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The Journal of Light Construction
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March/April 2025
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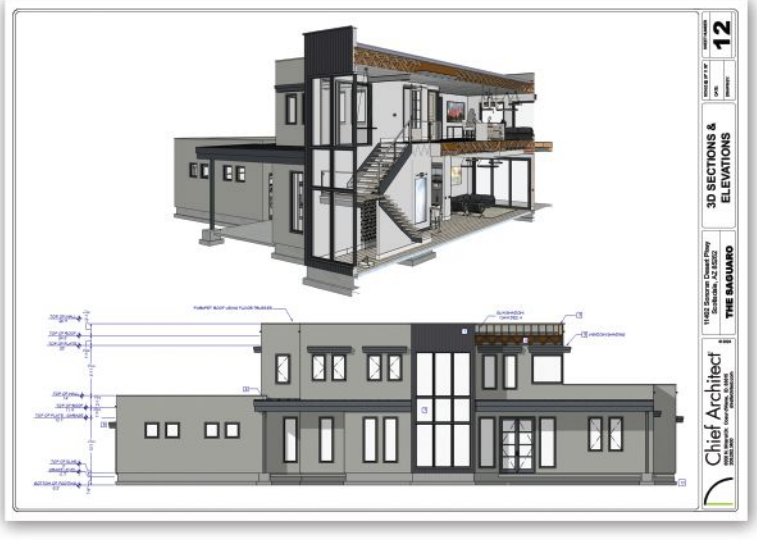

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On the cover: Carpenter Ed Backus secures a site-built jamb-and-casing assembly around the garage door in preparation for installing wood clapboards on a home in upstate New York. See the story on page 33. Photo by Jeremy Kassel.

Photos: top, Ernest Mueller; bottom, Rick Mills

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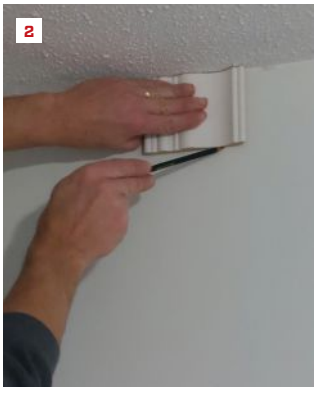
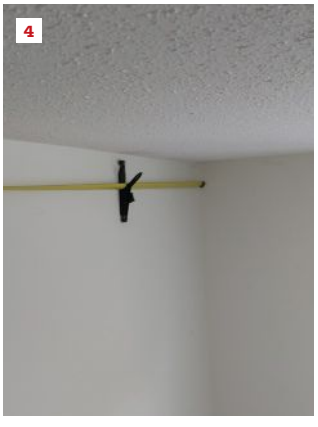
BY MARC FORGET

Crown Molding, Step by Step

Crown molding has an elevated place (pun intended) within trim projects. This, I think, has more to do with its visibility than the complexity of its installation. While baseboard and even casing can blend into a home, crown is meant to and does draw the eye. Due to that attention grabbing, it leaves fewer places to hide imperfections and understandably intimidates many carpenters the first few times they tackle it. Let's take away some of that mystery by walking through the steps of measuring, layout, cutting techniques, and installation.





With the crown squared up in the framing square, we can find the distance the crown will sit down from the ceiling **(1, 2)**. A crown hanger is an inexpensive way to hold up crown or a tape measure when you are working alone **(3, 4)**.

Photos by Marc Forget

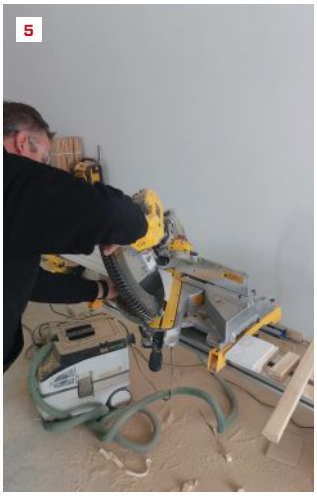
LAYOUT FIRST

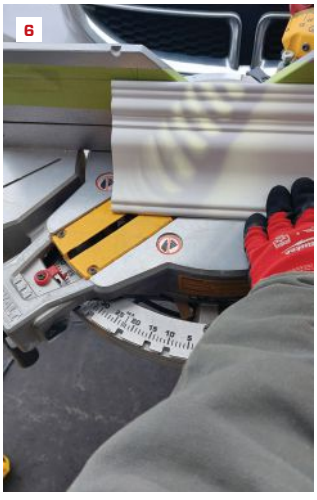
One of the first steps I take in laying out a room for crown is marking lines on the walls where the bottom edge of the crown will rest. To find the vertical distance down from the ceiling, I set a piece of crown in the corner of a framing square and read the measurement at the bottom edge of the crown where it meets the square. Next, I cut a scrap to that measurement, hold it against the ceiling, and use it to mark the crown layout around the room **(1, 2)**. While I do this, I take measurements for a cut list and write them on the wall just above the lines I make. That way, I, or a partner, can access them at any time. I also plan out the installation, thinking out how I'll use the material I have to reduce waste and checking for dips or bumps where I may need to adjust the nailing to float over these spots.

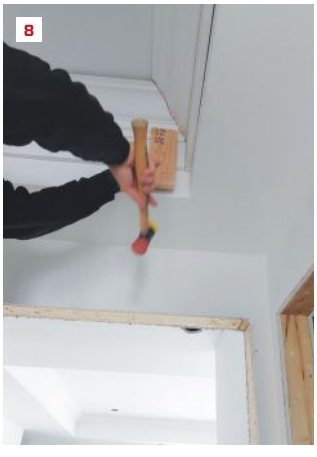
As you are taking these measurements, be sure to run your tape along the lines you marked on the wall. This is where the bottom of the crown is going to meet the wall, and running the tape there yields a more accurate measurement than would running the tape at the top of the wall. If I'm working alone, I stand at or near the middle of the wall, take a measurement from one side, and make a mark on the wall. Then I take a measurement from the other direction to that mark and add the two measurements. I may also use crown-molding hangers **(3, 4)**. These hang on a nail in the wall just below the ceiling to hold the crown up as you nail. Just unhook the hangers as you install the crown; the crown will hide the nails. They're great for installing crown solo, and they are also handy for setting a tape along when you're taking long measurements.

CUTTING

With lines drawn and a cut list in hand, we have what we need to begin cutting the crown. First, you need to decide if you will cope or miter the inside corners. Should you cut on the flat with the material laying on its face or back, or in position with the crown "upside down and backward"? I was firmly in the "coped joints and upside down and backward" camp for most of my career; that was what I first learned to do. After working with a partner who has installed miles of crown, mostly with mitered inside corners and always cut on the flat, I came around to see the benefit of knowing both ways to join inside corners.







With the saw set at a 33.9 bevel and 31.6 miter on the table, we can cut the crown on the flat **(5)**. Alternatively, hold the crown "in position" against the line drawn on the fence and set the bevel at 0 and miter at 45 **(6)**. By holding a jigsaw at the opposite angle of the miter, you can make an ideal back-cut **(7)**. The aptly named "tappy" block helps adjust the crown into place **(8)**.

For the "upside down and backward" (or "in position") method, the crown is set on the saw with the front of the molding facing the person cutting **(6)**. If you think of the saw table as the ceiling and the fence as the wall, the crown is upside down and backward relative to its installed position.

I put masking tape on the saw fence and trace a line on it at the measurement equal to the distance between the bottom of the crown and the ceiling (we found that number earlier with a framing square). By always keeping the material on this line, I can be sure the compound angle I am cutting stays consistent. I make a mark to show where I am cutting on the top edge of the workpiece (installed, it will be the bottom edge of the crown that runs along the wall). Inside or outside miters are made by adjusting the table to the needed angle.

For cutting on the flat, the saw is beveled to 33.9 degrees and the miter is moved to 31.6 degrees **(5)**. These angles, used with the most common 38-degree crown, are usually highlighted on a saw, and they may have indented stops. There are crown profiles that sit on the wall at 45 or 52 degrees; these sit higher up the wall (flatter to the ceiling) when installed and must be cut using different settings on the saw. However, in 20 years, I have run into these other types of crown only once, during a historical restoration project.

Cope or miter? Each method of joining inside corners has its benefits in terms of speed and appearance. Theoretically, a coped joint on the inside corners should separate less over time. With only one cut edge meeting the profiled face, the shrinkage from only one length of crown will show and, even then, this shrinkage will be visible from only one direction. On the other hand, with a miter, there is potential for both lengths of crown to shrink, doubling the gap. While this sounds bad, there are ways to overcome this shrinkage, and the speed of mitering makes for a far more efficient install.

Coping. When you cope a joint, you are sculpting the profile on one end of crown so that it marries with the profile of another piece of crown in a corner. To make this cut, first cut an inside miter to expose the material you need to remove by following the profile with a jigsaw or a grinding wheel. I use a jigsaw to cut away the bulk of the material and then do some cleanup on the back with a grinder **(7)**.

When using the jigsaw, I hold it at an angle opposite the mitered angle, creating a "back-cut" as I work along the profile. Removing material behind the front face of the crown allows the joint to sit tight to the piece it is being married to. It is best to use a blade that cuts on the downstroke when you're cutting the way that's shown in the photos; when the teeth are cutting on the upstroke, you can tear out the face of your trim. When I install a coped joint on crown, I run a generous bead of caulking on the back of the cut. This squishes into the crown and remains hidden while acting as an adhesive and backing for the joint.

Mitering. I make the first cut on the workpiece, then hook or place a tape on this point, run it to the measurement needed, and mark for the second cut. These marks are on the bottom edge of the crown where the crown will meet a corner.

To reduce the chances of an inside miter opening up, I will add PVA glue (Titebond Wood Glue, LePage Carpenter's Glue, Gorilla Wood Glue) on the cut face and work the miter together tight. The PVA has a longer open time than a quick-set glue and allows for more manipulation before it sets. Be sure to wipe away any squeeze-out so it does not create an uneven surface for painting later.

For the mitered joint, you can tap the pieces up or down with a block of wood to close the joint **(8)**. Tap the trim up to close the gap at the bottom or work the crown down to close the miter at the top. Be sure to set the block on the thicker part of the profile; tapping on the thinner edge at the top or bottom can damage the material.

To keep the miter tight, I always overcut the ends by 1/16 inch. This holds for miters and coped joints. The extra length provides some leeway for future shrinkage. Be careful, though; more than 1/16 inch long, and the corners are driven into the drywall, resulting in overlapping at the miter. Forcing a coped joint too tight can break the thin leading edge.

For outside miters, I glue up the miters before installing the crown. It is much easier to get a perfect fit on the floor or a table than it is over your head on a ladder. I use a fast-set glue like Mitrebond or 2P-10, usually without the instant activator so I have a second to line up the pieces. I've had a great experience with these fast-set glues on MDF, as they penetrate the material and create a joint that doesn't come apart without ripping material off. With pine, and more so with hardwoods, the bond seems brittle and doesn't seem to penetrate as deep. With hardwoods, I will use a few drops of the fast-set for the quick hold but will use PVA glue, as well, to create a deeper bond.

An added step I take with outside corners is to lay a bead of hot glue on the inside of the joint **(9)**. This weld line adds some strength to the joint and lets me flex the finished piece into place **(10)**.

A bead of hot glue adds strength to the outside miter after the joint is preset. By gluing the miter on the ground, I find it easier to get the right fit **(9, 10)**. Installed and ready for paint, crown always makes an impression **(11)**.

INSTALLING THE CROWN

With the parts cut, ladders in place, and glue at the ready, we're almost ready to start nailing the crown in place. Before I start nailing, I take a moment to mark the positions of the studs and strapping on the walls and ceilings so I know where to place the fasteners. Shooting blind and using more steel than wood should be avoided for a professional result. Proper and consistent placement of nails into the studs or strapping will result in a better hold and make caulking and filling easier.

You may not have strapping to hit on some runs because of its layout in the room. In those cases, I cross the nails to increase hold. Fire one nail at an angle into the trim and ceiling and another in the opposite direction next to it. This tends to create a better hold in the ceiling than just nailing once up and into the drywall.

Note that even though the gun can hold 2-inch nails, you don't have to use that size. To penetrate the thin edge of crown and hit studs or strapping, 1 1/2- or even 1 1/4-inch nails are plenty long. The added length of the 2-inch nail would be wasted and only increase the chance of finding a wire or pipe you didn't know was there.

The final part of the installation should be to go over your work. While caulking and filling nail holes is not always part of a carpenter's job, I often preferred to do at least the first pass myself. This gave me a chance to double-check joints and be sure the trim was securely fastened. All the better to do this now than get a callback later. While you are doing this, you can sight down the lengths of trim to be sure lines are straight. Bumps and dips in the wall and ceiling can make crown wavy. With crown being an accent feature, having it highlight those imperfections (even if they're not your fault) will reflect badly on what you are trying to accomplish. I will pull the crown away from the wall or ceiling to keep it straight. Defects can be particularly noticeable in a long line of travel, as in a hallway or large room. In a custom home, a float of plaster is often needed to even out defects in the walls or ceiling.

While crown is an attention grabber, it does not need to be difficult to execute. Careful preparation and a series of small steps done well will yield the result that its name alludes to. There are many tutorials available online for these techniques and more. I recommend searching them out, but since none of them will replace practice, my best advice is to try out these techniques and discover what works best for you. Take some care and time, and you will get the result you want. As I would tell my long-suffering partner each time we finished a crown job, "It may not be the best crown we have ever done, but it's up there."

Marc Forget is an associate editor at JLC.

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Q Our client wants us to install a 96-inch, three-panel glass door in a gable-end wall. The roof is framed with trusses. Do we need a structural header for the door?

A *Christopher DeBlois, a structural engineer in Roswell, Ga., responds:* If the house in question is a one-story house, or the door is on the second floor leading out to a deck, for example, then it's fair to assume that the primary load from the roof and ceiling is carried by the trusses to the front and rear walls, while the door you are installing is in an end wall. Most people assume this end wall is not a load-bearing wall, and it's not, in the sense that it's not holding up a floor or ceiling or roof, but there's still some weight—the weight of the wall above the header and of the gable-end truss (which is not really a truss but a flat-framed infill panel), and often there's a little bit of roof load from overhanging outriggers or a ladder-type projection framed along the rake. You need a header to support this weight. It just wouldn't be a very heavily loaded header.

In addition to holding up the weight, even though there's not a lot of it, you also have to limit deflection. If you don't, even if there's only a little bit of deflection, it could potentially cause problems with an operable door, especially the kind of folding panel doors that are popular right now. The doors may bind or simply won't open and close as cleanly as they should over time. The building code would allow L/240 for total load deflection, but I would at least cut that in half and go to L/480. This short span isn't going to require a giant header. Let's say the total header span for the rough opening is 102 inches. A double 9 1/2-inch LVL will limit you to around 1/16 inch or less total deflection, which is close to L/1700! So it's not going to be a heavy header at all, but certainly I wouldn't just flat frame it or put in a 2x8 or something like that.

As I sometimes find myself saying to potential builder clients with questions like this, you can spend a few hundred on an engineer's time to size the exact header, and I may come back and say, "You need two 9 1/2-inch LVLs, use one jack stud and two kings for this size of the opening, and here's my bill." Or you can look at the problem, and based on your experience on other jobs, you might say, "It seems like we've used two 2x10s, maybe 2x12s or a 12-inch LVL for an opening like this." Go spend a little extra and buy a 14-inch LVL header and put it in, knowing that it's probably gross overkill. The up-charge on the materials is still less than you would have paid me as an engineer to tell you that you didn't need a header that big. In residential work, if your choice for something simple like this is to pay an engineer to know you're getting the exact right header, or to put that same amount of money, or even a little less, into building a stronger house, I'd go with the stronger house. Even if it turns out you were unnecessarily conservative, just buy the big header. The labor's the same. You don't have to cut any more studs out, and you're still going to have the same amount of drywall to finish, the same trim. And if you end up with a stronger house than you otherwise would, that's OK.

Given all this, I advise going ahead and thinking conservatively of this as a "structural header." You can size it using the prescriptive spans from Table R502.5 in the IRC (free online at codes.iccsafe.org). This means you are treating the opening like a bearing wall, and we know that is overkill for the loads on the end wall, but again, it's perfectly fine to end up with a stronger house than you otherwise would have.

That said, there are loading conditions where I would not advise going it alone based only on your experience. If, for example, the roof is stick-framed and has a structural ridge supported by a column in the gable-end wall that you need to support, then you certainly should consult an engineer to advise on the temporary support of that wall during construction, as well as the header and bearing requirements to support the point load from the column supporting the roof ridge. Or if the door is on the first floor of a multistory building, the gable-end wall may be supporting floor loads that need to be taken into consideration. You still may be able to size the header using the proper roof and ceiling configuration, building width, and snow-loading conditions given in Table R502.5. Here again, I would advise taking a conservative approach and erring on the side of overbuilding.

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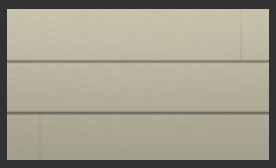

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Framing With Open-Web Floor Trusses

BY RICK MILLS

Photos by Rick Mills

When it comes to designing a floor system, we always want to offer our clients a rigid floor. We've likely all been in a house or room and felt the bounce or shudder of the floor when someone walked by. To avoid this in the houses we build, we ask our engineers to design the floor systems to be above industry standards for deflection.

To provide the stiffness we desire, open-web floor trusses have been our go-to option for the second-floor framing for around 10 years. Over this time, the houses we've built have grown in complexity, and open-web trusses give us the most flexibility, particularly for roughing-in the HVAC, electrical, and plumbing systems.

Open-web floor trusses are built just like roof trusses. In our area, southern yellow pine is the material of choice. Typically, the trusses are made with 2x4s connected together with metal gussets and configured to fit the truss maker's design.

Incorporating floor trusses into a build always starts with the structural engineer specing them in the plans. The engineer will typically call out the size (depth) needed for the spans in the design as well as any steel beams or LVL locations. Then, we typically submit the plans to the local lumberyard or a truss manufacturer, which will then develop a set of drawings with every joist fully detailed in plan and elevation.

TOP REASONS WE USE FLOOR TRUSSES

The rigidity that gives that "solid" feel to a floor is certainly the top reason we like to use open-web floor trusses, but there are two other key advantages: namely, the ease of installing ducts through the open webs and the overall ease of rough-ins for other trades.

Being able to run ducts through the webbing is especially welcome. Working on projects where the space allowed for mechanical systems is small to nonexistent can be frustrating, and building out chases and other workarounds to integrate the ductwork into such a floor system becomes very time consuming.

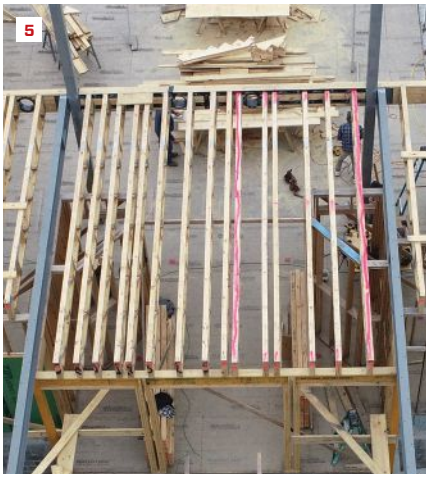
When defining the duct pathways through the trusses, we can send an initial truss design to our mechanical contractor (or mechanical engineer, if the project allows) for consideration when designing the duct layout, or we can get the duct layout first and include it when we submit our plans to the truss designer. We find the latter usually works best because the truss maker can then accommodate the duct layout into the truss design. Inevitably, we end up with compromises or field changes to trusses when the mechanical design follows the truss design.

Rough-in for other trades is also simplified because no drilling or cutting is necessary to run wiring, plumbing, audio/video, and the like. Trusses eliminate the problems of trades accidentally drilling a hole too large in the wrong location of a typical 2-by or I-web joist. Truss designers can plan around toilet locations, as well as any other large plumbing drops. For this reason, we strive to have our plumbing layouts designed in advance and allow the plumber to take a look at the framing layout before the trusses are fabricated.

STREAMLINING INSTALLATION

Once the details have been submitted, it usually takes only a week to receive a design back from the truss manufacturer. This design consists of a joist layout in plan view where each truss serving as a joist is labeled. It will also include an elevation of each specific joist. Of course, detailed dimensions are also part of the elevation sheet. The layout sheets we receive from the truss designer are thorough yet still easy to follow. Each joist has its own letter and number designation. Once we've fully exhausted the process of fine-tuning the duct locations and any special circumstances a project may present, we

Running HVAC ducts in the open webs of floor trusses offers a distinct advantage. On this job, the truss layout **(2)** and the openings defined for ductwork in the trusses **(3)** had to be coordinated with prefabbed openings in the steel girders.



The author paints the top of wall plates blue to define duct pathways **(4)**. At the edges of an area where trusses drop for a curbless shower, the author painted the top chord hot pink so framers stayed aware of a small change in elevation **(5)**.

will release the joist package for production. Typically, the plant needs only two to three weeks to prepare the trusses and have them ready to ship to us.

The joists will arrive on a flat bed and be set down on the site like a typical lumber package. We've found it's important to stage the package with the joists accessible to the framers in the order they will be installed. Another critical detail is to make sure the joists are lifted up onto the walls oriented in the right direction. With large projects, we will sometimes paint the joist ends that face out. We have found that different joists can be banded together for different areas, and painting the ends with different colors makes it easy to see at a glance which joists will go in the same location.

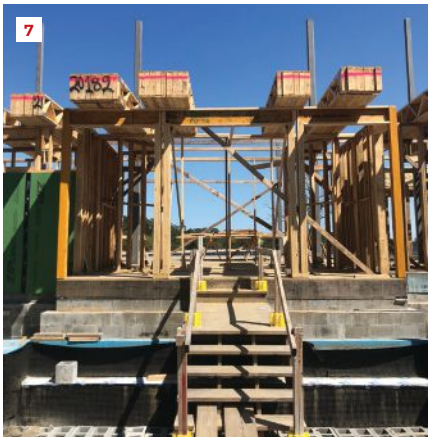
We will also mark the tops of walls where ducts will pass to make sure joists are not placed there. If we don't do this, joists may start to be set before we discover that the duct paths that were so carefully designed don't line up from joist to joist.

A couple of other cool features that have been designed into some of our open-web truss packages are zero-entry shower floors and "shade pockets" for roll-down window treatments. With zero-entry showers, the trusses are designed to step down, typically about 2 inches—more than enough to create the necessary slope. In some cases, the step-down can even be in the middle of a joist span. With details like this, of course, it's paramount that they be defined prior to making the trusses.

THE ENGINEER'S CONSIDERATIONS

I've mentioned the reasons we like open-web trusses, but I also reached out to our structural engineer to ask what he likes about them. Not surprisingly, topping his list is the stiffness they provide. He explained that the main reason behind this stiffness is their greater mass, and, as he put it, "mass is the enemy of vibration." In contrast, I-joists are relatively light and tend to vibrate easily.

Our engineer noted that trusses easily allow for the higher stiffness rating (less deflection) needed for specific projects. For example, on apartment projects, which tend to have a greater intensity and frequency of live loads, he uses a higher deflection tolerance (L/600) than he typically uses for custom homes (L/360). The stiffer L/600 rating amounts to a 3/8-inch deflection in a 24-foot span, compared with a 5/8-inch deflection over 24 feet for L/360.



Floor-joist bundles are color-coded after the lumber drop to ensure the correct bundles are lifted to the right locations and oriented in the right direction **(6, 7)**.

When defining the joist layout, the author's team works off the centerlines of headers and hallways to ensure there's room for can lights **(8)**. Where the gussets of overlapping joists touch, the crew inserts sill-seal foam to prevent squeaks **(9)**.

One last point our engineer made, which resonates with a lot of builders, is that the installation process for open-web floor trusses is straightforward. Everything has been defined ahead of time for the framers. There's no cutting involved and, as long as framers follow the layout and use the right joist number, all the details fall into place.

On the other hand, the biggest challenge of using floor trusses is the difficulty in modifying them in the field. If a change order involves lengthening or shortening a truss, you're going to have to call the truss designer and request a field modification detail. Trusses *can* be modified; this usually requires sistering 3/4-inch plywood on each side and nailing it off in a certain pattern. But this absolutely has to be done to the truss maker's engineering specifications.

To avoid making changes in the field, I highly recommend planning for all the "immovable," or must-have, objects that may land in the floor or ceiling. The truss designers are good about designing the layouts around toilet locations, for example. Along these lines, another big item we like to plan for early are can lights. This might not make sense for every builder but, for us, it's critical to be thinking through at least some of the general lighting locations. We'd hate to have to tell a client something like, "Sorry, but you can't have a can light there for your artwork; there's a joist in the way that we can't move." In hallways, especially with the 3 1/2-inch width of the trusses, you need to work off the centerlines.

With a little planning up front and some patience from the framing crew, we can usually work around anything we need to. Best case, we like to start developing room lighting layouts in the design phase. If these aren't fully developed, then the project manager needs to spend some time firming up proposed light locations with the clients and marking those out on the subfloor before the joists start to go in.

One other fine detail concerns joists that lap each other on a wall or girder. We add a piece of foam sill-seal between the overlapping joists to make sure there is no chance of a squeak from metal gussets touching each other. This may be an unlikely scenario but, if it should ever happen, it would prove extremely difficult to remedy after the framing has been closed in.

Rich Mills is a senior project manager for Jackson Andrews Building + Design, in Virginia Beach, Va.

Detailing Stucco-Wrapped Frame Chimneys

BY DOUG HORGAN

We're regularly called on to put a wood-framed "chimney" box on top of a roof, and often it's called out to be covered with stucco (or stucco's cousins, adhered stone and "thin brick"), so it looks more like a masonry chimney.

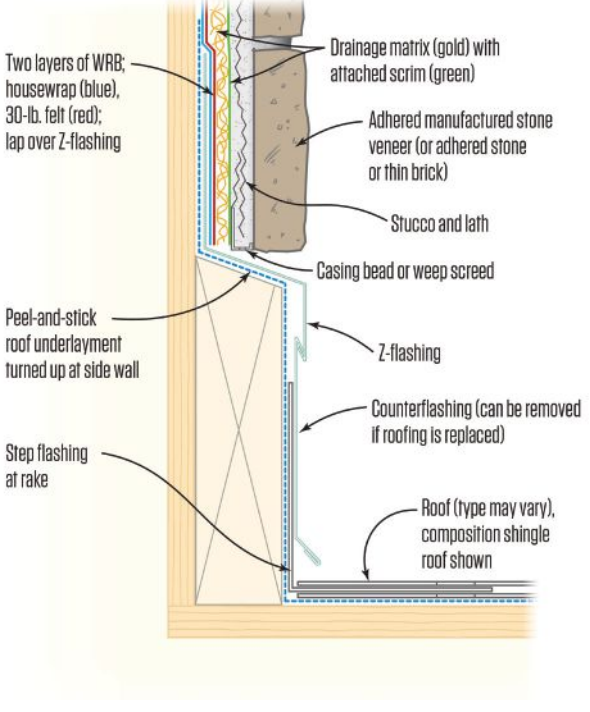
There are a lot of ways to connect this to the roof so it won't leak, but we find that if you take a couple of extra steps during the original construction, roof replacements will be much easier later on and less likely to leak. Since we tend to stay in touch with clients for decades, it could just as easily be us doing the roof replacement, so it's nice to make it easy to succeed.

CHIMNEY CLADDING TYPES

Stucco, "thin brick," adhered natural stone, and adhered manufactured stone veneer are fairly common on chimneys in our area. We have used all four of these different-looking finishes, which, to my way of looking at it, perform similarly and should be built similarly. They each normally consist of two heavy base coats of mortar embedded in metal lath that's fastened to the structure.

Stucco is a troweled-on finish coat, either a lime-based plaster or a heavy acrylic coating that simulates a masonry costing but is more flexible.

Thin brick comprises slices of brick about 3/8 inch thick that are adhered to the mortar base in a standard brick pattern. The companies who make it provide corner pieces, which, once installed, look like a full brick wrapping around the corner. Ordinary brick mortar is applied between the thin brick pieces, and the result is nearly indistinguishable from full-thickness bricks.



Photos by Doug Horgan; illustrations by Ola Kwiatkowska

The photo above **(1)** shows a framed chimney clad with adhered stone. Details for the base flashing are shown in the illustration to the right of the photo. Details for the metal chimney cap are shown in the illustration on page 20.

Both photos above **(2, 3)** show the through-flashing that is installed before the cladding. In each case, the author's company has installed a peel-and-stick roof underlayment first. Once the roofing and step flashings are installed, a second counterflashing will cover the step flashing and connect to this through-flashing.

Similarly, adhered stone or thin stone refers to thin pieces of natural stone that are adhered to a base coat and have mortar placed between them. Again, companies who sell the material make corner pieces to make the finished look realistic.

Adhered manufactured stone veneer (AMSV) is typically made of concrete pieces that are molded to look like real stone and are adhered to the base coat.

Joe Lstiburek famously called these types of finishes "lumpy stucco," and that aligns with our experience with them. The assemblies tend to get quite wet and stay damp, releasing water in all directions as they dry. I've seen enough pictures of spectacular failures (for example Mark Parlee's *JLC* article "How to Destroy a Wall in Two Easy Steps," Sep/2017) that we treat them with utmost respect.

It's reasonable to expect water on the back of the base coat, and the building structure behind the cladding must be protected. We use two WRB (weather-resistive barrier) layers and a drain space as our installation standard. While the most recent code versions now allow only one WRB provided there's a drain space, we have continued using two and a drain cavity for redundancy. It's also the case that, in our market, framers usually install a first WRB (felt, a housewrap, or a coated OSB like Zip System or other integrated WRB sheathing), and stucco contractors are used to installing a second, less permeable WRB like felt paper. We like having one layer of less permeable material, and we like the extra protection. The whole assembly aligns with what our trades would normally do anyway.

THREE-PIECE FLASHING AT ROOFLINE

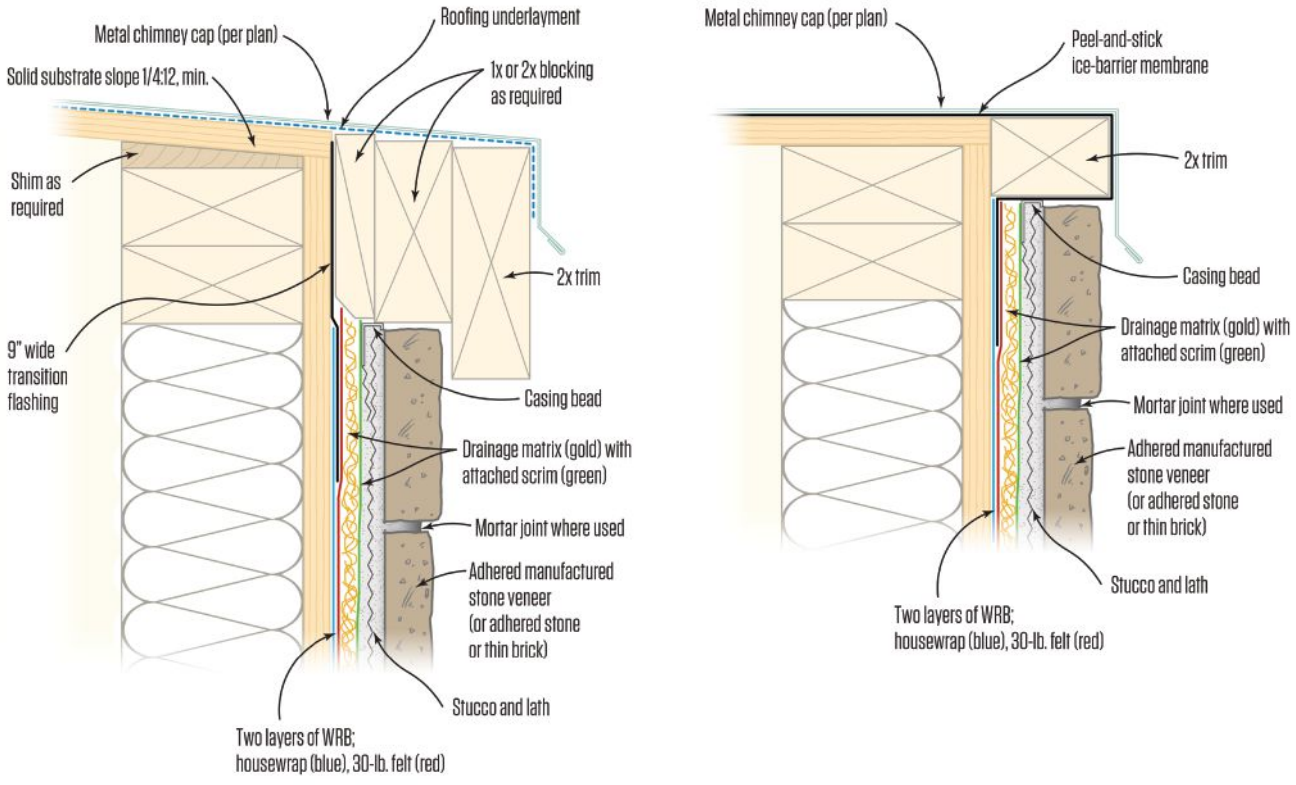
This isn't rocket science. The gist of a good installation is to keep the stucco (and adhered decorations like brick or stone) several inches above the roof plane so you don't have to touch it when you reroof. Our preference is to install metal flashings flush with or a little bit proud of the stucco, all around the base of the chimney (it looks more like a deliberate plinth that way).

I am a big believer in three-piece flashings for these situations. At the roof level, we use standard step-flashing pieces that weave between the shingles. A Z-shaped "through-wall flashing" tucks behind the stucco (and the WRB layers behind it). Last, a vertical counterflashing tucks under the Z *and* covers the top of the step flashing. This third piece—the counterflashing—is key. It's removable since it isn't attached to the roof and doesn't run behind the stucco, and, once it's off, reroofing is a breeze, as the edge of the roof is exposed and easy to rework. When we're being really clever, we bend a hook in the bottom edge of the Z-flashing and on the top of the counterflashing, and they connect; but we've used rivets or screws in addition to, or in place of, the hook bends.

As a base for these flashings, we normally ring the bottom of the chimney with 2x6 lumber. This does get a bit tricky at corners and roof crickets, and we sometimes trim the bottom of the lumber to align the tops. Since code-required step flashing is 4 inches tall, and stucco (and its cousins) requires a minimum 2-inch clearance from the roof, we try to keep the lumber a minimum of 4 inches tall, no matter how much cutting is needed. A 20-degree cant on the top edge can also facilitate installation and drainage.

There are illustrations out there showing

Chimney Top Details



Without a pronounced curb at its base, a chimney can look disconnected from the roof **(4)**. This approach also makes replacing the flashing during a future reroof especially challenging.

a simple 2-inch gap between the top of the roofing and the bottom of the stucco or stone, with no padded out base. The two downsides to this method are that it can look a little silly when a ponderous stone chimney has a visible lack of support, and it makes reroofing quite challenging. There's little chance a roofer will be able to replace the step flashings that run up behind the base coat—what's there is probably full of fasteners, and tucking new 4-inch flashings behind the stucco will be a tiresome challenge. (We find ourselves replacing step flashings on many reroofs, because shingle widths and code requirements for flashing heights keep changing, not to mention that older step flashings can be worn or bent.)

Of course, we manage for a few additional quality points. As mentioned, any stucco or adhered masonry in our climate should have two layers of WRB and a drain space behind them; we expect water will run down the WRB and drain out on to the roof at the bottom, so lapping everything correctly is crucial. Similarly at the top of the chimney, we have to keep water out, and we often have an order-of-operations issue, where the metal chimney cap is installed after the stucco, to manage. One way to facilitate the cap install is to ring the top with 1- or 1½-inch-tall wood strips to cap the cladding (stone, thin brick, or AMSV). The chimney top can be measured and fabricated while the stucco work proceeds. This wood ring can be wrapped with flashing tape or ice-barrier membrane down onto the WRB for windblown rain protection and, later, the metal chimney top can be fastened to it. This works much better than trying to fasten into the cladding without damaging it. Whenever we've tried that, it hasn't exactly always gone per plan.

Doug Horgan is vice president of best practices at BOWA, a design/build remodeling company in McLean and Middleburg Va.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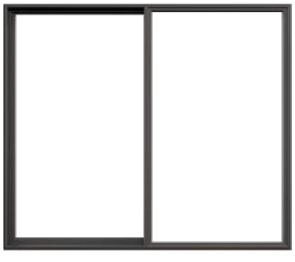

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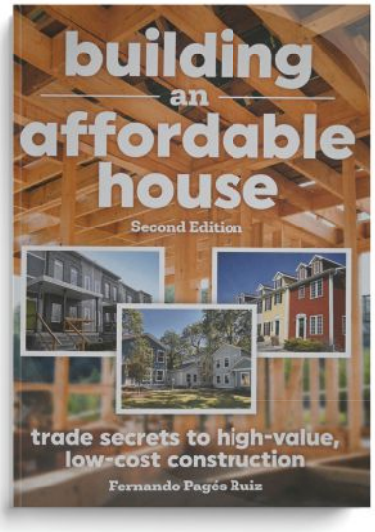
BY DAVID GERSTEL

A Masterful Guide to Building Better

When Fernando Pagés Ruiz published his first book on building affordable homes, it won a large audience in the construction industry. I was among the builders who benefited from the strategies it laid out for minimizing cost while delivering value. I had tired of building for wealthy people. I wanted to build a home that fit a wage worker's budget, made the least environmental impact I could manage, and produced a profit. The project's success on all three counts was in good part due to the guidance provided by Pagés' book.



Photos and illustrations excerpted from *Building an Affordable House*, courtesy Abrams

Now, two decades later, he has given us another book about building affordable homes. Nominally, it is a second edition. But it is so thoroughly updated with respect to the codes, budget-friendly construction, environmentally considerate practices, and business opportunities that it is best viewed as an essential new book.

Before going further into what the new *Building an Affordable House: Trade Secrets to High Value, Low-Cost Construction* offers, I want to tell you briefly what it is not. Pagés' book is not a grand vision of solving the housing crisis with new policy directives or a technological innovation. Nor is it a pitch for those "affordable" tiny houses that may work for single people with minimalist inclinations but not often for families.

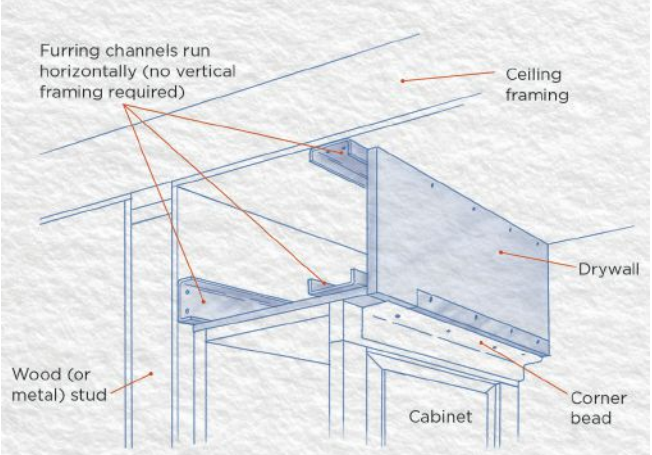
Instead, *Building an Affordable House* delivers one practical measure after another for trimming the cost of building family homes while also reducing the burden their construction imposes on our environment. Thereby, the book drives home a key lesson: Considerations for builders' and buyers' financial needs and for the environment are often joined at the hip. When you reduce labor and material costs, you usually reduce environmental impact. The right measures, such as those Pagés shows us by the hundreds, will put greenbacks in your pocket and/or leave them in your clients' pockets while also leaving the environment "greener" than it would otherwise be.

Pagés' book accomplishes its mission to educate us on achieving affordability with greener building via clear text supported by well-chosen graphics and photos. After a brief introduction, the book is organized in parallel with the natural order of construction, which Pagés, who has been building homes for decades, deeply understands. As a result, each set of his ideas is presented right where a reader would expect to find them.

Pagés starts with an overview, titled "Money Matters," of the challenges of and the possibilities for building more affordable homes. He concludes that first chapter with a forceful declaration: "Cutting back a little is not enough." As he explains, affordability must be expressed as a primary intention from the very beginning of a project. "Think of [the effort] as a construction diet requiring disciplined cost-cutting as you would cut calories—when you want ice cream, you have fruit." You want quartz countertops but instead specify a laminate with hardwood trim. Fail to diet from the get-go, and you can find yourself in the position of certain people who called Pagés for help. They had a budget of $200K, did not prioritize affordability throughout design, and ended up with a low bid of $600K. Pagés had to tell them he could do nothing for them.

Following his tough-minded introduction, in his second chapter, "Design," Pagés plunges into a narration of strategies for building affordably and profitably while minimizing environmental damage. Chapters 3 through 7 march steadily from foundation and other concrete work through framing and MPE (mechanical, plumbing and electrical). Chapters 8 through 10 cover insulation and drywall, the exterior shell and interior finishes. All chapters deliver numerous specific suggestions for profitable, affordable, and greener building along with delivery of attractive and sturdy homes.

The design chapter includes sound advice on harnessing architects and specialty contractors to the pursuit of affordability. It emphasizes, as well, a basic principle that I relied on in my efforts at succeeding financially with more affordable and greener home construction: The closer the house shape is to a cube, the more efficient will be your use of material and labor. The reduction in the use of material and labor will, Pagés points out, occur not only at the exterior walls. It will domino through the construction of the home from beginning to end. You will reduce the linear footage of the foundation, the number of joists and trusses, the square footage of siding and roofing, and the total length of baseboard and crown moldings. Even pipe and duct lengths will be minimized. All told, by choosing a cube rather than an elongated shape, you can reduce major building costs by 25%. Of course, a cube-shaped home will not work for every site. But Pagés, who is relentless in pursuing relatively small frugalities because they add up, provides a chart that shows the meaningful savings achieved with a variety of length-to-width ratios.



Soffits, like those over upper kitchen cabinets, can be made with drywall, furring channels, and corner bead. This is less expensive than making them from conventional framing and drywall.

Continuing his discussion of design principles, Pagés suggests one move after another that can lower cost without compromising either durability or aesthetic appeal. Here's a brief sampling:

- Simplify traditional forms rather than fluffing them up with grandiose roofs and complex intersections.
- To add square footage (for closets, for example) without installing additional foundation, cantilever the floor framing.
- Because windows cost far more per square foot than the surrounding wall area, use them "like jewelry"—say, to enhance a diagonal view across a room to the outdoors and thereby add a sense of spaciousness.

Pagés' dedication to affordability and greener construction is prominently in play in Chapter 3 where he takes on concrete. He emphasizes that foundations, retaining walls, and flat work are especially costly in dollars and that the production of concrete imposes great environmental costs. According to numerous sources, including *Scientific American*, the production of concrete adds a pound of carbon to the atmosphere for every pound of concrete produced and is responsible for close to a tenth of atmospheric carbonization. Mostly, the problem must be solved by re-engineering the process we use to make concrete. That is happening (slowly). Meanwhile, we builders can pitch in and lessen environmental damage while also saving ourselves and our customers' dollars by reducing the amount of concrete we use.

My own favorite strategy for reducing concrete use is installing pier-and-grade-beam foundations. I favor their use even on flat lots. On my last project, going with a pier-and-grade-beam foundation rather than a conventional T-footing and stem wall delivered these results: Material for forms was cut by 80%, and concrete and steel, by 50%. Off-hauling of excavated soil was eliminated because the small volume of soil from the pier drilling was used on site for a landscape feature. The dollar savings were huge.

Pagés brings his readers many other strategies for reduction of concrete costs. Foundations, he asserts, are among "the most over-engineered areas of a home." Why? Because, he says, the codes "assume worst-case soils conditions." Consequently, foundation specifications can exceed need by a factor of 10 or more. Example: "While a typical two-story home with a full basement transfers a load of 500 lb. to 1,500 lb. per linear foot, a standard 8-in.-thick basement wall on a 12-in. by 16-in. footing can handle about 80,000 lb. per linear foot."

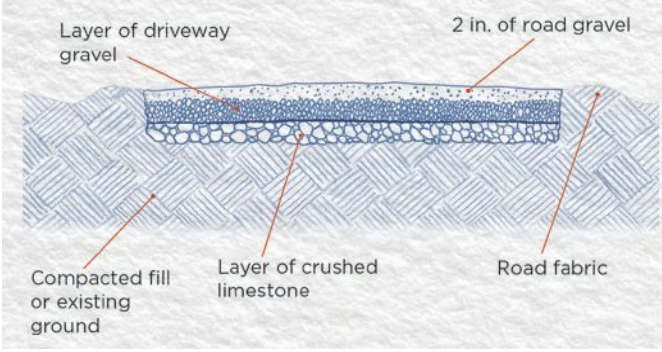
To pare wasteful dollar and environmental costs from concrete installations, Pagés suggests eliminations and substitutions. Among them: At a center bearing wall, eliminate separately formed and poured footings; simply thicken the slab instead. At exterior walls, get rid of footings altogether. Install the stem wall directly on the soil or a leveled bed of gravel. Going further, consider eliminating a basement in favor of a crawlspace or slab. And make that slab 2½ inches thick (as is standard in Europe). Cut more dollar and environmental cost from foundations by replacing steel (expensive stuff produced with huge releases of carbon into our air) with fiber. At driveways, get rid of concrete altogether. To save dollars and prevent rainwater runoff, build your driveway of gravel, as suggested in the illustration on the facing page.

Ideas for reducing both dollar and environmental costs likewise abound in the fourth chapter, "Framing." The basics are what is commonly pitched as "optimal value engineered" or "advanced framing." I like to call it "frugal framing," emphasizing appreciation for the careful, thrifty use of resources. Using frugal framing, I have reduced framing costs for a new home by close to a third even while optimizing energy efficiency and structural strength. Pagés reports similar results.

He goes beyond the basic first step of framing at 24 rather than 16 inches on-center and underscores the importance of reducing the material and labor used for headers, which he characterizes as the most wasteful of framing practices. While there is no one-size-fits-all solution, headers are often overspecified, Pagés says, and a single 2x10 may well do the job where "conventional brute force framing" would have called for double 2x12s.

In another attack on framing waste, Pagés suggests eliminating cross-bracing between joists less than 12 inches wide. Adequate bracing is provided by the subfloor above and drywall below. I wish the homebuilder who employed me long ago could have heard that idea. He would have embraced it. And I would have been spared many miserable hours stooping low to drive 16d commons through the joists and into the blocking with my 24 oz. framing hammer.

Like Pagés, I have searched long and hard for ways to reduce dollar and environmental cost in construction. Even so, much of what Pagés has turned up via his research and his decades of homebuilding amazed me. I did not know, for example, that you can lengthen the allowable span of joists by splicing shorter lengths together rather than going to a more costly larger dimension. Nor



Install a gravel rather than a concrete driveway, Pagés suggests. During construction, put down crushed stone to serve as a temporary drive. Add two layers of gravel at project completion. Payoffs: Big dollar savings. Elimination of atmospheric carbonization resulting from concrete production. Prevention of rainwater runoff. Prevention of falls caused by black ice. Plus, instead of an ugly swathe of concrete, a beautiful approach to the home.

was I aware of the level of savings that can be achieved with the thoughtful layout of the floor joists at stairways and the attentive selection of lumber for stringers, risers, and other details. Abide by the advice on stair construction in *Building an Affordable House*, and you will save the cost of the book many times over on the next stairway you construct. Additional lessons on lowering cost—with selection of attic trusses, for example—will leave even more dollars in your pocket.

By the time I finished reading the chapters about design, concrete, and framing, I was forming my evaluation of the book: This is a magnificent work. It's the kind of wonderful resource that can be created only by a person who has invested decades of study and thought coupled with the practice of their craft. That evaluation strengthened as I read chapters 5 through 10 with their discussions of MPE, insulation, air sealing, drywall, and the construction of the exterior shell and interior finish.

Here are just a few examples of the cornucopia of high-value ideas in chapters 5 through 10. Pagés urges centrally locating all major HVAC, plumbing, and electrical infrastructure, from space heaters through breaker panels. By doing so, you minimize use of ducting, pipe, and wiring. I adopted that strategy when building the house I cover in my book, *Building the Considerate House*. I grouped a combi hot water/space heater, an air handler, and the electrical panel close to the center of the cube-shaped structure. By then routing ducts, pipes, and wires above a drop ceiling in the adjacent laundry room, I was able to reach the three bathrooms, the kitchen, and all other rooms with very short and economical runs of material. Because modest space is required for heating and electrical equipment, similar centralization and reduction of construction costs can be achieved in almost any home.

As he moves to finish work in his later chapters, Pagés delivers a host of additional strategies for reducing financial and environmental impacts. For example, in a section titled "Making the Most of Drywall," he offers 11 cost-saving techniques. Among them is the soffit construction illustrated on the facing page (at top left). Another involves use of a so-called "buttboard" to join drywall sheets between studs, thereby saving the waste created by cutting sheets to meet right over studs.

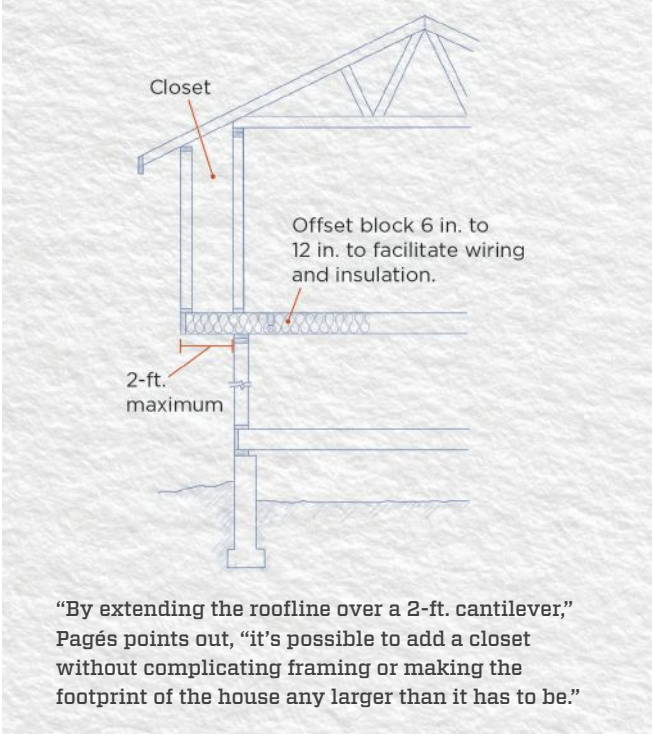
Pagés' section on drywall is included as a subchapter of the chapter titled "Insulation." At first glance, that surprised me. But the reason soon became apparent. Insulation must be accompanied by the crucial work of air sealing. And for that work, Pagés suggests the use of a technique developed in Canada called "Airtight Drywall." Though it is "one of the most effective, easiest, and least expensive means of sealing a home," it has been adopted by few builders in the U.S., Pagés reports.

For plumbing and electrical finish, Pagés encourages the use of builders' lines ("Cleveland" from Moen, for example). They cost far less than the heavily advertised "premium" lines from their manufacturers. But other than the name stamped on them, the premium lines and the builders' lines are likely to be near identical. In fact, the only significant difference between them, says Pagés, is cost to the purchaser. Cost is higher for the premium lines because it includes dollars spent on their pricey marketing

Pagés favors eliminating certain other finish items altogether. Example: At primary bedroom closets, don't install doors. After all, they are, he notes, rarely closed. Likewise, he suggests, you can go without doors at selected kitchen cabinets in favor of open shelving. That, along with producing savings, can add a nice bit of aesthetic "bling" when the shelves are used to display attractive kitchenware. I installed open shelving in place of cabinets in a home that I built 40 years ago. All the residents of that home have loved the results—a feeling of openness in the kitchen and the opportunity to get double duty from attractive dishes and pots by placing them on the shelves as decoration.

For all the strategies it proposes for cutting dollar cost and diminishing environmental impact, *Building an Affordable House* is far from indifferent to quality of design and construction. Pagés is keenly aware that to succeed as a builder, whether as a developer or a general contractor, you must produce good work. He learned that lesson, as he candidly divulges, with his first development. There, he brought homes to market at a price point around 60% of the next cheapest housing in town. But to get down to that level, he went with ultra-cheap windows. They leaked. He had to return to the project time and again to make repairs.

Flash forward to the far more experienced Pagés we encounter in the new *Building an Affordable House*: He now fully realizes that he is not trying to build homes that are merely cheap. They must be attractive



"By extending the roofline over a 2-ft. cantilever," Pagés points out, "it's possible to add a closet without complicating framing or making the footprint of the house any larger than it has to be."

and durable as well as affordable. Because he is, he declares, "in the business of building homes and not just housing, creating an environment that respects every American's dream represents a good deed and good business." He warns us against cutting corners too sharply as we pursue affordability, for the "lowest cost option is not a bargain."

Among his cautions: If you are building on clay soils, bring in a soils engineer for testing and recommendations. Yes, that will be costly but not nearly as costly as a foundation failure. For damp proofing or waterproofing foundation walls, turn away from spray- or roll-on asphaltic products. They are cheap. But they are also one of the least effective means of damp proofing, for they cannot bridge the cracks that inevitably form in basement walls. Upgrade, Pagés suggests, to a dimpled polyethylene product that provides a capillary break while directing water downward to a drainpipe. Then, before backfilling against your foundation wall, wait. "Basement cracks occur ... because builders backfill too soon and the uncured concrete cannot handle the stress."

Suggestions for frugal but smart, as opposed to stingy, specifications sprinkle Pagés' chapters on finish work. Here's his advice on plumbing fixtures: "Consider a steel tub with a simple, white-tiled wall" since that costs less than plastic. But also "make sure your plumber uses a mortar bed or foam insulation under the tub to add strength and avoid the tinny noise you hear when stepping into an unsupported steel tub."

If delivery of affordable and environmentally friendly homes is a mission you wish to embrace, be prepared to hit obstacles. Some may reside within yourself. You may have to break old habits and dismiss ingrained thinking errors. I find myself balking at 2 1/2-inch-thick garage slabs even though Pagés argues convincingly that they will do the job. Similarly, some readers of an article I wrote that advocated frugal framing pushed back against the idea. It would, they insisted, result in flimsy buildings. They were not able to bend to the compelling logic: Eliminating one stud per 4-foot-wide sheet of plywood or OSB results in eliminating only eight sheathing nails. And those can be more than made up for by slightly increasing nail frequency at the edges of the sheathing where, in any case, the substance of shear strength is achieved.

Architects and engineers may balk at some cost-cutting measures, as well. From wide experience working with architects, Pagés has sensed the root of their resistance: "They have deep insecurity about being associated with buildings that would not win their peer group's approval." Consequently, cost consideration is pushed aside by a desire to display their talent for striking design.

As for engineering, Pagés describes the segmented shear-wall design approach, for example, as "regrettably conservative." He zeroes in on the practice of designing one component of a structure at a time without taking into consideration strength contributed by other components. In contrast to that "segmented" approach, he holds out the possibility of a "holistic" approach to engineering, one that is, he emphasizes, now approved by building codes even in areas subject to earthquakes and hurricanes. By encouraging re-engineering from the segmented to the holistic approach—technically known as Perforated Shear Wall (PSW) design—Pagés was able to save $2,500 worth of hold-downs required for a ranch-style house.

Sometimes, engineers won't budge in the direction of affordability. I'm thinking of the guy who broke my clients' budget by insisting on a welded-steel roof frame for a straightforward home in the hills near my office. But other times, engineers can be persuaded to help foster cost control. For example, the soils engineer I hired when I was designing my *Considerate House* initially suggested I excavate 8 feet down for a footing and stem wall. I told him the cost would kill the project. I proposed instead a pier-and-grade-beam foundation. At first, the engineer resisted my idea. But I argued for it, pointing out the long-term success I had enjoyed using pier-and-grade-beam foundations on other projects. When his report hit my desk, that was the foundation design it called for.

Likewise, Pagés reports success bringing design professionals around. He points out to them well-known architects from Frank Lloyd Wright onward who designed simultaneously for beauty and affordability. Drop their names in your conversations with designers. Pass on lessons in affordable design you have picked up in Pagés' book. You can improve your chances of preventing designers from killing off projects by burdening them with excessive costs.

Fernando Pagés is a good writer. His narrative is concise and good humored. Even so, it poses a challenge: How is a reader to keep track of and make use of the many strategies he describes? Pagés anticipates this challenge and offers a solution by providing us chapter by chapter with "Money Saving Green" checklists. At HVAC, for example, the list includes centrally locating the

mechanical room, installing ductwork within conditioned space, and right-sizing air-conditioning equipment—which, as Pagés notes, is often wastefully oversized by mechanical contractors.

Pagés is primarily a developer. He has other developers in mind when he takes note, as he regularly does, of issues around the marketing of homes and of designing with buyers in mind. Developers should gobble up Pagés' strategies for reducing building cost while maintaining durability, performance, and aesthetic appeal. His methods will allow them to get to a sales price that makes their houses affordable for more people while maintaining profit margins. That's obvious.

What is not so obvious is that construction contractors can also draw on *Building an Affordable House* to gain financial advantage. Every trade will find ideas in the book that will help them to enhance their competitive position by reducing material and labor costs while producing good work. General contractors can greatly strengthen their ability to win contracts not only for construction but for preconstruction by mastering Pagés' tactics. Fifty years ago, builders rarely charged for their preconstruction work. Now the practice is widespread, with the services including three key components:

- Making sure the project is buildable as designed.
- Dialing in construction costs with increasing precision as project design moves forward.
- Collaborating with the designer and owner to value-engineer the project; namely, finding ways to minimize financial and environmental costs while honoring design intent.

Value engineering, perhaps even more than estimating, is one aspect of preconstruction service where many builders fall short. Fortunately, you can greatly up your value-engineering game by reading *Building an Affordable House.* It will enable you to offer numerous high-value, low-cost construction ideas during the preconstruction phase of a project. If you can also ensure buildability and can nail your estimating numbers, you will then be able to offer preconstruction services worth a professional fee.

Even if they become a fan of the book, any knowledgeable construction pro who reads *Building an Affordable House* is going to have some concerns and questions. I have a few myself, but just one serious concern with the content: Pagés' enthusiastic support for the use of plastic products, particularly vinyl siding. He does make a strong case for vinyl. Among other positives, he cites low cost, durability, and ease of maintenance. Recent generations of the material are even, in his opinion, quite attractive. He reports as well that vinyl has a global warming potential 75% lower than fiber cement siding and 85% lower than brick!

So far, so good. But Pagés also echoes the claims of manufacturers that vinyl is recyclable. Only about 5% of the plastic produced in the U.S. is recycled (*MIT Technology Review*, Oct/2023). Much of the remainder ends up in rivers and oceans. There it degrades into microplastics and nanoplastics *(Science Advances*, Jan/2024). These MNPs find their way into organisms, turning up in high concentrations in human brains (*Nature Medicine*, Feb/2025). To make matters worse, the plastic-recycling plants touted as a solution to plastic pollution are pouring MNPs into the environment (*Journal of Hazardous Material Advances*, May/2023). I could go on, but you get the point. Vinyl and plastics in general may support affordability. But green? No.

Pagés designed the interiors in this development to respond to cultural preferences of the new owners. On opening day, he placed an American flag and a flag of the new owner's home country on the front porch.

Setting aside my differences with Fernando Pagés about the use of plastic products, my view of his book comes down to one word: Admiration. I am not alone in that assessment. Andrés Duany, the highly regarded Miami architect who is credited with creating New Urbanism, is another. In his Foreword to *Building an Affordable House*, he writes that his shelves are loaded with books whose titles feature the words "affordable" and "housing." With one exception, Duany says, they espouse solutions that, if they happen at all, happen only at a hardly perceptible scale. Good point, that! How many folks are we now sheltering in homes built of rammed earth, hay bales, or shipping containers, or with 3D printing? The exception among his many books is *Building an Affordable House*. It is the only one, he says, that "displays the art of the possible" and is focused on achieving "affordability by reducing the costs of everyday building practice." Duany adds, referring to Pagés, "I trust him."

So do I. Pagés is not a theoretician. As Duany says, he's a man "who is in balanced measure, an artist, an architect, a hands-on builder." He's a man who has swung a hammer and has built 500 affordable homes including a dozen multifamily developments of six to 30 units. He's a man who, along with building, has for nearly half a century relentlessly researched possibilities for profitably building more affordable and greener homes. All that experience and learning has been distilled into the new *Building an Affordable House*. The result is a masterwork.

David Gerstel is a veteran builder and author of several well-known construction business books, including Crafting the Considerate House.

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BY JIM MAILEY

Selecting Hardware for Use With Treated Wood

Selecting the code-required options for pressure-preservative-treated (PPT) wood and hardware will extend the life of a properly built deck, porch, or outdoor structure. In this article, I'll first review the proper treated wood for above-ground vs. ground-contact applications. Then, drawing on the knowledge I gained over three decades with Simpson Strong-Tie, I will cover in detail the considerations that must be made for selecting hardware for various environmental conditions.

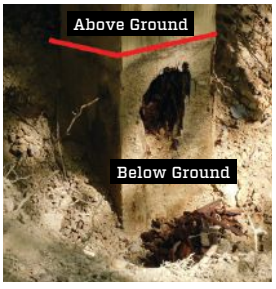
PRESSURE-PRESERVATIVE-TREATED WOOD (PPT)

In the United States, the American Wood Protection Association (AWPA) sets the consensus standard for the appropriate level of preservative treatment for wood for outdoor decks and other uses. This standard, *AWPA U1 – Use Category (UC) System: User Specification for Treated Wood*, classifies wood treatment for decks and porches into three levels: "Above Ground," labeled AWPA UC3B; "Ground Contact," labeled UC4A; and "Heavy Duty Ground Contact," labeled UC4B (awpa.com/standards/ucs). The following descriptions of the use categories are from AWPA:

- **"Above Ground":** *Wood and wood-based materials used in exterior construction that do not come into contact with the ground. These materials do not require an additional exterior coating; however, these materials may be finished to achieve the desired aesthetic appearance. UC3B materials are used for a variety of applications in either horizontal or vertical positions such as decking, sills, walkways, railings, and fence pickets.*
- **"Ground Contact":** *Wood and wood-based materials used in contact with the ground, fresh water, or other situations favorable to deterioration. ... Examples are sawn fence posts, sawn deck posts, sawn guardrail posts, structural lumber, joists and beams for decks ...*
- **"Heavy Duty Ground Contact":** *Wood and wood-based materials used in contact with the ground either in severe environments ... in climates with a high potential for deterioration ... permanent wood foundations, and wood used in salt water splash zones.*

This last category is of particular note, as IBC Section 1807.3 states: *Embedded (sawn timber and round timber) posts & poles shall be treated in accordance with AWPA UC4B.* While this is commercial code, it helps guide what is best practice for embedded wood.

Once contractors have chosen the correct level of wood treatment for each part of a deck, they need to be aware of the consequences of those choices. A higher level of treatment will increase the durability of the structure but will also increase the cost. In addition, the level of treatment, in particular UC4B, dictates the type of hardware that can be used. In the following sections, we'll look at how the level of preservative in the lumber guides the types of hardware used. In addition, we will detail how environmental conditions can also influence what hardware is deemed best for the job.

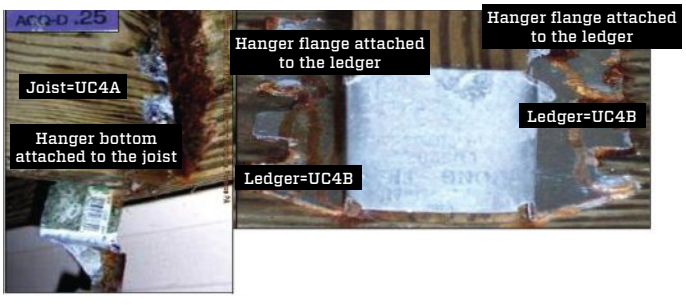


A 10-year-old embedded post treated to the level of UC4A has prematurely decayed where the wood is below ground.

CORROSION CRISIS

Prior to 2004, selecting the wood and hardware for building a deck was fairly simple. There was not much focus on choosing the right materials, because outdoor structures seemed to last, and there were few code requirements.

But when manufacturers voluntarily discontinued producing chromated copper arsenate (CCA) for residential use in December 2003 and started treating lumber with alternative preservatives, problems started occurring with hardware corrosion. The North American Deck and Railing Association (nadra.org) was founded at this time to address these issues. The primary problems occurred during 2004 and early 2005, as treaters and builders transitioned



On a deck built after CCA was discontinued for residential use, a joist treated to the level of UC4A did not corrode the joist hanger; however, the ledger, treated to UC4B, caused significant corrosion in less than six months.

Photos by Kevin Kelly; table by Jim Mailey

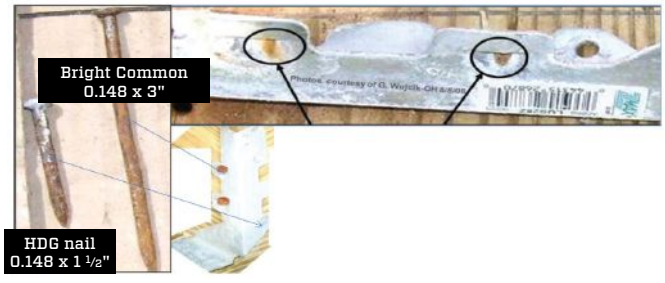
from CCA to the alternatives. During this time, about 2.5 million decks were built, according to NADRA.

The deck pictured on the previous page, bottom right, was one of those decks that had corrosion problems. Though the wood for the ledger and the joist came from the same batch of lumber from the same lumberyard at the same time, the part of the hanger flange attached to the ledger was corroding after six months, whereas the hanger bottom in contact with the joist wasn't. A chemical analysis of the wood by Simpson Strong-Tie showed that the copper oxide content for the ledger was 0.579 pcf, or UC4B, and the copper oxide content for the joist was 0.335 pcf, or UC4A. Researchers found higher levels of copper oxide in the wood than what was listed on the tag, which stated 0.25 pcf, or UC4A, for this ACQ-D-0.25 treatment. Inconsistent levels of the chemical treatment during the transition year resulted in premature hardware corrosion only where the retention levels were greater than UC4A.

Stainless steel is recommended when the chemical retention level is greater than 0.40 pcf for ACQ-Type D or the treated wood is rated at greater than or equal to UC4B. Therefore, if you would like to embed a post in soil, the wood should be treated to UC4B and the hardware used should be stainless steel.

HARDWARE SELECTION FOR TREATED WOOD

Building codes include guidelines to assist in selecting hardware for use with PPT wood. The IRC frequently states that any metal or flashings should be corrosion resistant. For example, Section R317.3.1 states: *Fasteners, including nuts and washers, for PPT wood shall be hot-dipped galvanized steel, stainless steel, silicon bronze or copper.* The IRC references numerous ASTM International standards (formerly known as the American Society for Testing and Materials; astm.org) for the required coating weights for zinc-coated fasteners and connectors: *Fasteners shall be in accordance with ASTM A153. ... timber rivets shall be permitted to be of ASTM B695, class 55, minimum.* And, *connectors with preservative-treated wood shall be in accordance with the connector manufacturer's recommendation. In the absence of manufacturer's recommendations, a minimum of ASTM A653, G185 or equivalent, shall be used."*



Zinc from the hanger was sacrificed to protect the uncoated, bright common nail on a one-year-old deck. Where a hot-dip galvanized (HDG) nail was used, there was no transfer of zinc between the nail and the hanger.

Zinc Coating Standard (grade)	Thickness (microns)	Detail
ASTM A653 (G90)	~20/side	Connectors—referred to as G90 (0.90 oz./ft² on both sides), continuous sheet galvanizing applied prior to fabrication
ASTM A641 (class 1)	6–25	Fasteners, anchors—electroplated (0.2–1.0 mil thickness coating ≈ 0.15–0.53 oz./ft²)
ASTM A653 (G185)	~42/side	Connectors—referred to as G185 (1.85 oz./ft² on both sides), continuous sheet galvanizing applied prior to fabrication
ASTM A123 (HDG ~grade 95)	~95	Connectors—HDG, "batch" or post hot-dip galvanizing applied after fabrication
ASTM A153 (class C)	~53	Fasteners, anchors >⅜ in.— hot-dip method (2.1 mils ≈ 1.25 oz./ft²)
ASTM A153 (class D)	~43	Fasteners, anchors ≤⅜ in.— hot-dip method (1.7 mils ≈ 1.0 oz./ft²)
ASTM B695 (class 55)	~53	Fasteners, anchors—mechanically deposited (2.1 mils)

The table above shows levels of zinc coating needed to resist corrosion on fasteners and hardware used with PPT wood.

Most metals will corrode under ordinary conditions, except noble metals such as gold, platinum, and palladium, which are obviously not called for by code. The most common solution for corrosion resistance is zinc.

Zinc, which is used in galvanization, has a lot of attributes that make it an ideal coating for many applications. It is the 23rd most abundant element in the earth's crust, with estimates of global supply at more than 750 years with current extraction levels, and it is less expensive to mine than many other metals. Zinc forms a zinc carbonate film about one to two years after being exposed to oxygen that greatly retards its corrosion rate. Zinc will also migrate to protect areas that have less zinc, so, in effect, zinc will sacrificially protect any small areas and will even allow "self-healing" (see photo, below left).

Generally, the more zinc, the better resistance the material has to corrosion. Fasteners should have the same level of zinc or an equivalent corrosion resistance as the connector they're in contact with. As you can see from the table above, when you use a connector galvanized to the level of ASTM A653 (G185, which denotes a coating thickness of 42 microns) you should use a fastener or anchor galvanized to the level of ASTM A153 (class C or D) or ASTM B695 (class 55) as a minimum because these fasteners will have the same or thicker coating level.

MATERIAL SELECTION BASED ON ATMOSPHERIC CONDITIONS

According to the International Zinc Association (galvinfo.com), many factors influence hardware and fastener corrosion. Salt exposure, pollution, humidity, temperature, fog, and rainfall all play a role in the annual corrosion rate.

The 304 stainless steel nails are corroding after one year of being near the coast and exposed to chlorides. The 316 stainless steel joist hanger shows no signs of corrosion.

IRC Table R507.2.3 specifies fastener and connector material and coating for use with decks. The table recommends ASTM A153 (class C and class D), or equivalent coatings and finishes, for nails, bolts, and lag screws, and ASTM A653 (G185) or ASTM A123 (grade 85) minimum for connectors.

There are conditions for which an even higher level of corrosion resistance is recommended. IRC Table R507.2.3, footnote b, states, *Fasteners and connectors exposed to saltwater or within 300 feet of a saltwater shoreline shall be stainless steel (SS).*

The distance of 300 feet is derived from a corrosion study by the International Molybdenum Association (imoa.info) Specialty Steel Industry of North America. The study, "Stainless Steel for Coastal and Salt Corrosion," states, "The distance airborne salt is carried can vary significantly with local wind patterns. Generally, locations within five to ten miles of saltwater are considered at risk for chloride-related corrosion. In some locations, marine salt accumulations are only a factor within the first 0.9 miles. In others, salt deposits have been measured 27 miles or more inland."

The code states "stainless steel" but does not recommend a type of stainless steel in the section referenced above. To choose the correct type of stainless steel for a specific application, we need to look at the types available and their performance levels. The most common used in construction are Type 304 (typically nails, some connectors and anchors), Type 305 (typically screws), and Type 316 (fasteners, connectors, and anchors). Types 304 and 305 stainless steel are less resistant to applications that involve chloride-type corrosion. The addition of molybdenum to Type 316 gives it superior performance in environments containing chlorides (salts), and this type of stainless steel is considered to be adequate for hardware near the ocean or in applications that are exposed to chloride-type corrosion (see photo, above). The Cedar Bureau (cedarbureau.org) recommends 316 stainless steel within 15 miles of salt water.

Type 410 stainless steel (used for some screws and concrete screw anchors) is optimized for hardness. It comes in two grades—one has a coating without a barrier that is recommended only for interior, noncorrosive applications, and the other has an additional coating or barrier that offers a moderate level of corrosion resistance.

Other possible exposure to salts should be considered by the builder. Deicing salts, salts used to melt snow, or atmospheric conditions that cause metal to corrode that are not addressed in IRC Table R507.2.3 should still be factored in to hardware selection. For example, the Illinois Department of Transportation reports (in "Atmospheric Dispersion Study of Deicing Salt Applied to Roads" by Allen L. Williams and Gary J. Stensland, January 2006) that sites within about 300 feet to 3,000 feet of highways appear to have salt accumulations from the use of deicing salts comparable to moderate to severe coastal areas. The NADRA Decks Done Right Education program recommends using 316 stainless steel within 10 miles of a salt-water shoreline, within about 300 feet to 3,000 feet from highways that use deicing salts, and wherever the hardware will be exposed to chlorides.

HARDWARE AND FLOOD RISK

According to "The First National Flood Risk Assessment," a 2020 study by First Street Foundation (a nonprofit organization that seeks to quantify climate risk in financial terms), more than 21 million properties in the U.S. are at risk of flooding, and more than 14 million of those properties are at substantial risk.

Homeowners insurance doesn't cover flood losses; buildings (defined by two or more outside rigid walls and a roof) and contents may be covered under a National Flood Insurance Policy. However, property and belongings outside the building envelope are generally *not* covered. Because the deck or porch is typically not covered by insurance, it should be built strong enough to withstand a flood event, or the homeowner or building owner will have to pay for the repairs out of their own pocket.

The American Society of Civil Engineers (ASCE) standard *Flood Resistant Design and Construction* (ASCE 24) is recognized by the codes as the default document for all structures in floodways or for structures built based on the IBC. For exposed materials below the design flood elevation (DFE), ASCE 24 sections 5.2.2.1 (Corrosive Environments) and 5.2.2.2 (Noncorrosive Environments) state that *exposed straps and anchoring devices shall be stainless steel or hot-dip galvanized after fabrication ...* .

The table on the previous page shows that ASTM A653 (G185) (typical trade names include Zmax for Simpson Strong-Tie and Triple-Zinc for Mitek) designates hot-dip galvanization under a continuous galvanizing process but prior to fabrication. Based on ASCE 24, connectors would have to be "batch" or post hot-dip galvanized to ASTM A123, for which designation the zinc is applied after fabrication. The one word "after" in the standard changes the requirement from ASTM A653 (G185) to ASTM A123. Or you can use stainless steel. In some cases, 316 stainless steel may be a less expensive option than using post hot-dip galvanized connectors.

SUMMARY

Being aware of the codes and standards for outdoor structures, along with the conditions that can shorten their service lives, will allow you to provide a better product to your clients. You will be able to explain issues that may result when incorrect materials are chosen, and you won't have to worry about your clients being dissatisfied or the building inspector identifying issues with your project.

Jim Mailey is retired after 32 years with Simpson Strong-Tie, where he developed programs on the structural code requirements and product solutions for decks and porches, wood-framed structures, and buildings in flood-hazard areas. He currently advises NADRA on technical issues and is the instructor for the Deck Evaluation class and the Decks Done Right Education program.

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Back to Basics: Wood Clapboard Siding

Old-school pine fits the bill for performance and price

BY JEREMY KASSEL

Some of my fondest memories of being an apprentice carpenter are from the summers I spent building and remodeling in Saratoga Springs, N.Y. It was in that small city, filled with late 1800s and early 1900s Victorian houses, that I learned the fundamentals of installing clapboard siding. Fast forward two decades later, and I still find hand-nailing clapboard siding to be very gratifying; it's one of my favorite jobsite tasks. As each course of siding is installed, covering the weather-resistive barrier (WRB) one piece at a time, the house looks increasingly refined.

A few years ago, we built a custom home on the Helderberg Escarpment in upstate New York. The house was clad with vertical cumaru siding, which gave the building a dark, rich, modern look. But for the freestanding garage, the customer wanted a more budget-friendly cladding that would provide visual contrast to the house. He opted for 1/2-by-6-inch beveled #2 pine clapboard. This regionally sourced white pine is abundant, easy to procure and install, and compatible with many finishing options. It also smells great when being cut and handled. While the oiled cumaru on the house would have a deep, strong appearance, the pine was to be left raw to the weather. The pine clapboard and trim boards start off blond, then turn to a medium brown and, eventually, a neutral gray.

PLANNING

As with any construction project, it's crucial with a siding project to be thinking 10 steps ahead. Having a clear idea and a strong visualization of the finished product is important. Good

Photos by Jeremy Kassel

With the garage framed and weathered in **(1)**, the crew prebuilds the jambs and casing **(2)** for the garage doors using 5/4 #2 pine, easing the edges of the trim using a round-over bit. A carpenter's pencil makes a ready gauge for the casing reveal **(3)**. The bottom ends of the verticals are treated with emulsified wax **(4)**. Using carefully placed 15-gauge stainless-steel nails, a crew member installs the preassembled jamb and casing sets **(5, 6)**.

foresight will help determine where and how certain materials will plane out, layer, project, and create reveals.

Though the garage is not living space and is completely unconditioned, we used the best principles for installing the siding with long-term durability in mind. As such, we installed the pine over vertically oriented furring strips and also paid close attention to flashing details and insect mitigation.

The goal was for the entire cladding of the build to look correct not only at a quick glance but also when scrutinized. I believe that a correct install is one where nothing stands out.

OVERHEAD DOOR JAMBS AND CASING

After framing the garage and making sure that the Zip System sheathing was fully taped and rolled, we turned to the first step of the siding process: building and installing door jambs and casing. Similar to the siding, the stock for the trim on the garage was simple #2 pine—in this case, 5/4 stock. Because the outside of the WRB would have 1/2-inch furring strips installed over it to create a drainage plane, we needed to install furring around the rough openings and extend the jambs 1/2 inch past the sheathing so the casing would be well supported and tight to the jambs with a traditional reveal.

We cut the 5/4 jamb components to length, then fastened them to each other with coated deck screws. We butted the casing joints and joined them using Kreg pocket holes with blue-coated screws. This would keep the faces nice and tight. Running a 1/8-inch round-over bit over the pieces softened the edges and eliminated splintering. We prefastened the casing onto the jamb sets with 15-gauge stainless trim nails, using a carpenter's pencil as a gauge to create a uniform reveal. The end grains that would sit close to (but not on) the concrete floor would be waxed.

Finally, we installed the site-made preassembled jamb and casing sets as whole units. Here, we also used 15-gauge stainless trim nails, giving thought to the fastener layout. Because all the pine material would be left to naturally age, we did not fill any nail holes.

FLASHING

We chose to make the main flashing components for this job with 24-gauge black galvalume because it's durable, and we were able to have it fabricated by a friend in his local metal shop.

The vertical (wall) leg of the head flashing sits tight against the WRB. This leg is taped to the Zip System sheathing at the top to create a water-shedding lap. The head flashing is bent slightly more than 90 degrees, so the horizontal leg has a slight downward angle to promote drainage and prevent water from sitting on it.

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The tops of openings are protected by 24-gauge galvalume Z-flashing **(7)** prior to the installation of 1-by furring strips that create a drainage space (rainscreen). Corner boards are fashioned from 5/4 stock, with one leg of the corner assembly 1 1/8 inches narrower than the other **(8)** so they show the same width on each side when installed. A router rounds over the outside edges of all the trim stock **(9)**. With the trim installed, the crew employs a story pole to align clapboards **(10–12)**.

We hemmed the outer edge and turned it down slightly to tuck over the top edge of the head casing. Later, furring strips would be applied over the top of the flashing but held about 1/2 inch above the metal to prevent water wicking into the end grain of the furring strips.

CORNERS

Similar to the door casing, the outside corners, also made of 5/4 stock, would need furring strips behind them for the siding to plane out nicely. We built the corners using the same Kreg pockets and coated screws as on the casing. We ripped the adjacent corner board minus the thickness of the stock so that visually the corner has the same width on both faces. (It drives me nuts when carpenters don't take the time to do that. It looks goofy to have one side wider than the other.) These corners also got dressed with the 1/8-inch round-over bit and waxed end grain. The assembled corner pieces were fastened to the building with 15-gauge stainless trim nails, again with thoughtful layout given to the fasteners.

STORY POLE, REVEALS, AND FULL COURSING

With the heights of the tops of the casings established, as well as the corners set, we could create a story pole for the siding courses. A story pole is simply a stick of wood that has all the siding coursing and reveals marked on it. The user can simply hold the story pole next to a trim board and lightly mark the board where the siding will be fastened. In this case, we could also mark the furring strips.

The important thing about making a story pole is understanding the limitations of the siding boards. On this project, we were installing "half by six" bevel pine clapboard with a finished dimension of 1/2 inch by 5 1/2 inches. The "reveal" of the board is what is exposed to the weather. Because each upper course will cover the top edge of the course below, we can "cheat" the reveal of the boards. The minimum overlap, which changes the reveal, can vary based on the supplier's recommendation. Typically, the wider the board, the larger the overlap. It's important to check with the supplier or mill to find out what that minimum overlap is.

The other thing to think about is to what degree you are comfortable pushing the limits of the recommended overlap. For example, in this case, the mill recommended 1 inch, but if a 7/8-inch overlap would enable having a full course over a series of doors or windows, we would opt for that. In this build, the risk of water infiltration and sheathing damage was mitigated by a rainscreen and a proven WRB, so pushing the limits of the overlap carried minimal risk.

For the most traditional and appealing look, it's best to shoot for a full course of siding below and above all doors, windows, and mounting blocks. The way to do this is to align the bare story pole at the bottom of the wall, mark the tops and bottoms of those features on the pole, and divide the remaining space(s) by the recommended reveal of the siding board. For example, if the space between the top and bottom of a window is 48 inches, and the recommended reveal is 4 1/2 inches, we would use 10.67 courses of siding. But because we want full courses, we might increase the number from 10.67 to 11 and shrink or "cheat" the coursing to approximately 4 3/8 inches. Adjusting clapboard siding reveals in this manner is barely noticeable at a quick glance yet yields a very intentional finished look with full coursing where wanted.

Ultimately, we always try to strike a balance between level, parallel, and full boards. In a new construction project, this is typically much easier because we have controlled the process from the start and have level sill plates, level doors, and plumb corners and trim. In a remodeling scenario, on the other hand, there are generally a raft of challenges. Windows may be out of level and multiple windows may not be level to each other. Siding may not be level and may need to run parallel to the top or bottom of an opening. Maybe the tops of all the windows don't line up, so the coursing at the head or sill needs to be notched. Often, the solution is picking the lesser of two evils and going with what looks right rather than what is truly level and square.

MOUNTING BLOCKS

With the courses of siding established by the story pole, we could locate the exact location and course where receptacles and lights would be installed. This was made much easier in our case because we self-performed the electrical work (which we *are* allowed to do in this municipality). Be sure to check with the local building department on licensing and inspection requirements. If you can't do this work, it will take some coordination with an electrician.

Because we knew the exact width of the siding course, we could then make a square mounting block that would fill that coursing space. Most outdoor lights that we handle have a 4-inch round base. Coursing that is about 4 3/4 inches wide leaves a nice margin around the fixture base.

Due to the nuances of the electrical boxes, light fixtures, and wood mounting blocks, I found it easier to weatherize these areas with fluid-applied liquid-flashing rather than hard, metal flashing. I was also afraid that hard flashing over these blocks might be asking for water to travel behind the fixture base.

With furring strips for the rainscreen installed **(13)**, the bases of the strips are wrapped with insect screen, and a starter strip is installed at the base of the walls **(14)** and above doorways **(15)**. The crew installed full-length clapboards along the back wall **(16)** to minimize the number of butt joints and used offcuts for shorter wall sections **(17)**. Nails penetrate only the bottom edge of the clapboards **(18)**, allowing the width of the board to expand and contract without splitting.

FURRING STRIPS

With the furring strips installed behind the trim components, we then needed to apply furring strips across the field of wall sheathing. We ripped regular dimensional 2-by stock down to 1/2 inch thick, placed the strips in line with the studs, and shot them with a 2 3/8-inch ring-shank nail. The furring strips can be made using nearly anything—corrugated plastic, Zip sheathing scraps, strapping, sheet goods, and the like. We chose to use dimensional lumber because we had plenty of it on site. We did not fasten the furring strips at the bottom of the wall, so that we could slide insect screening behind them.

INSECT SCREENING

The furring strips created a gap between the back of the siding and the face of the WRB, and we needed to block that gap with insect screening. This would keep insects out but still let water drain out should it get behind the siding. We simply took a roll of fiberglass window screening and crosscut it to 8-inch widths on a miter saw. We unrolled the screening, tucked the back of it behind the bottom of the furring strip against the WRB, and shot the bottom of the strip; then we rolled the front flap of the screen up onto the face of the furring and held it in place with a T-50 staple.

FRIEZE BOARD

The final trim component we installed prior to putting siding on the garage was frieze board. The low roof pitch of 1:12 made for very long angle cuts where the siding would meet the frieze. We made those long cuts with a track saw, but it was still difficult to make the angle cuts perfectly. Because the siding was not being caulked and painted, we chose to make a rabbet in the bottom of the frieze to allow the siding to tuck in nicely. This worked well to hide any imperfections, and in hindsight, I wished we had rabbeted all the trim boards. It leaves such a nice, clean look where the siding basically terminates into a shadow.

The author uses a simple, site-made jig to align nails precisely so they penetrate only one board **(19)**. Near knots, the crew predrilled for nails **(20)**. A crew member has cut a clapboard to length and holds it in place **(21)** to mark the precise position for the notch **(22)** around a wall outlet.

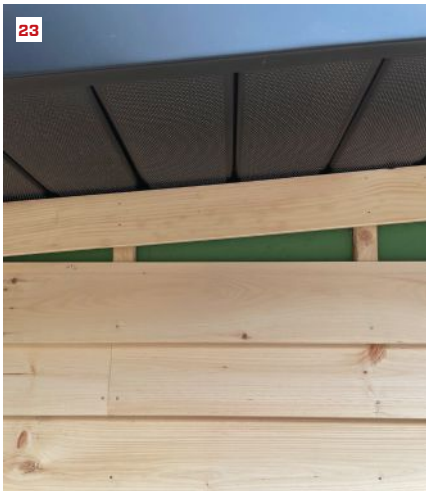
INSTALLING CLAPBOARDS

As with most efficient and successful construction, remodeling, and finishing projects, the prep work is where all of the heavy lifting takes place. Once all the trim, flashing, and furring strips are in place, and the casings and corners are marked using the story pole, the easy part is to start installing the siding.

This build did not have a water table or skirtboard but rather just the first course of siding. We started by ripping a 1-inch-wide "starter strip" off the top of a siding board. Installing this strip behind the first course replicates the cant or angle of having a course below, since there is no full course below the first one. The remainder of the board that we use to make a starter strip can often be used as a finisher higher up the wall.

Our strategy for installing siding boards is to use long boards along big sections of wall and use offcuts and shorter pieces between doors and windows. It's important to be mindful of what lengths were sent from the mill, to develop a plan on how to best use the material and mitigate unnecessary waste. When a single piece of siding can't be used in a section, we like to snap a chalk line from one story-pole mark to the other to create a reference on the furring strips where the full course will be fastened. I avoid red or blue chalk and opt for baby powder or purple chalk. The latter will not stain anything and can be easily wiped off. Some folks use a slip sheet of tar paper or flashing behind joints, but I don't find that to be necessary with today's high-quality WRBs, and especially not over a rainscreen. Any water that infiltrates the assembly should run down the drainage plane and out.

There are several schools of thought when it comes to nail placement on clapboard siding. We use a visible face nail, which can be installed in two main ways. The first is to nail close to the bottom edge of the board, ensuring that the nail punctures and captures the top of the course below. This means that each clapboard will have two fasteners in it—one low in the face and one high from the course above. While this securely fastens the board, it can create



At the top of the end walls, clapboards had to be ripped at a steep angle with a track saw to butt against the frieze board **(23)**. The installed clapboards **(24)** will be left to weather to gray without any applied finish.

some challenges. Removing a damaged board from the middle of the field can be more challenging because there are double the number of nails to pull out. Additionally, and perhaps more importantly, seasonal changes affecting the expansion and contraction across the grain could result in a cracked or broken board. For those two reasons, I prefer an alternative method, which is to nail through the face of the bottom of the board high enough that it drives *just* above the top of the board below. The course above exerts enough holding pressure to keep the top of the course below tight to the wall, and we eliminate the previously mentioned concerns.

To ensure proper nail placement, we made a small jig that spaces the nail just above the top edge of the course below (see photo 19, page 37). While an experienced carpenter may find this to be an unnecessary step, I find it to be helpful. I quickly developed muscle memory to hold the jig and the fastener with my left hand while grabbing my hammer off my belt with my right hand. It's important to note that as the reveal of the boards changes, so does the nail placement: A larger reveal means a lower nail placement, while a smaller one means a higher placement. We adjust to the reveal by simply scooting the jig up or down while fastening.

For fasteners, we went with 2-inch stainless, ring-shank siding nails. While siding nailers are undoubtedly faster, I continue to find hand-nailing to be superior. A slower pace promotes proper nail placement, and I find it easier to set the nail heads perfectly flush. Hand-nailing, however, causes vibration on the wall from hammering. In a remodeling or re-siding scenario, consider removing hanging pictures from interior walls. Drywall nail-pops can also occur.

I have always found a smooth-face, 20-ounce hammer works best for nailing siding. It has enough oomph behind it to easily drive nails but isn't so heavy that it becomes laborious to swing all day. Some carpenters prefer a 16-ounce when installing siding because they can swing a lighter hammer faster. And a smooth face is a no-brainer—no one wants waffle marks on their siding from a framing hammer.

As I work my way up the wall installing one course at a time, I vary board lengths so butt joints don't have a "stepped" look—like I have seen on some production homes clad in vinyl. I prefer a random appearance, similar to a hardwood floor. Creating this look means being thoughtful about being what I call "intentionally unintentional." We try to use the offcut of the "finisher" board of a course to be the "starter" of the next course above, always moving in the same direction, whether from left to right or right to left.

As we cut and install siding boards, using our story pole as a guide, these are things we stay mindful of:

- To avoid splitting clapboards, predrill for nails near board ends and knots.
- Use a square to check that courses line up around corners.
- Every few courses, check that the siding is level.
- Keep tabs on our stock of material lengths and waste factor.
- Reserve the straightest boards for starters.
- Beware of creep. One-sixteenth inch out of level or not in line with story pole marks isn't a big deal, but repeated 1/16-inch mistakes compound quickly.

Wrapping up the siding job was pretty simple. When we began running the siding, we ripped the top of a fresh piece of siding to create a starter strip. At this point, we took the remainder of that board and used it as a finisher. We ripped the final course at the top of the wall to the width that was prescribed by our story board and butted it up tight to the underside of the frieze board. Sometimes, the top of the last piece needs an additional nail because there is no course above it to hold it tight to the wall. Here, we used a smaller, trim-head stainless steel nail.

Jeremy Kassel is the owner/operator of Kassel Construction in Glenmont, N.Y. Follow him on Instagram at @kasselconstruction.

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Contemporary Patio Upgrade

Replacing a worn and dated hardscape with large-format porcelain stoneware paving

BY ERNEST MUELLER

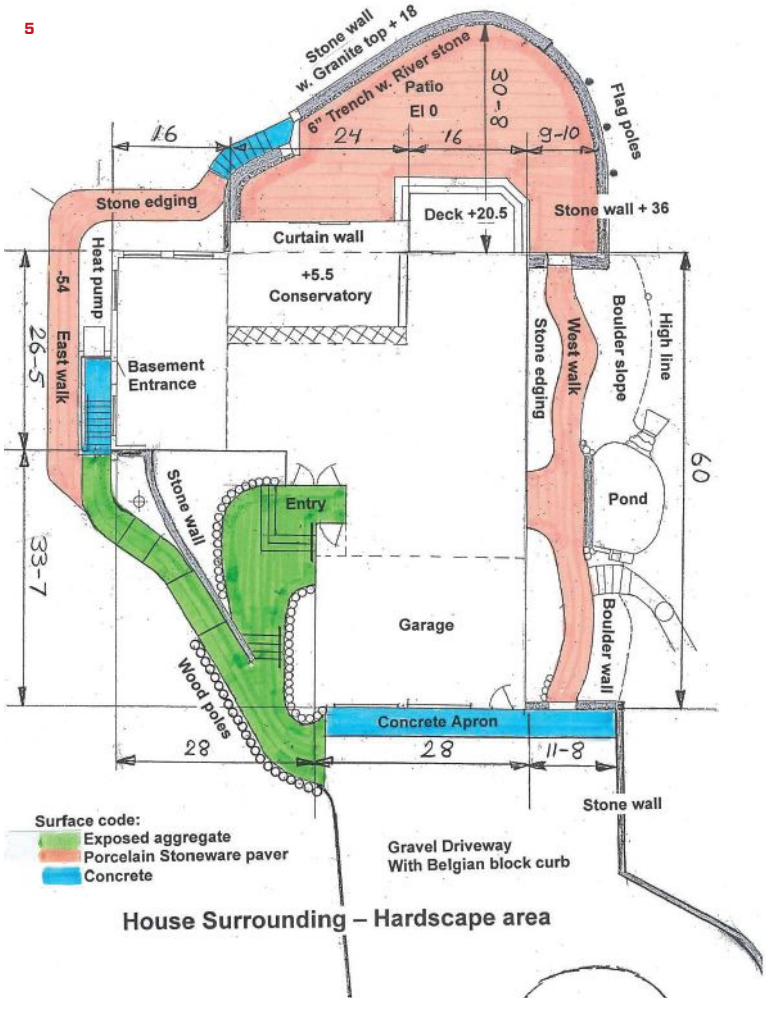
This 1982 New Jersey house was built on a sloping one-acre, heavily wooded lot. The area immediately surrounding the house had previously been hardscaped (see photos, facing page). The existing patio and walkways along the rear and sides of the home consisted of 8-by-4-inch concrete pavers set in rock dust on a base of crushed stone over sandy soil, with the joints between the pavers left open for water drainage (see photos, facing page). Over time, the joints would become clogged with moss, weeds, and debris and require periodic cleaning with a power washer. The pavers had also developed uneven surfaces, where water puddled after every rain.

The patio and walkways were obviously in need of a facelift. We decided to replace the old pavers with large-format porcelain stoneware tiles, which are available in 20mm (3/4 inch) thicknesses for outdoor paving. The quickest and least costly solution would have been to install the new tiles over the existing pavers, but the patio had no pitch, so water drainage was marginal. To fix the drainage problem, I decided to excavate to the old gravel base and add clean gravel before retiling. To complete the scope of work, we hired Landscaping by Craig (landscapingbycraig.com). Although the crew had never used porcelain stoneware pavers, company owner Craig Mandell agreed to take on the project with my guidance.

PLANNING AND DESIGN

For the new surface, I selected 600mm-by-600mm-by-20mm Caesar Aextra20 Graustein porcelain stoneware pavers. The

Photos and illustration by Ernest Mueller



Before: The concrete pavers on the existing patio **(1)** and walkways **(2)** had settled, leaving depressions where water would puddle. Steel edging **(3, 4)** was already in place along one stone wall, but this had to be reset to match the new surface elevation. **After:** The author's plan **(5)** shows which areas would be resurfaced with porcelain tile.

DEMOLITION AND PREP WORK

Demolition consisted of removing the wood steps leading to the home's deck, the wood poles along the west walkway, and all the concrete pavers. Workers also removed the rock-dust bedding, leaving a clean gravel base **(6)**.

Because access was limited, all work had to be done manually; the crew carted removed material to the driveway and loaded it onto trucks for recycling or disposal.

The patio has a free-form D-shape, with a stone wall along the curved part of the D. In the stone wall are two openings, to which the author added 2-inch-thick bluestone sill plates.

One of the openings had an angular shape that required multiple cuts to the bluestone; these were laid out using a cardboard template **(7)**.

On the west walkway, the crew redid the hill retention with boulders placed on the steep slope. They also replaced the original timber steps leading to the east walk with bluestone **(8)**.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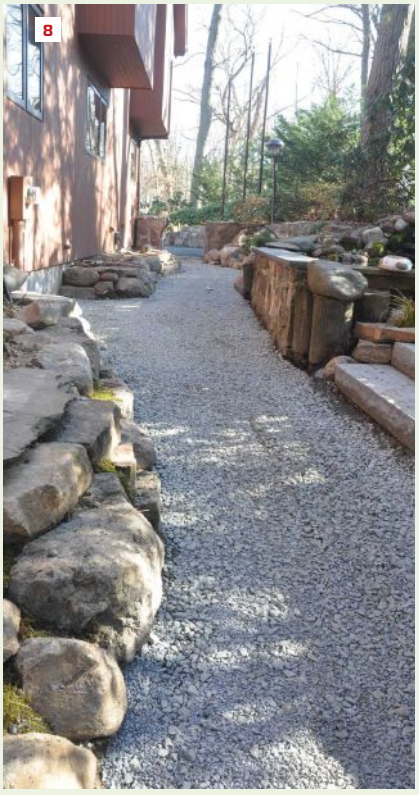
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CREATING A LEVEL BASE

A well-prepared base and a perfectly leveled bedding layer are preconditions for a neat installation. The design of the gravel base depends on the site, soil, and climate to ensure good drainage and stable conditions for setting pavers.

The first step was to complete the steel edging. Where new edging was needed, the crew used two different installation methods. For the patio and west walk, they placed some base gravel, installed the edge plates at the correct elevation, and added the remaining gravel. For the east walk, they set the pavers on a wide gravel base before embedding the edge plates into the gravel. Then, they removed the gravel outside of the plates.

The second option proved less than ideal: Pounding down the edge plates after the tiles were in place caused voids to form below the tiles' edges. Those tiles had to be lifted out with a spreader tool, the gravel leveled, and the pavers reset **(9)**. The crew had a stable substratum to work from, on which we added a base layer of clean, open-graded ¾-inch gravel, compacted in layers. This was topped with a 1½-inch-thick bedding layer of ⅜-inch split gravel.

Workers had already used a transit to ensure that the edge plates at the patio periphery were all at the same level. When it was time to level the gravel, they wrapped strings around the plates and stretched them from one side of the patio to the other. They worked pipes into the gravel, checked the pipes' elevations against the strings, and added more gravel in spots where it was needed to level the pipes. They then used a 2-by as a screed, pulling it across the pipes to level the gravel. Finally, they removed the pipes and filled the grooves where the pipes had been **(10)**.

LAYOUT AND TILE SETTING

For a modern look, the author arranged the tiles in a simple grid pattern.

The starting line for the patio ran perpendicular to the house foundation toward the gate pillars in the stone wall **(11)**.

After setting the first paver **(12)**, the crew set the rest of the first row of pavers along the starting line **(13)**. Additional rows were then installed **(14)**.

For the west walk, the starting line ran along the retaining wall in front of the fish pond **(15)**.

For the east walk, the starting line ran along the basement stairwell **(16)**. When calculating the accumulated length of installed pavers, we needed to work with the rectified paver dimensions (which are less than the nominal dimensions) and add the joint spacer width.


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pavers look and feel like granite and have a textured, anti-slip surface. They're rectified for precise installation; putting them in place is more like tile setting than like installing typical hardscaping. They also weigh just 36 pounds each—compared with 108 pounds for a 2 1/4-inch-thick concrete paver—so they can be handled by a single worker (caesarceramicsusa.com).

With the exception of a short stone wall in front of a 100-square-foot fish pond, the walkway on the west side of the house had been edged mostly with wood poles. Eight-inch-diameter landscaping poles ran along the edge next to the house, and salvaged power poles ran along the opposite edge at the base of a small hill. The poles were deteriorating, so we decided to remove them and use natural stone instead. For the hill side of the walkway, I sketched a design using boulders with small plantings between them.

The edges of the patio and walkways would be lined with powder-coated steel edging, which can be bent around curves and held in place with long stakes. This type of edging was already in place along a stone wall that surrounded the back patio, but we had to extend it vertically because the new surface would be higher than the old one (see photos 3 and 4 on page 41). The metal makes for a neat look (the pavers need not be cut to fit the irregular stone wall surface) and creates a gravel drainage channel between the tiles and retaining walls.


17


18

All four corners of each paver need to be set onto spacer plates **(17)**. These consist of a 6-inch-diameter plate to set the pavers on and 1/8-inch stub-ups for spacing joints. They can be cut into halves or quarters **(18)** as needed.

THE IMPORTANCE OF SPACERS

Paver setting is precision work, but the use of plastic spacer plates where the corners of the pavers intersect makes it relatively easy (see photos, above). The spacers need to be pushed snug against the edge of a paver before the next paver is put into place. The crew used rubber mallets at the paver corners to sink the thin spacer plates into the bedding gravel until the entire paver rested firmly on the gravel. This ensured that there would be no "hollow" sounds when someone walked on it.

If the surfaces of adjacent pavers aren't perfectly flush, hammering them with a rubber mallet may solve the problem. Otherwise, it may be necessary to lift the paver, level the gravel, and reset it.

We filled small gaps between pavers and steel edging with TEC slate gray sanded Caulk 850 from a cartridge. This helped secure the paver periphery, especially in spots with small cut pieces.

FINISH AND MAINTENANCE

After completing the paver installation, I built new steps to the


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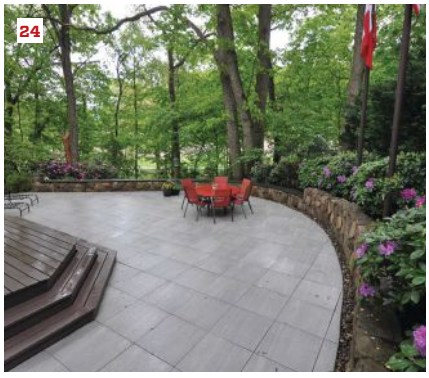
CUTTING PAVERS

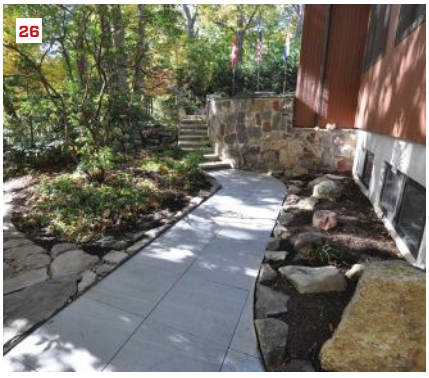
With the right tools and a bit of practice, we were able to cut the outdoor porcelain pavers with ease. For clean, precise cuts, we used a continuous-rim diamond cutting blade. For curved cuts, putting the blade on a hand-held tile saw or an angle grinder worked well **(19)**. For linear cuts, we used a diamond blade on a table saw.

The smooth steel edging allowed a close fit with simple paver cuts. Where tiles needed to be cut to fit irregular stone walls, we made cardboard templates and transferred the lines to the paver **(20–22)**. The cut tiles were set in a masonry adhesive added to the spacer plates.

Wet cutting is best. Dry cutting porcelain stoneware creates a crystalline silica dust that's harmful if inhaled, especially with prolonged exposure. Proper respiratory and eye protection need to be worn. In fact, my contractor started dry cutting with a gasoline-powered saw and a large-diameter blade but stopped when it spread too much dust into the air and caused some paver chipping.

Switching to a wet tile saw with a 4-inch continuous rim blade produced clean cuts and solved the dust issue **(23)**. Be aware that the sludge that forms during wet cutting may obscure the cut mark. A solution is to dry-scar along the cut mark and then turn on the water for cutting.





To finish the job, the author and crew rebuilt the steps leading to the deck **(24)** and added plants and new rocks along the walkways **(25–27)**. Over time, the drainage spacers between pavers may accumulate debris and need cleaning **(28)**.

existing redwood deck—three steps on three sides, as shown in photo 24, above, and the photo on page 40.

Gaps between the new pavers and the stone walls were filled with river stone or pebbles, depending on the location. We added plants, which also help hold the soil in place, to the "stone hill" next to the west walkway.

At the east walk, large stones on the raised bed along the house provide a minimalist look. Salvaged flagstone was reused for the beginning of a nature walk leading to the adjacent woods. All disturbed areas were restored.

Porcelain stoneware pavers require minimal maintenance. They are nonporous, do not need sealing, and do not stain like natural stone or concrete do. They're easily cleaned with a garden hose, and dirt can be scrubbed off with a bristle broom and flushed with water. If cleaning products are used, make sure they don't leave a residue behind that could aid dirt adherence. For power washing, a modest pressure setting with a wide-angle nozzle spray is suggested.

I decided to leave the narrow paver joints open for drainage. Over time, debris may accumulate in them, but it can be removed using a shop vacuum with a narrow nozzle guided along the joint. If necessary, caked build-up may be scraped loose with a saw blade.

BOTTOM LINE

As my first project with porcelain stoneware paving, this was a learning experience for all involved. I carefully planned the project, prepared detailed drawings, determined and ordered the paver and spacer quantity, wrote specific installation instructions for the subcontractor and crew, and provided guidance where necessary.

I can't stress enough how important the preparation of the base, the edging installation, and the leveling of the gravel surface are for a successful project. The use of corner spacers makes for a perfectly aligned and level surface.

The result of this project is that the original rustic look has been replaced with a modern appearance for a moderate cost. In the unlikely event that a paver gets damaged, it can be simply lifted out with a spreader tool and a new paver set in its place.

Ernest Mueller renovates homes in East Brunswick, N.J.

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Zonda Media

BY VINCENT SALANDRO

1. Sustainable Wood Cladding

Accoya siding is made of FSC-certified wood that has undergone an acetylation process, promising durability, sustainability, and low maintenance. According to the manufacturer, acetylated wood is rot-resistant without containing biocides or harmful chemicals and is likely to stay free of any visible distortion over its lifetime. The siding takes a range of finishes, including Shou Sugi Ban, and comes in custom board sizes and profiles. Left unfinished, the wood will weather naturally. accoya.com

2. Fresh-Air Intake

InOvate Technologies launched FreshVent to help meet the ventilation needs of energy-efficient homes. The 4-inch-diameter (6 1/2-inch-square outside dimension) vent port features deep-draw 22-gauge galvalume steel construction, powder coating, and high-strength magnets for reliable closure. A low profile helps it blend in on exterior walls as it provides fresh-air intake for HVAC systems. Available in four standard (as well as custom) colors, FreshVent is also suitable for outward-venting kitchen and bath systems with built-in dampers. It costs about $45. freshvent.com

3. Fluted Vessel Sink

Ruvati's Cordona collection is crafted from the manufacturer's epiStone material, a blend of crushed stone and minerals bonded with a proprietary resin. The 3 5/8-inch-deep vessel-style sink basin (pictured) measures 19 inches by 14 inches, has a nonporous, easy-to-clean surface, and retails for $436. A matching tub is also available. ruvati.com

4. Impact-Rated Glass

Therma-Tru's impact-rated, full-light, flush-glazed glass designs for its Smooth-Star doors offer a clean aesthetic and abundant daylight. The glass is built directly into the fiberglass doors with a dual-adhesive weather seal, reducing the potential for air and water infiltration. The EnLiten flush-glazed glass is engineered to withstand extreme weather conditions and is available in privacy and textured, energy-efficient low-E, and a selection of simulated-divided-light styles. thermatru.com

5. High-Strength Aluminum Siding
CertainTeed's Urban Reserve Siding is manufactured from high-tensile-strength aluminum at a 0.027-inch thickness and coated with a two-coat system that includes a baked-on corrosion inhibitor. CertainTeed says the siding will not rust or rot and is resistant to extreme cold, heat, rain, fire, and UV exposure. The siding is available in nine smooth, fade-resistant solid colors in black, gray, brown, and white hues. certainteed.com

6. Thermal Steel Windows
Hope's Windows says its "Thermal Evolution" technology provides superior thermal efficiency without compromising the slim profiles of its windows. To achieve this, a thermally resistant fiber-reinforced polymer (FRP) isolator is precision-manufactured to nest within Hope's traditional hot-rolled solid steel frame profiles and structurally bonded to the steel frames. The configuration is available for the Landmark175 Series and the Old World Suite product lines, with either true or simulated divided-light muntins. hopeswindows.com

7. Enhanced Butyl Tape
Trex has updated its Butyl Tape for RainEscape with Clean-Edge Butyl Tape. The tape is integral to the manufacturer's under-deck drainage system, which employs troughs and downspouts to capture water and divert it away from the deck, creating dry, usable space underneath while protecting the foundation from moisture penetration. Once the troughs are installed, the self-adhesive, waterproof tape is applied to create a watertight seal between the trough overlaps. The tape also seals around deck screw holes to help to prevent rust and corrosion. A 4-inch-by-50-foot roll sells for approximately $65. trex.com

8. Ridge Vent and Weather Block
Westlake Royal Building Products' Dryroll is a universal ridge vent and weather block designed to safeguard a roof from the elements. With its rollable installation, Dryroll reduces unappealing field vents and roof penetrations. Equipped with stretchable aluminum sides and butyl strips, Dryroll seals the ridge and hip areas of the roof, repelling wind-driven rain and snow while also providing airflow and 15.6 square inches of attic ventilation per linear foot. westlakeroyalroofing.com

9. Discreet Deck Clips

Deckorators designed StealthLock Universal Deck Clips to fasten the manufacturer's grooved Surestone, composite, PVC, and hardwood deck boards to joists without leaving visible screw heads on the surface of the deck. According to Deckorators, the clips "work seamlessly" with Camo installation tools. The preassembled, one-pass fasteners come in 90-, 450-, and 900-count packages; we found a 450-count box, which covers about 250 square feet, for $260 online. deckorators.com

10. Fast-Install Railing

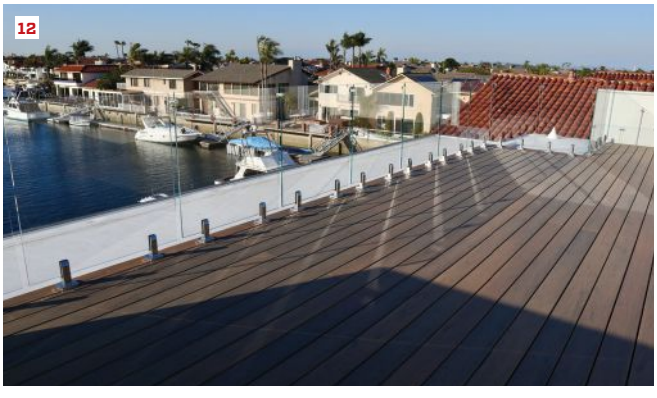
To speed up and simplify railing installation, Envision preassembles the brackets, balusters, and rails that make up its E-Fit Railing Innovations FastFit components. For posts, choose either black aluminum 3-inch-square structural posts with premounted brackets and threaded levelers in the base or white vinyl 4-by-4-inch post sleeves with quick-mount brackets. Preassembled panels are available in textured black aluminum or white vinyl, both with square balusters. Caps and trim are sold separately. envisionoutdoorliving.com

11. Whole-House Air Quality

Panasonic has begun marketing its residential ventilation and heat pump products (both mini-split and central systems) as Oasys, a "holistic home comfort" solution. Organized around a new website that focuses on "green living," Oasys combines a select group of energy recovery ventilators and heat pumps with specific point-of-use exhaust fans, filtration, and control products—all the components needed for marrying dedicated, continuous whole-house ventilation with heat-pump space conditioning. oasys.na.panasonic.com

12. Solid to See-Through Glass Railing

A layer of Polymer-Dispersed Liquid Crystal (PDLC) technology within a conductive coating enables users to control whether the glass in IG Switch Frameless Glass Railing is transparent or opaque. Users can toggle between opaque white with 88% privacy to 88% visual light transmission with the touch of a button. According to the manufacturer, the glass blocks 99% of harmful UV rays in its opaque white setting. The PDLC interlayer has a 50,000-hour estimated life cycle. igrailing.com



Festool Planex Sander and Cleantec Dust Extractor

BY MYRON FERGUSON

When you're doing drywall work, dust happens; it's part of the process. Nobody likes the dust, and other subs dread sanding day. It's important to be professional and try to reduce the amount of airborne dust by capturing as much of it as possible and then thoroughly cleaning the jobsite when you're done. That also needs to happen quickly for the job to progress. Using a power sander to help speed up the sanding process and capture the dust as you go can help, but the tool must be easy to use. If it's cumbersome, heavy, hard to use, or too aggressive, or it leaves too rough of a finish, it will cause more problems than it solves.

When I received the Planex sander (LHS 2-M 225 EG) and the CleanTec vacuum (CT36 E AC) from Festool, I was hoping for something with significant improvements, as I've been using the Festool sanders for years. I have been happy with those sanders, but I was hoping for a chance to report on an even better one. So, I was pleased with this new version. The dust extraction was exceptional, and I found myself sanding without even wearing a dusk mask—although I still recommend wearing one. I also liked that it's lightweight and that the weight is even reduced because of the superior suction to the wall (the suction is adjustable).

If I were to compare power sanders with pole sanders, I might be concerned with the additional weight of a power sander. But that isn't an issue, because all I'm doing is moving the tool from one place to the next—the tool is doing the sanding work. When using a traditional pole sander, you must apply continuous pressure as you're moving it along the surface, which I have always considered good exercise, but enough is enough and time is money. I found using power sanders is as much as 30% faster than pole sanding.

This new sander design has a lot more holes in the sanding head, so you can't use the old papers on the sander, or, at least, you shouldn't—so that it works at its best. Those numerous and smaller holes help collect more dust compared with older models. Another feature of this model is that instead of using just a rotating head, it has a random orbit sanding motion, which helps reduce any scratches that you might cause with a typical power sander. One thing to keep in mind is most of us are using lightweight compounds for the final coat, so be sure you're not using too coarse of a sanding grit. I usually go with a 220-grit sandpaper.

At first, I wasn't too sure what I thought of the handle having a T-grip on the end, but it turned out to be handy. It is necessary to

The CT36 dust extractor comes with a removable cradle for holding the sander when not in use. The top of the extractor will also fit the Festool Sustainer boxes **(1)**. While the T-handle may feel odd at first, its position makes sanding overhead much more comfortable **(2)**.

Photos by Myron Ferguson

use the attachment that holds the hose and power cord away from your hand. I didn't attach this at first, and it seemed like the hose and cord were always getting wrapped around my arm, so that's a feature you're going to want to take advantage of.

The number one concern I have when using any power sander is how much dust control it has and, here, the Planex exceeded my expectations. Also, I used the unit with a Cleantec dust extractor vacuum, which does an excellent job. It has an auto-clean system that cleans the filter as you work to maintain suction. This was the first time I used the plastic bags that fit inside the Cleantec to capture dust; all you need to do is unhook the bag and throw it out when it's full. While I think it's good feature, when I run out of the bags, I probably won't replace them. I just dump the dust into the garbage from the vacuum. You have your sanding tool, you have your dust extractor, and then you can use the cleaning kit for the vacuum to clean the floors, electrical boxes, and around windows and door cutouts. I liked using the complete system.

If I'm going to have a complaint, the hose and cord for the sander are too short for my taste. I always attach an extra cord, and I buy an extra hose and connect it to the one that comes with the tool so I have twice the length. I don't want to be dragging the dust extractor along with me; I want to put it in the center or corner of the room and sand that whole room without having to pull it along. I believe Festool makes an attachment sleeve for attaching two hoses together. I didn't have one of those, so I just taped the hoses together—that has worked fine over the years for me.

Another concern is whether the new Planex with the smaller holes will work for popcorn ceiling removal, like my older sanders do. That I will have to test; for now, I will be using this new sander just for drywall sanding.

The Planex is high-quality tool with an overall length of 55 inches, which is fine for me reaching an 8-foot ceiling. I know if I'm sanding a 9-foot ceiling, I might not be happy with the reach. So, I may end up getting on my stilts when I'm working the higher ceilings.

Sanding day is typically the last day of the drywall job, which makes the sanding a little more rewarding because hopefully the following day, we're going to be starting a fresh job. I used to say that drywall dust is like money in my pocket, and I guess I meant that we're finishing up the job, and it's time to get paid. Nobody likes the dust, dust in the air, dust on everything … this tool helps make managing it a lot easier.

As an afterthought, I want to add that I like the lighter duty electrical cord on the Cleantech. On my older units, the cord is too heavy.

The Planex LHS 2-M 225 EQ sander sells for $1,000; the Cleantec CT36 E AC dust extractor, $990. festool.com

Myron Ferguson is a drywall and home-performance contractor in Middle Grove, N.Y., and a presenter at JLC Live. See his website at thisisdrywall.com and follow him on Instagram @thatdrywallguy.

PRO TIPS FOR DRYWALL SANDERS

JLC asked Myron to give us his pointers for using a powered drywall sander. This is what he suggests:

- **Don't run the tool at full speed and full suction.** Medium speed is less likely to cause oversanding, while too slow a speed will not work well at all. If you have too much suction, it will be hard to move the sander around as it sticks to the surface.

- **Keep the sander moving, always.** If you hold still on a section, you will oversand. Steady, sweeping movements are best for both finish and speed of work.

- **Start the sander near the compound and move to it.** If you start directly on the compound, you can cause swirls and gouges as the tool starts up. As you finish an area, pull off away from the seam or compound.

- **Have good lighting.** While this advice is not just for a power sander, it's best practice to have the area well lit. If you can't see your work, you will miss something. The sander has a built-in light, which is great but not a substitute for good overall lighting.

- **Don't go deep into the corners.** Getting too close to the edges of the ceiling or walls will cause you to dig into the other surface, meaning more touch-ups.

- **Know your surface.** Check the compound before you start. If it is soft, then be sure to start with a softer grit and begin in a less obvious area to test. Being too eager will create more work later.

- **It's not a magic wand.** The tool may not get everything, so a light pass with a pole sander will probably be necessary. This also gives you a chance to check your work to see if it needs more sanding or mud.

Cordless Microwave Oven

BY JAMES BURGESS

Makita's microwave runs on batteries.

The new Makita microwave (MW001GZ 40-volt Max XGT) is one of the more unique cordless tools out there; none of the other tool brands out there seem to sell one.

As a microwave, it works great. With one 40-volt battery, you get about eight minutes at its full 500-watt capacity. Or you can use two 40-volt batteries and get about double that. Though its max power is about half that of a conventional microwave, it's still plenty of power to warm up last night's stew; it'll just take a bit longer to get hot. Other than leftovers, the one thing tradespeople are interested in heating up is their cup of coffee. For that, you are going to need a regular-size microwaveable cup to fit in the unit.

For what seems like a large enough appliance, it has a small oven: 10 by 9 1/2 by 4 inches. That's just big enough for a frozen microwavable meal and short containers.

Features include a USB port for charging other devices; a low-battery alert; a sensor to turn off the microwave if it tips; a simple-to-clean interior; and an LCD display with easy-to-use controls. The fold-flat carry handle makes the microwave easy to move around; it weighs about 20 pounds without batteries.

Having the unit on site certainly got a lot of attention. Everyone who saw it had questions and wanted to give it a try. For around $800, it's a pricey conversation starter. For me, it doesn't solve a problem that I couldn't fix with a cheap, second-hand microwave. While it is innovative and was fun to try, I can't justify putting it on my wish list.

However, if you are running the 40-volt line of batteries and are on the road or not near a plug, this microwave could be a nice benefit for your crew. A hot meal from home on a cold day always feels like luxury on site. And, as with the rest of Makita's lifestyle line, it could also be handy for camping or another off-grid activity.

James Burgess is a carpenter and cabinetmaker in Ottawa. Follow him at @jbcwoodwork.

Work Pants That Work

BY MARK CLEMENT

During my tenure with *JLC*, my primary influence was Don Dunkley, author of many *JLC* articles and a progenitor of JLC Live. If there is one word to say about Dunk, it could be efficiency. As a framer, he was ruthless in rooting out wasted motion or time. That brings me to the Brunt Martin work pants that I've been wearing—and trying to wear out (see photo, right).

They embody Dunk.

The pants have no flaps, velcro, "cargo" pockets, loops, or pen holders—not a lick of wasted motion. All storage points are easily accessible, front and back. The belt loops make sense. The thigh pockets are awesome for wallet, keys, and phone. They have a hidden, double knee layer. The pants fit and move when I move in all kinds of weather.

During my testing of the pants, I demoed a bathroom, built a few decks, and dry-stacked a stone wall. On one particularly low deck that had what I call "critter countermeasures," I spent several days on my knees trenching around the bases of two 16-by-18-foot platforms and integrating chicken wire with the deck structure. The Martins show no signs of wear.

I also wore the Martins (with a base layer) while doing snow removal on my tractor in 20°F weather. In all cases, the durable water repellent (DWR) finish provided a protective layer that prevented me from getting soaked. I didn't know these pants even had the DWR when I was wearing them, but it made a noticeable difference in my comfort level.

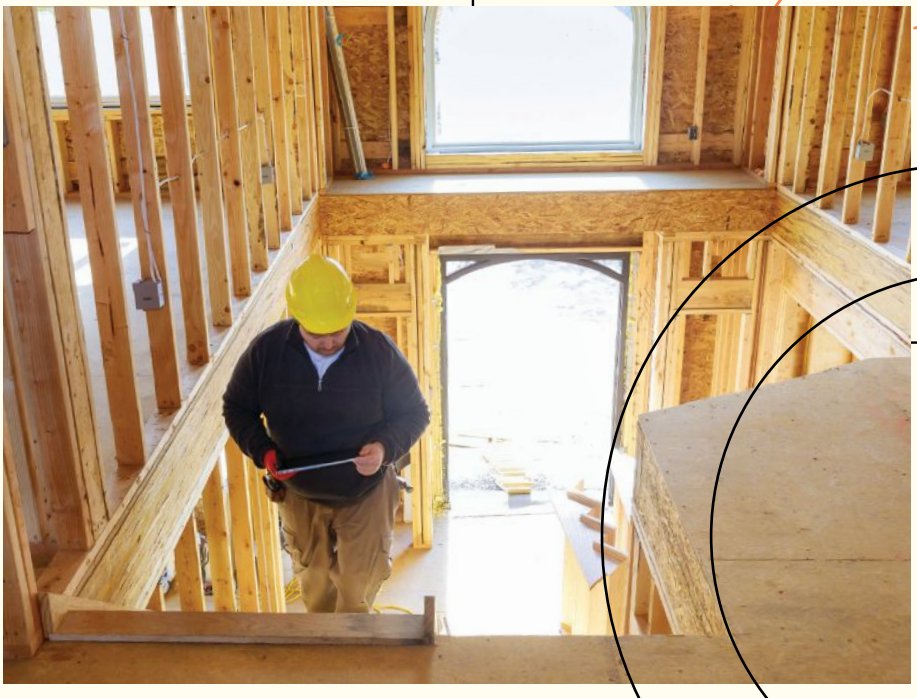
For everything from crouching to shoveling snow off a stoop to picking up another scoop of shattered tile from a bathroom floor to sitting in the truck while running from home center to client meeting back to the current job, they're comfortable. They bend, they flex, they breathe—and they don't cost a million dollars. No motion wasted in delivering maximum motion. Dunk approved. The pants sell for $80. bruntworkwear.com

Mark Clement is a deck builder and remodeler in Ambler, Pa. He's the author of The Carpenter's Notebook. *Follow him at @myfixituplife.*

Photos: top, Marc Forget; bottom, courtesy @MyFixItUpLife

JLC

The Journal of Light Construction



JLConline.com offers sound technical advice, practical how-to articles, roundtables with industry experts, as well as networking opportunities.

Zonda Media

BY MARK LUZIO

Will The Circle Be Unbroken?

Editor's note: Sadly, renowned stair builder Jed Dixon died on November 29, 2024. A few days after his passing, cabinetmaker Mark Luzio (who first introduced us to Jed in 1995, jump-starting Jed's long tenure as a contributor to JLC *and JLC Live) sent us this essay, which we offer to the* JLC *community as a fitting tribute to a dear friend and mentor.*

In 1907, Ada Habershon published the gospel hymn *Will the Circle Be Unbroken*. The first commercial recording of it was made years later, in 1935, by the Carter Family. Then, in 1972, the young musicians in the Nitty Gritty Dirt Band released an album with this song as the title track, collaborating with older legendary country/bluegrass players to perform traditional songs. The album was very popular and introduced young people to these great players from the recent past. The song laments the loss of a mother and implies that if we are good and righteous, we may be rewarded by meeting her again. Over time, that 1972 recording and many subsequent performances helped layer on an additional meaning to the song—the passing on of skills, musicianship, or craftsmanship to the next generation.

Appropriately, for the band's farewell concert in November 2024, it played *Will the Circle Be Unbroken* at the Ryman Auditorium in Nashville, considered the home of country and bluegrass music. For many years, that building had lain dormant and unused. In the 1980s, it was slated to be demolished but was saved, and the entire interior was rebuilt as a modern concert hall by 1994. During the renovation, the carpenters were asked to cut out a large circle from the original wood floor and inlay this "Dutchman" in the new stage floor as a tribute to the many performers who came before.

This song came to mind as I was studying a photo (above left), circa 1886, of seven carpenters with their tool chests. These chests were designed to be transported to jobsites by wagon. At left is a small wooden box, and in it is a Stanley 45 molding plane that was first sold in 1884. The crosscut and miter-box saws were important tools and are front and center. The tools that look like small drill presses were for cutting mortises in large timbers; the carpenters sat on them and rotated the crank arms to bore holes in the timbers and then squared up the mortises with the large chisels on the far right. The large planes were their only way to create long, straight edges on floorboards, corner boards, and all types of interior trim. The overall feeling of the photograph is the pride that the carpenters show for their "tools of the trade."

This old photo in turn struck me as remarkably like another photo (above right), taken outside a custom wood shop in Boston. The date is 1976—90 years after the earlier picture. The eight men and one woman pose with their tool chests—all suitcase-style chests common in the Depression era. You could still buy these, often with a few surviving tools inside, at flea markets and junk shops in the 1970s. The practice then was to make your own copy of this style of chest and fill it with new and antique tools of the trade.

I was 23 in 1978, working in New York City and carrying my own suitcase toolbox on the subway. I met the man in the center holding the shop dog, Sam, about eight years later when I moved my wood shop up north. His name was Jed Dixon, and he eventually became a presenter at JLC Live and wrote numerous articles for *JLC* and *ThisIsCarpentry.com*. Jed built some of the finest and most difficult curved stairs in Boston. I worked with Jed on some of his stairs and, for 40 years, his input and knowledge helped me with some of the most complex curved paneling jobs that I took on in my shop. I spent hours at his dining room table reworking my shop drawings. Jed never wavered when it came to sharing his knowledge, drawing myself and countless others into the circle of building knowledge.

In this age of stackable plastic toolboxes, I doubt many new carpenters build their own toolboxes. But I'd like to think there are a few who might be inclined to craft their own suitcase-style tool chests and collect a set of old and new quality hand tools. Think of it as a rite of passage, a commitment to your trade, and an acknowledgment of an unbroken circle of building knowledge that brought us where we are today.

Photos: left, courtesy Jim Bode; right, Steve Horn

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