

**Innovating  
Home Building**

**Smart Lighting,  
Smart House**

**Cool Tools**



# Chief Architect®

Smarter Design Software



Designed & Rendered in Chief Architect.  
See more of this model online.

## Download a Free Trial Version



Residential Design

Remodeling & Cost Estimating

Kitchen, Bath, & Interior Design

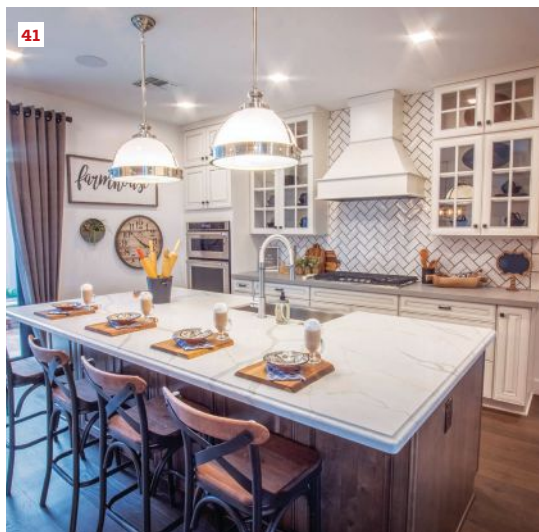
3D Design, Floor Plans, Elevations

Construction Drawings

CAD Tools & Section Details

208.292.3400 • [chiefarchitect.com/FreeTrial](http://chiefarchitect.com/FreeTrial)





On the cover: Tommy Hotaling and Travis Rau, of Unity Homes, position a prefabricated roof panel onto a home on Cape Cod. Assembly of the factory-built home took a little less than five days. Photo by Roe Osborn. See the story on page 33.

## FEATURES

- 33. Factory Building: The Next Wave**  
Computerizing and automating home panelization
- 41. Smart Lighting, Smart House**  
Control systems change the homeowner experience

## DEPARTMENTS

- 7. Training the Trades**  
Toughening up the roof
- 13. Q&A**  
Installing new tile over old; are I-joists an option for headers?
- 17. On the Job**  
Inside-out porch columns; replacing windows from the exterior
- 25. Business**  
The greased pigs of estimating
- 29. Troubleshooting**  
Fixing a poorly installed window
- 47. Products**  
Interior trim; rainscreen; pendant light; luxury vanities; swing-clear door hinges; large-format stone tile; metal-roofing underlayment; more
- 51. Tools of the Trade**  
Editors' Choice Awards
- 54. Advertising Index**
- 55. Trade Tips**  
Peel-and-stick trick
- 56. Backfill**  
Not your basic Cape

THE JOURNAL OF LIGHT CONSTRUCTION (ISSN 1056-828X), Volume 37, Number 5, is published monthly by Hanley Wood, One Thomas Circle, NW, Suite 600, Washington, DC 20005. Annual subscription rate for qualified readers in the construction trades: \$39.95; nonqualified annual subscription rate: \$59.95. Frequency of all magazines subject to change without notice. Double issues may be published, which count as 2 issues. Publisher reserves the right to determine recipient qualification. Copyright 2019 by Hanley Wood. All rights reserved. Canada Post Registration #40612608/G.S.T. number: R-120931738. Canadian return address: IMEX, PO Box 25542, London, ON N6C 6B2. Periodicals postage paid at Washington, DC, and at additional mailing offices. POSTMASTER: Send address changes to JLC, Box 3530 Northbrook IL 60065-3530.



## JLCONLINE.COM

**V.P., Editorial Director** John McManus, jmcmanus@hanleywood.com  
**Chief Editor, JLC Group** Clayton DeKorne, cdekorne@hanleywood.com  
**Executive Editor, JLC Group** Andrew Wormer, awormer@hanleywood.com  
**Editor, Tools of the Trade** Mark Clement, mclement@hanleywood.com  
**Design Director** Tina Tabibi, ttabibi@hanleywood.com  
**Managing Editor** Laurie Elden, lelden@hanleywood.com  
**Senior Editors** Ted Cushman, tcushman@hanleywood.com;  
Tim Healey, thealey@hanleywood.com;  
Roe Osborn, rosborn@hanleywood.com  
**Freelance Designer** Melissa Krochmal, mkrochmal@hanleywood.com  
**Contributing Editor, Products** Simone Garvett, sgarvett@hanleywood.com  
**Contributing Editors** David Frane, Dave Holbrook, Tom Meehan,  
Matt Risinger, Emanuel Silva, Jordan Smith, Gary Striegler, Tim Uhler  
**Senior Web Developer** Braddock Bull, bbull@hanleywood.com

**Production Manager** Daisril Richards  
**Inside Sales Ad Coordinator** Annie Clark  
**Ad Production Coordinator** Bernadette Couture  
**Group Director, Audience Marketing & Circulation** Christina Lustan  
**Circulation Promotions Designer** Chara Anderson  
**President, Contractor Group** Rick Strachan

## HANLEY WOOD MEDIA

**Chief Revenue Officer/President** Dave Colford  
**Executive V.P., eCommerce & Digital** Jennifer Pearce  
**Executive V.P., Operations** Sarah Welcome  
**Senior V.P./General Manager, Digital** Christie Bardo  
**V.P., Digital Strategy and Operations** Bridget Forbes  
**V.P., Client Operations** Mari Skelnik  
**V.P., Design** Aubrey Altmann  
**Senior Director, Print Production** Margaret M. Coulter

## PUBLISHED BY HANLEY WOOD

**Chief Executive Officer** Jeff Meyers  
**Chief Financial Officer** Melissa Billiter  
**Chief Revenue Officer/President, Media** Dave Colford  
**Chief Data Officer/President, Metrostudy** Andrew Reid  
**President, Marketing** Dobby Gibson  
**Senior V.P., Marketing** Sheila Harris  
**V.P., Finance** Ron Kraft  
**V.P., Corporate Controller** Keith Rosenbloom

**Editorial & Advertising Offices:**  
**The Journal of Light Construction,**  
Hanley Wood LLC  
One Thomas Circle NW, Suite 600  
Washington, DC 20005  
202.452.0800

JLC will occasionally write about companies in which its parent organization, Hanley Wood, has an investment interest. When it does, the magazine will fully disclose that relationship. Reproduction in whole or in part is prohibited without written authorization. Opinions expressed are those of the authors or persons quoted and not necessarily those of JLC.

## INFORMATION DIRECTORY

### CONTACT INFORMATION

**jlconline.com**; 202.452.0800  
**JLC**  
Hanley Wood LLC  
One Thomas Circle NW, Suite 600  
Washington, DC 20005

### EDITORIAL

We welcome letters and article submissions from our readers. Contact us by mail at the address above, **Attn:** Editorial Dept., or via email at [jlconline@hanleywood.com](mailto:jlconline@hanleywood.com). Keep copies of all original materials.

### SUBSCRIPTION SERVICES

For help with your JLC subscription, contact us:

**Online:** [jlconline.com/cs](http://jlconline.com/cs)  
**Email:** [jlconline@omeda.com](mailto:jlconline@omeda.com)  
**Phone:** 888.269.8410  
**Mail: JLC**, PO Box 3530, Northbrook IL 60065-3530

You can subscribe online at:  
[jlconline.com/subscribe](http://jlconline.com/subscribe)

#### Subscription rates for qualified readers:

1 year/ \$39.95; 2 years/\$64.95.  
Canada, International: add \$15/ year for surface delivery.  
Sales tax will be added to total due if required by your state law.  
Frequency of all magazines subject to change without notice. Double issues may be published, which count as 2 issues.

### JLC BACK ISSUES

JLC subscribers have free access to every issue of JLC since 1986. Enable your free access at [jlconline.com/register](http://jlconline.com/register). Copies of individual back issues can be purchased for \$4.95 each, plus \$5 shipping per order. Call 888.269.8410 for availability.

### ARTICLE REPRINTS

For custom reprints of JLC articles, call Wright's Media, 877.652.5295; [hanleywood@wrightsmedia.com](mailto:hanleywood@wrightsmedia.com)

### JLC UPDATE EMAIL NEWSLETTER

JLC Update, our email newsletter, is free to JLC readers. Each issue contains industry news and the latest tips on building materials, techniques, tools, and technology. Subscribe online at [jlupdate.jlconline.com](http://jlupdate.jlconline.com)

**For list rentals:** The Information Refinery, Brian Clotworthy, 800.529.9020, [brian@info refinery.com](mailto:brian@info refinery.com)

**Privacy of mailing list:** We rent our subscriber list to reputable companies. If you do not wish to receive promotional materials from other companies, please call us, toll-free, at 888.269.8410.

IBS booth SU207



design | 3D | materials lists

"... you guys got this right, the program is awesome...  
SoftPlan is the best and I have used them all..."  
Andrew Bozeman, Montgomery, AL



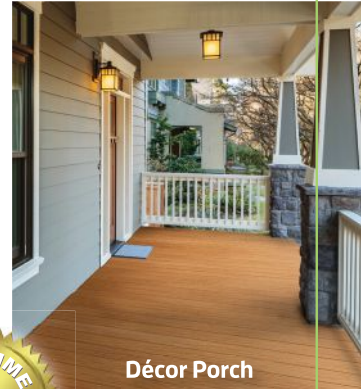
SoftPlan version 2020 coming soon

free trial: [www.softplan.com](http://www.softplan.com) or 1-800-248-0164

# The Look of Wood without the Worry



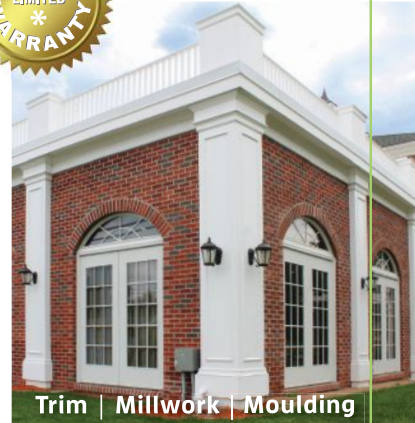
Décor Deck



Décor Porch



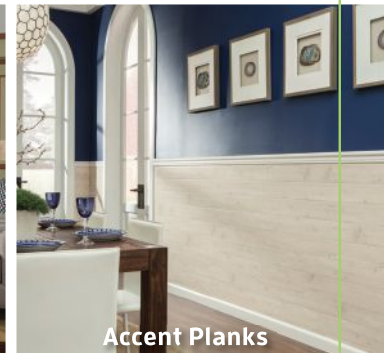
- Our products stand up to the weather elements better than wood
- Unlike wood, our products are already finished saving you time on the job
- Install our products using the regular woodworking tools
- A limited lifetime warranty on our PVC products give you and your customers peace of mind



Trim | Millwork | Moulding



Interior Moulding



Accent Planks

\* Lifetime Limited Warranty only apply to Deck, Porch, and Trim Products

Visit us at NAHB International Builders' Show 2019  
Las Vegas, Booth #C2654

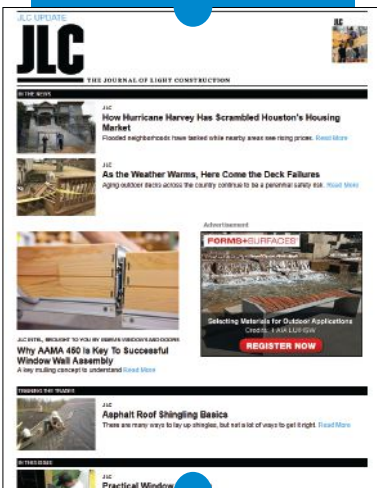


Deck | Porch | Trim | Millwork | Moulding | Accent Planks

[www.inteplastbuild.com](http://www.inteplastbuild.com)  
8 0 0 . 5 2 1 . 4 2 5 9

Made in the U.S.A.

# JLC



**JLC Update** the source for information to help pros improve job performance—including hands-on job tips about the best materials and techniques, industry news and product trends. Sign up now at [jconline.com](http://jconline.com).



**Need an extra hand?  
Lift, shift, align,  
level and plumb.  
Holds up to  
300 lb!**

**AIRSHIM™**

- Great for window, door, cabinet and appliance installs
- Raise and lower to perfect alignments *by yourself!*
- Durable, no-scuff cover leaves no marks



Call **1-800-854-8075**  
or visit **WWW.AIRSHIM.COM**  
for video and more information. Model 1190

**SHIM™**  
**AIR™**  
INFLATABLE PRY BAR & LEVELING TOOL  
**300 LBS - CONTRACTOR-GRADE**



WWW.AIRSHIM.COM

**JLC**

**SALES OFFICES**

**HEADQUARTERS**

**Rick Strachan** President, Contractor Group  
202.736.3332  
rstrachan@hanleywood.com

**Dan Colunio** Vice President, Sales, Remodeling & Distribution Groups  
617.304.7297  
dcolunio@hanleywood.com

**NORTHEAST/MID-ATLANTIC**

**Paul Pettersen** Strategic Account Director  
(Including CT, DC, DE, MA, MD, ME, NH, NJ, NY, OH, PA, RI, VA, VT, WV)  
516.252.8020  
ppettersen@hanleywood.com

**MIDWEST/ SOUTHEAST**

**Ed Kraft** Strategic Account Manager  
(Including AL, FL, GA, IL, KY, MI, NC, SC, TN)  
443.445.3488  
ekraft@hanleywood.com

**MIDWEST/SOUTH CENTRAL**

**Kay Ross-Baker** Strategic Account Manager  
(Including AR, IA, IL, IN, KS, LA, MN, MO, MS, ND, NE, OK, SD, TX, WI)  
773.824.2576  
krossbaker@hanleywood.com

**WEST COAST**

**Carol Weinman** Senior Strategic Account Director  
(Including AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY)  
831.373.6125  
cweinman@hanleywood.com

**NEW ENGLAND REGIONAL EDITION**

**Phil Guerra** Account Manager  
516.586.4797  
pguerra@hanleywood.com

**CANADA**

**John Magner** York Media Services  
416.598.0101  
jmagner@yorkmedia.net

**NEW BUSINESS**

**Maura Jacob** Account Manager  
678.451.8627  
mjacob@hanleywood.com

**JLC**



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



JLCONLINE.COM



**More  
lightweight.**

**More  
reliable.**

**More  
precise.**



### Introducing the Quik Drive® PRO250G3 Subfloor System

The no. 1 subfloor tool is now even better. Lighter in weight and more ergonomic, our next generation Quik Drive PRO250G3 provides a best-in-class self-locking depth adjustment, an improved screw-feed mechanism and a new gated guide tube for increased reliability — ensuring you're in, out and on to the next job.

To learn more, visit [go.strongtie.com/pro250G3](https://go.strongtie.com/pro250G3) or call us at (800) 999-5099.

**SIMPSON**

**Strong-Tie**



## A reputation is built one replacement project at a time.

At Marvin, we know that you depend on our quality to keep working for you long after the job is done. However, success requires more than just having the right products.

That's why we offer some of the best service and support around.

Discover a smarter way to replace.

Find your local Marvin replacement partner at [Marvin.com](https://www.Marvin.com)



BY TED CUSHMAN

## Toughening Up the Roof

Whenever a hurricane or tropical storm makes landfall, roof blowoffs are a typical form of damage. After every storm, aerial photos show a sea of blue tarps on rooftops, protecting houses against rain until repairs can be made.

A roof blowoff may be relatively minor compared with a total building collapse. But taken together, widespread roof blowoffs can add up to big dollars. Shingle loss can also be the first step on a journey of destruction: If the roof deck leaks in a storm, attic insulation can be soaked, drywall may be saturated and fall to the floor, and flooring, finishes, furniture, and other belongings can be ruined and the house made uninhabitable.

Ceiling drywall isn't just a finish; it sometimes serves a significant structural bracing role in homes, too. So if rain soaks the drywall during a severe windstorm, the loss of the drywall could contribute to structural failures of the building.

The point is that a weathertight roof is the first line of defense in a storm-resistant house. That's why IBHS, the Institute for Building and Home Safety, created the Fortified Roof program as an incentive to builders and roofers to upgrade their roofing details above the bare minimum required by the building code. (Full details of the program and standard are available online at [disastersafety.org](http://disastersafety.org).)

When following the IBHS Fortified prescription, roofers waterproof the roof deck so that even if shingles are lost, the sheathing will stay on the roof and the underlayment and sealed roof deck will protect the home from water intrusion. Repairs after a storm can be limited to shingle replacement, instead of also entailing extensive, and expensive, work inside the attic and the living space below the roof.

For re-roofs, the job starts by stripping the roof deck clean, then re-nailing the sheathing on close spacing with ring-shank nails. Rotted material must be replaced. Seams between sheathing sheets are sealed with peel-and-stick tape, and then underlayment, drip edge, and roofing are applied with enhanced details. Let's take a closer look.

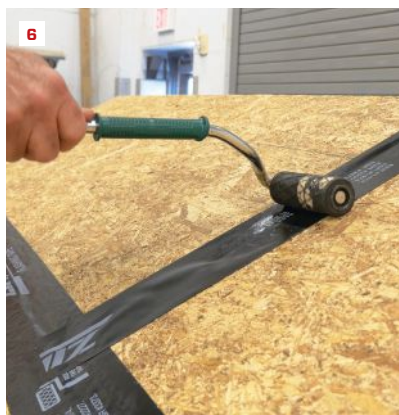
### NAILING THE SHEATHING

Plywood or OSB sheathing should be at least  $\frac{7}{16}$  inch thick (1) and fastened with 8d ring-shank nails (2). At panel joints and within 4 feet of the gable end, nails should be spaced 4 inches on-center. On the rest of the roof, nails should be spaced no farther apart than 6 inches on-center. If the building is near the coast and exposed to salt air, fasteners must be corrosion-resistant.



Roof sheathing—either plywood or OSB—should be a minimum of  $\frac{7}{16}$  inch thick (1). Within 4 feet of the rake, sheathing panels should be nailed to the roof with ring-shank nails spaced 4 inches on-center on the edges and 6 inches on-center in the field (2). On the rest of the roof, the ring-shank nails should be spaced 6 inches on-center everywhere.

Photos courtesy IBHS



One allowable method for protecting the deck is to install double-coverage asphalt-saturated felt before shingling (3). Fasten the felt to the roof with cap nails, 6 inches on-center at the edges and 12 inches on-center in the field (4). Alternatively, you can seal the sheathing seams using peel-and-stick tape (5, 6) and protect the roof using a synthetic roof underlayment, following manufacturer's instructions (7, 8).

### SEALING THE DECK

If shingles do get blown off the roof, you want the roof to still shed water. The IBHS Fortified standard provides several pathways for making sure of this.

The first method is to cover the roof deck with two courses of #30 asphalt-saturated felt (3). All asphalt felt is not created equal: IBHS testing has found that some lighter-weight products labeled as #15 and #30 felt will not perform effectively in the face of wind-driven water. So always choose #30 felt that is labeled compliant with industry standards ASTM D226 (Type II) or ASTM D4869 (Type IV).

The felt comes in 3-foot-wide rolls. Begin with a 19-inch starter course, then apply a full 3-foot course directly over this. Continue shingle-fashion with full 3-foot material, leaving a 17-inch reveal. Fasten with cap nails, spacing the nails 6 inches on-center on the edges and 12 inches on-center in the field (4). Don't nail the felt on the roof edge. At this location, drip edge will be nailed over the felt to secure the assembly.

As an alternative to double-coverage felt, the IBHS Fortified program also allows you to protect the deck with single-coverage underlayment (either organic felt or synthetic underlayment). But in that case, you must start by sealing the seams of the roof deck with peel-and-stick tape (5).

As with felt, not all tape is the same. If you use a modified-bitumen tape, make sure it meets ASTM D1970. If you use a butyl or acrylic tape, it must meet AAMA 711, Level 3.

Roll the tape with a pressure roller (6) to make sure it's fully adhered without air gaps or wrinkles.

Once the seams are taped, you can apply either an organic-felt or synthetic underlayment (7) with the overlap and fastener spacing specified by the manufacturer. Always use cap nails (8) to attach the underlayment.

### INSTALLING DRIP EDGE

Drip edge should be 26-gauge galvanized material and should extend a half-inch below the roof sheathing and 2 inches up the roof. In the IBHS Fortified program, drip edge is installed over the underlayment and nailed at 4 inches on-center. The reason for applying the drip edge over the underlayment, rather than lapping the underlayment over the drip edge, is to



# Henry® and Fortifiber®: Building confidence together.

Stop by booth SU1248 to learn more about our compatible Building Envelope Systems®

productsupport@henry.com | 1-800-486-1278  
[www.henry.com](http://www.henry.com)





A good weather seal between shingles and underlayment is key to preventing damage in a storm. One approach is to apply a self-adhered manufactured starter strip (9). Another option is to embed the starter shingles in a 1/8-inch-thick bed of roof mastic (10, 11). You can also use this approach for sealing shingles along the rake (12, 13).

help hold the underlayment down to the roof and to prevent wind and rain from penetrating between the drip edge and the underlayment. To prevent rain that gets past the shingles from running down the roof under the drip edge, this joint is sealed from the top when starter strips are applied.

### STARTER STRIPS

Many shingle manufacturers now supply starter strip material, either in long rolls or in short, shingle-width pieces. If the starter strips are self-adhered, they meet the IBHS Fortified standard; the peel-and-stick adhesive on the underside of the strips serves to seal the material down to the drip edge, creating a watertight assembly. But you do need to check to find out whether a primer is required for adhering the strips to drip edge, and also whether the strips are compatible with the brand of shingle you'll be installing.

To install the starter strip, peel off the removable backing and use the adhesive backing to secure the material to the drip edge (9).

### USING ROOF MASTIC

If the starter strip material doesn't have its own adhesive backing, it needs to be set into a bed of asphaltic roof mastic (10). Apply the mastic over the drip edge in a bed no more than 1/8 inch thick and 8 inches wide. Set the starter strip into the mastic (11). You can tack it in place to hold it securely.

You can use a starter strip on the rake as well as the eaves, but if you prefer, you can set the shingles directly into roof mastic using a method sometimes called "step-bulling." With this technique, the roofer applies the 1/8-inch bed of roof mastic up the edge of the roof (12), and then lays the shingles into that bed of mastic (13). This bonds the shingles to the drip edge.

As you shingle up the roof, add a dab of roof mastic to each shingle before you set the next shingle in place. This helps the shingles resist wind uplift in case of high winds.

*Ted Cushman is a senior editor at JLC.*



For a more detailed discussion of IBHS Fortified roofing practices, go to [www.jlconline.com/training-the-trades/toughening-up-the-roof](http://www.jlconline.com/training-the-trades/toughening-up-the-roof).

# Upgrade your coiled strap.



## Introducing our innovative CSHP coiled strap.

Our new, patent-pending high-performance CSHP coiled strap features an embossment that makes it easy to install with a standard pneumatic framing nailer. This new tested feature provides improved performance — resulting in fewer nails, shorter straps and an overall lower installed cost.

Upgrade your coiled strap, visit [go.strongtie.com/cshp](https://go.strongtie.com/cshp) or call (800) 999-5099.

**SIMPSON**

**Strong-Tie**

# Roofing TurboShears with 360° Accessibility

Powerful TurboShear attachments that rotate clear of work surface, follow cut lines, navigate profiles and fit a drill you already own!



## **TSHD** Heavy-Duty TurboShear

The Ultimate tool for those who want to make fast, easy cuts, in most common sheet metals. This versatile shear cuts straight and to the left and is capable of navigating profiles, tight patterns or square corners in 18-gauge galvanized or mild steel.

Pat. No. 9,649,702



## **TSCM** Corrugated Metal TurboShear

The rotating head combined with elongated offset blades and a compact jaw opening, easily manages cross-cuts, length-wise trim cuts and circular or square outlet holes in tightly-spaced corrugated or trapezoidal profiled metal panels.

Pat. No. 9,649,702



For complete and up to date product selection and information, go to [www.malcotools.com](http://www.malcotools.com)  
Use the Dealer Locator or Online Distributor Tab to learn where to buy.

**JLCLIVE**

RESIDENTIAL CONSTRUCTION SHOW  
NEW ENGLAND 2019

**LIVE DEMOS!**  
**Booth #839**

MARCH 27 - 30, 2019  
RHODE ISLAND CONVENTION CENTER | PROVIDENCE, RI

**Malco**

Work. Perform. Outlast.

## Q Can I install new tile over old tile for a bathroom floor?

**A** Tom Meehan, a second-generation tile installer and co-author of *Working with Tile* who lives and works in Harwich, Mass., responds: Putting new tile over old is possible if the work is done properly and if the condition of the existing floor—both the tile itself and the subfloor below—is in good enough shape for a successful installation. You also need to consider that adding another layer of tile will increase the height of the floor, which can create complications with bathroom fixtures, thresholds, and doors that swing in.

The first and most important question is whether the existing tile floor is structurally sound with no loose tile or major cracks. A visual inspection for cracked or missing grout is a good initial check for possible loose tile. Another way to check is by tapping on the surface of the tile with a small hammer. Hollow sounds can be an indication that tiles may be loose. If I find one loose tile, it usually means that others are loose, so in that case I typically remove all

of the existing tile rather than risking problems with an added tile layer. Grout missing or large cracks in the middle of the floor can also indicate loose tile, but a little grout missing near the edges of the floor usually means that the floor is OK to tile over.

Cracks running through the tile can also indicate excess deflection in the subfloor. The Tile Council of North America (TCNA) offers strict guidelines for deflection in its handbook. But if the bathroom is over a basement, I'll often inspect the floor framing from below to look for cracked or broken floor joists or improper joist spacing. When in doubt, I sister in new joists to the old to beef up the framing.

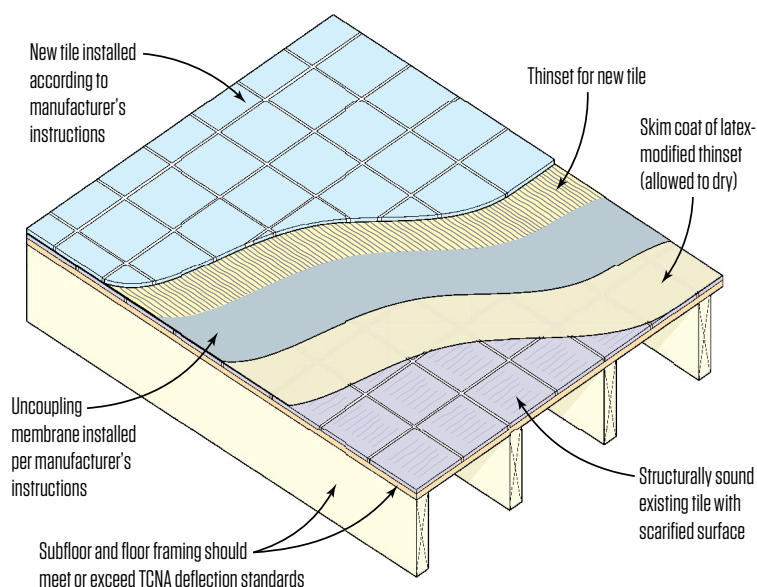
To install the new tile over the old, I have one of two approaches, depending on the condition of the tile. For both approaches, I start by scarifying or abrading the surface of the old tile with a grinder outfitted with an aggressive diamond blade. This removes most of the glazed surface from the tile and gives the thinset a better chance of adhering. Then I vacuum and sponge off the surface of the tile.

When the floor is dry, I apply a tight (1/16 to 1/8 inch thick) skim coat of high-quality latex-modified thinset, such as Laticrete 254 Platinum, and let this skim coat sit overnight. If the floor is solid with no cracks or missing grout, the next day I install the new tile over the prepared floor the same way I would tile any other floor, using a high-quality modified thinset, which adheres best in these applications.

If the floor has hairline (nonstructural) cracks in the tile or grout, I install an uncoupling membrane, such as Schluter's Ditra, over the skim coat of thinset. The membrane bridges any cracks, preventing them from telegraphing up through the surface of the new tile layer. I install the membrane over the dried skim coat that I had applied to the scarified tile, using the thinset recommended by the membrane's manufacturer. After letting the membrane set overnight, I install the tile the next day.

If you have any doubts about the integrity of the old floor or your ability to assess the floor's condition, I'd go with the membrane approach. The little bit of extra work and expense is cheap insurance that the new tile floor will not develop any problems in the future.

### New Tile Over Old



When new tile is installed over a structurally sound tile floor, an uncoupling membrane limits differential movement and keeps the tile from loosening.

## Can I-joists be used as headers in walls?

**A** Jim Anderson, P.E., with the Product Engineering, Codes and Standards group at Weyerhaeuser, responds: With careful design, detailing, and installation, I-joists could possibly be used for headers, but the practice is not recommended. I-joists are commonly used in floor systems today. They are strong, stable, and available in long lengths, and they produce stable floors. They are specifically designed to efficiently support typical floor loads. At first glance, I-joists may look attractive as low-cost, lightweight, stable members that could replace dimension lumber in wall-header applications. However, special detailing, design, and connections may make using them more laborious and expensive than using a sawn lumber or structural composite lumber (SCL) header.

The unique cross section of an I-joist utilizes LVL or Machine Stress Rated (MSR) lumber flanges to resist high bending forces that occur in the middle of the span (for uniform loads). At the ends of the member, reaction forces need to be transferred into the support through an OSB web. I-joists work well for the transfer of reaction loads in typical floors, but they are not designed to support heavy point loads from a roof girder truss above. In addition, the reaction capacities for I-joists were developed and tested with a minimum 1<sup>3</sup>/<sub>4</sub>-inch end bearing length. This minimum required bearing length exceeds a typical 1<sup>1</sup>/<sub>2</sub>-inch-thick jack stud used to support wall headers. Therefore, if an I-joist were used as a header, each end would require a minimum of two jack studs, which may not be desirable.

I-joists, which typically support a uniform load, can also support point loads from above, such as a truss reaction; however, if the load is too high, the flange may crush the web. There are published provisions that if point loads

are 1,500 pounds or more, web stiffeners are required to reinforce the top flange. Accurate placement of web stiffeners could prove difficult if truss placement locations are unknown or if they are different from what was assumed.

Under most conditions for wall headers, multiple-ply I-joists would be required to support the load. Having two or more members support the load will increase capacity, but special detailing would be needed to connect the two I-joists together, increasing construction costs. The detail would require filler blocks between the webs of each of the I-joists. Depending on the series of I-joist (different width of flanges), the filler may be a 2-by or a combination of a 2-by and sheathing. The filler would have to be the full length of the joist and be properly nailed together. If the multiple header is flush to the exterior sheathing or to the drywall inside, you may need to install an additional filler to flush out the surface for gypsum attachment.

End connections would be difficult as well. Typical prescriptive nailing for the end of a header to a stud is four nails. It would not be possible to get this quantity of fasteners into the end of an I-joist. Finally, lateral stability (buckling to the side under load) of the top edge needs to be addressed. This is true of all structural members, but I-joists typically require more frequent bracing than a solid piece of wood. Typically, in a floor system, this is achieved with the floor sheathing attached every 6 to 12 inches.

Because of the lower capacities, bearing length requirements, web stiffener requirement at point loads, and connection of multiple pieces, premade loading charts are not usually available for this application. If you are looking for the benefits of engineered lumber, using shallower (less than 9<sup>1</sup>/<sub>2</sub> inches) structural composite lumber is easier to design and install for wall headers. If you still desire to use I-joists in a header application in a wall, I would contact the manufacturer or a design professional for assistance.

# JLC

## Content Licensing for Every Marketing Strategy



### Marketing solutions fit for:

- Outdoor
- Direct Mail
- Print Advertising
- Tradeshow/POP Displays
- Social Media
- Radio & TV

Leverage branded content from JLC to create a more powerful and sophisticated statement about your product, service, or company in your next marketing campaign. Contact Wright's Media to find out more about how we can customize your acknowledgements and recognitions to enhance your marketing strategies.

Contact Wright's Media at:  
877.652.5295,  
[wrightsmedia.com/sites/hanleywood](http://wrightsmedia.com/sites/hanleywood)  
[hanleywood@wrightmedia.com](mailto:hanleywood@wrightmedia.com)

NAHB **IBS**™

Stop by and visit us at:  
**BOOTH #C6731**

February 19-21, 2019  
Las Vegas, NV



Stop by and visit us at:  
**BOOTH #1701**

February 11-13, 2019  
Nashville, TN

# My job is to make your job easier.

Every day ABC Supply associates from over 700 locations nationwide dedicate themselves to making your job easier. It starts with 24/7 access to pricing and order placement with ABC Connect and ends with your materials delivered accurately, complete and on time, every time.

- ✔ Competitive pricing, hassle-free returns.
- ✔ Deliveries complete and on time. Every time.
- ✔ Manufacturer Rewards Support™.
- ✔ 24/7 access to products, pricing and order placement.

**ABC**  
Supply Co. inc.

ROOFING • SIDING • WINDOWS • TOOLS  
GUTTER • ACCESSORIES • AND MORE

*Experience the ABC Supply Difference.*

[abcsupply.com](http://abcsupply.com)





# Coming together. Building together.

You're building more than a home, you're building your reputation. That's why Dow and DuPont have come together as DuPont Performance Building Solutions—so you're covered top to bottom, inside and out on every job. And, the unprecedented portfolio of products from two of the foremost leaders in the building industry provides the freedom, flexibility, and confidence to make every house you build home worthy.

Visit us at IBS Booth C5837

**DuPont Performance Building Solutions**  
Build your way at [PerformanceBuildingSolutions.DuPont.com](http://PerformanceBuildingSolutions.DuPont.com)



## Inside-Out Porch Columns

BY GARY STRIEGLER

**Recently, I built a home that** featured a 300-square-foot front porch with four support columns. The plans didn't give a lot of details for the columns, and my client definitely did not want turned posts or fluted square ones—the two standard options where I live.

**Decorative covers.** Treated 4x4s carried the roof load for the porch, so I just needed something decorative and not structural. For the size and height of the porch, I thought that 12-inch columns would look best (1). In the past I'd made porch columns from Extira, an exterior MDF product, creating a paneled look with a frame layer over the MDF. The finished product looked amazing, but it was a lot of work and the extra layers

meant more maintenance down the road. For this job, I wanted a panel look but with less work.

I decided to try an interior trim trick that I'd learned years ago. I used a Whiteside router bit to simulate a raised-panel look. Once I got set up, I knew that routing two panels in each face wouldn't take long, and skipping the frame layer would save on material and painting.

**Layout.** Extira comes in several different sizes, but for this job I used the standard 49-inch-by-97-inch sheets. I ripped four sheets to 12<sup>1</sup>/<sub>4</sub>-inch widths, which let each face butt on one edge and lap on the other. I would end up with 13-inch square posts with almost no waste. To get the height right, I would add a base and a two-step capital detail.

After ripping the material to width, I laid out the panels. From the bottom, I measured up 5 inches and laid out a 29-inch-tall panel. Five inches up from that lower panel, I laid out a taller panel to within 4 inches of the top. I wanted the look of a 9-inch-wide panel with 2-inch styles on each side. Because <sup>3</sup>/<sub>4</sub> inch of my final width came from the lap joint, I would have to rout the panel off center by <sup>3</sup>/<sub>4</sub> inch and offset the layout to the same side for all four faces of each column.

**Routing the panels.** Similar to the process of routing hinge mortises, I mounted a bushing onto the router base to guide the cut for panels. The router bushing rode against a rectangular wooden template that I pocket-screwed together. To get the correct panel width, I oversized the templates to allow for the distance from the outside of the bushing to the router bit.

Once I had the layout right, I located the templates, using a tape measure and a Kreg multi mark (2). After tacking the templates to each column face with 18-gauge brads (3), I took a scrap that was the same thickness as the templates and placed it inside them to keep the router riding flat (4).

To rout the panels, I started with a plunge cut. Once the bit was at the correct depth, I focused on keeping the bushing in contact with the template, making sure that the router moved in the right direction (6). If the bushing strays away from the template, the piece is ruined.

Routing MDF creates a lot of dust, so I wore a mask



The 4x4 posts that supported this porch looked spindly and out of proportion, so the author and his client decided to wrap the posts with a decorative covering that mimicked raised-panel columns. The author made the columns from exterior-grade MDF and routed the panel detail.

Photos by Gary Striegler



After ripping sheets of exterior MDF to width, the author built wooden templates, laid out their position on the column faces (2), and tacked them in place with a brad nailer (3). Scrap boards that fit inside the templates supported the router base (4), which was fitted with a guide bushing (5). After plunging the router into the material, the author routed the edge pattern into the MDF, keeping the bushing in contact with the template at all times (6). Vacuuming after every cut kept the dust under control (7).

and cleaned up with a shop vacuum after each panel cut (7). When I finished routing each panel, I pried the template off and removed the brads.

Once I'd routed several column faces, I started gluing them together in pairs using Titebond 3 glue (8). First, I tacked the joint in place using 18-gauge brads (9). To ensure tight joints, I then clamped the boards every 6 to 8 inches (10). After an hour or so, I pulled the clamps and belt-sanded the joint. By alternating the routing and clamping, I was able to rout and mate up all the pairs with no downtime, and I was ready to move everything to the jobsite.

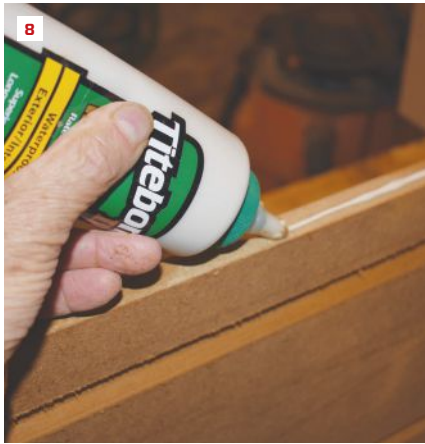
**Installing the columns.** On site, I had a simple method for installing the columns. First, I created a plumb surface on the posts, using a level to add shims as needed (11). I then attached the first half of the column with galvanized finish nails (12), using a short section of 2x4 to support the assembly while I nailed it in place (13).

Next, I nailed pairs of 2x4 spacers to the top, bottom, and middle of the 4x4 posts to brace the second half of each column (14). I ran

a bead of glue (15), then used 18-gauge brads to keep the sides lined up until I could clamp the joint (16). Clamping takes a little more time, but it's the best way to get a good joint. When the glue has set, I pulled the clamps and sanded the two new joints (17).

To keep the trim details simple, I used the same Whiteside 1801 router bit to shape all the edges of the bases and capitals. After routing the material, I mitered 12-inch-tall base pieces to fit around the column, squaring off the edge of the columns to keep the base pieces level (18). After scribing them to the concrete floor, I glued and nailed the bases in place (19). For the capitals, I installed a 4-inch-wide layer of MDF 1 1/2 inches from the top of each column (20), then added a 3 1/2-inch strip with the same edge profile above that (21). A simple square-edge MDF cap seals the top of the hollow column.

*Gary Striegler owns Craftsman Builders, in Fayetteville, Ark., and teaches workshops at the Marc Adams School of Woodworking. His website is [craftsmanbuildersnwa.com](http://craftsmanbuildersnwa.com).*



Each face of the column butts on one side and laps over the other. After routing the panel pattern into a few sides, the author assembled them in pairs, running a bead of glue down the edge of one side (8). To hold the two adjacent sides in alignment, he tacked them together with brads (9), then he fully clamped the assembly and moved on to the next pair of panels while waiting for the glue to set (10). After removing the clamps, the author cleaned up the joints with a belt sander.



On site, the author began assembling the columns by adding shims to create a plumb surface on each post (11). He fastened the first half of the column to the post with galvanized finish nails (12), holding it at the proper height with a 2x4 spacer block (13). Then he nailed pairs of horizontal 2x4 spacers to the top, middle, and bottom of the post for attaching the second half of the column (14).



Before setting the second half of the column in place, the author ran beads of glue along the edges (15). He tacked the halves together to align them, then nailed the second half of the column to the horizontal 2x4 blocks he had installed earlier. With the sides joined together with glue and nails, he clamped the assembly together (16). After allowing the glue to set, the author removed the clamps and used a belt sander to smooth the edges (17).



After marking a level reference line across the bottom of the column (18), the author scribed the base pieces to the sloped concrete porch floor. The base pieces have mitered corners and are fastened together with glue and nails (19). The bases and capitals at the top of the columns were profiled with the same router bit used for the panel design on the column faces. After fastening the first layer of the capital to the column with glue and nails (20), the author applied a second band over the first (21), sealing the top of the hollow columns with a simple square-edge cap.

# Replacing Windows From the Exterior

BY KYLE DIAMOND

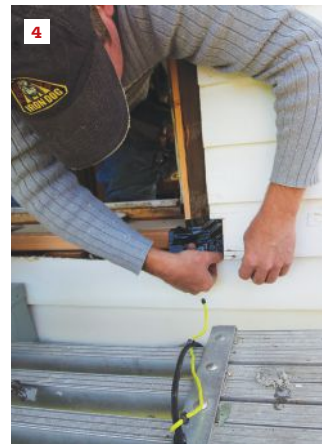
**Last fall, my company,** New Dimension Construction, replaced 23 single-pane windows in an 1860s-vintage farmhouse in Dutchess County, N.Y. The homeowners had grown tired of the old, drafty windows and their quirky traits (their operability ranged from “frozen” shut to closing too quickly, much like a guillotine), so they decided to upgrade them.

The home’s interior trim was in excellent condition. A majority of the windows were trimmed out with an 8-inch-wide built-up casing (which wrapped the jambs and head) and an accent panel located below the sill (1). The complexity of the interior trim, plus the potential for damaging it and the adjacent plaster walls, convinced us that it would be easier to work from the exterior.

In our region of the Northeast, older homes from this era were often built without board sheathing (much less a WRB). With the farmhouse’s existing clapboard siding nailed directly to its post-and-beam framed walls, we had to figure out how to flash and seal the window without the benefit of a WRB. We would have to rely on the seal between the clapboards and trim to keep out bulk water.

**Prepping the opening.** Prior to demolition, we masked off the interior side of the windows. Next, we began removing the windows from the exterior by first cutting through paint at the clapboard-to-trim seams with a multi-tool (the home’s exterior lead paint had been abated 12 years earlier). Then, we pried the jamb trim off, which allowed us to remove the sashes, parting bead, and sash weights. After carefully removing and salvaging the window’s pediment (2), we removed the window frame and sill, exposing the roughly 3 3/4-inch-deep wall cavity.

We padded out the rough opening with new 2-by stock to take up the space of the sash weights, adding head and sill framing as needed at the gable-end walls (3). For sill flashing, we installed a piece of beveled siding on the sill plate, then installed small pieces of Zip System flashing tape at each corner (4). Next, we ran a length of the flashing tape along the framed sill, adhering it about half an inch onto the top of the existing clapboard below for drainage. To make the critical sill-to-jamb transition, we installed a second length of Zip System Stretch Tape (5), running it 6 or so inches up the jamb. We find the Stretch tape easy to apply and have had a good track record using it. Last, we applied a bead of sealant to act as a back dam (6), and then we moved on to inserting the window.



Complex interior trim (1) necessitated removing the 150-year-old windows from the exterior (2). New 2-by stock padded out the R.O. (3), while the sill “pan” was made from flashing tape products (4, 5). A bead of sealant acts as a back dam (6).

Photos by Tim Healey and New Dimension Construction

**Installing the window.** Another issue related to the unsheathed walls was that the homeowners chose a two-over-two, Marvin Ultimate double-hung wood window, which has a minimum available frame depth of 4<sup>9</sup>/<sub>16</sub> inches. This is a standard size for a 2x4 wall, but our wall depth netted out to roughly 4 inches deep. This cornered us into having to install the window proud of the exterior face of the framing, which meant that we needed to rabbet the new jamb trim and pediment in order for it to lay flat.

Starting out, we set the frame in the opening, marked the sill horns (the sill was factory-applied mahogany), and cut out the siding, and then we installed the frame (7). The window was leveled and held in place with clamps and blocking. To through-jamb fasten the window, we removed the sashes and popped out the check rail plugs in the middle of the jambs to gain access to the jamb frames (8). This enabled us to slide the top and bottom jamb filler strips up and down as needed to secure the unit. On each side, we used 3<sup>1</sup>/<sub>2</sub>-inch-long #10 screws at the top and bottom and a GRK adjustable Top Star shim screw in the middle. The shim screws allowed us to micro-adjust the jamb for plumb and straightness (9).

With the window secured, we reinstalled frame pieces and window sashes (10), then we air-sealed the head and jambs from the exterior with spray foam.

**Finishing up.** After the foam cured, we ran a length of Zip System flashing tape up the jambs (butted to the existing clapboards and lapped onto the unit's frame), then a length across the head. We next prepped the salvaged pediment for reuse. As mentioned above, the new windows were installed proud of the existing framing, so we rabbeted the interior edge of the pediment with a router so it would lie flat when re-installed. We primed it and ran a bead of sealant along the edge where the clapboards met the pediment legs and along the unit's frame. Then we slid the pediment up and under the existing metal flashing and fastened it off.

For our trim legs, we used Solid Gold treated radiata pine by Claymark. Prior to installing it, we rabbeted its inside edge, then ran a bead of sealant down the inner edge of the pediment and the existing clapboard and onto the unit's frame (11). Then we set the jamb trim in place (12).

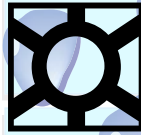
With the new trim and pediment secured with finish screws, we ran another bead of sealant down the clapboard-to-trim junction. A narrow piece of beveled clapboard was then installed underneath the sill, gapped to allow any water to escape from the sill "pan" flashing.

We've had a very wet fall and winter (so far), and our flashing system is performing well.

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



The window unit is lifted in place (7), its frame partially disassembled for access to fastening points (8). A shim screw is used to micro-adjust the jamb (9). The window is reassembled (10), then sealant and trim are applied (11, 12).



MARK E INDUSTRIES

# GOOF PROOF® SHOWERS



## GOOF PROOF LINEAR DRAIN 6 Length Combinations from 27" - 60" designed for use with all waterproofing methods



Roll On



Vinyl Liner



Sheet Membrane

Prod. ID GPLD/26/60 Description: 6 length combinations ranging from 27" to 60" Tileable insert top (metal grates not available) with female receivers to attach Quick Pitch Float Sticks directly to the drain. Can be used with any waterproofing method including Roll on, Vinyl, and Sheet Membrane. Install with or without a curb to create a barrier free shower.

Check our website for videos and more information: [www.goofproofshowers.com](http://www.goofproofshowers.com)

Mark E Industries, Inc. Toll Free: 1-866-771-9470 • [info@markeindustries.com](mailto:info@markeindustries.com)

# ZIPWALL®

DUST BARRIER SYSTEM

800-718-2255

## Do it right.

**Start every job with ZipWall®.**

- Sets up in just a few minutes – brings in business for years
- No ladders, no tape, no damage

See how easy it is at [zipwall.com](http://zipwall.com).





# GET THE JOB DONE FASTER

**HEAVY DUTY MAX** Construction Adhesive

**HYBRID TECHNOLOGY**

Up To **5X** Faster Bond  
Strength On All Materials



**DYNAGRIP**  
THE GRIP THAT OUTPERFORMS\*

LEARN MORE: [DAPOnTheJob.com/dynagrip](http://DAPOnTheJob.com/dynagrip)

## NEW: Keep Beautiful Home Exteriors Beautiful

### Venting Never Looked So Good



## DryerWallVent

The people who brought you the Dryerbox® are taking that quality commitment outdoors. Today, exterior terminations get the attention they deserve as components that actually enhance aesthetics. Built in the USA of powder coated heavy gauge galvanized steel, they stand the test of time. Clean lines and superior performance make Dryer Wall Vents™ worth a closer look.

**Powder Coated  
Galvanized Steel**



**In-O-Vate**  
Dryer Products

*The Dryerbox® People*

**888-443-7937**  
[www.DryerWallVent.com](http://www.DryerWallVent.com)

## The Greased Pigs of Estimating

*David Gerstel has been a builder for four decades and is the author of Running a Successful Construction Company, often referred to as an industry "bible." David's new book, also a bestseller, Nail Your Numbers, A Path to Skilled Construction Estimating and Bidding, can be ordered from Amazon, other online booksellers, and most local booksellers.*

**Recently, I was corresponding** with the builder and author Mark Kerson about spreadsheets and their use as a kind of net to capture the elusive items that can slip by us during estimating. Mark has managed to succeed—namely, do work that makes him and his crew proud and his customers happy even while he prospers financially—as both a developer and a general contractor. He has also written a good book, *The Elements of Building*, about construction company management.

I read Mark's book regularly for inspiration as well as information. But sometimes Mark and I differ about business strategies or systems. We were exploring one of those differences in our recent exchange. Mark has long made use of a software estimating package that includes a digital catalog of labor and material costs along with a spreadsheet prefilled with lists of thousands of items of work from site prep through finish details.

Mark chose his software with care, because, as he says, "software estimating packages are not all created equal, not by a long shot." Even with his software, he is skeptical about the cost data and does not rely upon it. But he values the spreadsheet because it includes such a comprehensive list of work items—one that can be easily customized to fit his operation. He feels the list prompts him to capture every bit of the construction called for in his projects. He also believes that any builder, especially an inexperienced builder, is better off letting a reliable outside party create an initial but customizable list rather than trying to build one from scratch.

While I think Mark is dead right about the need for prompts and about the need for spreadsheets to double as comprehensive checklists, I have preferred building my own checklist on an Excel spreadsheet rather than buying a construction software package. Excel is inexpensive. You can get superb education in its use, also at low cost, at Lynda.com. And if you construct your own spreadsheet/checklist on Excel, you have complete control of it.

I also think that even if you are new to the building business, you can readily build your own comprehensive checklist. You simply create a skeletal list out of your own experience and awareness.

### A SAMPLER OF ITEMS THAT CAN EASILY SLIP BY DURING ESTIMATING

#### GENERAL REQUIREMENTS

- Labor for obtaining permits
- Special fees such as school district levies

#### SITE WORK

- Protection of special plants & trees
- Erosion control
- Removal of roots & grubbing

#### DECONSTRUCTION AND DEMO

- Temporary protection of finishes
- Hidden layers of wall covering

#### FOUNDATIONS

- Trimming of footing trenches
- Below slab insulation
- Exacting layout and construction of formwork for modernist designs

#### FRAMING

- Blocking
- Tie-ins to existing framing

#### FINISH

- Special hardware such as peep holes, mail slots, & address numbers.
- Matching of existing materials

#### TRADE PARTNER WORK

- Crew and supervision time used by trade partners
- Completion of small items overlooked by trade partners

*Note: This list is excerpted from chapters six through eight of Nail Your Numbers*

Then you expand that list by drawing items from the extensive columns of items provided in estimating books like *Nail Your Numbers* and others listed in *Nail's Resources* section.

The books will cost you far, far less than a software package, which will burden you not only with an initial substantial cost, but with annual fees for updates. It is steady pursuit of such savings, in my experience, that is the surest path to financial independence and beyond as a builder. I have been fortunate to enjoy great results by operating as an overhead frugalista, vigilant in my conservation of resources and out to assassinate every little bit of overhead that is not essential to the strength of my enterprise and its survival through times both good and rough.

**But there is another reason, too, that I prefer to build and maintain my own spreadsheet/checklist. It derives from my sensitivity to the prime rule of estimating: Don't miss anything.**

Do not miss any of the items of construction called for in the plans. Or in the specs. Or in the scopes of work to be handled by trade partners.

Mark thinks that a comprehensive list such as the one included in his software package is arguably the best tool for preventing misses. It "allows you," he says, "to focus more on the important stuff instead of wondering all the time about what you might have overlooked."

I, on the other hand, am inclined to think that the spreadsheet/checklist that you have built entirely yourself will prove the better tool. As I said to Mark, "It strikes me as virtually incontestable that you increase your awareness of your list by building it yourself, just as you understand any construction and its use more deeply by entirely creating it yourself." You won't understand framing as well if you only remodel structures initially built by other builders rather than also framing new structures yourself. You won't have as strong a grasp of all that goes into estimating for framing if you just work your way through someone else's checklist, modifying it here and there, rather than building your own checklist by thinking through the entire process step by step.

Mark and I have wrapped up our exchange by concluding that neither of us is likely to be absolutely right or wrong. His approach might be better for some guys, mine for others. Or as Mark says, "That is what makes construction so complex (and interesting). Both and neither. This idea and that." Take what you can use, leave the rest.

**No matter which method you elect for acquiring a spreadsheet/checklist—buying one prebuilt and modifying it or building your own—you must keep after what I call "the slipperies"—those greased pigs of estimating that can so easily evade your awareness as you work your way down a spreadsheet.**

There are myriad such slipperies. If they escape your attention, they can do major damage to your bottom line and, thereby, to your company. They are expensive. And they stick their snouts into every division of work in a project.

During estimating for site preparation, you may need to account for measures that are not always required but that may be for a particular job. You may, for example, have to estimate for the material and labor costs for protecting trees treasured by an owner or a town.

When you arrive at your spreadsheet division for concrete, if you are estimating formwork for a "crisp" modernist design, you want your checklist to nudge you to capture the full cost of the hyper-meticulous layout and installation required by such designs. Let that one slip away, and you can miss your labor cost by 50%, according to one veteran estimator. She told me that she doubles her usual labor figure for formwork for modernist designs. She has discovered, in the sleek, high-end homes for which she often builds estimates, that a small deviation in the forms can translate into wavering drywall on the third floor—and that in turn can stimulate disappointment or worse in the designer and client. So, she allows for extreme horizontal and vertical control during construction of the forms. She is right to do so. Modernist designs may



The stepped concrete column (whose formwork is visible behind the scaffolding) was costly to construct for several reasons, including complexity and difficult access. Most impactful, the column was to serve as a prominent finish item, so all forming and concrete installation had to be meticulously controlled.

Photo excerpted from *Nail Your Numbers*

appear simple. But as one of my leads likes to say, “simple is hard.”

When you arrive at your estimate for framing, you encounter a whole slew of slippery piglets—notably in the form of blocking. I gradually became aware of them as I improved my spreadsheet/checklist over the years so that it now includes blocking for joists, cabinet hanging, bathroom fittings, support of rough plumbing, mounting of electrical devices, drywall backing—and the list goes on. Even so, I sometimes wonder if it is yet complete. The same estimator who emphasizes the cost of the formwork for “simple” modernist projects told me that she allows 4% of the total cost of framing for blocking.

That 4% can translate into a large chunk of dollars. Assume that framing runs 15% of direct costs of a large addition or new home, with total direct costs of \$400,000. In that case, blocking will cost \$2,400 ( $400,000 \times .15 \times .04 = 2,400$ ). That’s a sum worth catching in your estimating net.

At the finish division of an estimate, slipperies can arise from requirements to match existing finishes. Just how close a match are you providing for? There is reasonable matching. Then there is the exact matching of that beat-up old strip oak hoped for by a client who views their flooring as a precious antique while you thought of that stain-and-wax-gooped-over mess as ripe for removal and replacement. (You can take care of such items by including with your estimate a written assumption that states the degree of matching you and the client have agreed upon, then allowing sufficient labor and material to achieve it.)

Some of the most potentially damaging of the finish slipperies pop up in designs that require you to produce structural elements that double as finish. Consider the column shown in the photo on the facing page. Such items can require labor several times what would be needed for the same installation if it were hidden from view, not functioning as finish.

**Of all the greased pigs, the most insidious are those that can occur at multiple points in an estimate. I will hit on a few big ones here.**

First, there are General Requirements—items such as initial job mobilization, daily job setup and cleanup, scaffolding, permits, special inspections, and most especially, supervision by crew leads or project managers (see “A Big But Often Overlooked Cost of Building,” Jan/19). They are slippery because they are, for the most part, invisible in the plans and specs. They aren’t mentioned or shown. But you must see them, nevertheless.

There are a great many General Requirements. And they are costly, not only individually but in aggregate. They can amount to 10% or even much more of the direct costs of a job. Somewhat amazingly, as was emphasized in our recent article on General Requirements, they seem to slip by even seasoned builders.

Apprentice labor may well be the most significant of the elusive items for builders who employ in-house crews. The real cost of apprentices often is misunderstood and severely underestimated. When you factor in the much higher workers’ comp rates for apprentices along with the supervision they require, their hourly cost can run close to that of journey-level carpenters. If they are

deployed to tasks beyond their skill level, their inefficiency and mistakes will push their cost per unit of production far past that of full carpenters. Therefore, during estimating, you need to use their base rate only for those simple repetitive tasks at which they can be efficient and effective. If you anticipate deploying them to more complex work to keep them busy, you must either jump up their rate or allow for very low productivity.

**When you arrive at your estimate for framing, you encounter a whole slew of slippery items—notably in the form of blocking. You might be surprised at what a sizable percentage of direct costs it can amount to.**

If you prefer to work largely with trade partners rather than employing crews, then the greased pigs you will need to keep after most persistently are items that can readily slip between the trades. For example, you don’t want to find yourself in the position, as did a builder who was working in my neighborhood recently, of assuming your foundation sub will install the under-slab insulation when he thought that either you or another trade partner was taking responsibility for it. The Included/NIC form for use with subs that we discussed in an earlier article (“Taking the Slack Out of Subcontractor Bids,” Oct/18) can help you round up such items and avoid the need to repeatedly “split the difference” with subs for items that escaped attention.

How else can you best avoid getting trampled on by the pigs during the course of building estimates? If you like prebuilt spreadsheet/checklists such as Mark Kerson prefers, then perhaps you would be wise to go through them and emphasize or add elusive items.

If you prefer to build your own spreadsheet/checklist, as I do, then my method of netting the slipperies might work for you, too. Whenever I am working with a new set of plans, if I notice an item that is not already listed on my spreadsheet, I immediately open Excel and include it. If I am in the field and notice an item that I have not yet put into my spreadsheet, I make a note of it. The note goes into my inbox to remind me to put the item into Excel the next time I am doing office work.

One way or the other, you do have to get the slipperies into your spreadsheet/checklist. You must corral those greased pigs. Fail to do so and you will fail to bring home enough bacon. Construction is a tough enough business without letting some of the elusive financial reward slip away due to oversights of items in a project you should have accounted for during estimating.

*David Gerstel’s books, including Nail Your Numbers, as well as Mark Kerson’s Elements of Building can be purchased from Amazon.*



# You Can Take Us Anywhere!

Maze Nails are designed to fit tools made by Bostitch, Fasco, Hitachi, Makita, Max, Senco and other leading brands.

- ★ Maze Nails are 100% Made in the USA!
- ★ Maze Nails are genuinely Double Hot-Dipped Galvanized - providing a lifetime against rust!
- ★ Maze Nails offers Stainless Steel coils and sticks for marine and seacoast projects.
- ★ Coils and Sticks are packed in handy smaller count "job lot" cartons.



1.800.435.5949 • [www.mazenails.com](http://www.mazenails.com)

Maze Nails are not endorsed by, sponsored by or affiliated with any of these tool manufacturers.

©2018 199853 LKCS • www.lk-cs.com

BY EMANUEL SILVA



Rot was visible from the ground **(1)**. A closer check revealed the causes: no drip cap over the window casing, and siding caulked to the casing **(2)**. In addition, the flashing tape had been improperly installed **(3)**, and the bottom casing had been caulked to the window **(4)**. Before repairs could proceed, the siding was peeled back **(5)**.

## Fixing a Poorly Installed Window

**I seem to get a lot of calls to fix windows with rot around them.** The most recent case was a second-floor window that had been replaced just seven years earlier. While the vinyl-clad window itself seemed sound, the head casing and the top of one side casing had rot that I could see from the ground.

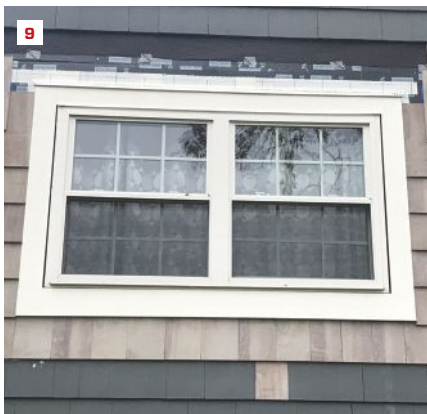
**Caulking culprit.** When I checked out the window from my ladder, the first thing I noticed was that there was no metal drip-cap flashing over the head casing. I also saw that caulking had been used to seal the cedar shingle siding tight to the top of the casing, trapping moisture behind the siding. Below the window, the casing was also caulked to the window, preventing water from draining out.

**Siding issues.** Another problem was that the new shingles had not been properly woven into the existing siding after the window was installed. In many places, the joints of successive courses did

not have the proper offset of at least 1½ inches. I also found that the top course of new shingles had just been butted and caulked against the course above, instead of being slipped up and behind the existing shingles. These defects allowed water to get behind the siding, leading to rotted trim and sheathing.

When I peeled back the shingles to expose the sheathing, I found that this window had replaced an existing window that was both shorter and wider. After reframing and sheathing the new rough opening, the carpenter had applied flashing tape along the sides before installing the window but hadn't applied new house-wrap over the sheathing, leaving a path for air and moisture to enter the structure.

**Casing causes.** When I pulled off the window casings, I could see that there was no flashing behind the bottom flange of the window. On the sides, the window flanges hadn't been sealed to the



The author replaced the sheathing above the window (6), then sealed the flanges to the sheathing with flashing tape layered from the bottom up (7, 8). After installing the PVC window casing (9), the author finished up by installing new shingles, using gauge blocks to leave a gap above the head casing (10).

sheathing with flashing tape, and the nails through the flanges were pretty rusty from water getting behind the casing. After pulling the nails and checking behind the flashing to make sure the sheathing hadn't rotted, I renailed the side flanges with 2-inch galvanized roofing nails.

While there was flashing tape behind the top casing, it had been installed incorrectly, which contributed further to the rot in the sheathing above the window. Here, I removed enough shingles to expose the original housewrap and removed the rotten 1-by sheathing boards. With the sheathing removed, I found only minor damage to the framing, which didn't require replacing. After replacing the sheathing, I opted not to remove the window from the opening, to keep the interior finish intact.

**Fix the flashing first.** After removing the nails from the bottom window flange, I installed SAF tape behind it, following the principles outlined in my article "Practical Window Flashing" (Apr/18). I layered the SAF from the bottom up, lapping it over the existing siding below the window and up and under the bottom window flange, and overlapping the existing side flashing tape.

Next, I applied 12-inch-wide flashing on the sides from bottom to top to seal the window flanges to the sheathing, and pieced in new self-adhering housewrap on both sides. Then I sealed the top flange to the sheathing with 12-inch flashing tape, layering it shingle-style with the new and existing housewrap.

**Trim and siding.** Before casing the window, I installed a metal drip cap over the top of the window, sealing the cap's top leg to the house with flashing tape. I trimmed the window with 1-by PVC stock that I assembled on my workbench, sizing it to leave a 1/4-inch gap between the casing and the window frame on every side. Then I installed another drip cap, over the head casing, again sealing the top leg with flashing tape.

As I reshingled around the window, I made sure to properly offset the joints. Over the head casing, I used 3/8-inch gauge blocks to maintain a proper gap between the shingles and drip cap. To speed installation of the starter course over the window, I joined the cut shingles together on my worktable with pieces of tape and installed them on the wall as a single panel.

Before installing the final course of shingles, I cut just enough off the top of each shingle to keep it from hitting the nails above. Holding each shingle just below a layout line I had marked on the wall, I drove nails up at an angle just below the bottom edge of the shingles in the course above. Then I tapped each shingle up into position, hiding the nail heads. Finally, I applied sealant to the gaps between the sides of the window and the trim, leaving the gaps at the top and bottom open for proper drainage.

*A contributing editor to JLC, Emanuel Silva owns Silva Lightning Builders, in North Andover, Mass.*

VISIT US AT IBS BOOTH #C5348 & P23  
**\$15,000**  
IN PRODUCT  
REBATES  
FOR YOUR CHANCE TO WIN



**IT'S NOT A TREND. IT'S A REVOLUTION.**

Visit [ZIPRevolution.com](http://ZIPRevolution.com) to learn how easy it is to make the switch.

**ZIPsystem**<sup>™</sup>  
SHEATHING & TAPE

<sup>1</sup> Rules and restrictions apply. See Official Rules at [IBSRebate.com](http://IBSRebate.com) for complete details, odds and prize conditions. © 2019 Huber Engineered Woods LLC. ZIP System, the accompanying ZIP System logo and design are trademarks of Huber Engineered Woods LLC. Huber Engineered Woods' ZIP System® products are covered by various patents. Please see [ZIPSystem.com/Patents](http://ZIPSystem.com/Patents) for details. HUB 16509-3 12/18



Runs grinders, pumps, drills, saws,  
and rings around the competition.



On the jobsite, time is money. Crews can't afford to sit idle due to lack of dependable on-site power. Reliability, stability, and fuel-

efficiency are just a few of the reasons why Honda Generators are consistently ranked as “most preferred” by a leading industry publication\*. For more info, go to [gen.honda.com](http://gen.honda.com).



**HONDA**

 [facebook.com/HondaGenerators](https://facebook.com/HondaGenerators)

\*Builder Magazine sponsored Readex Study ranked Honda as “most preferred brand” for 12 consecutive years. Please read the owner’s manual before operating your Honda Power Equipment and never use in a closed or partly enclosed area where you could be exposed to odorless, poisonous carbon monoxide. Connection of a generator to house power requires a transfer device to avoid possible injury to power company personnel. Consult a qualified electrician. © 2019 American Honda Motor Co., Inc.

# INNOVATION



## Factory Building: The Next Wave Computerizing and automating home panelization

JLC STAFF REPORT

**T**edd Benson has “only a small ambition,” he told assembled guests at the grand opening of his Unity Homes factory in Keene, N.H., in 2018. “We intend to change the building industry. Dramatically.”

Benson’s roots as a builder go back to the 1970s, when he helped to kick-start the timber-framing revival in the U.S. with his classic book, *Building the Timber Frame House*. But the vision has evolved over the years, and Benson’s current venture, Unity Homes, is about much more than honing a chisel.

In July 2018, *JLC* toured Unity’s factory in Keene, N.H. What we saw was a state-of-the-art computerized and automated facility where comprehensive CAD plans are turned into complete

high-performance custom home packages that the company’s trained crews can erect on site in a matter of days.

In December, we went on site in Brewster, Mass., to see a crew set one of Unity’s house packages. What follows is a look at both ends of the process: the precise factory fabrication of house components in the Keene facility, and the quick erection of the home on site in the field.

The company’s goals are ambitious and broad: building in a few weeks homes that can last for hundreds of years; precisely controlling fabrication to eliminate construction defects completely; and creating a process that can scale up to become standard practice throughout the nation. Can they do it? Read on.

Photo: Roe Osborn

## Touring the Unity Homes Factory Floor

Humans have dreamed for years of a future where all the work would be done by machines. At the Keene, N.H., manufacturing plant of Unity Homes and Bensonwood, that future is one step closer to becoming a reality. The plant cranks out complete home frames, bundled for assembly on site, including walls, roofs, and floors. There's still plenty of work in the facility for people. But much of the fabrication, along with all of the heavy lifting, is done by high-precision machinery (see photos). On a tour of the facility, *JLC* got to see some of the equipment in action as Hans Porschitz, Unity's chief operations officer, explained the setup.

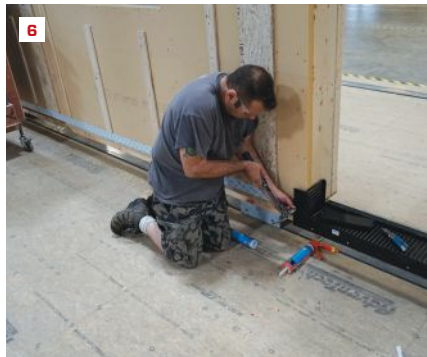
At the heart of the operation is a Hundegger Speed Cut SC3, a versatile robot that gets its instruction directly from a home's CAD design file. Workers load the machine with raw materials using a vacuum-lift crane. The Speed Cut can handle solid beams as fat as 7 inches by 24 inches and has no trouble with wood I-joists or glue-laminated stock. Inside the machine, a spinning saw blade makes all the necessary cuts for stud, joist, and rafter framing. Routers can hog out mortises and tenons or holes for chases. Cuts are precise to 1/16 inch. And the Speed Cut's ink-jet printer not only labels every part that's cut, it also handles layout for wall, floor, and roof panel assembly. Workers who put the components together rarely have to touch even a tape measure or pencil.

From the Hundegger, parts are bundled and carried by forklift to three parallel assembly lines: one for walls, one for roofs, and one for the "open cavity" components (interior walls and floors). During assembly work, operators don't have to bend over or lift heavy weights, because machines handle the lifting. And operators seldom touch a tool; they just place parts on the framing table. Machines nail studs to wall plates. Workers do have to tack sheathing in place (although they don't have to lift it), but automated routers handle the sheathing cuts, and rack-mounted nail guns nail the material off with precision accuracy.





(Facing page) Mortise-and-tenon joinery substitutes for steel connectors in some situations; here, Hans Porschitz demonstrates a mortised porch-roof connection **(1)**. Brad Ramsey, the Hundegger CNC equipment operator, works the controls for the machine. Also at Ramsey's fingertips is the control panel for the Joulin semi-automatic vacuum feeding system, which allows him to select and feed a variety of materials from a magazine into the cutting equipment **(2)**.



Alex Morin assembles the framing for a window rough opening. This component will then get fed into the automated framing system that will frame the other parts of the wall **(3)**.

(Facing page) The CNC bridge gantry is equipped with nailers and a router. It travels over the wall on the table, fastening the sheathing to the framing and trimming it to the final panel size as well as cutting out the sheathing for any door and window openings **(4)**.



Jason Furland places insulating fiber sheathing on the exterior of a wall panel. The gantry will nail off and trim the panel later **(5)**. Ray Zabel installs the standard sill pan detail of a doorway rough opening prior to the door install **(6)**. All doors and windows are detailed and installed before the walls are shipped, allowing the home to be blower-door tested as soon as the last panel is installed in the field. Greg Bruns preps the exterior of the rough opening for a window, using Siga tape **(7)**. All wall panels are fully airtight and watertight when they are shipped to the field.



A worker manhandles parts for a custom curved roof package created by the Hundegger Speed Cut saw. The Unity Homes plant is capable of accomplishing fully panelized building shapes ranging from simple geometric forms to one-off architect-designed creations **(8)**.

## Built in a Factory, Assembled on Site

The first sign that assembly of the house was imminent was the far-off sound of a semi truck winding its way down a narrow dirt road through the woods on Cape Cod. The Unity Homes crew had arrived from New Hampshire a day earlier and set mudsills on the foundation. The crane—an absolutely essential part of the assembly operation—was set up and ready. What followed over the next five days was nothing short of incredible to observe.

**Crew coordination.** The crew of four from Unity Homes worked together like a well-oiled machine. These guys had assembled many Unity homes together. In addition, they alternated their time on assembly crews with time in the factory, so they were able to bring valuable feedback from the field to the factory floor.

Whether unstrapping a load from a trailer, rigging panels for lifting, or nestling a panel into place on the house, they worked quickly, efficiently, and methodically. Every crew member seemed to have a good idea of what was supposed to be done next.

**Safety first.** It would be easy for an experienced crew to get lax with safety on the jobsite. But these crew members always wore hard hats during crane operations, and their bright yellow shirts were much more for jobsite visibility than for promotion.

Fall protection equipment was used at all times while the roof panels were being set. The lifting-strap anchors on the roof panels worked perfectly as attachment points for the equipment. And the panels even came from the factory with toe boards attached.

**Attention to detail.** Perhaps the most impressive thing was the crew's attention to detail when it came to air-sealing the panels. Specialized gaskets were used to seal every connection between the subfloor, walls, and roof panels. They meticulously executed every detail with a complete battery of different tapes and sealants.

The photos on the following pages offer a quick look at the assembly process. To see more photos, please check out the online version of the article, at [jlconline.com](http://jlconline.com).



The parts for the house come on big flatbed trailers, shrink-wrapped, labeled, and numbered for assembly (9). After glulam carrying beams supported by posts tenoned into them are dropped into place (10), the crane sets the first-floor deck panels (11). As each floor panel is set in place, the crew draws the panels together with specialized ratchets (12). The panels are then fastened to the sills from below.





Unity Homes often have a timber-frame component, and this house was no exception. After setting the floor deck panels, the crew assembles a timber-frame bent made from glulam lumber that was cut in the factory (13). Besides adding a distinctive decorative note to the home's interior, the bent supports the main roof. Although cut on CNC machines, all the joints are pegged together in the traditional manner of a timber frame (14).



Specialized gaskets are attached to the floor panels (15) before the wall panels are dropped into place (16) to air-seal this critical joint. Note that each panel is fully insulated and comes with an interior 2x3 wall for running utilities. As each panel is set and braced, the crew attaches the gasket material to the corner of the panel where it meets the adjoining wall panel (17). After raising the timber-frame bent, the crew continues to stand the walls around the house (18).



After attaching gasket material to the top plates of the walls, the crew sets the gables (19). Roof panels have an integral lip that fits into a groove on the top of the bent beam (20). Chainfalls on the lifting straps hold the panels at the proper angle (21). After installing the intersecting roof beam (22), the crew staples gasketing to the roof in preparation for the next roof panels (23).



Even the porches are on this house are prefabricated in the factory. Supports for the inner porch walls are part of the foundation pour to avoid the need for a ledger (24). The main porch uses a timber frame to support the roof, but prebuilt gable panels sit on the frame (25). After installing the porch ridge beam, the crew installs the porch roof panels (26).



Siga Rissan tape seals the lifting holes in the walls (27), and Zip System tape seals the roof-panel seams (28). A crew member layers the various tapes and gaskets for a crucial wall-roof-deck intersection (29). At the peak, backer rod fills the gap between panels (30), followed by expanding foam (31) and Zip tape (32), which also seals roof-panel holes (33). Siga Wigluv tape air-seals the wall-panel intersections (34).

The crew's truck is packed up and ready to return home with the shrink-wrap material, extra lumber, food coolers, and luggage (35). No dumpster was needed, and no trash pile was left on site.

# BADASS THINGS COME IN THREES.



 **TimberTech**  
PRO



 **TimberTech**  
AZEK



 **TimberTech**  
EDGE

Want decking that walks the walk? Then, hey: nothing beats TimberTech. Our comprehensive Decking Portfolio—covering every application you can imagine—merges superior technology with unmatched design versatility. And you know what that allows you to build? One. Badass. Deck. Imagine the possibilities at [TimberTech.com](https://www.timbertech.com)

 **TimberTech**  
Go Against the Grain.



# TECHNOLOGY



## Smart Lighting, Smart House Control systems change the homeowner experience

BY GEOFF FERRELL

**A**s the chief technology officer for Mandalay Homes, a production builder based in Prescott, Ariz., it's my job to keep my company on the cutting edge of advancing home technology. Our strategy is to make technology and affordability work together. At the same time we're building a better house that is more attractive to buyers, we're finding ways to contain or cut costs so that we can stay price-competitive in our midrange real-estate market segment.

I'm responsible for implementing a wide variety of specific solutions in our houses. For example, we've introduced AeroBarrier aerosol home sealing to our construction work flow (see "A Game Changer for Airtight Construction?" Mar/18), and we've

started equipping every new house in some of our neighborhoods with a battery system paired with photovoltaic rooftop panels (see "Grid-Optimized Solar-and-Battery Systems," May/18). Both of those advances add value for our customers while saving energy.

The scope of my responsibility also includes lighting and home automation. In this story, I'll describe how we use advanced control systems and advanced lighting to save energy costs for our homeowners, while at the same time enhancing their experience of living in the house.

In practice, smart lighting and smart home automation are closely connected, because the first upgrade after you've put the best modern lighting into a house is to put in the controls that help



Mandalay Homes installs LED downlights over garage doors, rather than traditional carriage lights flanking the doors. This helps comply with “dark sky” regulations, creates a pleasing light, and conserves energy.

the homeowner get the most utility out of those advanced lighting fixtures. In our case, we’ve made the switch to 100% LED lighting in our homes and, in most of the homes, control of that lighting is integrated into a Control4 home automation system ([control4.com](http://control4.com)). But that’s just the beginning: The home automation system can control many other things besides just the lights.

### **LIGHTING: THE BASE PACKAGE**

As I mentioned, our new houses now have a “solar plus storage” solution that collects power from the sun, stores it in batteries, and uses it to offset the home’s needs during peak power draw periods. There’s an up-front cost to the system, but it brings a bottom-line savings for our homeowners when power-bill savings are factored in. To do that trick cost-effectively, however, we need to shave down our homes’ power needs, which includes lighting. We’ve done that in part by phasing out compact fluorescent lights (CFLs) in favor of LED lights.

An Energy Star-rated compact fluorescent equivalent for a 60-watt incandescent bulb draws about 14 or 15 watts. A 60-watt equivalent LED-integrated luminaire uses 9 to 11 watts, and it supplies better quality light. What we’ve done is to transition away from fixtures that require screw-in or plug-in bulbs, and we’ve gone over entirely to integrated-LED luminaires. So instead of a standard line-voltage fixture with an LED bulb screwed into it, we’re installing a purpose-built, high-quality Energy Star-rated fixture, with the LEDs built in. Our typical house has about 25 recessed ceiling luminaires, and if the homeowners choose to add more fixtures, we offer them the same kind of integrated equipment.

One advantage to using integrated luminaires is that a future homeowner can’t go backward by installing a less-efficient replacement bulb. Although with these fixtures, the issue of replacement is unlikely to come up: The fixtures we install have a rated life of 50,000 hours. When you consider that Arizona gets a lot of high-quality natural daylight, and you think about how much a

Photos: Mandalay Homes



Inside the garages, Mandalay Homes has transitioned away from conventional 40-watt fluorescent tube overhead lights in favor of LED panel lights; the up-charge for those fixtures is mostly offset by their greater light output and improved light quality. An internet-controllable garage door opener from LiftMaster is also standard in the garage.

light is really used, these light fixtures are going to last 20 or 25 years before anybody has to think about replacing anything. Of course, nobody knows what sort of technology will be available in 25 years. But if a homeowner did have the need to replace an entire integrated fixture today, the light fixtures we install are readily available on the market as replacement units, both in home centers and from online vendors.

If you walked through one of the models that we are building right now as compared to a couple of years ago, you would see closer to 30 recessed can fixtures, instead of the maybe 12 or 15 in the old model. We've eliminated wall sconces, bar light fixtures over vanities, and fluorescent tube fixtures in the closets, laundry rooms, and garages. Instead, we have gone either to integrated-luminaire recessed fixtures or to a surface-mounted LED panel light—a much more efficient unit that puts out really great light. For recessed downlights, we spec Parmida dimmable retrofit fixtures and Nicor 4-inch Surefit LED fixtures.

So how has this change affected our costs? Compared with a recessed can with a screw-in bulb, the recessed integrated luminaires we've chosen cost the same. But it does cost us about \$7 or \$8 more per location to install one of these integrated luminaires than it would cost to do a wall sconce or a bathroom bar fixture. That cost differential varies case by case. In some places, we lose a little bit of money, and in other places, we make a little bit.

Transitioning from fluorescent tube fixtures over to LED panels in the garage did cost a bit more: The LED fixtures cost about three times as much per fixture. But whereas we used to put two fluorescent fixtures per garage bay, now we are installing only one of the LED panel fixtures, because they put out so much more light per fixture than the fluorescent did. So when you do the math (including labor), it's only about a 20% cost increase to provide that better light.

Quality of light is a factor in our selections. Light quality is defined by a metric called the Color Rendering Index (CRI). The



Mandalay Homes' basic home package includes internet-capable amenities such as a programmable Kwikset SmartCode door lock (above left) and a smartphone-controlled Rachio landscape irrigation timer (above right). In most homes, these elements can be programmed using the home's Control4 interface (see facing page).

lighting we install has a CRI of about 93 or 94, which is very high quality. As for color temperature, studies have shown that as people age, they are looking for brighter and bluer or whiter light, especially in task areas. That holds true for us: Most of our clients seem to prefer a 3,000K light source rather than a 2,700K light.

Light sources are one part of a lighting solution; the other part is controls. About 15% of our homes are basic workforce housing; these units don't come with home automation in the base package. In those houses, a lighting upgrade consists of advanced manual switches for the lights. All of the LED luminaires we install are dimmable. So instead of a simple on-off switch, the customer can select dimming switches. But in the houses with home automation, the lighting can be integrated into the home automation controller, which allows for a fully programmable lighting experience. In addition, the home automation system can be configured to integrate many other household amenities into a single centralized control center. Let's take a closer look.

**CONTROLS: THE BASE PACKAGE**

As I mentioned, our basic workforce housing doesn't come with a home automation controller. But we do supply a nice structured wiring package as standard equipment in every house. We include two RG6 coaxial cable connections at the service panel, in case the homeowner wants to use the local cable vendor for internet and wants a satellite dish for TV.

We also run two Cat6 connections to the panel, so the homeowner can access telephone and internet service from a local phone company provider.

Then inside the home, we allow six drops. The owner could choose coax and a Cat6 to the great room because they plan to plug in a smart TV; they could ask for coax in all three of the bedrooms because they want a cable box in each bedroom; they can put telephone service in for a home office; and so on. If homeowners want more than six drops, we charge by the drop. All of the hard wiring is handled by the low-voltage contractor.



Mandalay Homes' basic workforce housing includes a programmable, internet-capable thermostat supplied by Trane (top). But in most houses, a Control4 home automation interface takes over the job of the thermostat. This Control4 panel also manages lighting, audio, video, and more (above).

Those basic houses also include the following:

- a Wi-Fi router
- an internet-connected SmartCode 910 programmable door lock from Kwikset, controllable using Kwikset's SmartCode smartphone app
- an internet-connected garage door opener from LiftMaster with the MyQ control module included, also controllable using a smartphone
- a programmable Trane thermostat, the ComfortLink II XL850, capable of being remote-controlled with a smartphone through Trane's home automation system, Nexia
- a Generation 3 connected programmable landscape irrigation controller from Rachio

All of these modules are capable of being connected to the Control4 home automation system, but in the basic house, they're just controlled by the apps supplied by the manufacturers of the components. In most cases, those homeowners don't even have to use

the smartphone app unless they want to. They can control their garage door with an ordinary remote control, they can operate the thermostat by hand, and they can program the combination for their front-door lock by opening up a panel on the back of it. The Rachio landscape timer is the exception: It doesn't even have any buttons on the actual device. You cannot manually manipulate that timer at all—you need to use an app (either the Rachio app or the Control4 interface).

## CONTROLS: THE UPGRADE

So our basic, entry-level house package has a lot of controllable elements. Most of our homes, however, also come with a Control4 controller installed as a standard feature. That way, the customers don't have to bite the \$1,000 bullet on the controller itself; when they come to the design center in the model home to make selections for their own house, they're just looking at all the cool things the controller can do. We've already made the investment in the controller for them.

Here's how it works: As part of the 60-day design process before we break ground on a new home, the buyers will have an appointment at our design studio where they can pick out the pretty stuff, like tile, countertops, flooring, and so on. While the buyers are at the studio, they also meet with our electrician representative and can talk about high-voltage upgrades, such as a spa circuit or an additional 220-volt outlet in the garage, in case they have some kind of hobby that requires one.

As part of that same appointment, the buyers also meet with a salesperson who specializes in low-voltage devices. That's when they get to choose from a suite of cool gizmos that the Control4 system can integrate: landscape fountain lights, security cameras, remote controls, distributed audio and video, and so forth. Because we've already made the investment in the controller, they don't have to get over that hurdle.

The controller lets us manage things that we don't even need the homeowner to be aware of. For example, we set the dimming controls on the LED lighting so that when the fixture is turned on, it ramps up to only 80% power. Studies have shown that the human eye can't tell the difference between 80% and 100%, but the lower setting saves energy and extends the service life of the fixtures.

In the future, we're waiting for the sensor technology to become available that will let us configure the Control4 controller to manage air quality in the home. Soon, we'll be able to program every home's ERV so that it boosts its air exchange volume any time there's a spike in CO<sub>2</sub>, VOCs, humidity, or harmful particulates in the house. That serves our interest as a builder in the durability and livability of the house, as well as in the homeowner's health and comfort. Ideally, the home will automatically react to any indoor pollution signals, and start ventilating the home for the occupants while they are just carrying on, having a glass of wine, and enjoying their family. Everybody stays comfortable, healthy, and happy.

*Geoff Ferrell is the chief technology officer for Mandalay Homes, in Prescott, Ariz.*



## INNOVATIVE BUILDING SOLUTIONS

Visit us at  
**NAHB | IBS**  
**Booth #C3848**

Featuring thoughtful designs constructed with the strength of more than 40 years of innovation, Fortress Building Products is one of the strongest brands in the multi-family industry. With a diverse range of high-quality, code-tested products, Fortress is a category leader with a complete line of long-lasting, easy-to-install, low maintenance solutions that complement virtually any design while meeting stability, safety and security goals.

### THE FORTRESS FAMILY



[FortressBP.com](http://FortressBP.com)

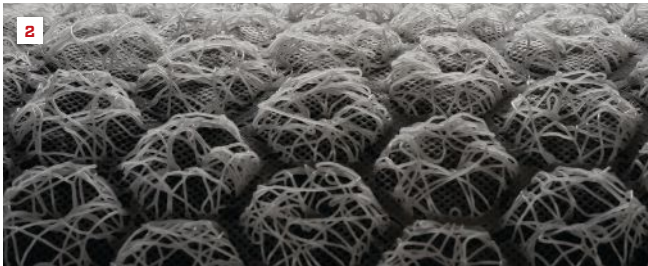
BY SYMONE GARVETT



1

### 1. On-Trend Molding

To facilitate trim selection, Metrie has curated interior trim and door styles according to current home décor trends into its new Option {M} collections. These collections, with names such as Bohemian, Country, Modern Farmhouse, and Vintage Industrial, group together baseboards, casing, crown molding, and doors that achieve a particular look. Elements within the combinations vary by region. Contact a local distributor for pricing. [metrie.com](http://metrie.com)



2

### 2. Rainscreen

The DuPont Tyvek DrainVent Rainscreen is designed to create a 6mm (0.25 inch) space for water drainage and air movement behind exterior claddings such as stucco, stone veneer, brick, wood, fiber cement, and metal panels. The company says DrainVent replaces the intervening layer required for stucco and stone cladding and prevents mortar or stucco infiltration with a layer of filter fabric. The material uses a honeycomb texture to protect against exterior moisture damage. The roll is designed to be easy to cut, roll tight against corners, and lay flat. We found a 4-foot-by-50-foot roll online for \$188. [dupont.com](http://dupont.com)



3

### 3. Water-Saving Dishwasher

Wine-storage provider Vinotemp has launched a new line of kitchen appliances with the collection's first product: the Brama Stainless Dishwasher. The stainless-steel Brama is designed to clean large loads, with room for 16 place settings across three racks. The Energy Star-certified unit features a self-cleaning, multifilter system that the manufacturer says reduces water use. The dishwasher has six washing options, six cycle selections, and a turbidity sensor. All options operate at a quiet 44 dB or below. Pricing starts at \$1,000. [vinotemp.com](http://vinotemp.com)



4

### 4. Mineral Composite Bathtubs

MTI Baths Designer Collection has five new freestanding bathtubs, made from a blend of minerals mined near the manufacturer's operations in Georgia. The tubs are treated with a polyresin coating, which provides a high-gloss white finish that is insulating, durable, and stain, scratch, and UV resistant, according to the manufacturer. All shapes feature large, deep proportions, as well as lumbar support. Pricing ranges from \$5,100 to \$5,455. [mtibaths.com](http://mtibaths.com)

## Products

### 5. Clover Ceiling Pendants

A pattern of four-leaf-clover silhouettes distinguishes a new pendant series from Meyda Custom Lighting. Offered in 34- and 60-inch-wide frames, the lighting fixture reveals five-light or 12-light candelabras in the center. The overall height of the pendants ranges from 27 to 74 inches with the adjustable chain length. Hardware and frame for the 34-inch pendant (\$3,000) are finished in black chrome; the 60-inch pendant (\$7,800) is finished in timeless bronze. [meyda.com](http://meyda.com)

### 6. New Luxury Vanities

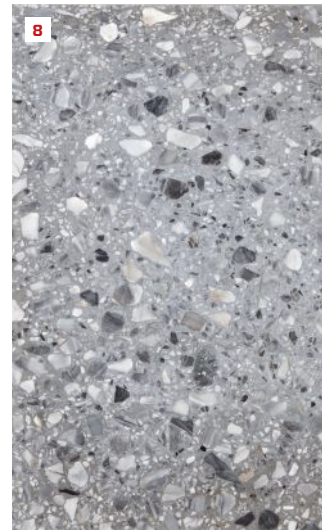
Jacuzzi Luxury Bath has made its first foray into the bath furniture category with four new vanity collections—Barrea, Mincio, Razzo, and Salone. Each is named for and coordinates with Jacuzzi's existing Premium Collection of faucets, tub fillers, and bath accessories. The vanities range from 24 to 72 inches in length and arrive fully assembled and predrilled for faucets. Hinges and drawers are designed to slow-close. Mincio, Barrea, and Salone vanities are available in a white, gray, or espresso finish, while Razzo vanities are available in gray or espresso. Pricing starts at \$1,400. [jacuzzi.com](http://jacuzzi.com)

### 7. Swing-Clear Door Hinges

Stone Harbor Hardware's swing-clear hinges offer a cost-effective, alternative solution to widening doorways in homes. When a door is opened, swing-clear hinges move the door out of the opening and create an unobstructed path for walkers and wheelchairs. The hinges can be installed in place of standard 3 1/2-inch hinges. Stone Harbor now offers its swing-clear hinges with 1/4-inch and 5/8-inch radius corners. Both versions come in a variety of finishes. Hinges are sold in pairs and include screws; pricing starts at \$19.80 for a pair. [stoneharborhardware.com](http://stoneharborhardware.com)

### 8. Natural Stone Tile

Walker Zanger has debuted two new large-format natural stone tile collections, Fragmenta Terrazzo and Marble Luxe, as part of its Curated Elegance line. Fragmenta Terrazzo takes inspiration from terrazzo tiles seen in 17th century Venetian palazzos and adds modern shades of gray, white, and black. Alternatively, Marble Luxe accentuates the classic elegance of large-slab marble and incorporates crisp colors including a bold turquoise, creamy whites, warm browns, and rich grays. Square-foot pricing for Fragmenta Terrazzo starts at \$21; for Marble Luxe, \$21 to \$42. [walkerzanger.com](http://walkerzanger.com)





9

### 9. Improved Thermal Windows

The newly-redesigned casements for Ply Gem's Mira aluminum-clad wood windows offer an improved thermal design system, standardized hardware, and a thinner screen. Ply Gem says the new sash cladding gives the window a historic look and works together with the overall thermal design to protect against cold air and heat intrusion. Mira is available with 7/8-inch-thick glass as standard, with options for triple-pane insulated glass and four additional new glass options. Contact a local distributor for pricing. [plygem.com](http://plygem.com)



10

### 10. Metal-Roofing Underlayment

Self-adhered Boral Roofing MetalSeal underlayment is designed especially for metal roofing but may be used with any roofing type. The underlayment sheet bonds to the roof deck or base sheet upon installation, self-sealing around fastener penetrations for protection against rain, snow, and ice. The manufacturer says that MetalSeal eliminates the need for an excessive number of nails, reducing installation time and cost, and that it remains intact under high foot traffic and provides traction for safe installation. It comes in 216-square-foot rolls for a net two squares. Contact a local distributor for pricing. [boralroof.com](http://boralroof.com)



11

### 11. Smart Energy Monitor

Schneider Electric's Wisier Energy from Square D helps homeowners stay connected to their smart home by monitoring home activity and energy use in real time. The monitoring device installs in an electrical panel and integrates with smart-home devices such as Google Home and Amazon Alexa to help keep track of which fixtures are on or off in the home. With 24/7 access to a home's data on the Wisier Energy app, users can set goals to optimize energy use and save on energy bills, according to the company. A standard version will cost \$300; a solar version, \$350. [schneider-electric.us/en/](http://schneider-electric.us/en/)



12

### 12. Tile Shower Drain Outlet

The Wondercap Tile Shower Drain Outlet is designed to prevent shower-pan-liner leaks and stop construction waste from entering and blocking shower drainpipes. It also provides an accurate connection between the waste pipe and strainer while adding protection, says the manufacturer. Constructed from no-stain polypropylene and manufactured with an anti-bacterial agent, the product has a removable strainer with a simple turn-and-lock mechanism that allows for quick access and cleaning. Pricing starts around \$45. [wondercap.com](http://wondercap.com)



# 2019

**BUILD YOUR KNOWLEDGE. PERFECT YOUR SKILLS.  
UP YOUR BUILDING GAME.**



- **LIVE installation and building clinics**
- **LIVE Exhibitor demonstrations**
- **TWO expo halls**
- **Conference Sessions designed for the residential construction pro**
- **Unlimited networking opportunities to build and maintain new relationships**

Join us for the largest event in New England created for builders, remodelers, contractors and their crews. Learn from nationally recognized experts who are available to sharpen both your business and jobsite skills.

**EXHIBITS: MARCH 29-30, 2019**  
**CONFERENCE: MARCH 27-30, 2019**  
RHODE ISLAND CONVENTION CENTER | PROVIDENCE, RI

**REGISTRATION OPEN**  
USE PROMO CODE **JLC** FOR A **FREE EXPO PASS**  
Register for JLC LIVE New England at [ne.jlclive.com](http://ne.jlclive.com)

## Weigh In!

Want to test a new tool or share a tool-related testimonial, gripe, or technique? Contact us at [JLCtools@hanleywood.com](mailto:JLCtools@hanleywood.com)



## Editors' Choice Awards

BY JLC STAFF

*Throughout 2018, the former editor of Tools of the Trade, Chris Ermides, and several contributing editors were on the lookout for new tools and technologies that they felt showed real promise in helping building professionals work better—that is, faster, more efficiently, and more accurately. Here's their report:*

We can't include every tool or product that drew our attention since last year, but there are 13 standouts that we touch on here (and describe in much more detail on [ToolsoftheTrade.net](http://ToolsoftheTrade.net)). Some of these are new-to-market concepts soon to be released, some improve on an existing technology, and all are worthy of special recognition. As always, this list is completely unbiased and not sponsored by any manufacturer. We put most of these tools to the test (with a few exceptions, limited by availability).

### DEWALT CORDLESS STAPLER FOR ELECTRICAL CABLE

Of all the tools DeWalt launched last year, this one stood out as the most brilliant. Who doesn't hate stapling wire, especially in tight spaces? Powered by DeWalt's 20V Max battery platform, the DCN701D1 Cordless Cable Stapler (1) can handle NM-B cable from 14-2 all the way up to 10-3, and it will work with low-voltage wire as well. [dewalt.com](http://dewalt.com)

### HILTI RIGID FOAM NAIL GUN

For foundations or finish basements, the GX-IE cordless fastening system is the best tool for attaching rigid foam (from 1 to 8 inches thick) to concrete (2). The system is composed of a cordless battery/gas-powered nailer and anchors specifically sized for the thickness of the rigid foam that you're attaching. [hilti.com](http://hilti.com)

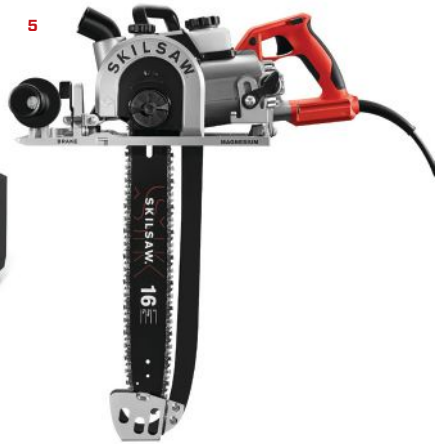
### 3M WORKTUNES

We love these—even as just normal hearing protection. They're lightweight and you can stream music on them. Though it's not a new concept, it's worth remarking that the execution of 3M's WorkTunes Connect Wireless Hearing Protector With Bluetooth (3) is solid. The microphone isn't great for having a conversation, but it's fine for answering the phone to confirm a delivery or to simply agree to call back a contact on a clearer line. [3m.com](http://3m.com)

### BOSCH CORE CHARGING SYSTEM

Bosch has been making a solid push with its new ProCore battery and its cordless GAL18v160C Charger (4), which has five charging modes: Standard, Power-Boost, Storage (charges up to 50% if battery will be stored for long periods), Long-Life (charges to 80% for constant use), and Transportation (charges to 30% to comply with flight





rules). In Power-Boost mode, it can charge an 8-Ah battery from 0% to 50% in 15 minutes and full charge in 30 minutes. [boschtools.com](http://boschtools.com)

#### SKILSAW CHAIN SAW

Named after its 16-inch circular-saw cousin, the 16-inch Sawsquatch Carpentry Chain Saw (5) has a 14 1/2-inch cut capacity. It is self-lubricating, and it features a 56-tooth fully housed chain for more precise and efficient cutting and on-board tool-less tensioning controls. The end of the blade is supported by the stationary blade guard and it can bevel up to 60 degrees, making the saw a legitimate choice if you want to gang-cut rafters. [skilsaw.com](http://skilsaw.com)

#### MAKITA CORDLESS TRACK SAW

The Makita X2 LXT (6) seems to be the most-praised track saw by contractors in the field after the Festool TS55, but it's cheaper. People love the smooth plunge mechanism. The only downside is that you need to use both batteries (the Festool version runs on two batteries for 36V as well, but it will also run on 18V at a slower rpm in a pinch). That said, the two 18-volt batteries provided more than enough power and runtime for almost anything we could throw at it, including 3/4-inch oak flooring with a layer of 3/4-inch AdvanTech subfloor beneath it. This saw allows

you to control speeds ranging from 2,500 rpm all the way up to 6,300 rpm with plunge depths up to 2 3/16 inches at 90 degrees and 1 9/16 inches at 45 degrees. [makita.com](http://makita.com)

#### BEITER BOX LASER GREEN OR RED

Beiter has been making lasers for other manufacturers for a long time, so it is not exactly new to laser technology. What qualifies Box-CV2G Green and Box-CV2G Red lasers (7) for recognition is that they are amazingly priced (about \$300 each) but still pack nice features, including a rechargeable battery, a 360-degree horizontal line, and two verticals pointing 90 degrees from each other. [beiterlaser.com](http://beiterlaser.com)

#### EVERWIN NAILER

Everwin is a relatively new company, and it has done a fantastic job of building lightweight nail guns that deliver. The FCN90L Framing Nailer (8) is an excellent example: It held up well on site and compares favorably with the Hitachi NV83A5 but weighs in 2.2 pounds less. [everwinpneumatic.com](http://everwinpneumatic.com)

#### HANGPRO DRYWALL LIFT

This is a contractor-invented tool (by @thatdrywallguy, Myron Ferguson) that makes it possible for one person to load and hang up

10



11



to a 16-foot-long sheet of 1/2-inch drywall on a wall. The Hangpro (9) can be broken down for easier transport, features large rubber wheels and a heavy-duty auto-locking winch, and works for walls up to 10 feet tall. We were blown away by how easy it was to load and move sheets around, and how easily it can be adjusted to keep a sheet on the wall as you fasten it in place. [hangprolift.com](http://hangprolift.com)

#### MILWAUKEE CORDLESS TABLE SAW

Like many of the Milwaukee M18 Fuel cordless products, the new 8 1/4-inch table saw (10) packs some impressive power. As a portable jobsite saw, this unit offers a number of great features, including one-wrench blade change, fast blade height adjustment, and a useful riving knife design. Dust collection, cutting capacity, and portability also shine. [milwaukeeetool.com](http://milwaukeeetool.com)

#### MULTI-USE BAKER STAGING

Baker staging already gets used for much more than just a work platform, and this adaptable version enhances that multiplicity. Metaltech's ScaffoldBench (11) has four modes: scaffolding, miter-saw stand, storage rack, and utility cart. With fully assembled dimensions of 74.75 by 29.75 by 75 inches, the setup can be rolled through any door openings wider than a 2-6 rough (2-8 finished). It's rated for 1,100 pounds. [metaltech.co](http://metaltech.co)

#### METABO HPT MULTIVOLT

The Metabo HPT MultiVolt battery (12) is a dual-voltage 36V/18V battery that delivers more than 1,440 watts; the packs offer 4 Ah in 36V tools and 8 Ah in 18V tools. (Metabo joined forces with Hitachi last year, rebranding as Metabo HPT.) The batteries will work in all Metabo HPT (and all existing Hitachi Power Tools) 18V tools. In addition, an optional MultiVolt AC Adapter lets you run Metabo HPT 36V tools corded or uncorded. Concurrent with the announcement of the MultiVolt platform was the introduction of the first 10-inch cordless table saw (all the others are 8 1/2 inches). This saw is essentially the same as the company's new corded table saw—on either platform, it's a well-designed portable table saw, especially for the money. [metabo-hpt.com](http://metabo-hpt.com)

#### FESTOOL BLUETOOTH CONVERTER KIT

This affordable converter kit is a no-brainer for anyone who runs a CT vac. The system (13) revolves around a small plate that makes a CT dust extractor instantly Bluetooth-enabled. The Bluetooth module plate replaces the cover plate that sits on the front of the CT dust extractor just next to the tool-operated power outlet. Once the Bluetooth module is installed, the vac can be turned on cordlessly either by the included remote or by a cordless power tool equipped with the new 18V Bluetooth battery. [festoolusa.com](http://festoolusa.com)

# Classifieds

**FLEXCORNER**



**Protective Products**  
Surface Protection Solutions

Adjustable corner protection provides maximum versatility.

Call 1.800.789.6633 or visit [ProtectiveProducts.com](http://ProtectiveProducts.com)



Bathroom Exhaust Not Vented Outside Can Cause Mold Growth. The New Kozy Kollar Is The Only Vent Hood Installed From The Attic!

VISIT US AT  
[WWW.KOZYKOLLAR.COM](http://WWW.KOZYKOLLAR.COM)

The Ultimate Door & Window SILL PAN SYSTEM

**ASTROpan™**



Patent Pending

1-800-334-4474

[www.astroplastics.com](http://www.astroplastics.com)

## February Advertising Index

Advertiser	Page #
ABC Supply Company	15
AdvanTech	C3
Astro Plastics	54
AZEK Building Products	40
Boise Cascade	C4
Calculated Industries	4
Chief Architect	C2
DAP Products Inc.	24
Dryerbox	24
DuPont Tyvek	16
Fortifiber Building Systems Group	9
Fortress Building Products	46
Honda Generators	32
Inteplast Group LTD.	3
JLC LIVE New England	50
JLC Newsletter	3
JLC Reprint	14
JLC Website	4
Kozy Kollar	54
Malco Products	12
Mark E. Industries	23
Marvin Windows & Doors	6
Maze Nails	28
Protective Products	54
Simpson Strong-Tie	5, 11
Softplan Systems Inc.	3
ZIP Systems by Huber Engineered Woods	31
ZipWall	23

BY PETER HEARD

## Peel-and-Stick Trick

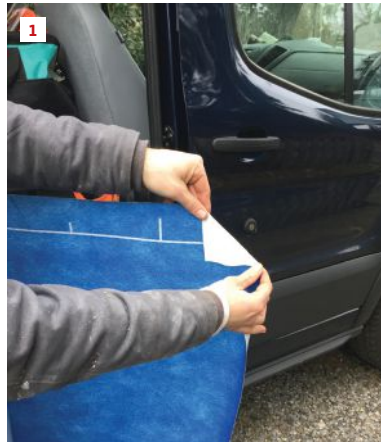
**Fully adhered WRBs** have definitely found a foothold in our industry. Products like Henry Blueskin, Grace Vycor EnV-S, and others are becoming more popular.

However, effectively installing any of these products requires a different mindset from that of simply rolling out and stapling up felt paper or conventional housewrap.

One thing that has taken some getting used to for me is the careful removal of the thin film covering the adhesive backing on the product. Like me, most contractors I know have chewed their fingernails down to the bone with worry over whether or not they're making money on the job. This "lack of claws" makes it especially tough to remove that film.

Here's my tip: Fold the corner of the product over on its face **(1)**. Using your thumb and forefinger, rake your thumb tip over the corner a few times **(2)**. That generally stretches and loosens the film enough that you can grab it with your stubby fingers or at least create an opening between the backing and the membrane to get your knife blade behind it **(3)** and peel it back **(4)**.

*Peter Heard is the owner of North Country Carpentry & Restoration, operating on the east end of Long Island, N.Y. He is a frequent presenter at JLC Live and he instituted #tinytuesday on Instagram; follow him there @peter\_heard.*



**Send us your tips:** JLC, in partnership with our sister publication *Tools of the Trade* and Milwaukee Tools, is giving away a power tool each issue to the reader who sends us the best trade tip. Next month, we'll give away a cordless Milwaukee M18 Fuel 7<sup>1</sup>/<sub>4</sub>-inch Dual Bevel Sliding Miter Saw (photo, right). Send tips to [JLC-Editorial@hanleywood.com](mailto:JLC-Editorial@hanleywood.com) with "Trade Tip" in the subject line. Any building trade qualifies. Don't sweat the grammar or writing. But please send us high-quality photos to explain your tip.



BY ROE OSBORN



Repairs progress in earnest on the Kugel/Gips house, one of a number of modern houses built on Cape Cod **(1)**. Exposed to the elements, the homes fall into disrepair quickly **(2)**. But with the help of CCMHT, the houses are being brought back better than new **(3)**.

## Not Your Basic Cape

**Believe it or not, Capes** aren't the only type of house you can find on Cape Cod. In the 1940s, artists, architects, and members of the modernist movement went to the Cape for inexpensive and inspiring getaways. Land was cheap on the Cape then, and these creative folks began buying property in remote wooded areas and on bluffs overlooking the ocean.

They built small, simple houses on these lots, drawing on their ties to modern architecture to create functional, organic designs on a micro scale. They sited the buildings to let occupants feel one with nature with expansive windows, open plans, and large outdoor living spaces. These homes became social gathering spots for the famous people in the modernist scene who vacationed on the Cape.

In 1961, the Cape Cod National Seashore was created, and homes that fell within its boundaries had to be abandoned. Exposed to the harsh coastal environment, the lightly constructed buildings

quickly fell into disrepair. In 2007, architect Peter McMahon created the Cape Cod Modern House Trust ([ccmht.org](http://ccmht.org)), a nonprofit organization dedicated to restoring and maintaining these buildings. The CCMHT leased its first house—the Kugel/Gips house—from Seashore in 2010 and began restoring it. The organization has since finished restoring two other houses and is working on another. McMahon curated an exhibit in 2016 at the Provincetown Museum of Art documenting these crumbling gems, and he also co-authored a book, *Cape Cod Modern*, that tells the fascinating stories behind these houses and their owners.

To raise money for the projects, the restored houses are available to stay in. The CCMHT hosts artist residencies as well, and offers programs for architecture students to visit and study the houses.

*Roe Osborn is a senior editor at JLC.*

Photos: 1&2, courtesy Cape Cod Modern House Trust; 3, Roe Osborn

**AdvanTech**

**SUBFLOOR ASSEMBLY**

VISIT US AT IBS BOOTH #C5348 & P23  
**\$15,000**  
IN PRODUCT  
REBATES  
FOR YOUR CHANCE TO WIN<sup>3</sup>

# BRING YOUR A-GAME.

**SQUEAK-FREE  
GUARANTEE**



Reputation is built from the ground up and the jobsite is the true testing ground. To stay ahead, you bring your A-game to every aspect of the build, and when it comes to subfloor products, we do the same. Proven on the jobsite for over 20 years, AdvanTech® products are the FLAT OUT BEST™ for a quiet, stiff floor, and when used in combination, AdvanTech® subflooring and AdvanTech™ subfloor adhesive provide an assembly so strong you won't hear a squeak — guaranteed<sup>1</sup>.

Discover the AdvanTech™ Subfloor Assembly advantage at [AdvanTechAGame.com](http://AdvanTechAGame.com).



<sup>1</sup> Limitations and restrictions apply. Guarantee for panel-to-joint connection on an AdvanTech™ Subfloor Assembly. See [SqueakFreeGuarantee.com](http://SqueakFreeGuarantee.com) for details.

<sup>2</sup> BUILDER magazine Brand Use Study, 2002-2018, OSB Category. <sup>3</sup> Rules and restrictions apply. See Official Rules at [IBSRbate.com](http://IBSRbate.com) for complete details, odds and prize conditions. © 2019 Huber Engineered Woods LLC. AdvanTech and AdvanTech logos and designs are trademarks of Huber Engineered Woods LLC.

HUB 20523-2 12/18.



# WE COMPARED APPLES TO APPLES. WE HAVE STRONGER APPLES.

Any way you slice it, **VERSA-LAM® LVL 2.1** now leads the industry in strength — giving you better performance, longer spans, and the best overall value.

When you want stronger beams, you want Boise Cascade.®



**Boise Cascade®**  
ENGINEERED WOOD PRODUCTS

**IBS 2019, Booth C1825**

**[bc.com/ewp](http://bc.com/ewp) | 800.232.0788**

© 2018 Boise Cascade Company. All rights reserved.