical area retrofits. It also identifies ICC codes and best practices related to those recommendations.

The Blueprint for Safety: Wind Mitigation is offered at hanleywooduniversity.com. The course fee is $99 and includes course content, knowledge questions, interactive exercises, and a final exam.

Enroll today at http://tinyurl.com/hwu-wind

Products | by Tom O'Brien

Copper Tub. The *Aurora* freestanding soaking tub is made of 16-gauge recycled copper that's been hand-hammered for a distressed appearance. The antique finish shown in the photo is not lacquered or sealed and will patina over time, the maker says. A brushed nickel finish is also available. The tub comes in 60-inch and 72-inch lengths. Prices range from $9,875 to $17,900.

Native Trails, 800/786-0862, nativetrails.net.

A Safer Stripper? According to the manufacturer, *LeadOut* doesn't simply dissolve paint — it actually reacts with lead on a molecular level and converts it to nonhazardous lead sulfide. The soy-based product can be applied without gloves or a respirator, the company says, and is capable of stripping as many as five layers of paint per application (coverage ranges from 80 to 125 square feet per gallon). It comes in quarts, gallons, and five-gallon containers for $33, $100, and $490.

Franmar Chemical, 800/538-5069, franmar.com.

Big Bamboo. Teragren's *Bamboo Worktops* provide a durable and environmentally friendly alternative to traditional butcher-block countertops, says the maker. The parquet pattern is assembled using end-grain bamboo and a food-safe, formaldehyde-free adhesive. The 1½-inch-thick slabs come in two sizes — 30 by 96 inches and 36 by 72 inches — either unfinished or prefinished with a mineral oil-beeswax coating. Costs range from $26 to $36 per square foot.

Teragren, 800/929-6333, teragren.com.

Crawlspace Cover. The *8 Mil Floor Liner* is designed to be durable and easy to install. It consists of a heavy-duty inner layer of fiberglass reinforcement sandwiched between two plies of high-strength virgin polyurethane. A 20-by-200-foot roll costs $310 and a 12-by-100-foot roll costs $185. Similar liners are sold in thicknesses of 6, 12, and 20 mils.

Crawlspace Depot, 888/331-9991, crawlspacedepot.com.

For more information about these products, go to http://jlc.hotims.com.

Products

Seamless Drains. Lenova has redesigned its stainless steel sinks to eliminate the yuck factor. Instead of a simple hole in the bottom that requires putty to seal, the drain is drawn and flared like a funnel. The drain fittings (or disposal) attach to the outside and seal with a rubber gasket. What the owner sees, and has to clean, is a one-piece sink from top to bottom. Dozens of sinks that incorporate the *PermaClean Drain System* are available for prices ranging from $260 to $1,750.

Lenova, 877/733-1098, lenovasinks.com.

High-Performance Windows. Zola's *Tilt & Turn* windows are often speced for Passive Houses, the company says, because they are so energy efficient. Specially designed hardware enables the sashes to swing or tilt in with the turn of a handle. Sashes can be double or triple glazed, in sizes as large as 5 feet wide. The windows come factory finished in a range of stain or paint colors. Aluminum cladding is also available. Prices run from $35 to $75 per square foot.

Zola European Windows, 303/578-0001, zolawindows.com.

Black and White Tile. *Atelier Flooring* is cut from large ceramic sheets using a computer-controlled water jet containing a high-pressure mixture of water and sand; the pieces snap together like a jigsaw puzzle to create uniform patterns. According to the maker, the tiles are sturdier and easier to clean than most ceramics. Prices range from $635 to $970 per square meter.

Devon & Devon North America, 718/649-5882, devon-devon.com.

Salvaged Counters. Reclaimed *Heritage Countertops* are made from hardwoods rescued from old barns, factories, and commercial buildings. Species include white oak, red oak, red gum, and beech. Numerous colors and edge choices are also available. Thicknesses vary from 1¼ inches to 2 inches, depending on the species. The average material price is about $90 per square foot.

Artisan Group, 512/263-7625, artisan-counters.com.

For more information about these products, go to http://jlc.hotims.com.

Accessible Fridge. The DCS 36-inch *French Door Refrigerator* combines a side-by-side's ease of access with a traditional unit's storage capacity. It has drawers with heavy-duty full-extension runners, humidity-controlled produce bins, gallon door shelves, and fans in the refrigerator and freezer compartments that allegedly cool food faster and maintain consistent temperatures. The appliance has 19.5 cubic feet of interior space and costs $3,000.

DCS by Fisher & Paykel, 888/936-7872, dcsappliances.com.

Earth-Friendly Fasteners. According to Maze, *Stormguard Coil Roofing Nails* are made in the U.S. using at least 85 percent recycled steel and zinc. The company also says it reclaims almost all of the waste products — steel, zinc, and acids — generated by the manufacturing process and uses only recycled paper for packaging. A 30-coil (3,600-nail) carton costs $115. The nails are also available in hand-drive.

Maze Nails, 800/435-5949, mazenails.com.

Paper Countertop. Though they're made from recycled paper, Richlite's *Northwest Collection* composite countertops are denser than typical stone or solid-surface offerings, says the maker, so they can handle longer spans and cantilevers without reinforcement. They're also stain-resistant and impervious to heat and moisture, and can be cut with standard woodworking tools, the company says. They come in seven colors. Installed prices average $90 per square foot.

Richlite Co., 253/383-5533, richlite.com.

Smaller Spa. Aquatic recently introduced an acrylic drop-in hydrotherapy tub sized to replace the ubiquitous 60-inch bathtub without any need to move walls. The *Starla Tub* measures 57 inches by 38 inches by 24 inches and has eight adjustable whirlpool jets. Its built-in backrest, headrest, and armrests make it feel bigger than it is, the maker says. Pricing starts at $960.

Aquatic, 800/945-2726, aquaticbath.com.

Senco JoistPro Metal-Connector Nailers

by Tim Uhler

My crew and I used to hand-nail framing hardware, but as codes changed and we had to install more and more of the stuff, it became impractical to nail by hand. Now we use single-blow hardware guns. For this article we tested two Senco hardware nailers that came out early this year. Both have rubberized grips, adjustable exhaust caps, dry-fire lockout, and metal rafter hooks that pivot to either side of the gun.

JoistPro 150

The JoistPro 150 shoots 1½-inch metal-connector nails. The tip of the nail sticks out from the end of the gun so you can locate the hole in the hardware. This tool is designed to be light and compact, so it holds only one strip of nails at a time. We used it on a couple of projects, and it had more than enough power to set nails in sawn and engineered framing lumber. And at just under 11 inches tall, it was easy to maneuver in tight quarters.

JoistPro 250

The JoistPro 250 shoots 1½- and 2½-inch metal-connector nails, and relies on a metal probe to locate the nail in the hole.

The tool has sufficient power to drive large metal-connector nails in sawn and engineered lumber. I like the magazine because it has a single slot for both lengths of nails. With two-slot magazines, the gun will jam if you put short nails in the long slot.

The JoistPro 250 is one of the lighter guns around, so it's easy to use overhead (for hurricane clips and the like). It's also quite compact — short both top-to-bottom and front-to-back.

The Bottom Line

These two guns performed very well, and I wouldn't hesitate to buy either of them. Both have plenty of power, and we experienced no jams or misfiring. If there's a downside, it's that their magazines hold only one strip of nails. As a result, they require frequent reloading — but if you work in tight quarters, that's a reasonable trade-off for a shorter, more compact gun.

The JoistPros are very low-priced compared with similar tools, so if you're still installing hardware by hand, this may be your opportunity to move up to a gun.

Tim Uhler *is a lead framer for Pioneer Builders in Port Orchard, Wash. This article first appeared in* Tools of the Trade *magazine.*

JoistPro 150 Specs

Nail length: 1½ inches
Nail diameter: .131 inch to .148 inch
Capacity: 30 nails
Weight: 4.6 pounds
Height x length: 10.4 inches x 12.0 inches
Country of origin: China
Street price: $220

JoistPro 250 Specs

Nail length: 1½ inches and 2½ inches
Nail diameter: .131 inch to .162 inch
Capacity: 20 nails
Weight: 5.9 pounds
Height x length: 14.1 inches x 14.1 inches
Country of origin: China
Street price: $300

Senco Brands, 800/543-4596, senco.com

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December Advertising Index

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In-O-Vate Technologies, Inc.	68	Dryerbox.com	
JLC LIVE	27	jlclive.com	
JLCOnline	34	jlconline.com	
Knauf Insulation	5	knaufinsulation.us	
Lenox Tools	33	lenoxunplugged.com/samplejlc	800-628-8810
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Source Of Supply In Polyurethanes, Inc.	68	sosfoams.com	800-598-9826
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Tjernlund Products, Inc.	70	tjernlund.com	800-255-4208
wedi Corporation	22	wedicorp.com	877-933-WEDI
Wilsonart	6&7	WilsonartHD.com	

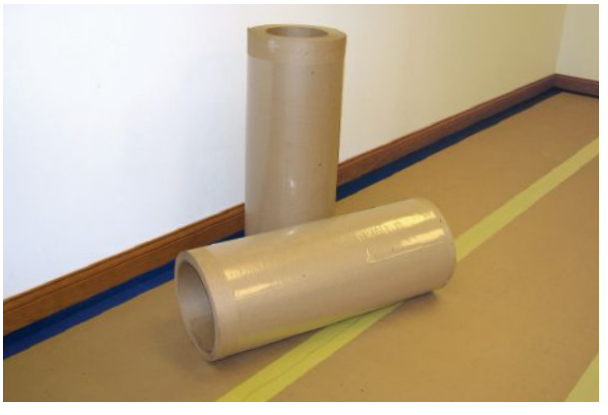
Toolbits | by Tom O'Brien

Safer Fishing. *Volt-Guard* is a 3/16-inch-diameter fiberglass fish tape designed to be used around live circuits. It's nonconductive to 1,000 volts and has an elliptical shape that gives it more pushing power than other nonconductive tapes, says the maker. It comes in a 12-inch-diameter plastic case and has a fiberglass eyelet on the end. Two lengths are available: 60 feet ($110) and 120 feet ($130).

Ideal Industries, 800/435-0705, idealindustries.com.

Tool Tether. The *Gear Keeper Retractable Lanyard* (model RT4-5601) features a rotating belt clip and a 36-inch tether that's suitable for tools weighing up to a pound. (A beefier model for 2-pound tools is also available.) Prices range from $27 to $35. Separate connectors that allow users to swap out individual tools cost $5.

Hammerhead Industries, 805/658-9922, gearkeeper.com.



Floor Saver. According to the maker, *FlexBoard* does as good a job of protecting finished floors as hardboard does, but it's a lot easier to handle and store. The 45-mil-thick product is water-resistant, nonstaining, and vapor-permeable, and it's made from recycled materials. It can be laid over vinyl, laminate, wood, concrete, stone, marble, and tile; after a job it can be reused or recycled. A 32-inch-by-50-foot roll costs $30, a 100-foot roll $50.

Protective Products International, 800/789-6633, protectiveproducts.com.

Versatile Torpedo. With the new *DWHT43003,* DeWalt has given the lowly torpedo level a significant upgrade. The tool has an extruded aluminum body with machined edges, and solid block vials that are guaranteed accurate to within 0.0005 inch/inch. One edge is V-grooved and fitted with magnets for work with metal and pipes. Other improvements include a magnified center vial and a rotating end vial with an angle scale on one side and a roof-pitch scale on the other. The level costs about $25.

DeWalt Industrial Tool Co., 800/433-9258, dewalt.com.

For more information about these products, go to http://jlc.hotims.com.

Backfill

Song of the Nightingale

In wood flooring, as in most of carpentry, the quality of the product is the measure of the installer. By today's standards, that means a floor should have tight joints and be smooth, level, and free of squeaks.

But it hasn't always been that way. In feudal Japan — where precision timber joinery was refined to a high degree — a carpenter with a wealthy client might be called upon to install an *uguisubari,* or "nightingale floor," which was designed to emit a chorus of birdlike chirps under the slightest foot pressure anywhere on its surface.

Anthony Jones

Careful craftsmanship and the right metal fittings are the secret to a long-lasting and loudly chirping floor, as in this example from Nijo Castle in Kyoto, Japan.

These floors served as early security systems: Alerted by the squeaking floor to the presence of an intruder, the homeowner could spring out of bed and grab a sword. Judging by the examples that survive, most such floors were constructed in hallways, with stout floorboards running crosswise and supported by parallel beams at each end.

Len Brackett is a woodworker who completed a traditional five-year apprenticeship in Kyoto in the 1970s and now builds traditional Japanese structures from his workshop in Nevada City, Calif. He recalls examining an *uguisubari* that can still be seen (and heard) at Nijo Castle, a massive, heavily fortified complex built in the early 1600s as a sort of summer home for the ruling Tokugawa shoguns.

"The boards are planed to be slightly convex at the bottom," he explains, which allows them to rock almost imperceptibly from side to side when walked on. The hooked upper end of each fitting engages a mortise in the edge of the floorboard, while the lower end is nailed to the support beam. In addition to holding the boards in place, the fittings respond to the rocking action of the boards by flexing back and forth, squeaking against the nails as they do so.

Sadly, with the development of electronic security systems, construction of traditional nightingale flooring seems to be a lost art. Could its revival represent a business opportunity for a skilled and determined modern flooring contractor? Perhaps, but he or she had better be ready for a steep learning curve — and, no doubt, for the occasional callback from a dissatisfied customer annoyed by a floorboard that won't squeak. — *Jon Vara*

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