

**Troubleshooting  
Site Drainage**

**Custom Cabinets**

**Hardening Oils  
for Wood Floors**

**Wildfire Resilient  
Homes**





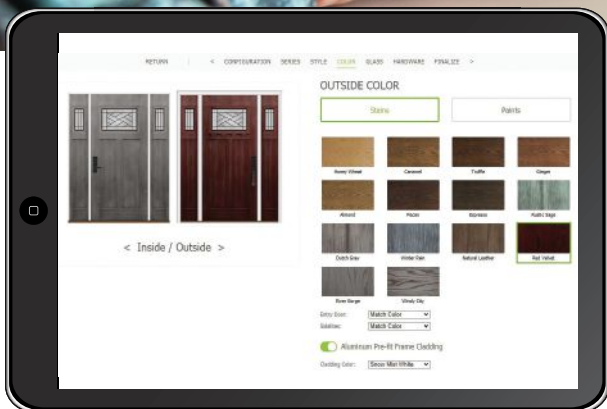
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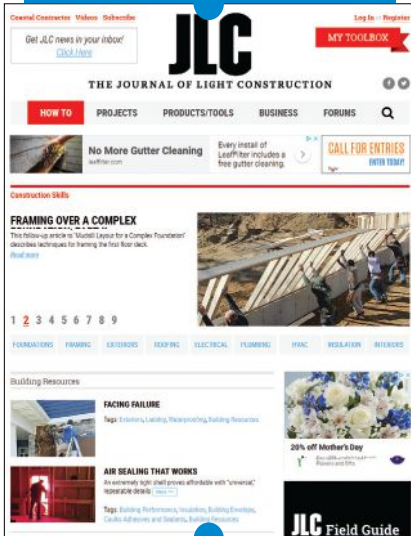
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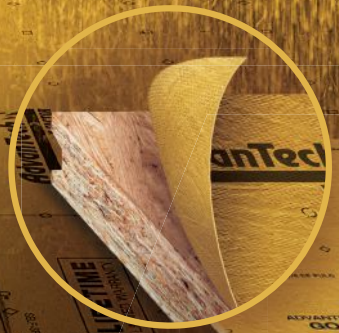
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JLC INTEL



# ALTERNATIVE SIDING REDUCES CALLBACK RISK

Seattle-area homebuilder goes with an engineered polymer technology.

**Custom homebuilders Jon and Jay Roberts** discovered a silver lining behind today's building challenges.

The Roberts brothers own and operate Cascade Custom Homes & Design, a 35-year-old design-build company serving picturesque Whidbey Island, about 30 miles north of Seattle in Puget Sound. The brothers have faced their share of ups and downs since March 2020, including recent news a leading fiber-cement siding manufacturer was limiting product availability in the Pacific Northwest.

No builder needs that kind of disruption, especially on a basic building material. The brothers required a rock-solid alternative. "It's an island. We live with our customers. Positive word of mouth means everything," Roberts explains, referring to the island's 70,000 residents.

It was about then fate smiled.

## LIMITED LIFETIME WARRANTY

The brothers had researched alternatives to fiber cement before, including composites. When a siding and trim rep suggested they consider PVC, an engineered polymer, they took another look. While plumbing pipe may be the first thing that comes to mind when you hear PVC, the siding specified was a more durable, uniform and trusted version of free foam cellular PVC.

Engineered polymer trim and siding is ideally suited to protect a home from the island's harsh saltwater environment. It's formulated to resist moisture and will not split or rot like a wood-based product. AZEK Exteriors, a leading manufacturer, even backs up the resilience claim with a limited lifetime warranty. "A lifetime warranty is huge for homes on this island," Jay Roberts says. "Our homes come with a 10-year builder's warranty. But the truth is, we always take care of good customers. We operate by a lifetime warranty, too."

## CALLBACK-FREE

Last summer the brothers installed PVC straight edge shingle siding and trim on a custom-designed 1,450 square foot,



2-bedroom dream cottage.

The installation revealed several engineered polymer advantages ... not all of them expected:

- **Minimal Maintenance.** "We strive to build zero maintenance homes," Jay Roberts says. "In three or four years if the exterior looks like it could use a refresh, just hit it with a garden hose. It will look like new."
- **Fast Installation.** Installation subcontractors are understandably wary of any new material. By the end, the Roberts' long-time subs were believers in engineered polymer. "They started on the most difficult side of the house first, with lots of doors and windows to cut around. Once they got past that, the panels went up very fast," Jay Roberts says.
- **Less Waste.** The brothers returned nearly a full pallet of unused panels back to the distributor. Jon Roberts says panel length and the fact cutting didn't "... burn through shingles left and right to create a staggered shingle pattern" reduced cladding waste.
- **Superior Aesthetic.** The clean, straight shake edges appealed to the owner and conforms to a Northwest Contemporary design style. "We set up head-to-head panel comparisons. She preferred AZEK Exteriors Shingle Siding for its refined shading pattern," Jon Roberts says. AZEK Exteriors is an exterior building product manufacturer specializing in siding, cladding, trim, molding, and other building products.
- **Ready Availability & Price.** Speedy installation and one-coat painting reduced siding costs. The product was readily available through the island distributor.
- **Paint Guarantee.** A proprietary polymer siding technology from AZEK called PaintPro supports a 15-year warranty on shingle siding painted finishes. No surface prep or primer needed. Color selection includes lights to darks, including black. The cottage owner opted for a gray tone.

In uncertain times, it's good to know manufacturers are stepping up with quality alternatives that can outperform traditional choices. Keep an open mind to solutions like the AZEK Shingle Siding with PaintPro technology and AZEK Trim to help differentiate your projects while affirming your commitment to quality, timeliness, and performance.

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**Q** We plan to install underslab piping on an upcoming project for drainage. Rather than installing a sump pit inside the basement, we're hoping to install sleeves in the footing so that the underslab piping can drain to daylight, since the building site is sloped. Does a sleeve cast into a footing weaken the footing?

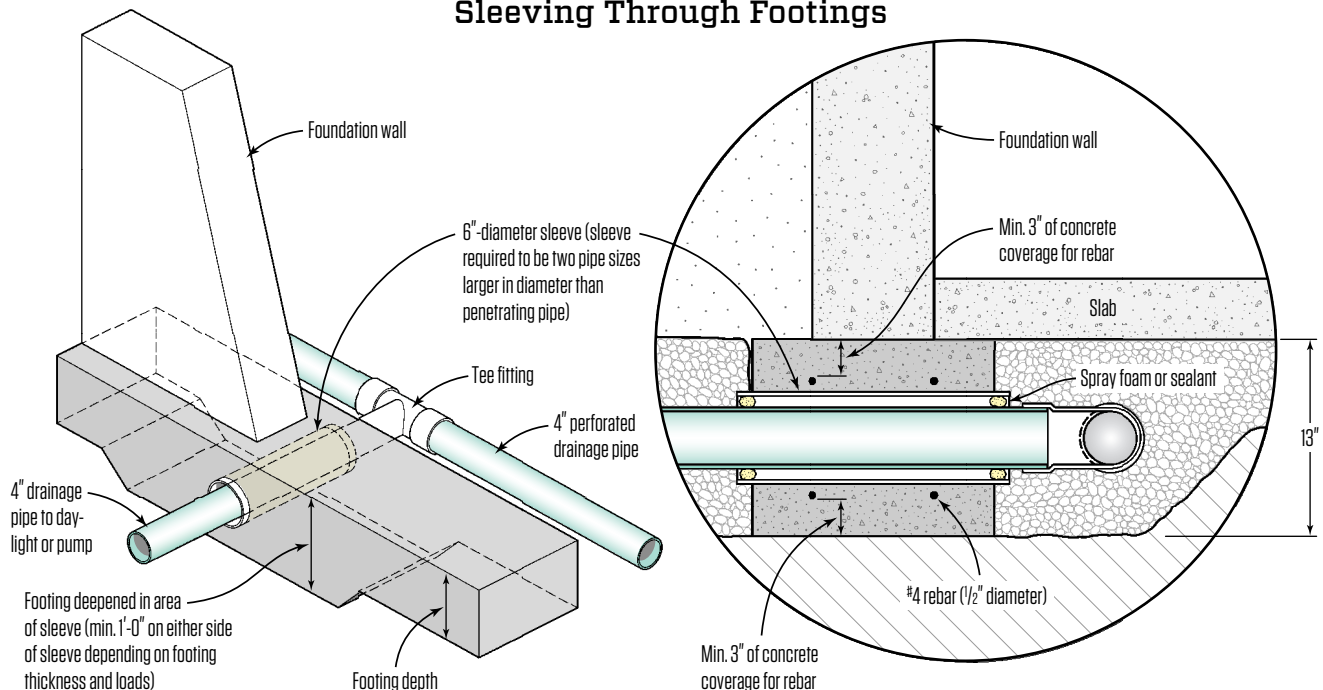
**A** Darren Tracy, P.E., owner of West Branch Engineering in Saratoga Springs, N.Y., responds: Generally, it is not a good idea to sleeve through a footing when it can be avoided. If you must do it, the sleeve is required to be two pipe sizes larger in diameter than the penetrating pipe, per P2603.4 of the 2021 International Residential Code. Presumably, this is to allow for movement in the pipe or the foundation and compensate for imperfect field installations to ensure that the foundation never comes in contact with the pipe and damages it. In this case, for typical 4-inch-diameter drainage pipe, the sleeve would need to be 6 inches in diameter.

That's a problem with footings formed with 2x10s. Any rebar in

concrete that is permanently in contact with the ground requires 3 inches of concrete coverage, per ACI 318-19 table 20.5.1.3.1. The reason for this coverage is that even though the high pH of the concrete provides some protection against corrosion, it needs to be an adequate thickness. Above grade, only 1½ inches to 2 inches of concrete cover is required, depending on the size of the rebar. Assuming ½-inch-diameter #4 rebar is used both above and below the sleeve adds another inch that must be accounted for in determining clearances.

Without consideration of the specific loads, but based upon the requirements noted, the minimum thickness of the footing would need to be 13 inches: 3 inches of concrete coverage for the rebar

### Sleeving Through Footings



A protective sleeve that is two sizes larger than the pipe is required for any pipe that passes through a concrete foundation wall or footing. Depending on the size of the sleeve and the size of the footing, the footing may need to be deepened as shown to provide the required minimum 3 inches of concrete coverage for the rebar above and below the sleeve. The gap between the pipe and the sleeve should be sealed with spray foam or sealant.

underneath the sleeve; the 6-inch-diameter pipe sleeve; 3 inches of concrete coverage for the rebar on top of the sleeve; and another inch for the two lengths of 1/2-inch-diameter #4 rebar. That is a tight dimension with exact placement of the sleeve and rebar. To achieve the added depth, the footing could be deepened in the area of the sleeve, typically a minimum of one foot on either side of the sleeve, depending on footing thickness and loads. As with any penetration through a foundation wall, the gap between the pipe and the sleeve should be filled at both ends with spray foam or sealant to keep stones from working their way into the end annular space between the pipe and the sleeve.

When a pipe penetration in the foundation system is required, it's better to sleeve the foundation wall instead of the footing, though that solution won't work in this example because the drainage flow is relying upon gravity and a pitch. Another option is to install a sleeve under the footing. The same two-pipe size increase would apply, and the sleeve would need to be made with a robust material, such as schedule 80 PVC or ductile iron.

A better approach is to not use any underslab drainage piping at all, and instead install a minimum 4-inch-thick layer of #2 stone

under the slab and footing to act as a drainage conduit. This subbase layer should be separated from the undisturbed subgrade by a geotextile fabric so that earth fines do not migrate into the stone subbase and clog the drainage system.

I used this method when constructing my home 20 years ago and have never had a water problem in the basement, even though there were springs spewing when we excavated for the footings. Because of those springs (I do live in a town called Saratoga Springs), I almost always have water in the stone layer under my slab and footings (verified by the sump pit I installed in my basement), but it has never risen to the slab level because the perimeter foundation drain is lower than the slab, and drains by gravity to daylight. The same result could be achieved with a pump if the site does not have the grades for gravity drainage.

Finally, to help keep water away from the foundation, consider installing an impenetrable layer adjacent to it at grade level. The layer—which could consist of a high-clay-content topsoil or polyethylene sheet covered with pea stone—should extend away from the foundation for several feet. And if the house is in a wet area with a high water table, consider raising the proposed elevation of the house.

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## Detailing Rot-Proof Wood Exteriors

BY BRIAN CAMPBELL

**Construction law firms** often cite water damage as the most common complaint leading to lawsuits against builders. While some of those water-damage lawsuits result from burst water pipes, most are caused by water leaking through the exterior of a building. This article explores principles and details that carpenters need to know to avoid liability. Think of it as a checklist of items to watch out for when working on the exterior of a home.

### CRITICAL ELEMENTS

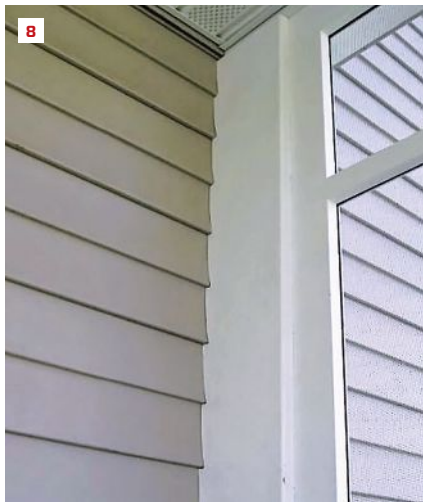
I'm not an expert on roofing, but the worst leaks start there, so

I'll begin with a few notes about roofs. Whenever I work on the exterior of a home—even if I'm not repairing damage caused by a roof leak—I first survey the condition of the roof. My goal is not to guess how many years the shingles have left but to get a sense for the slope and overhangs. How efficiently does the roof get rid of water? Is there a correctly installed drip edge that directs water away from the eaves, or is water leaking in behind gutters and fascias? Are roof-wall intersections properly executed with step flashing and kickouts? Much has been written in *JLC* about the importance of roof flashings. Two must-reads are Mike Guertin's



Omitting roof drip edge can result in severe deterioration (1). Even with a drip edge, rainwater can flow down the bottom of a rake board. This decorative detail (2) is a nice way to force water to fall before it runs down and soaks the end grain. The rot on this window head (3) occurred because an ice-melt wire plugged in above created a “water highway” that soaked the wood. After rebuilding the window, the author advised the owner to move the outlet (and replace it with an exterior-rated GFCI unit) (4).

Photos by Brian Campbell



A wood head cap can serve as an effective way to shed water, but in this instance (5), it is a fail—the premilled drip kerf should have been installed face down, not up. On any metal horizontal flashing, the author recommends bending an end dam, such as on this sill flashing (6) and transition rail (7). One of the best ways to avoid water getting into a wall is to not cut into the siding when adding anything to the face. Instead, cope meeting trim to the face of the siding (8).

“Drip-Edge and the IRC” (May/18) and “Kickout Flashing: Required by Code, Yet Often Overlooked” (Oct/19). Just installing the drip edge and kickout flashings correctly will avoid a high percentage of the most common roof leaks.

Installing the water-resistant barrier (WRB) well will also prevent headaches down the road. The big takeaway here is to lap it correctly—a lesson all carpenters need to take to heart as they begin to integrate the WRB with their flashing and woodwork. Plastic and metal materials are just like shingles and clapboards: Each higher

piece needs to lap over the piece below it; any vertical legs of a metal flashing must be overlapped by a WRB or piece of flexible flashing.

**Carpenter strategies.** Thinking about roofs with good overhangs is a good way to begin thinking about the wood components of an exterior. Wood lasts longer outdoors if it is part of an assembly that sheds water. Equally important, exterior wood must be detailed to absorb less water and be allowed to dry naturally. Finally, wood must be protected from UV radiation and treated to resist decay-causing organisms. Let’s take each of these strategies in turn.

### SHEDDING WATER

Horizontal surfaces must be sloped to allow any water to run off. The top edges of deck ledgers, skirtboards, transition rails, sills, thresholds, headers, porch and deck railings, and post caps are all elements that need to be beveled at least 10 degrees. The steeper the bevel, the faster it will shed water.

**Flashing.** Ideally, horizontal edges should be flashed with metal that bends up the wall to divert any water running down the wall over the horizontal surface. But take care. Too often, I see metal flashing on windows and doors that is overbent, with the L less than 90 degrees; as a result, it holds water rather than sheds it. It’s best when the metal is underbent, creating a 95- or 100-degree angle. The metal can then be pushed onto the horizontal surface, creating a slight tension that will keep the flashing straight. I slope flashings about 10 degrees and extend them ¼ inch beyond the horizontal member. This extension should bend down to create a drip leg.

I also like to bend end dams on head and ledger flashings to guide water off the front and prevent it from spilling over the edges

where it can dump into the wall system and be absorbed into open end grain. End dams are also effective on sill flashings. In Europe, metal window-sill flashing on top of the sill (not to be confused with the equally important sill pan *under* the sill) is a common detail. It typically has end dams and a healthy overhang to keep water well away from the siding below. This is a smart detail that we should adopt more often in this country.

Long cap flashings on skirtboards and ledgers are best if they’re continuous. If you have to join lengths, though, overlap the seams

a couple of inches and use a high-quality caulk to seal the lap.

Another caution with metal flashing concerns the use of dissimilar metals. Too often, steel fasteners are used to install aluminum or copper flashing. The different electrical properties of the dissimilar metals interact and cause corrosion. It's surprising how fast even a medium-gauge metal can dissolve under the force of galvanic corrosion, leading to extensive water damage in a very short time.

On porch and fence posts, copper caps are ideal for blocking water from being absorbed into the end grain, and the copper won't react with the copper treatment used in pressure-treated materials.



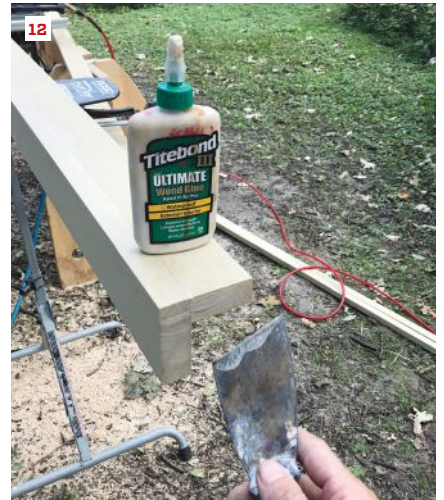
### ABSORBING LESS WATER

Along with detailing exterior wood to shed water, we need to think about how materials soak up water. A few simple rules come into play to limit the absorption of water into the wood.

**Provide capillary breaks.** Capillary action occurs whenever there is a small gap. The surface tension of water wants to hug the surfaces of the materials and can draw water upward, against gravity. This is how water moves up the pores of a tree, and this speaks to how powerful the mechanism is; capillarity literally pumps water up small gaps. This is why end grain, which exposes the open pores in the wood, is at particular risk of absorbing water. But water can be absorbed into any unsealed wood surface, and the longer the surface stays wet, the more water is absorbed.

Capillary action can draw water in between two pieces of material that are layered. A metal flashing without a drip leg over fascia is one example where water will be drawn up the fascia, and because the space is so small, it won't dry out very readily and can quickly rot out the eaves. This also occurs with two wood layers, such as where a column base is applied to a column face.

The solution is to provide capillary breaks. In the case of the metal flashing, a drip leg moves the edge of the metal out away from the surface of the fascia. The surface tension of the water draining down the metal is not strong enough to hold the water on the edge and it drips off. A drip kerf on the bottom of a wood overhang is a version of this.



To build a durable base for an exterior column, the author creates a ventilation space, oversizing the base about  $\frac{1}{4}$  inch on all sides (9). This space can be capped (10), leaving a smaller space of about  $\frac{3}{16}$  inch between the trim and the column. Wherever possible, the author seals end cuts: This is critical for cuts through pressure-treated wood (11) to maintain the treatment in high-exposure and ground-contact situations. The same principle applies to any exterior woodwork. For painted trim work, the author seals cuts with an exterior wood glue (12).

With a column base, provide space between the two wood layers. I build each side of a column base about  $\frac{1}{4}$  inch larger than the sides of the column. A few shims provide a nailing surface with minimal exposure to capillary action. Then I close the gap at the top of the base with a drip cap. I have to resist my impulses as a finish carpenter to make the cap fit tight to the column, though. Wood butting wood presents a minute gap that can wick and hold water, so instead of butting the cap to the face of the column, I



The flashing used for this deck ledger (13) was a site-bent aluminum L-flashing installed with steel nails. The dissimilar metal caused rapid corrosion of the flashing, allowing water to get behind the ledger and saturate the OSB sheathing, which began to rot. Mitered clapboards (14), if done well, are more durable than woven corners that leave vulnerable end grain exposed.

leave a gap of about  $\frac{3}{16}$  inch to allow any water to drain through.

Another example of a capillary break is a  $\frac{3}{8}$ -inch gap between the siding and a window head or skirtboard. Wherever there is a chance for water to pool rather than drain off quickly, increase this gap to an inch or two. Examples include the gap between siding and the flashing surface at roof-wall intersections and the gap between siding and the top of the flashing on a deck ledger. In these two cases, it is often the sheer volume of water in these locations that increases the chance that the water will be deeper than  $\frac{3}{8}$  inch. Similarly, open the gap to an inch or two any place wood runs to grade (though where there is the possibility of roof runoff splashing back, this space needs to be at least 8 inches).

**Allow for drying.** The gap around the column base points to a third important strategy to avoid water damage: The gap not only breaks the surface tension of water and prevents capillarity, but it also allows air to circulate between the column and the base to allow drying.

In general, we need to assume outdoor materials will get wet. In spite of all our best efforts to shed water and prevent capillary action, wood will get wet. Trying to create a barrier against water using tight joints and caulk is likely to fail. A much more effective strategy is to open things up to let water drain through and let enough air circulate. Fungal decay sets in when wood is not able to dry and remains wet for extended periods. On the other hand, if it gets wet and then dries relatively quickly, there is little chance for decay.

Rainscreens for any cladding are a well-known example of this strategy. We should be applying the same reasoning to any piece of wood we use on the exterior of a building and thinking about how we might create a capillary and air gap between the wood pieces.

It's not always practical, since structural connections need wood-to-wood contact, but where not just cladding but also trim work is applied, a rainscreen strategy can go a long way toward increasing the life span of the building.

**Seal exterior surfaces.** Another important, though somewhat more obvious, strategy in preventing wood from absorbing water is sealing surfaces. Primer and paint are the most common materials for sealing exterior wood. It's not just the exposed face we need to worry about, however. Because water will get through, it's critical to seal all six sides of a board. Prepriming, and especially back priming before installing wood pieces, is needed.

As stated earlier, end grain wicks water more readily than the face and edges of boards, so focus on the ends. I make it a habit to keep a bottle of Titebond 3 (Ultimate) wood glue near my cut station and smear cut ends with this. It serves to seal the end even if I'm not depending on the glue joint, per se. Of course, often I am purposefully creating a glue joint. In that case, I smear the entire surface with glue, and I clamp the connection to ensure a truer bond.

When using preservative treated wood, I use an end-cut sealer matched to the type of treated wood I'm using—something like Wolman CopperCoat for green wood or Nisus Bora-Care for borate-treated woods.

**Avoid film-forming finishes.** With wood that will be left natural and not painted, it's best to use a stain—even a neutral one, if you don't want to change the color—or penetrating sealer. Urethanes, varnishes, and other film-forming surfaces require regular maintenance. Look for a penetrating finish that provides UV protection. Ultraviolet light from the sun degrades the lignin that bonds wood fibers together, and the sun can degrade wood in



For this simple set of exterior steps, the budget was tight, but the author was still able to incorporate several principles to prolong its life. A gap between each step and riser allows water to drain and the wood to dry freely (15). In addition, the deck boards are installed with the growth rings curving down. If the boards do cup, they will drain water rather than hold it. Both the top and bottom rails of the guards were beveled to shed water (16); this was also the case on the balcony rail (17), where the author used a rail assembly from American Porch Architectural Details ([americanporch.com](http://americanporch.com)) that has a steeply beveled bottom rail and spindles cut to match.

a matter of weeks. Products such as Sikken's Cetol, Owatrol Dek's, Rubio Monocoat, and Osmo UV-Protection Oil are a few, but by no means the only, such finishes to consider.

### DECAY-RESISTANT WOODS

The topic of wood selection is an extensive one, but I will touch on it here as it is an important strategy in combating water damage in exterior woods and deserves at least a mention. I recommend carpenters search online for the USDA Forest Products Laboratory's "Comparative Decay Resistance of Heartwood of Native Species." This document provides a useful comparison of different U.S. species, underscoring the fact that decay resistance is entirely in the heartwood. This provides an important lesson in itself: Wherever possible, select out, or rip off, the sapwood to ensure the greatest durability.

As carpenters, we should also pay attention to the grain. On

porch and deck boards, for example, it's critically important to install the growth rings so they curve down. That way, they will shed water when they cup, rather than hold water.

I always tell carpenters to avoid boards with grain that runs diagonally across the face and to avoid boards with pith—grain that shows full-circle growth rings on the end or the dark center of a limb on the face of the board. Both types of boards will tend to bow and twist more over time, even if they are fairly straight when you buy them. The very best, of course, are boards with growth rings as close to 90 degrees from the face of the board as possible. Wood will move, and the straighter the grain, the more evenly and predictable that movement will be, limiting how much a wooden assembly will work itself apart with changes in temperature and humidity.

*Brian Campbell is a finish carpenter and foreman with Solid, based in St. Paul, Minn.*

BY DAVID POLLARD

## Taking Design From Loss Leader to Profit Center

**Our company has taken** design income from 2% to 12% of revenue in the last five years. When asked to speak about this recently at the Remodelers Summit in Phoenix, I had a chance to reflect on how we realized this change. It wasn't just through standardizing procedures and cracking the production whip; making design profitable starts with charging more money for it, period. For a business owner, doing that requires taking a deeper dive into the culture and value that good design brings to the world and our clients. If you are rolling your eyes at that last sentence, please bear with me. It's not easy to charge more until you have confidence in what design can add to the value your company provides.

### NO REMODELING GAIN FROM A LOSS LEADER

Often, remodeling companies start as construction only, and in an effort to control more of the process, eventually add design services. In this scenario, design is seen simply as a cost of doing business, and having it under the same roof provides efficiencies. These companies evolve to considering themselves full-service design-build firms but too often undervalue design or treat it as a loss leader. Inexpensive design, or even free design, may seem like an easy way to get customers in the door, but is it getting you quality clients who value the full range of your services?

The concept of the loss leader has been around for decades. Obvious examples are inexpensive computer printers and razors that require exorbitantly priced ink-cartridge and blade refills. The cheap, good-looking product gets you in the door, and then you are on the hook for replacement parts for the next five years. These examples could be considered gimmicky and as marketing to emotional whims. Using design in a similar way essentially puts the value and professional accomplishments of the design community into the same basket as cheap printers and razors—not a good look for our industry. So if you consider your company full-service, treat every service as valuable; your bottom line will benefit more than you think.

### DESIGN AS CRAFT

Even if you are running your design department profitably or at least at break-even, you may think of design as a means to an end—necessary to make the initial sale easier, but hell to manage. Managing creative minds has been a great mystery since the beginning of time, but instead of thinking of the design staff as just CAD technicians, engage them the same way you would a great carpenter.

I remember once stepping onto a jobsite with new trim carpenters and being so frustrated that they had not yet installed any trim. They had been working at least 12 hours at that point, and I couldn't see any casing, crown, or cabinets on the walls. Then I stepped into

another room and saw they had cut, sanded, and preassembled all of the pieces. It was a beautiful thing, the mise en place of a well-crafted jobsite. I was so used to seeing and measuring results in one way, I forgot to think about and respect the carpenters' process—which ultimately led to an efficient install and a beautiful built product.

**Instead of thinking of the design staff as just CAD technicians, engage them the same way you would a great carpenter.**

Good architects and designers are no different from carpenters. They also have trained for years and have developed their own ways to get to a final product. Looking over their shoulders or giving daily to-dos may not be the way to get the best-quality result. Good designers take pride in their work. Just like carpenters, designers go to sleep every night subconsciously processing what they will be doing the next day. If you walk in and ask a carpenter to do something different from what they have planned, the likely result is a major loss of productivity and possibly even a weaker final product. The same holds for designers.

### DESIGN A PACKAGE

Once you understand your design team's strengths, seek ways to package them as a fixed deliverable. A defined end product will give your designers focus and a tangible goal. Without that clear deliverable, though, design will likely churn in perpetuity, creating frustration for everyone—designers, owners, and clients.

Our initial design package includes a detailed home measure with a "client needs analysis" interview, followed by two iterative design concepts delivered during two meetings at our office. At each in-office meeting, our clients receive a printed package of concept plans and views, a three-dimensional walk-through on our conference-room screen of their future space, and an initial detailed budget. Our first design-review meeting provides a deep creative dive into the feel of the space and addresses pragmatic issues such as functionality and anticipated costs. Clients offer feedback at the first meeting that we then incorporate into the second design concept. After meeting number two, our process is complete.

Clients can choose to move to the next paid design phase (which is equally defined), pay for a design extension, or schedule a follow-up if they need more time to review the proposal. The fixed

deliverable—not a fixed schedule—gives our design team the freedom to be creative as they work to provide clients what they want.

#### ANALYZE THE RESOURCES

Once the package is designed and defined, create a system that helps you understand what company resources it takes to deliver it. This could be through tracking design time on a project basis, understanding software expenses, and determining what other tools or products are necessary to deliver the package at a professional level, such as custom folders or virtual reality goggles.

Design-build firms often price design according to what they think the market will pay. Instead, create an incredible package that clients are excited to buy, and then determine what it costs for your design team to make it. Whatever it takes to make the best product your team can deliver should be defined, and then priced accordingly.

#### SUPPORT THE SALE

Even the perfect design package won't sell itself. If your current marketing highlights only your construction process, think about how to highlight your design services as well. Our sales meetings

and marketing materials clearly define how we front-load design, which is a paid service for a reason: to provide ultimate value to our clients through creativity, visualization, and qualified budget information. We explain that our design service delivers the best information for our clients to make decisions about the future of their home at our first design step. Applying your marketing strategy to the value of design as well as your process will differentiate your company and create an easy and tangible point of entry for your clients to begin working with you.

By eliminating the term “loss leader” from your vocabulary, digging into design culture, developing a valuable sales package, and then marketing its value, you will not only see the value design brings to the world but also see results in your company. The initial results will be better front-end design income. The later results will be better clients—ones who respect your organized process and your appreciation of good design.

*David Pollard, AIA, is an architect, builder, and co-founder of Liv Companies (LivCo), a full-service residential design-build firm delivering award-winning projects throughout Chicago's suburbs.*



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BY CHRIS POLEY

## Fixing a Flood-Prone Basement Walkout

I own and operate an excavation company in northern Vermont. In addition to our site work projects, we provide snow plowing and removal services to local residences. Last summer, one of our plowing customers approached us about fixing his 400-foot-long driveway (this was great news because the gravel road was steep, pretty gnarly with ruts, and tough on our plows).

We replaced several rusted-out galvanized culverts with new corrugated HDPE ones and regraded the driveway and parking areas. Included in the scope of work was managing stormwater runoff from the sloping backyard and the roof, which would occasionally flood the existing basement via a walkout basement door that was cut in years after the foundation was poured in the 1980s. The homeowner mentioned that the flooding seemed to occur with greater frequency lately, mainly after deluges from intense summer thunderstorms.

Rather than redirecting the stormwater away from the walkout area and contributing more runoff toward the steep driveway, we suggested installing a catch basin in front of the basement door and running the stormwater to daylight.

**Catch basins.** We install catch basins for stormwater management fairly often on residential projects. Depending on the location, we install either concrete catch basins (for high-traffic areas, such as the middle of a driveway) or catch basins made with corrugated HDPE plastic culverts installed vertically (for low-traffic areas, such as the basement walkout on this project). A plastic catch basin offers a more economical drainage solution than a concrete one with a heavy cast-iron grate, which can run \$1,000 or more.

For this application, where the catch basin will serve as interior flood protection against occasional high-volume rain events, we installed a 15-inch-diameter pipe. In wetter low-traffic areas, we typically install wider diameter HDPE pipes.

**Installation.** We began excavation at the basement walkout with our 15-ton excavator, digging a trench below the frostline in the site's bony gravel soil. Prior to installing the culvert, we bored a 4-inch-diameter hole at the bottom of it, using a cordless drill fitted with a coring bit, to receive the outlet pipe. We rolled the



Excavation begins at the basement walkout (1). A length of 15-inch-diameter HDPE culvert installed vertically acts as a catch basin; 4-inch SDR-35 pipe inserted into the culvert's base serves as an outlet (2).



The 75-foot run to daylight is excavated in two sections: first, the walkout end, then the daylight end (3). A crew member joins lengths of SDR-35 with PVC cement (4). The daylight-side piping is complete and ready for backfilling (5).

Photos by Tim Healey



After the HDPE pipe is trimmed closer to grade, the basin's heavy-duty HDPE grate is dryfit to prevent dirt and stone from entering the basin (6) during backfilling (7). The pipe is cut to its finished height, a few inches below slab height (8), and clay soils are used to create a slope away from the house toward the basin (9). Ditch stone is applied around the finished basin (10).

length of corrugated pipe into the trench, then inserted the 4-inch SDR-35 outlet pipe into the vertically installed culvert's base.

With the basement-walkout end plumbed, we began excavating the daylight end, some 75 feet away. The daylight side dropped off precipitously, some 60 feet down, so we were mindful about digging at that end of the trench. (An upside to excavating in northern Vermont's hilly topography is it's usually easy to drain to daylight, as opposed to flatter terrain where the only option is to pump water back to the surface.)

We dug as far as we could from the ends, then moved the excavator to the side to dig the middle of the trench.

We joined the lengths of SDR-35 outlet pipe with Hercules PVC cement (oatey.com), which we get from Northeast supplier E.J. Prescott (ejprescott.com). Hercules cement is a one-step, rain-or-shine cement that we've had good luck with over the years. With the daylight-end piping complete, we began backfilling the trench.

Back at the walkout side, we cut the length of vertical pipe closer to grade, then inserted our heavy-duty HDPE plastic grate (ndspro.com) and placed a scrap piece of plywood over the grate to prevent dirt and stone from entering the catch basin as we backfilled around it.

**Finishing up.** We cut the catch basin to

its desired height, several inches below the existing basement's slab elevation, then installed clay soils over 4 inches of XPS insulation placed over the exposed existing footing (a result of the basement walkout cut in after initial construction). We sloped the clay away from the house toward the basin, and then put in some large ditch stone around the finished grate.

For about \$500 in materials and a day's labor, we provided a stormwater runoff solution for the homeowner's flood-prone basement walkout.

*Chris Poley owns and operates Terrain Tek Unlimited, an excavation company in Underhill, Vt.*



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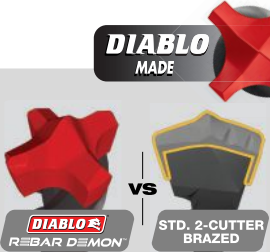
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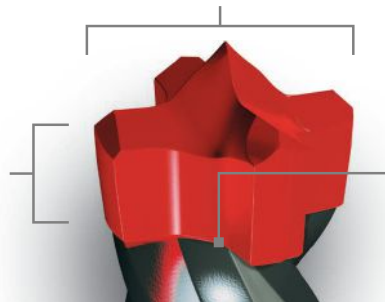
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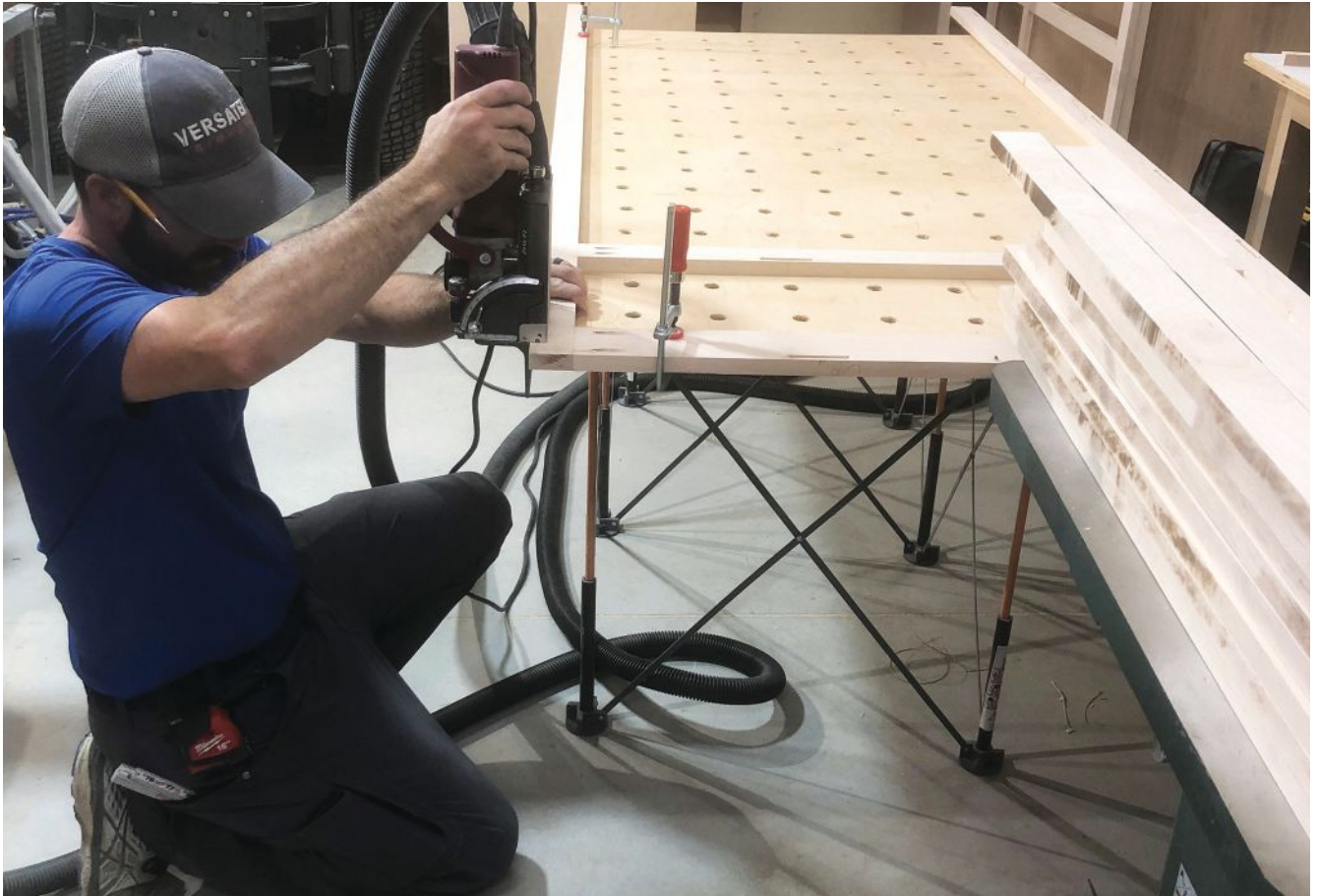


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# KITCHENS



## Efficient Custom Cabinet Construction Tools and techniques for getting a perfect fit every time

BY JASON STIMIS

I got my start as a carpenter in the 1990s working for my dad, who was a longtime custom home builder on Maryland's eastern shore. Back then, he and his crew always built kitchen cabinets in place, ripping the plywood on site to create the boxes, adding face frames and drawers (also built on site), then installing doors and drawer fronts purchased from an outside supplier to complete the cabinets.

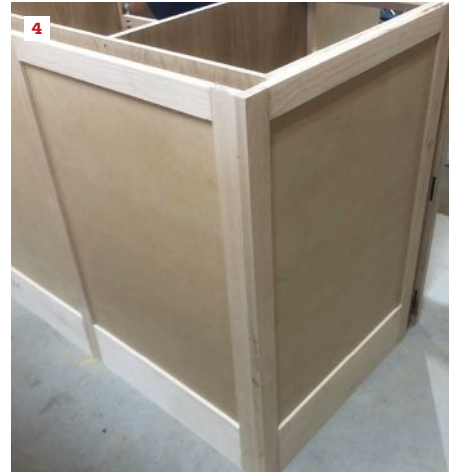
When I started my own construction company, we shifted to installing modular stock cabinets because they were faster and less labor-intensive (and therefore less expensive). This remained our standard practice until a couple of years ago. I had always been bothered by the limitations of building up cabinet runs out

of modular boxes sized in 3-inch increments and was growing frustrated with the long lead times (up to 20 weeks in some cases) that only became worse as the COVID-19 pandemic spread. Because it was becoming increasingly difficult to get cabinets on site, I decided to return to my roots and start building our own cabinets again.

Our approach is a bit of a hybrid. We build the boxes in our small shop, sizing them to fit the space rather than in standard increments. At the same time, we build the face frames, again sized to fit the space, along with the doors, drawers, and drawer fronts. We then fit the doors and drawer fronts to the face frames, finish them, and even install most of the hardware, but we don't

Photos by Jason Stimis

## EFFICIENT CUSTOM CABINET CONSTRUCTION



The author assembles the cabinet boxes out of  $\frac{3}{4}$ -inch prefinished plywood (1), then uses a Lamello Zeta P2 biscuit joiner to cut slots for the Tenso P-14 biscuits that will be used to fasten the face frames to the boxes (2). Where the ends and backs of the cabinets will be exposed, such as for kitchen island cabinets, the author covers the plywood box with a separate frame-and-panel assembly, attaching it to the face frame with P-14 biscuit connectors (3, 4).



The author uses pocket screws and glue to assemble the face frames (5), then cuts the slots for the biscuits following the layout marked on the cabinet boxes (6). The two parts of the Tenso P-14 biscuit connect mechanically when fitted together but can be easily disassembled if needed (7). Holes bored in the plywood worktable make it easy to position the clamps used to securely hold the frame flat and square during assembly (8).

permanently attach the frames to the boxes until we are on site and the boxes have been installed.

Key to our approach are the mechanical biscuits in the Lamello Zeta P2 system. These biscuits allow us to temporarily install the assembled face frames in our shop to do our fitting, and remove them to easily transport the cabinet components to the site. Once there, we install the cabinet boxes, which are slightly undersized for the openings, and then template the openings for the face frames,

which we've built to be slightly oversized. After trimming the frames to size, we snap them in place. The resulting cabinetry looks like it was built in place without any seams.

### DESIGN AND LAYOUT

While my company also builds custom homes, probably 80% of our cabinetry work is retrofit into existing construction as part of a remodeling project. When meeting with the homeowners to



Stiles and rails for the doors are ripped from full 1-inch-thick S3S stock, then run through a shaper fitted with a tongue-and-groove cutter with a 15-degree bevel (9, 10). To aid assembly, the author clamps a wood square with a perfect 90-degree angle to the worktable, which helps align the door's stiles and rails as the 1/2-inch-thick panel is slid into place (11). During glue-up, the author checks that the diagonals are equal to ensure that the door is square (12). A couple of passes through a wide belt sander clean up the glue joints and prep the door for a paint finish (13).

discuss their project, I take careful measurements of the space with a Bosch GLM165-40 laser distance measurer, which I then use to accurately dimension photographs that I've taken of the space with the help of Bosch's MeasureOn app.

I sketch out the designs on graph paper, and after the clients have settled on a plan, I refer to the dimensioned photos to size the cabinet boxes. My goal is to fit them easily into the opening, while making efficient use of the plywood that we build them with. For example, a 90-inch-long run of cabinets will consist of a single box, with plywood dividers placed as needed to separate the box into individual compartments.

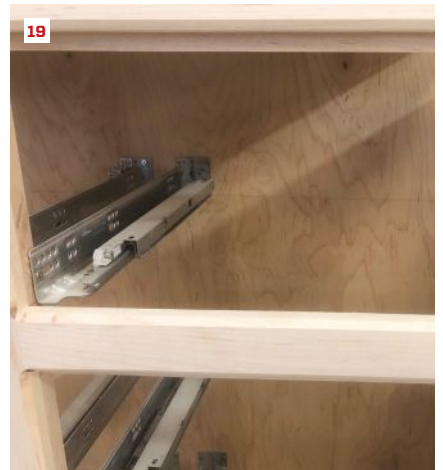
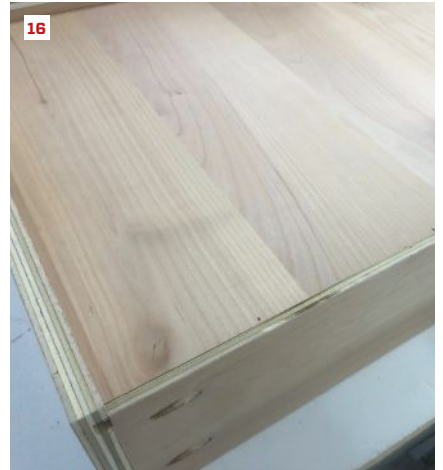
To save time breaking down full sheets of plywood, we special-order prefinished 2-by-8-foot 3/4-inch plywood panels for the cabinet sides and bottoms and full 4-by-8-foot sheets of 1/2-inch plywood for the backs from our local Home Depot. Manufactured by Columbia Forest Products, the formaldehyde-free veneer-core PureBond panels that we most often use come with a maple finish, but white oak and walnut panels are also available.

After cutting the panels to size, we use a router guided by a track to cut dados and rabbets that we'll use to fit the panels together when assembling the boxes. Sometimes, clients want in-cabinet lighting, in which case we rout 3/8-inch-deep light-rail tracks with a 3/4-inch-diameter dado bit for Loox flush lighting fixtures from Häfele. Where the cabinets will contain shelving, we drill holes for shelf supports. Because it does a cleaner job than a drill, we use a router, which we fit with a collar and a 1/4-inch-diameter upcutting bit, and guide it by a simple shelf-pin jig that we made out of MDF.

After gluing and screwing the panels together, we pocket-screw 1x2 stretchers to the fronts of the boxes to stabilize them and provide a mounting point for installing the face frames.

### FACE FRAMES

Most of our clients want face-frame cabinets with a paint finish. We mill the stock for the frames, doors, and drawer fronts from full 1-inch-thick S3S maple or white oak, which typically measures 17/16 inches thick and comes in random widths and lengths



The author cuts his drawer boxes from the same prefinished  $\frac{3}{4}$ -inch plywood used for the cabinets, finishing the top edge with iron-on edge banding (14). He joins the fronts and the backs to the sides with pocket screws, which will be hidden once the drawer front is installed and the drawer is mounted on the slides (15). The drawer bottom is cut from  $\frac{1}{2}$ -inch plywood, and fits into dados cut into the drawer sides (16). The author uses Blum's drawer slide template to drill the holes in the back of the drawer box (17) for the slide locking devices (18) used with the Tandem Plus Blumotion concealed undermount slides (19).

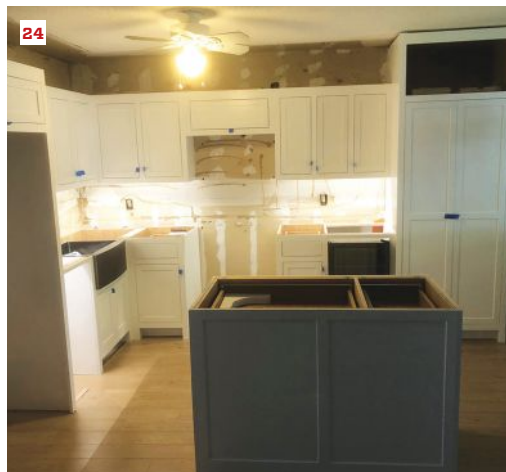
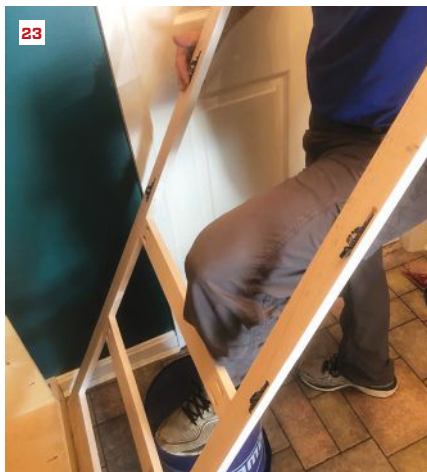
with one straight edge. This material is currently about half the cost of similar S4S lumber, and while it takes a little longer to rip down to a final 2-inch width, it gives our cabinets a sturdier feel.

To eliminate the seams that you typically get with box units, we size the frames so that they are as long as they need to be for each run of cabinets, plus a little bit extra on either end. We join the frames together with glue and pocket screws, using a clampdown table that we made and Rockler clamps to keep the joints tight and flush when screwing them together. After assembly, we run the frames through a Powermatic 2244 22-inch drum sander.

When we first started building our own cabinets, we joined the face frames to the boxes with pocket screws. We still use a lot of

pocket screws in our production process and recently added a Kreg Foreman semi-automatic pocket hole machine, which definitely is faster than our old Kreg jig. However, for attaching the face frames to the boxes, we now use Lamello's Zeta P2 biscuit joiner and P-System connectors, which results in a cleaner-looking install with no visible pocket screw holes. Another advantage is that we can completely assemble a cabinet in our small, 750-square-foot shop, then quickly break it down again to make room as we work on additional cabinets. Then we transport everything to the jobsite and do our final fitting and assembly on site, as described below.

While different styles of P-System mechanical biscuits are available, we primarily use Tenso P-14 biscuits, installing them



During cabinet assembly, the author uses a shelf-pin jig to guide a router fitted with a collar and a 1/4-inch-diameter upcutting bit to make the pin holes (20). After installing a set of cabinet boxes (21), the author uses strips of hardboard and hot-melt glue to make a template, which he uses to mark the final width of the frame (22). After frames have been trimmed to fit, they can then be snapped into place onto the cabinet boxes (23), and the doors and drawers fitted (24).

about every 10 inches around the perimeter of the face frame and cabinet box. With these biscuits, the frames simply snap into place onto the boxes.

## DOORS

For the kitchen in this article, we built inset doors and drawers, but on about 50% of our projects, we build 3/8-inch overlay doors, which are a bit more budget-friendly because they don't require as much labor to fit. For inset doors, we size the doors slightly larger than the openings and trim them to fit later with a consistent 3/32-inch reveal between door and opening. We cut 2-inch-wide stiles and rails from the same stock as the face frames, typically paint-grade maple or white oak, and cut the panels from 1/2-inch MDF sheet stock.

We have the cutters to cut raised panels, but most of the time we build Shaker-style doors with flat panels, running the stiles and rails through a shaper fitted with an Infinity T&G shaper cutter with a 15-degree bevel. On 3/4-inch stock, the bevel is probably unnecessary, but with our full 1-inch-thick stiles and rails, we think the bevel

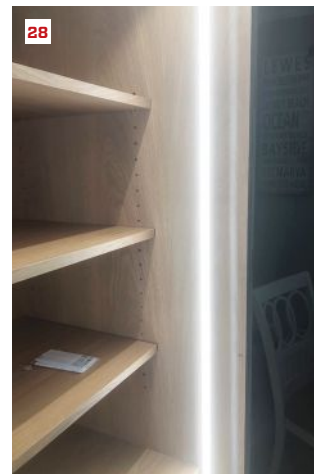
makes a noticeable improvement in the appearance of the door.

We use either Titebond III or Titebond No Run, No Drip wood glue when gluing up the door frames. To ensure that they are perfectly square, we first screw a 90-degree wood bracket or jig to the clampdown table. The jig makes squaring them up—which is especially essential for inset doors—easy and fast. After the glue dries, we run the doors through a wide belt sander.

## DRAWERS

We build drawers out of the same prefinished 3/4-inch plywood that we use for cabinet boxes. After cutting the sides to size, we rout them with a 1/2-inch-wide dado for the drawer bottom and apply iron-on edge banding. We glue and screw the drawers together through their fronts and backs with pocket screws, which will be invisible once the drawer fronts are fastened to the drawers and the drawers installed.

We make the fronts for shallow drawers out of solid stock. For drawer fronts that are at least 6 inches high, we make a frame-and-



To further customize his cabinets, the author offers a number of upgrades, including flush-mounted electrical outlets. He installs them using a Trufig system router template (25) to cut the opening in the side of the island cabinet for the electrical box and specially designed outlet and cover plate (26). He also fits some cabinets—such as wardrobes—with flush interior LED cabinet strip lighting that runs inside an aluminum track covered by a diffuser. The track fits into a dado routed into the cabinet box (27). Manufactured by Häfele, the Loox LED lighting is controlled by a daylight sensor that turns the lighting on and off automatically when the door is opened or closed (28).

panel style that is identical to the cabinet doors. For drawer fronts that measure 5 inches high, we reduce the width of the top and bottom rails to 1½ inches, a barely perceptible difference that allows for a full 2-inch-wide panel.

## FINISHES

Before installing any hardware and before bringing the cabinets on site, we spray the face frames, doors, and drawer fronts with Sherwin-Williams Kem Aqua, a waterborne lacquer finish. We apply two coats of primer, with a light sanding between coats using a Graco droptube airless sprayer. Then we apply another two finish coats, avoiding sanding between coats unless absolutely necessary to remove blemishes. As much as possible, I like to spray everything when it's in a horizontal position to avoid drips and runs, though we do apply some touch-up work as needed on site.

Once the paint is cured, we install as much hardware as we can in the shop. Whether the cabinets are face-frame or frameless, Blumotion soft-close concealed hinges are our go-to option. For drilling the hinge cup locations, we use a Kreg concealed hinge drilling jig, which has the screw hole locations for predrilling, making squaring up the hinges easier. For the hinge mounting plates that fit in the cabinet boxes, we use a Rockler Jig It mounting plate template.

To mount drawers, we used to use side-mount soft-close slides, which required wood runners for the inside of the boxes to support them. But we've switched to Blum's Tandem Plus soft-close undermount slides, which cost a little more but are much easier to install. We use Blum's undermount drawer slide jig to accurately position and mount the hardware that needs to be installed on the drawer box.

## INSTALLATION

Along with the boxes, face frames, and other cabinet components, I bring a stack of ¼-inch plywood rippings to the jobsite when it's time to install the cabinets. After the boxes are leveled and screwed to the framing, I use the rippings to template the openings, joining the corners together with hot-melt glue. Then I lay the template down over the face frame to mark the exact size of the opening.

When cutting the face frame to fit with a track saw, I back-cut any side or end panels by 10 or 15 degrees to make it easier to scribe the panels for a perfect fit. Most of the time, just a back cut provides a tight fit to the drywall. Once I'm satisfied with the fit, I insert the Tenso biscuits and snap the face frame in place.

To complete the cabinet installation, we finish up the drawer hardware installation and slide the drawers into place. Then we screw the door hinges into the predrilled holes, adjusting the hinges as needed for the proper fit.

Adding equipment such as a Lamello biscuit joiner, a wide belt sander, and a robust Laguna dust collection system to manage the sawdust was a big investment for my small shop, but it is definitely paying for itself. Besides saving a lot of time, these tools and this process have greatly improved the quality of our work. I'd prefer to hire another experienced cabinetmaker, but a labor shortage in our area has made that difficult. Meanwhile, these new purchases have increased our efficiency and allow us to offer our clients quality custom cabinets at a price that is competitive with stock boxes.

*Jason Stimis owns Stimis Enterprises, a multigenerational home improvement and construction business based in Allen, Md.*

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# FLOORING



## Finishing Wood Floors With Hardening Oils These penetrating products redefine ‘The Good Stuff’

BY MICHAEL PURSER

Finishes for wood floors fall into two categories: coatings and penetrating products. They have two jobs to do, protect the wood and provide an attractive surface. In that context, coatings have been the overwhelming favorite. The biggest rap against them, though, is how they wear over time and how difficult it is to repair them when damaged or worn.

The appeal of penetrating products is they don't form a film that can be abraded and damaged; theoretically, they are absorbed into the wood without leaving one on the surface. They may not show wear or damage as much, but their Achilles heel is the inability to provide minimal protection from casual contact with just about any liquid. For that reason, they are often used under coatings as a sealer or stain.

What would be ideal, of course, would be a domestic stand-alone penetrating finish. Hardening oils appear to have filled that void.

But do they work? To answer that, let's start by comparing hardening oils to the solvent-based penetrating products that have been available in North America for decades. Open any can of a U.S.-made penetrating product and look inside. The product might be clear or could have color added to create a stain, but two-thirds to three-quarters of the contents of the can are solvents. The remainder is what I call “the good stuff” (TGS)—the resins, dyes, pigments, driers, and drying oils that give the product its working characteristics. The solvents are smelly hydrocarbons that can stink up a jobsite. They dilute the good stuff (TGS) and keep it in suspension so you can get it out of the can, spread it on the wood floor, let it penetrate, and then remove the excess to avoid any type of film formation. After proper application, the wood is supposed to be sealed and protected.

With a can of hardening oil, you may also be looking at a clear or an opaque product that may have color added to qualify it as a stain.

Photos by Michael Purser

## FINISHING WOOD FLOORS WITH HARDENING OILS



**Troweling method.** Mike Somodean, a floor refinishing contractor based in Roswell, Ga., shows both sides (1, 2) of the flexible trowel he uses to apply hardening oil. He begins by pouring out a puddle of Ciranova oil, spreading it quickly in a broad sweep and working it skillfully to the edges (3). Working a section as wide as his arm can sweep (4), he covers the length of the room (about 18 feet) in about two minutes.

The big difference is the lack of solvents. This is possible because the vegetable-base oils (linseed and soy being the most common) are highly refined and purified. Several manufacturers claim they use no solvents at all. If a solvent is used, it's down around the 2% range, which, in my book, still qualifies as no solvents. So, everything you are seeing in that can of hardening oil is TGS. You can take the contents out of the can, spread it on the floor, let it penetrate into the wood, and buff off any residue. You end up with no film formation. You don't have noxious, smelly, and flammable hydrocarbons saturating the air and posing a threat to a worker's health and the natural environment. As good as that is, do not lose sight of the fact that when the solvent-based products are absorbed into the wood, most of what is absorbed is solvent and not TGS. On the other hand, the hardening oil that's absorbed is nothing but TGS.

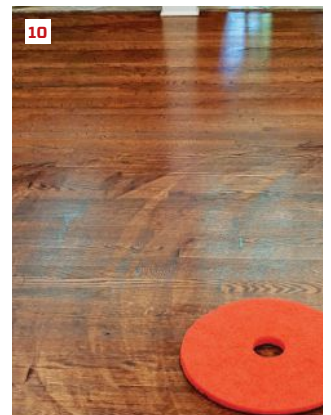
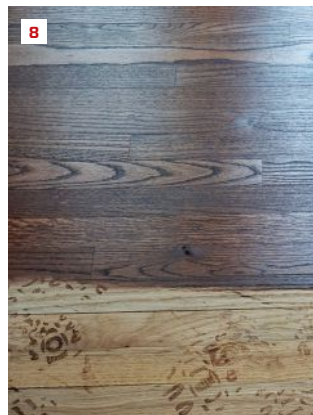
I've worked with tons of U.S.-made penetrating finishes over the years. But after applying them, I've always covered them with multiple layers of a film-forming coating, usually some type of ure-

thane, because you cannot rely on a solvent-based penetrating stain or finish to protect wood from casual contact with most liquids. Like most wood flooring contractors, I know that conventional penetrating products wish they could seal and protect, but the reality is, they won't without help.

In contrast, the hardening oils I've used have done an outstanding job of providing the needed protection without a topcoat of finish. When the oils saturate the wood, they work at a molecular level and attach to the walls of the wood cells. Since a solvent does not dilute the oils, you're getting the full benefits of TGS. Once in the walls of the wood cells, the oils start to harden, bonding all that TGS that has been absorbed.

### AVAILABLE PRODUCTS

I started out using Master Oil from WOCA and eventually included Magic Oil by Pallmann in my finish selection. For this article, I approached all the manufacturers I knew of who have



After 10 to 15 minutes of “dwell” time, a crew member comes in behind Mike to further work the oil into the wood with a buffer fitted with a red buffing pad (5). When the wood reaches saturation, excess oil will “spit” out (6). He changes the red pad out for a white one (7) to absorb the residue (8) and polish the floor (9). The crew works the floor in sections to stay ahead of the oil before it hardens (10).

a hardening-oil product and asked for an interview. These included WOCA, Pallmann, Rubio, Ciranova, Loba, Osmo, Bona Kemi, and Pro Coat. The first four agreed to the interview, and the others either never replied or declined an interview at this time. I also interviewed several contractors to evaluate their experience and measure it against my own feelings about the products.

### GETTING IT ON THE FLOOR

Before I get to the application process, two quick points:

1. With few exceptions, all the oils come with a chemical hardener that you mix into the oil before starting the application. This expedites drying and curing and enhances the chemical resistance to liquids the oils will likely come into contact with over time.

2. To maximize the amount of oil absorbed, it helps to wet the wood to pop open the grain before applying the oil. When the floor has dried, the surface will absorb the oil more evenly. Every contractor I talked to did this, especially if they were using a stain with

color. Water is the great equalizer and helps create a uniform look.

The three primary methods of getting the oil on the floor are troweling, rolling, and buffing. All of these methods physically force the oil down into the wood tissue. If you’re good with a trowel, you can cut in and do detail work with its blade. If you’re rolling the oil on or buffing it in, you will likely cut in using a small brush or a slice of a red buffing pad to rub the oil in. Most contractors agree it’s wiser to work in manageable sections as opposed to taking on a whole room at once. The size that’s manageable will depend on your level of experience, so be deliberate when you start. After applying the oil with the trowel or roller, let the oil sit on the floor and dwell for about 10 to 15 minutes, and let gravity do its thing.

After the dwell time, use the buffer and the red pad to methodically buff the surface. I recommend buffing in patterns going against the grain and with the grain. This does two things: It forces more oil into the wood, and the red pad starts to pick up the excess. As the floor reaches its saturation point, the excess is thrown off the

## FINISHING WOOD FLOORS WITH HARDENING OILS



**Buffing method.** Everything needed by the author for applying hardening oil is shown here (11). A fresh can of Pallmann Magic Oil has room for the hardener so it can be mixed in the can (12). Some of the mix goes into a plastic squeeze bottle to be applied precisely (13). The author immediately rubs it in by hand with a pie-shaped piece of red pad (14). He cuts it in neatly to the baseboard, working a swathe about 6 inches wide around the perimeter of the room (15, 16).

pad in small droplets, called spitting. As the spitting is minimized, what little oil is left is removed with a white polishing pad or a terry cloth-type rag. At this point, you will notice a dramatic reduction in the amount of oil your shoes track, as the majority of the residue has been removed. I strongly encourage wearing mesh booties to reduce tracking even more and keep your shoes cleaner.

I prefer the third method of getting oil on the floor: buffing the oil into the wood. Prior to buffing, we cut in around the perimeter by using a brush or making small deposits of oil with a squeeze container and then rubbing it in with portions of a red pad. This keeps oil off the trim and makes for a cleaner application.

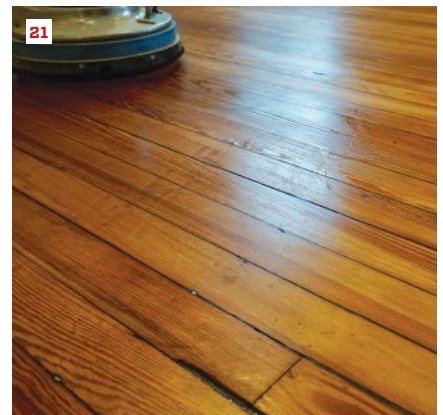
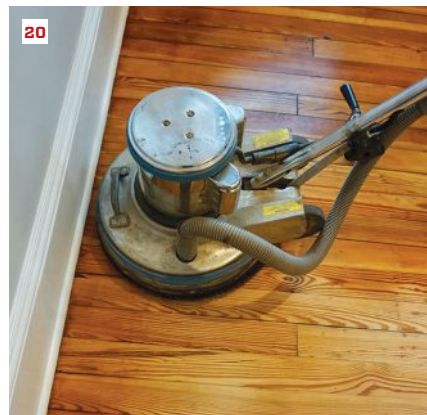
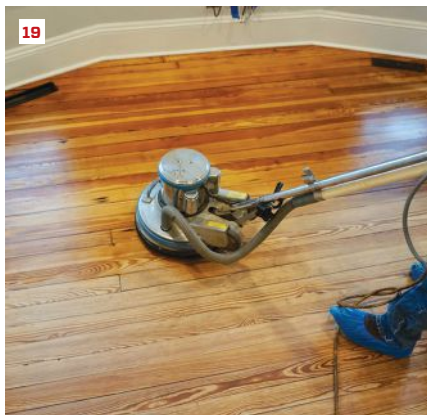
When we're ready to buff the oil, we start by removing the center section of the red pad, creating a 3-inch hole to pour the desired amount of oil into. I put a drive pad on top of the red pad on the buffer and hit the switch. To get maximum coverage, I typically move the buffer quickly and in patterns that look like the number 8. Once the oil is deposited in the pattern, I work the oil into the wood

by buffing against the direction the floor is laid. As I spread the oil, I gradually work my way to the perimeter of the room where we had cut the oil in, and blend the two areas. Once I'm confident I have sufficient oil on the floor, I buff in any direction I want.

Since the biggest risk to this method is not getting sufficient oil on the floor, I monitor the amount of spitting coming off the red pad to determine if the oil is being absorbed or the wood is reaching saturation. I also look for any color variations in the wood, as those indicate areas that haven't absorbed enough oil. If I feel I need more oil in an area, I make light applications.

Once the majority of the excess has been removed with the red pad, the final buffing is done with a white polishing pad, a terry-cloth towel, or both. What you are doing now is making sure the oil has been applied and removed uniformly as the oil enters the drying/curing phase. Always back your way off a freshly oiled floor to ensure any shoe tracks are removed with the buffing pad.

The application processes are logical and easy for a seasoned



Once the perimeter is cut in, the author fills the center of a red pad with enough oil for a manageable section (17). He spreads the oil quickly in a figure 8 to smear it on the surface (18), and then methodically works it into the field (19) and blends this area with the perimeter (20). Compared to troweling, buffing the oil on creates the least “spitting” (21).

operator. You do have to pay attention to the amount of pull on the red buffing pad, as it accumulates oil while the work progresses. The buffing creates friction and that means heat. Combine that with the hardener and it won't take long for you to notice more drag as the heated oil is well into the drying phase. This makes the buffer more difficult to control, as it will grab at the surface, and eventually you will have to flip the pad over to the clean side or replace it. Pay particular attention to the circular residue left from a saturated pad when you lift it off the floor. I encourage you to quickly wipe it up with a terry-cloth rag. He who hesitates will think he's wiping up Super Glue.

When you finish with the white pad, rely on the manufacturer's suggestions and product specifications for what comes next. For some products, that's it, you're done. For others, you have the option to make another, much lighter application. Others will tell you that if you want to make another application, wait a day and make it a light application. If the initial application was done correctly, the wood should already be pretty much saturated. The most you would be doing with a second application would be to get oil in what I call

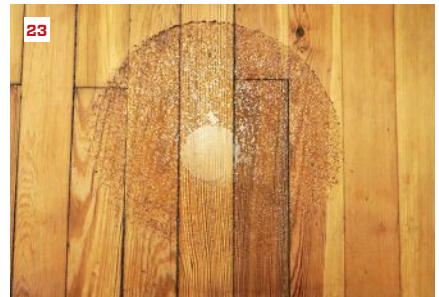
the grain relief pattern. It won't be much, but if you want to do it, you can. I typically use a plastic condiment squeeze bottle for getting the additional oil on the floor, as I don't need much.

Drying and curing times vary, especially if the oil has color. Pay close attention to what the manufacturer requires and make sure the client does too.

It sounds easy, and it is for someone with experience. Take a second and breathe in the air that is remarkably clean and devoid of noxious solvent vapors. These are some of the most environmentally responsible finishes you'll ever work with, and for me, they have been a joy to use.

### CRUNCHING THE NUMBERS

The initial reaction to the price of hardening oils warrants some close inspection. On the low end of the pricing spectrum, you'll be paying about \$110 per liter. On the high end, by the time you add in taxes, you'll be bumping up against \$200 per liter. For those of you still clinging to the Imperial weights and measures scale,



Buffing uses less oil, but the red pad will pick up some excess, mostly at the edges (22). The pad will need to be flipped or replaced as it becomes more difficult to manage. When the pad is removed from the floor, the excess that's left under the pad (23) must be cleaned up immediately (24) before it hardens.

that puts a gallon of this stuff at around \$400 to \$750, depending on which end of the spectrum you're purchasing. Once the sticker shock wears off, let's run those numbers through a real-world example to get a good idea of the impact on your job pricing.

For simplicity, let's say we have 1,000 square feet of wood flooring in a kitchen, family room, a couple of halls, and a powder room all needing the typical sand/stain/finish. Let's compare two finishing options: One version calls for a hardening oil with color, the other calls for a solvent-based stain followed by multiple applications of a two-component waterborne finish. The prep work for either system is the same. Let's assume all the prep work has been done and we are joining each crew on the day they start the staining and finishing.

The first crew (two workers) will be using the more expensive, one-coat application of colored oil at \$200 per liter. After mixing the hardener in the oil finish with color, the crew starts the application at 9 a.m. They will go through roughly three liters of finish in about four hours for a total cost of \$600 for the finish and the cost of the crew for a bit more than half the day. They should be through with the application and gone by 2 p.m. at the latest.

The second crew (also two workers) gets started the same morning with the staining of the floor using one of the faster drying solvent-base stains that are so popular. They start at 9 a.m. and use about a gallon and a half of the stain and pay about \$75 for the product. They finish up around noon. Since they need to let the stain dry for about three hours before applying finish, they call it a day and head off. The crew returns the next morning to make one applica-

tion of a waterborne sealer, using two gallons for about \$100 in materials. The sealer will dry in a couple of hours. They take a long lunch and return to pad the floor, vacuum it, and make the first application of the two-component high-grade waterborne finish, using close to two gallons, or \$250 in materials. It's a full day of work. They show up the next morning and because they are within the 24-hour window since the finish was applied, they don't have to do any prep work. The crew applies the second and final topcoat, and uses about a gallon and a half of the two-component high-grade waterborne finish for an additional \$190 in materials. They are done by 11 a.m.

So the floor done with the hardening oil with color was completed in a bit more than half a day for \$600 worth of finish, plus labor and one trip. The other project took two and a half days of labor and at least three trips, and consumed about \$615 in stains and finishes. Materials costs are almost identical, but the time, labor, and trips make a huge difference. Several contractors told me this is the silver lining to these products. As one contractor sagely chanted, "It's the trips, it's the trips ... you have no idea until you factor in the trips." I can't argue.

## DETAILED COMPARISON TO COATINGS

Hardening oils were the first true penetrating finishes I ever worked with, and for me, they provide the most accurate comparison to film-forming coating products. Let's do the side-by-sides:

**Appearance.** Coatings are more decorative than hardening oils. Coatings can range from a flat matte to a high gloss. Lower-luster finishes, satin in particular, are more popular as they tend to not show



The final step is to polish the floor with a white pad (25, 26). The author feels buffing with pads is the cleanest and most efficient method of applying the oil. However, there is potential for not getting enough oil on the floor, so you need an experienced eye and patient hand to make sure the wood is reaching saturation.

wear as much. Hardening oils are low luster, period. Some manufacturers of hardening oils do offer products that will increase the luster, but I am hesitant to describe them as anything but low luster. The good news is that as consumers have gotten more accustomed to the look of hardening oil, they have become more accepting. We're even seeing it used on some high-end prefinished and engineered flooring.

**Protection.** Both products do an excellent job of protecting wood. The high-tech, high-end waterborne finishes are more chemically resistant to common household liquids than ever before. Hardening oils are also protective of wood. Many of my historic preservation projects include rooms that see a lot of activity with food and beverage consumption and people celebrating in every manner. In this context, the hardening oils have done just fine.

**Cleaning.** Manufacturers of coatings did themselves a big favor when they started promoting a simple, straightforward cleaning kit for their finishes. They did a great job of marketing and distributing them. Hardening oil manufacturers have done the same but with slight variations. Along with cleaning products, some manufacturers offer refurbishing products to help maintain a healthy-looking floor. Do your homework and use the company's website to drill down on this topic. I pay close attention because unless it's simple, the homeowner will skip it.

**Wear.** This is where we notice big differences. Even the toughest coatings are susceptible to scratches, gouges, indents, and wear patterns. They sit on top of the wood where use and abuse can be plainly seen. It's difficult to mitigate areas of damage or wear without doing a full-blown clean and recoat of the entire area. With hardening oils, all the protection is in the wood so there's no film on the surface to show abrasion and wear, even though it's still occurring. If you do get some visible damage, touch-up is relatively easy in a single location without refurbishing or refinishing a whole room. Most manufacturers have touch-up products for doing just that.

**Refurbishing** an aging finish defines the long-term performance of a finish and life span of the floor. With coatings, you are pretty much limited to cleaning and recoating the surface. Major coatings manufacturers know this and have good products to support this option with cleaners that will remove most contaminants. The biggest downside is that you are increasing the buildup of finish by applying new finish over old. You eventually reach a point where the natural look of the wood is compromised and future refurbishing will likely require sanding.

The approach with hardening oils is slightly different. Most manufacturers offer what I call "interim" products to help deal with any wear patterns or a dry look after repeated cleanings. These products help address these issues with no buildup on the surface. Over time, many floors will need to be professionally re-oiled. All manufacturers have support products for this. The wood absorbs the new oil and you still avoid film formation. This can easily extend the life of the wood by avoiding the need for sanding.

When a coated floor starts looking shabby, the knee-jerk reaction is to sand the finish off, along with a lot of the wood. With hardening oils, everything is down in the wood and any crud that accumulates on the surface can be removed without a major sanding. These products can stain, seal, and protect a wood floor with one application instead of the multiple steps that coatings require. You do need to educate your clients on the look and maintenance so they will know what they're getting. If they are comfortable with that, I can assure them that I've used these products in demanding situations with good, long-lasting results. Because of all of these advantages, there's always room for them on the shelves of my truck.

*Michael Purser is a second-generation floor finisher based in Atlanta. He owns The Rosebud Company, which specializes in the restoration of historic wood floors.*



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# RESILIENCE



## Wildfire-Resilient Buildings Builders hold the key to combating this growing threat

BY JLC STAFF

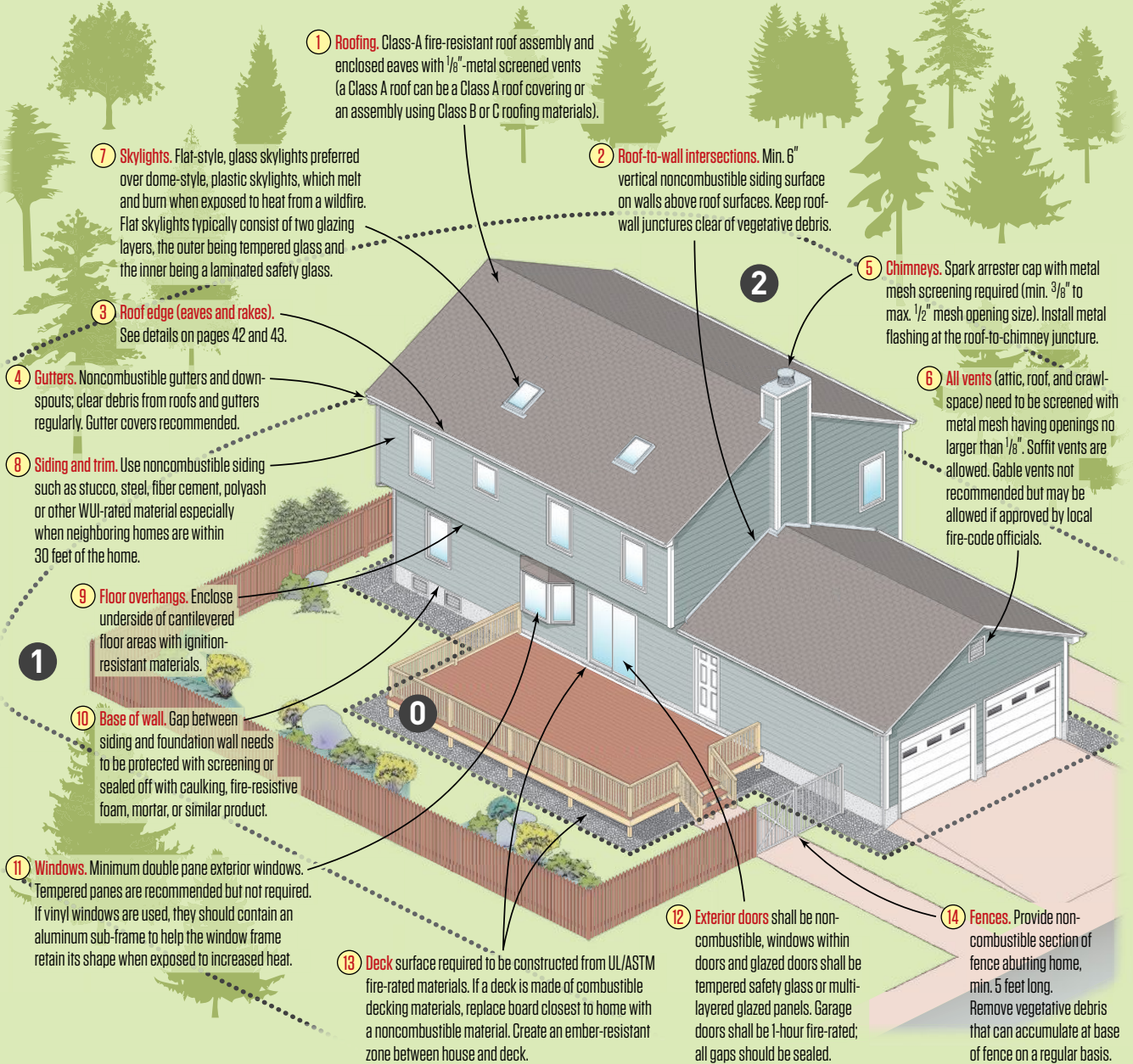
**T**he Dixie Fire in California was the largest wildfire of 2021 in the U.S. It burned from July to October, consuming 963,309 acres and destroying 1,329 structures, 600 of which were homes. The Dixie Fire was the largest single wildfire in California history, but not the largest overall. That honor goes to the August Complex Fire, so named because on August 30, 2020, four fires burned together to create one massive wildfire that consumed 1,032,648 acres—an area larger than the state of Rhode Island. One person died in each of these fires. Yet, despite their vast sizes, these fires pale in terms of death and destruction compared with California's 2018 Camp Fire, which killed 85 people and destroyed 18,804 buildings, or the Tubbs fire of 2017, which killed 22 people and de-

stroyed 5,636 buildings. And this is only in the state of California. Though the largest and deadliest U.S. fires in the last decade have all occurred there, notable fires have broken out in Washington (Carlton Complex Fire), Arizona (Yarnell Hill Fire), and New Mexico and Arizona (Wallow Fire). During 2020 alone, over 13 million acres were consumed, and nearly 15,000 buildings were destroyed in the U.S. by “large event” wildfires (those that burn more than 1,000 acres).

While none of these are the most destructive in U.S. history (compare to The Big Burn of 1910, a single fire that killed 87 people and consumed 3 million acres in the Northern Rockies in August 1910, or the 1871 Peshtigo Fire, which killed 2,500 people and burned 1.2 million acres in Wisconsin and Northern Michigan), the

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## Hardening Structures Against Wildfires



### Defensible Space

**Ember-Resistant Zone (Zone 0).** 0 to 5 feet: Gravel, a concrete or brick walkway, or another hardscape feature is commonly used to construct this zone. Zone 0 should include the area under and around any attached deck. Keep zone clean of any woodpiles, wood mulch, or flammable vegetation.

**Lean, Clean and Green Zone (Zone 1).** 5 to 30 feet: Lean indicates that there is only a small amount of vegetation, if any, present. Vegetation should be grouped in discontinuous islands. Clean indicates that vegetative debris and dead materials are routinely removed. Green indicates that vegetation within this zone is kept green and well irrigated during the fire season.

**Reduced Fuel Zone (Zone 2).** 30 to 100 feet: Remove dead plant material, lower tree branches and other ladder fuels, such as shrubs, lower branches, smaller trees. Locate outbuildings at least 30 feet away from home and create an ember-resistant zone around all outbuildings and propane tanks.

Illustration adapted from "Wildfire Home Retrofit Guide" (2020), University of Nevada, Reno Extension.

- 1. Roofing.** Homes that ignite in wildland urban interface (WUI) fires tend to burn from the top down. Class A roofing materials such as asphalt shingles, clay and cementitious tiles, and some metal roofing materials are recommended.
- 2. Roof-to-wall intersections** are vulnerable areas because wind-blown embers will gather at the same locations where leaves, needles, and other debris have accumulated. At roof-wall junctures, install metal flashing that extends up the siding at least 6”.
- 3. Roof edges (leaves and rakes).** Use of noncombustible products for fascia, soffit, and rake trim is strongly encouraged. Open-eaves designs are more vulnerable to flames. Enclosing open eaves is recommended.
- 4. Gutters.** Embers can ignite debris in gutters and potentially other components along the roof edge.
- 5. Chimneys** serving fireplaces and heating appliances must have an approved spark arrester or cap. These will help minimize the possibility of sparks and embers leaving the chimney and starting a wildfire.
- 6. Attic vents** provide an entry point for embers. Vents should be covered with min. 1/8” metal mesh screening. Finer, 1/16” mesh screening is more effective at keeping embers out but requires more maintenance to keep it debris free.
- 7. Skylights** on steep roofs can be vulnerable to heat exposure and flame contact, particularly if nearby combustible materials ignite. Skylights on low-slope roofs are more prone to the accumulation of vegetative debris.
- 8. Siding and trim** should consist of noncombustible or ignition-resistant material. Approved materials include, but are not limited to, fiber-cement board, polyash, stucco, masonry/brick, manufactured stone, and similar materials. Natural wood/cedar siding, hardboard, vinyl, and similar combustible materials are typically not allowed for new construction.
- 9. Floor projections** are vulnerable to heat and embers collection. Enclosing the underside of projections with ignition-resistant products helps reduce the likelihood of ignition in these areas.
- 10. Base of wall.** As winds and embers blow up against the foundation wall, the gap left between the siding and foundation can leave the framing or wall cavity exposed to ember intrusion.
- 11. Windows.** Ordinary window glass may break when exposed to flames or radiant heat, allowing embers and flames to enter the home. Tempered glass is more heat resistant and, if it does break, is less likely to allow an opening for embers to enter the home.
- 12. Exterior doors** should be constructed of noncombustible materials such as metal or composites. Wooden doors are acceptable if they are solid core construction. Sliding glass doors or decorative front doors with glass panels shall have tempered glass designed to withstand impact and meet the design standards required by building codes.
- 13. Deck.** Wood is not permitted to be used for the decking surface but can be used for all large structural components and railings. Clear combustible debris from cracks and gaps near exterior walls.
- 14. Fencing.** Combustible fencing can provide a direct path to a home if surrounding vegetation or embers ignite it. Separate fence from house or upgrade last 5 feet of fence to a noncombustible material. Do not use fences as a trellis for plants because plants can create and trap ignitable debris.

incidence of wildfire has increased exponentially in recent history. Though there is debate over whether the overall number of wildfires has increased, there is little debate that the intensity of, the area consumed by, and the cost of reconstruction from wildfires have grown. According to NASA, which tracks wildfire activity by satellite, the average annual number of acres burned has been steadily increasing since 1950, and the number of “megafires” (fires that burn more than 100,000 acres) has increased in the past two decades.

All of this has deeply influenced wildfire safety policy in the U.S. Traditionally, the recommendation to protect homes was to create “defensible space”—an area of landscaping with little combustible material surrounding a home—so fires would not have a chance to reach the building. (Note: The specific zones that define “defensible space” around a home vary. The illustration at left details the three zones that are commonly recommended mostly outside California. The California Building Code has a more stringent definition that includes a zone clear of combustible material that extends 30 feet around the house, an area of low, clumped vegetation extending from 30 to 70 feet, and a reduced fuel area from 70 feet to the property boundary. These stricter requirements have also been adopted outside California, just not as frequently as those shown on the facing page.)

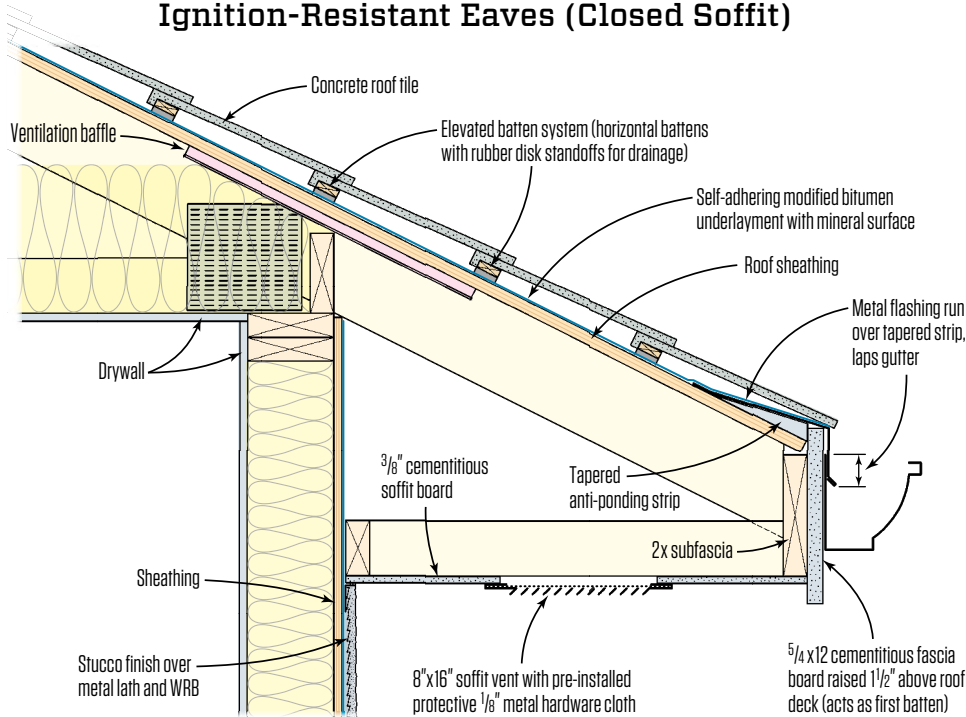
While defensible space is still a primary strategy for protecting homes, it has proven less effective for two reasons: The first is the increase in the concentration of homes in developments. Smaller lot sizes mean homes often don’t have sufficient room to create much defensible space around them. Second, the increase in the intensity of wildfires has made blowing embers, which can travel distances measured in miles, a primary cause of ignition for building fires. These days, the prime strategy involves the hardening of homes to resist damages.

## WE KNOW HOW TO DO THIS

According to a 2018 study published by the National Academy of Sciences, the number of homes in the U.S. wildland-urban interface (WUI)—land near forests and other natural areas where wildland vegetation and development intermix—increased from 1990 to 2010 by 41%. This made the WUI the fastest-growing land-use type in the U.S., a trend that hasn’t shown signs of abating since. As the name suggests, some of this land is at the margins of large towns and cities. Much of it has arisen as new residential neighborhoods, but not all of these areas are necessarily under the jurisdiction of nearby municipalities.

To address increased wildfire risk, municipalities have begun to update their jurisdictions by adopting (often amended) versions of several well-known WUI

## Ignition-Resistant Eaves (Closed Soffit)



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

standards, which include Chapter 7A of California’s Building Code (identical to Section R337 of the California Residential Code), the International Code Council’s Wildland-Urban Interface Code (IWUIC), and the National Fire Protection Association’s NFPA 1142.

All those documents are similar in nature and implement a two-pronged approach to reducing the risk of home ignition: They call for ignition-resistant building details for the house itself, along with the more traditional measures to control natural fire hazards on the landscape surrounding the home.

We know how to do this. These approaches have been around for decades but have only become more widely adopted and publicized as the size and intensity of wildfires have grown in recent years.

### RESISTING EMBER STORMS

In most wildfires, windblown embers—which can fly for a mile or more in a high wind—are the biggest danger to homes. These embers may land on a roof or collect in a gutter or valley, setting fire to accumulated leaves or pine needles. Sometimes they pile up at the base of a house wall, then ignite siding or the exposed bottom edge of sheathing. And typically, embers are sucked into soffit or gable-end roof vents, igniting the attic and burning the home from the top down.

To limit embers from setting fire to buildings, codes focus on all the areas where they can collect. (Focusing on these areas is also the strategy for hardening existing homes, which don’t always fall

under the requirements of building codes.) Often, these corners and crevices on a building exterior are the places where leaves, tree needles, and other organic debris accumulate, creating tinder for the embers to ignite. Places like gutters, roof-wall intersections, and the gap over the ledger for an outdoor deck should be cleaned of debris regularly, and an area 6 inches to either side of such prime collection places should be replaced with noncombustible material. Few WUI codes require gutter guards, but these are a good way to limit the accumulation of debris. Clearly, upkeep, as much as construction, comes into play in protecting homes from wildfire.

**Base of walls.** Embers piling up against a house can set the exposed bottom edge of wall sheathing on fire, even if the cladding is noncombustible. The gap between cladding and the foundation should be air-sealed with fire-rated caulking (or 1/8-inch wire hardware cloth, if weep holes are needed). Testing by the Insurance Institute for Building and Home Safety (IBHS) on full-scale homes subjected to an ember storm demonstrated that a 6-inch separation between combustible siding and the ground is enough clearance to sharply reduce the risk of fire from embers at the base of walls.

**Roof vents** have to be screened with wire mesh or hardware cloth, with openings no larger than 1/8 inch. According to wildfire expert Stephen Quarles, who helped craft California’s wildfire code before joining IBHS, 1/8 inch is a compromise. While the mesh may let small sparks through, it will hold out the bigger embers that carry the most heat. At the same time, the holes are big enough

## Ignition-Resistant Eaves (No Soffit)

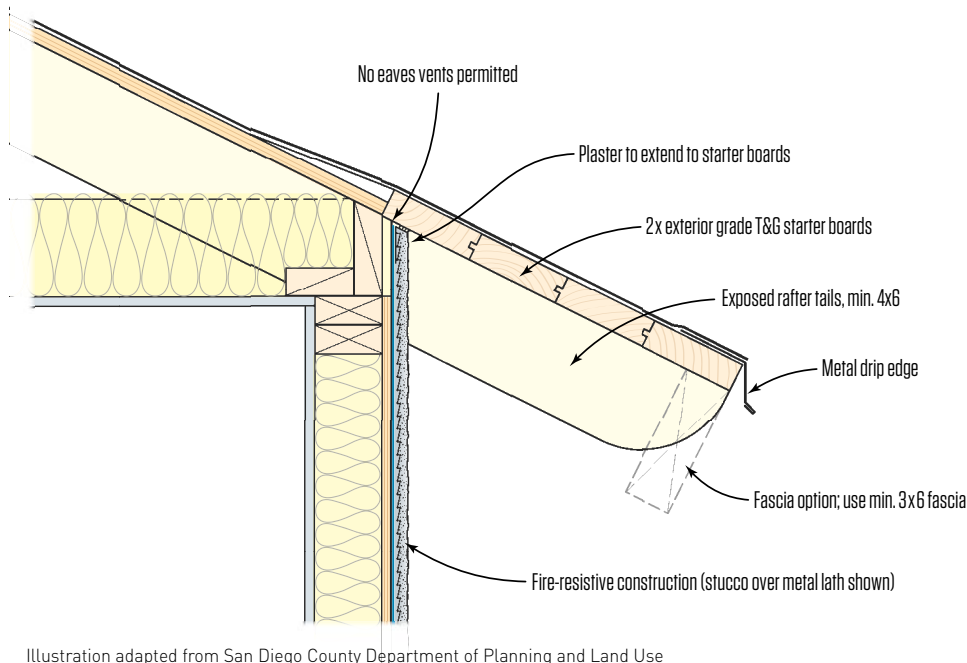


Illustration adapted from San Diego County Department of Planning and Land Use

In open-eaves construction, blown embers can accumulate between blocking and rafter tails and may be sucked directly into the roof assembly through soffit vents in the blocking. For this reason, some Western municipalities have adopted Wildland Urban Interface (WUI) codes that call for unvented roof assemblies and thicker than usual solid-wood rafter tails on the exposed underside of roof eaves. Solid wood is less likely to be ignited by embers and is more likely to char over if it does catch fire.

that they're less likely than finer mesh to become plugged with paint or dirt over many years in service.

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

### FULLY HARDENED EXTERIORS

While forest fires can produce a lot of flying embers, a house on fire has the potential to produce far more, and this potential lasts for a longer period of time. As neighborhood density has increased, the most likely ignition path for a large number of homes in the WUI is the house next door. As a result, the focus on fire prevention in more densely developed areas zooms out to address the full building exterior, where intense heat and flames from a building measured in tens or fewer feet away pose a risk *as well as* the embers collecting in the home's cracks and crevices.

**Roof areas.** Most WUI codes require Class A roof systems. The Class A rating is based on laboratory testing of roof assemblies, in which a large crisscross stack of burning wood is placed on the roof covering and allowed to burn out. The assembly passes if the sheathing is not ignited. Concrete tile, clay tile, slate, fiber cement, and metal roofing typically provide enough protection to pass, as do most Class A-rated fiberglass asphalt shingles.

Bear in mind that because the rating is based on an assembly, code doesn't always require that the roofing be the sole deterrent. Roofing with a lower-class fire rating may still be used (at the discretion of the jurisdiction) if installed on battens or over upgraded underlayments that are deemed sufficient to resist heat transfer.

**Doors** should be noncombustible. Wood doors with solid cores at least 1¾ inches thick qualify. Any glass in the door must be either tempered safety glass or multilayered glazing, with one exception: Front entry doors with decorative single-pane glass are allowed.

**Windows** must be dual pane. Research has shown that dual-glazed windows can survive the intense radiant heat of a wildfire. (Typically, outer panes crack or collapse, while inner panes survive.)

Tempered glass has proven to be the best performer in practice, as well as in laboratory testing. Wildfire expert Stephen Quarles points out that even before wildfire codes began to take effect, code required tempered glass for certain windows, such as windows close to the floor or next to stairs. Thus, most window companies have had no difficulty making dual-glazed tempered options available.

**Deck areas.** Brush and trees near a deck can readily catch fire, as can stores of combustible material such as firewood stored under a deck. Windblown embers can also ignite a deck, but composite decking typically proves less likely to ignite than wood decking, which tends to split and crack and catch hot embers. Most WUI codes require ignition-resistant or noncombustible material for decking but allow wood framing for the deck structure.

The 2021 JLC Editorial Index contains listings for feature articles, selected departments, product reviews, and tool reviews. References are listed by topic rather than by article title. The following codes are used to help you find information:

- \* — In-depth coverage
- L — Letter to the Editor
- Q — Question and Answer
- P — Product information

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BUILDING PRODUCTS



BY VINCENT SALANDRO



1

### 1. Insulating Bathroom Substrate

Designed for use with radiant-heat floor systems under tile, the Hottrok Tile Mat has both thermal and acoustic insulating properties and can be installed over most wood and concrete substrates that meet TCNA standards. Grooves in the mat hold, support, and protect cables until they are covered with mesh and leveler. The 1/2-inch-thick molded polypropylene foam material is resistant to alkalis and acids and highly resistant to humidity and water, according to Hottrok. Mats have an R-value of 1 and retail at \$39 per 2-foot-by-3-foot sheet. hottrok.com



2

### 2. Tech-Controlled Aluminum Pergolas

Louvers on the Pergola X from Struxure open, close, and pivot with one-touch control. The extruded, recycled, lightweight, and non-corrosive aluminum and stainless steel components have a textured, scratch-resistant powder-coat finish in six color options. Pergolas come in four models, including one that can be fully opened like a sunroof; choose between 4-, 6-, and 8-inch posts. Pricing starts between \$20,000 and \$40,000 and can run higher depending on size, model, and accessories. struxure.com



3



4

### 3. Silicone Sealant

XtraBond 250 is a 100% acetoxy-based, one-component, mildew-resistant silicone sealant that promises to be permanently flexible. The sealant can be used in high-moisture areas, such as baths, as well as in areas near food preparation and storage, according to the manufacturer. XtraBond 250's antimicrobial formula is NSF approved and FDA compliant. We found a 10.1-ounce tube online for about \$5. premierbuildingsolutions.net

### 4. Recycled MDF Panel

Recommended for shutters, raised panels, wall panels, and nonstructural paint-grade millwork, Roseburg Forest Products' Armorite Exterior medium density fiberboard (MDF) is a no-added-formaldehyde panel that resists moisture, rot, decay, and insects. Panels come in 4- and 5-foot widths up to 18 feet long and in thicknesses ranging from 1/4 inch to 1 1/4 inches. Armorite is available with the option of FSC or SFI certification and contains 92% pre-consumer recycled content. Contact distributors for pricing. roseburg.com

## Products

### 5. Wire-Brushed Stair Treads

Wood treads can experience a lot of wear and tear, especially in homes with young children or pets. Viewrail says its new wire-brushed treatment leaves the heartwood on the tread exposed, providing a weathered look that holds up well in high-traffic areas while creating a textured finish that provides improved slip resistance. Viewrail offers wire brushing on treads for Flight, Stratus, and Terrace floating stair systems in 15 species, 39 finishes, and widths from 36 to 72 inches, at no additional cost. [viewrail.com](http://viewrail.com)



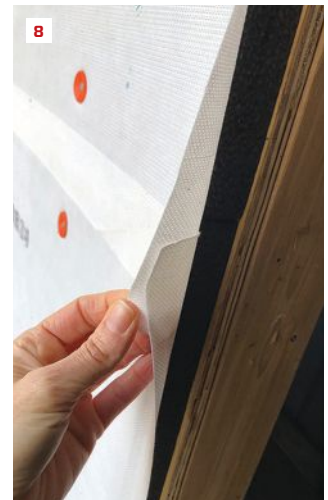
### 6. Foam-Glass Aggregate

Derived from recycled glass and free of chemicals and hazardous materials, Glavel foam-glass gravel is a high-performance aggregate used for sub-slab insulation and green roof fill. The fire-, water-, and pest-resistant product provides thermal insulation of R-1.7 per compacted inch and can typically be used in place of both gravel and foam board beneath slabs, according to the manufacturer. The gravel's closed cell structure will not absorb water, and pieces can be compacted into mounds and slopes up to 45 degrees. The gravel costs \$65 per cubic yard plus ground transit. [glavel.com](http://glavel.com)



### 7. Engineered Unfinished Flooring

Aacer Flooring's Unfinished Engineered flooring is available in three species, three thicknesses ( $\frac{1}{2}$ ,  $\frac{5}{8}$ , and  $\frac{3}{4}$  inch), and three widths ( $3\frac{1}{4}$ , 5, and 7 inches). Northern red oak has a tight grain and a neutral color that allows for a variety of applied stains; northern white oak is straight-grained and ideal for custom staining; and northern hard maple features a denser grain. [aacerflooring.com](http://aacerflooring.com)



### 8. All-in-One Insulation Panel

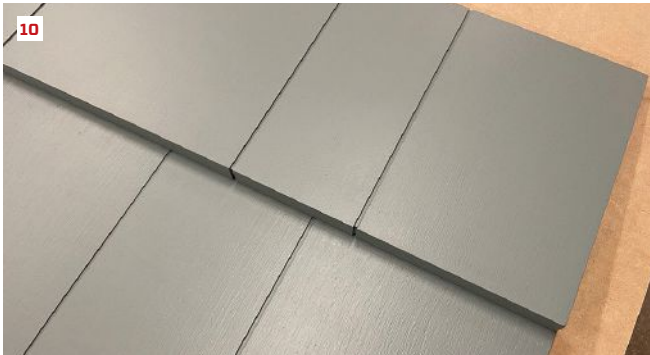
On ThermalTight Panels, the weather-resistant barrier is laminated to the exterior of a rigid insulation board, effectively eliminating an installation step. The Neopor graphite polystyrene insulation contains no blowing agents and is rated at R-4.7 per inch at 75° and R-5.2 at 25° (the manufacturer says the R-value increases as the temperature decreases). The vapor-permeable, nonwoven polypropylene WRB has overlapping flaps that are used to seal the panels together on all four sides to create a continuous air barrier. Panels are 4 feet wide and are available in three thicknesses ( $\frac{1}{16}$ ,  $1\frac{1}{2}$ , and  $2\frac{1}{8}$  inches) and three lengths (8, 9, and 10 feet). [brincbp.com](http://brincbp.com)



9

### 9. Ladder Safety Accessory

Werner's Extension Ladder WalkThru allows users to step directly from a ladder onto a roof without stepping out to the side, bracing for the transition from the roof to ladder, and vice versa. The Ladder WalkThru installs without any tools on Werner's Type II, I, IA, and IAA extension ladders and, when installed, serves as a 3-foot extension above the top support for access to an elevated surface. The accessory retails for approximately \$280. [wernerco.com/us](http://wernerco.com/us)



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### 10. Fly-Ash Shake Siding

Duration Millwork's Simulated Shake Siding is made from polymer-infused fly ash and comes in 4-foot panels that butt together tightly to create a seamless shadow line. The lightweight panels can be blind-nailed with a reveal between 4 and 6 inches. According to Duration, the cladding doesn't require back or edge sealing, can be painted any color without priming, and won't rot, decay, or be affected by insects or high heat. The cladding has no clearance requirements and installs with much less labor than individual wood shakes. Pricing starts at \$12.90 per square foot. [durationmillwork.com](http://durationmillwork.com)



11

### 11. Military-Style Work Hoodie

The Truewerk Woobie is an extremely light and flexible work hoodie. (The name is inspired by the military-issued poncho liners called "woobies.") It can be worn on its own in moderate weather but is specifically designed as an insulating mid-layer; both the shell and lining are made to stretch, allowing some freedom of movement. According to Truewerk, the exterior is abrasion resistant and water repellent, while the interior is designed to wick moisture away from the body. The Woobie hoodie is \$140; it also comes as a vest for \$100. Both are black. [truewerk.com](http://truewerk.com)



12

### 12. Engineered Asphalt Shingles

Pabco Roofing's asphalt shingles are engineered to provide protection and performance for both ultra-wet and arid climates. The company's Signature Cut Shingles are offered in three options: Paramount Advantage, Paramount, and Cascade. Each option features open-tooth, architectural shingles and meets fire-resistance standards. The shingles also feature "Algae Defender" to mitigate moss and lichen growth and are warranted against black streaks caused by algae. [pabcoroofing.com](http://pabcoroofing.com)



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# TOOLS OF THE TRADE

## Metabo HPT MultiVolt Plunge Router

BY TIM UHLER

**Life in the trades** has gotten so much easier over the last few years thanks to the growing number of cordless tool options and the fact that they perform so well. A good example of this trend is the Metabo HPT 36-volt cordless plunge router (M3612DA). Our crew has been using a pair of cordless trim routers (from Milwaukee and DeWalt) on our jobsites for the last two years or so, giving us a good perspective on the capabilities of Metabo HPT's new offering.

**Router for framing?** I began using a router to cut out door and window openings, trim the top edges of rake walls, and perform a number of other sheathing-related tasks back in 2001. In order to quickly plow through  $\frac{7}{16}$ -inch sheathing, I fitted my workhorse corded  $\frac{3}{4}$ -inch HP router with a big flush-cutting bit with a  $\frac{1}{2}$ -inch-diameter shaft. This was a heavy setup, but it did the job and supported its own weight.

For a long time, I didn't think a router could be the type of tool that could go cordless, but both Milwaukee and DeWalt managed to make it happen with their smaller trim routers, with good results. I've posted a number of videos on Instagram over the last couple of years showing how well these little cordless routers work on our framing jobs. Quite a few naysayers have since bought them after seeing that the routers don't burn up but keep on going.

**First cordless plunge router.** Unlike the DeWalt and Milwaukee routers, however, Metabo HPT's 36-volt router is a full-featured plunge router that comes with collets for both  $\frac{1}{4}$ -inch and  $\frac{1}{2}$ -inch bits. It has a tool-less depth adjustment that works like that on any other plunge router, a variable speed control from 11,000 to 25,000 rpm, and a handy LED work light. In addition, it's compatible with Metabo's adapter (sold separately) that allows HPT tools on the MultiVolt 36V battery platform to be plugged in to a standard AC outlet and used as a corded tool.

I use a spiral cutting  $\frac{1}{4}$ -inch bit to rout sheathing, and that bit is fast. This router is very fast, too, but if you push it too hard, a protective circuit will cut off power, and it'll stop. So we've learned to back off and let the bit do the work.

What I especially like about this tool is the two handles, making it more comfortable than a smaller cordless trim router for a framer to use. For shop work, the kit includes a template guide set, straight guide, and a dust collector; I won't use these accessories often, but they are in the bag for when I need them. A charger and one 2.5-Ah MultiVolt battery are also included. I found that I ran this battery down more quickly than the larger-capacity batteries I use on my Milwaukee and DeWalt trim routers, but I still managed to get through a full day of framing without the battery dying.

**Good value.** At \$400, the kit is expensive, but is it worth it? I can't make that decision for you, but here's how I look at it: For a

framer, a router is a must-have tool that saves a lot of time, improves quality, and increases productivity. There doesn't seem to be a bare-tool option, which would save some money if you already own other Metabo HPT MultiVolt tools, but I believe that the labor savings using a router will make up for the cost over time. Of the three cordless routers I've used, this is my favorite. However, all are a huge upgrade over their corded counterparts, so pick the one you can afford that best fits your needs and buy it. You won't be sorry. [metabo-hpt.com](http://metabo-hpt.com)

*Tim Uhler is a lead carpenter for Pioneer Builders in Port Orchard, Wash., and a JLC contributing editor. Follow him on Instagram @awesomeframers, subscribe to his YouTube channel, or visit his website: [awesomeframers.com](http://awesomeframers.com).*



A router fitted with a flush-cutting bit makes quick work of cutting out door and window openings in a sheathed wall (above). Metabo HPT's MultiVolt plunge router comes with collets for both  $\frac{1}{2}$ -inch- and  $\frac{1}{4}$ -inch-diameter bits. It can be powered by its 36-volt battery or be used with an adapter and plugged into an AC outlet (left).

## Wet Saw Work Station

BY TIM HEALEY

**One of the great things** about the JLC Live trade show is the opportunity to meet tradespeople who had an idea for a time- or labor-saving tool or product (haven't we all?) and, unlike most of us, followed through to create it and bring it to market. At last year's JLC Live show in Providence, R.I., I visited with Jesse Gionta, a longtime contractor who grew tired of going outside in cold Northeast weather to cut tile using his wet saw. His idea for a secondary containment system became the Wet Saw Work Station, a tile-saw enclosure that allows users to make clean tile cuts right inside the room being tiled. Gionta says the work station is made in the USA of low-density polyethylene (LDPE) plastic, with a high-density poly (HDPE) shelf. The 32-inch-high base is designed to collect and contain spray from the wet saw, with the assistance of the three side panels and top panel. The overall height of the work station is about 65 inches, and the panels can be assembled in a few minutes without tools. It's available for \$390 directly from the manufacturer, with free shipping. [wetsawworkstation.com](http://wetsawworkstation.com)



The Wet Saw Work Station's plastic panels snap together without tools to create a secondary containment system for a wet saw, allowing it to be used close to where tile is being installed instead of outside.

## Wood's PowR-Grip Hand-held Vacuum Cup

**Moving a big, heavy window** around on a jobsite and jockeying it safely into position in a window opening is a chore, even when plenty of strong arms are available to carry the weight. There's just no good place to grab onto the window without bending over and risking back injury. To solve this problem, installers of commercial glass have long used vacuum cups that can be clamped pretty much anywhere onto the fixed panels to create a handy carrying handle and help manage the load.

On a recent project covered in *JLC*, the crew used hand-held



vacuum cups on loan from the glass supplier to help them install large, fixed-panel windows (see photo, below left, and "Building a High-Performance Window Wall," by Nate Hayward, Mar/21). This inspired one member of the crew, *JLC* contributor Kevin Lovejoy, to purchase his own pair of 8-inch-diameter Wood's PowR-Grip vacuum cups for installing the high-performance triple-glazed windows typically used on Passive House projects. He reports that the cups have made it much easier to handle these heavy windows.

Vacuum cups are available in different sizes and load capacities and from a number of manufacturers. The 8-inch PowR-Grip N4950 cups purchased by Lovejoy are rated at 125 pounds lifting capacity and have a red-line indicator to warn the user of any significant vacuum loss. I found them online for about \$85 each. [wpg.com](http://wpg.com) —T.H.



Transporting and installing a large, heavy window is safer and easier with vacuum cups, which clamp onto the glass (far left). Wood's PowR-Grip N4950 8-inch-diameter vacuum cups (left) are rated for 125 pounds and have a red-line indicator that signals a loss of vacuum pressure. They come with a carrying case.

Photos: Top, courtesy Jesse Gionta; Products, bottom left, Tim Healey

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BY CLAYTON DEKORNE

## Review: *Shop Class as Soulcraft*

I am late to the party reviewing *Shop Class as Soulcraft: An Inquiry into the Value of Work*, by Matthew Crawford. The book came out in 2009 and created quite a splash then. You can find many reviews online, most of them positive and well-deserved, and Crawford made the rounds on many a talk show (including an appearance on “The Colbert Report”), delivering his message on the value of hands-on work. Crawford’s specific trade is the rebuilding and repair of old motorcycles. He is a gearhead at heart, but his exposition deliberately celebrates all trades in which knowing comes from doing. “My purpose in this book,” he writes, “is to elaborate the potential for human flourishing in the manual trades ...”

The book opened my eyes to the problems of sustaining a skilled workforce. This is a topic I thought I had a firm grasp on, and I have written frequently on different perspectives of this challenge, beginning with “How Will Construction Solve the Skilled Labor Crisis?” (Sep/19). Reading Crawford’s book, I began to see just how big a chip I have on my shoulder about social class. As I raised the issue previously, “What never gets discussed in industry reports, but may prove to have the greatest impact on the lack of youth participation [in the construction workforce], is the issue of social class. Young people today don’t want to align with outmoded, underserved, and culturally marginalized social groups. Put bluntly: Young folks don’t want to be associated with what they perceive as low-class work.” While I still believe this statement rings true and think it lies at the heart of why it has become increasingly harder to fill needed construction jobs, the big “Aha” for me reading Crawford’s book came in his critique of the American workforce as a whole. According to Crawford, it’s not just the blue collar workforce that has been disrespected; it’s white collar workers, as well.

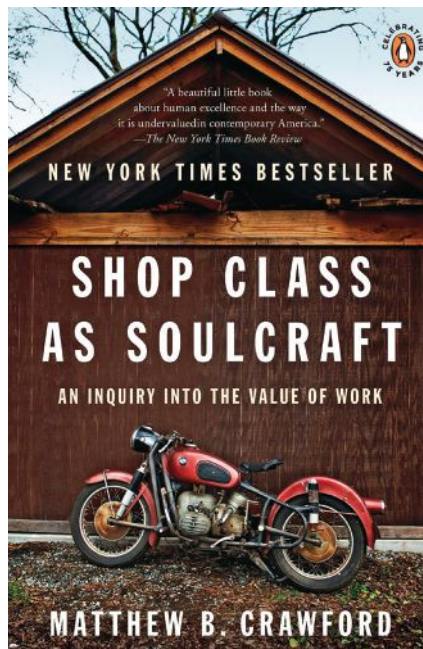
Crawford builds a convincing argument that the entire U.S. workforce suffers from the attempt by industry managers to separate thinking from doing. In the push toward standardization of process, the soul of every worker has been drained. While the value of manual work may seem undervalued from our perspective, it’s perhaps even bleaker for white collar workers who have been persuaded to become “knowledge workers” and “creatives,” but end up eking out their livings meeting quotas in cubicles. It is a critique that explains the popularity

of “The Office” and “Dilbert.” We are all in the same boat, it would seem, driven by a relentless economic engine and steered by efficiency experts who place value only on rule-based systems of production and devalue human experience.

Ultimately, Crawford urges everyone to reach for and embrace the fulfillment that comes from self-reliance. This sort of self-reliance is not the ideal of the rugged individualist, or as Crawford says, the “cult of the sovereign self.” Fulfilling work is not so much self-directed as it is directed by the work itself, by an essential truth: Does the motorcycle run clean or not? Is a house frame level and square or out of whack? These are realizable measures of fulfillment. The self-reliant worker is directed by the work, whereas work directed by others can only provide arbitrary measures of performance. Even if workers are designing or making a tangible thing in the usual mass-production environment, they are alienated from the situations where those things have purpose. That is merely a husk of Crawford’s argument. I urge you to read the book for yourself. But the upshot is veteran tradesmen and tradeswomen who are on site with things that perform or don’t are the closest in the social hierarchy to realizing this self-reliance, this flourishing of human potential.

I can’t dispute Crawford’s view, but I am disheartened by the lengths Crawford needs to go to make his points. Crawford is a philosopher as much as gearhead, having gone the extra mile to earn a Ph.D. in philosophy

backed by an undergraduate degree in physics. He can go toe-to-toe with anyone in the upper strata of society, but for all his advocacy of practical knowledge, much of the book is, well, so bookish. There’s not a lot of practical knowledge in it, only glimpses of the challenges faced by the mechanic. But as I think about it, that makes sense. It wasn’t written to gratify those who might already have found fulfillment in self-reliant work. What does he need to persuade them to do? Rather, I suspect, it was written to persuade those among the ruling class who make decisions for entire fields and industries, challenging the long-range viability of a production-based economy relying solely on rule-driven processes and algorithms. Perhaps it was also written to persuade a few of those academically trained cubicle drones, urging them to make a career shift. I hope the message is heard by both these audiences.



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