

KNOW THE CODE: 3 WAYS TO VENT A KITCHEN ISLAND

FineHomebuilding

DESIGN • BUILD • REMODEL

New Windows for Old Homes

When insert units make sense—and when they don't

PAGE 36

Clever fix for sagging floors

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New and noteworthy products

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Built-up moldings, step by step

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¹ Based on comparing written limited warranties of leading national wood window and wood patio door brands. See Pella written Limited Warranty for details, including exceptions and limitations, at pella.com/warranty, or contact Pella Customer Service at 877-473-5527.

² Performance solutions offering an unbeatable combination of energy efficiency, sound control and value require upgrades to triple-pane, AdvancedComfort Low-E and mixed glass thickness. Based on comparing product quotes and published STC/OITC and U-Factor ratings of leading national wood window and patio door brands.

³ Performance solutions require upgrades to triple-pane and AdvancedComfort Low-E. Window energy efficiency calculated in a computer simulation using RESFEN 6.0 default parameters for a 2,000-square-foot new construction single-story home when comparing Pella Lifestyle Series windows to a single-pane wood or vinyl window. Double-hung windows are not available with triple-pane glass. The energy efficiency and actual savings will vary by location. The average window energy efficiency is based on a national average of 94 modeled cities across the country with weighting based on population. For more details, see pella.com/methodology.

⁴ Performance solutions require upgrades to triple-pane and mixed glass thickness. Reduction in sound based on OITC ratings of Pella Lifestyle Series windows to a single-pane wood or vinyl window with an OITC of 19. Double-hung windows are not available with triple-pane glass. Calculated by using the sound transmission loss values in the 80 to 4000 Hz range as measured in accordance with ASTM E-90(09). Actual results may vary.

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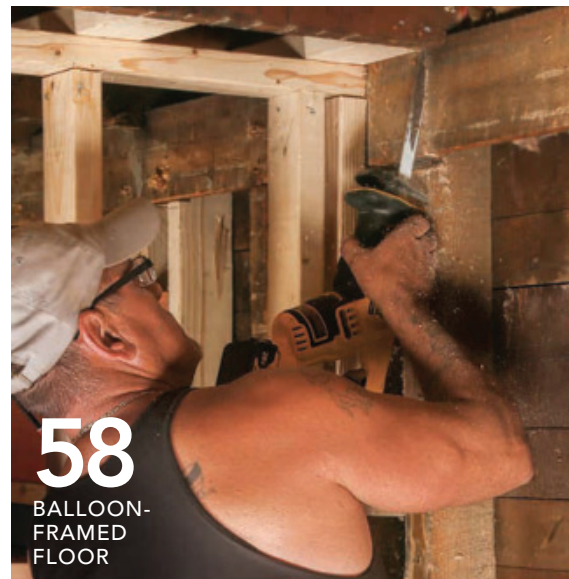


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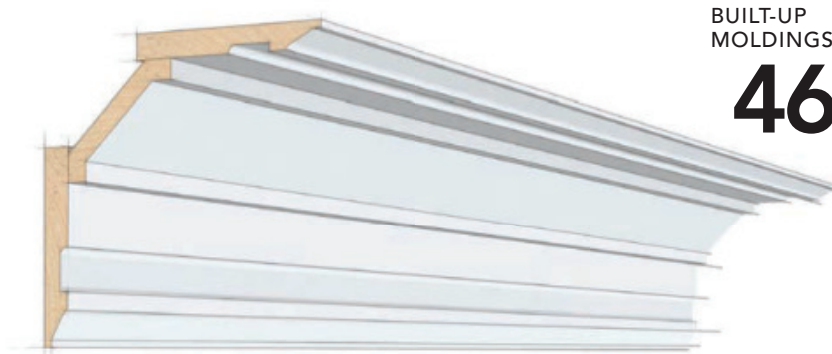
BY JASON BLACK



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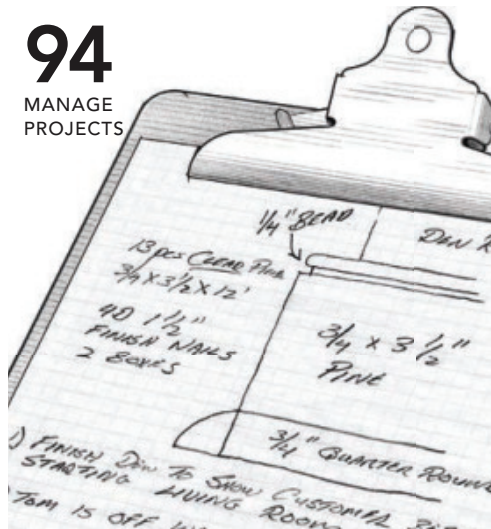
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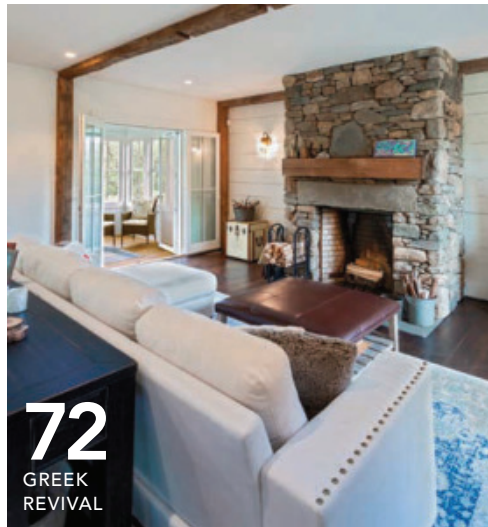
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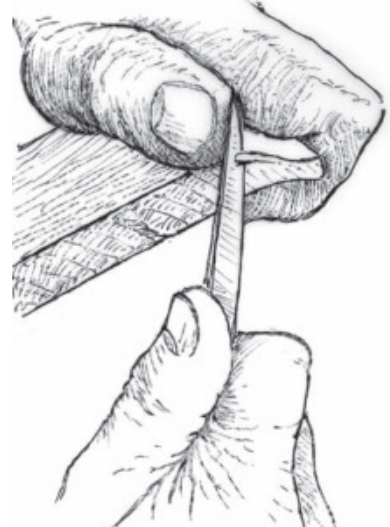
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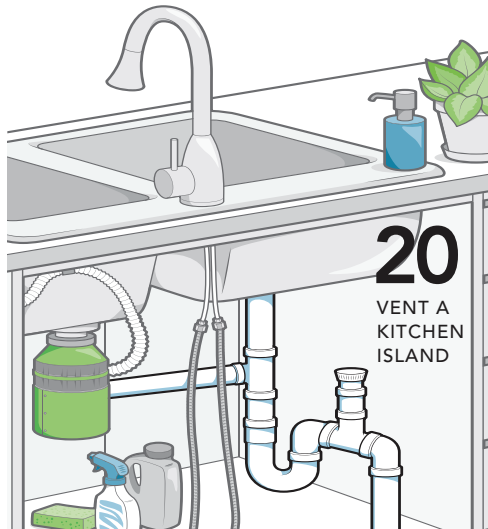
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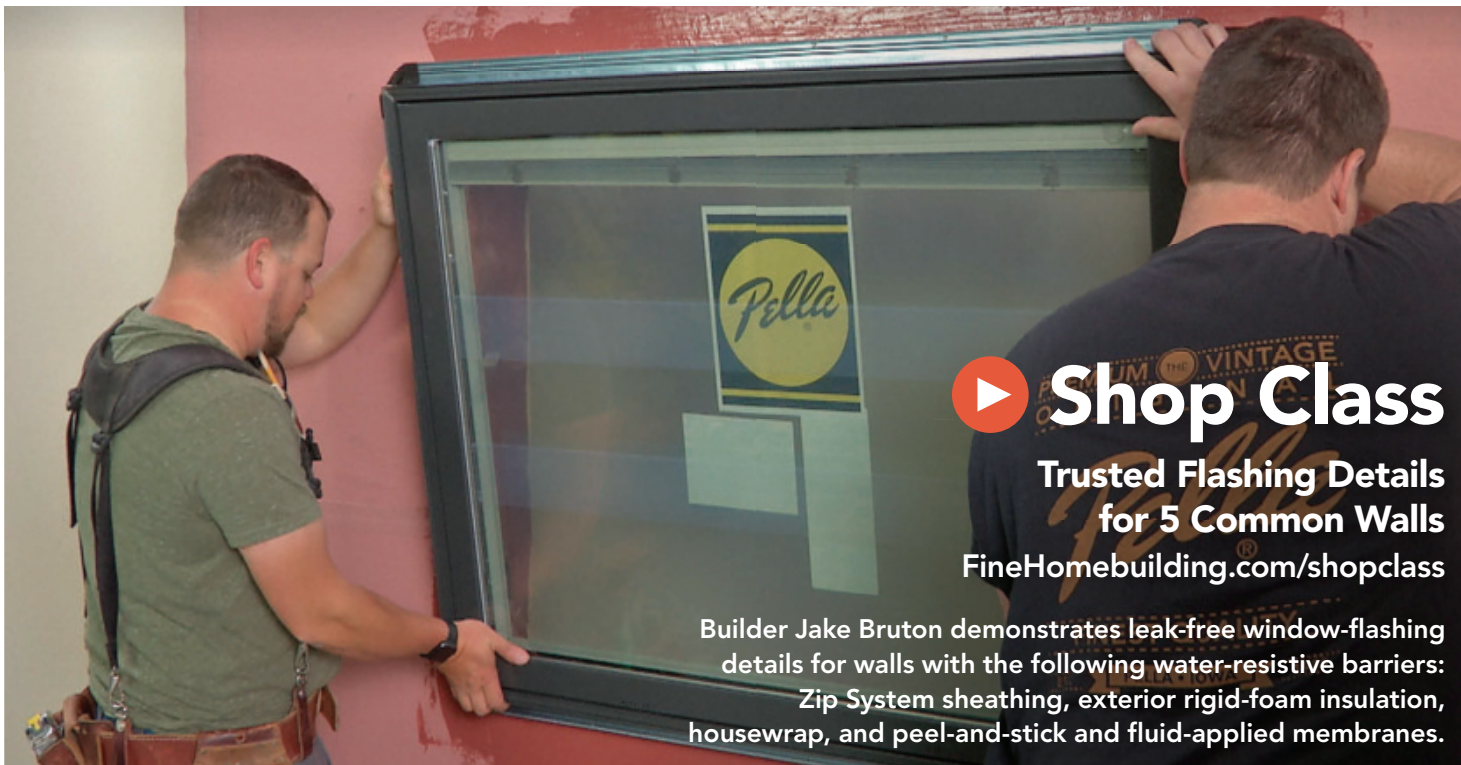
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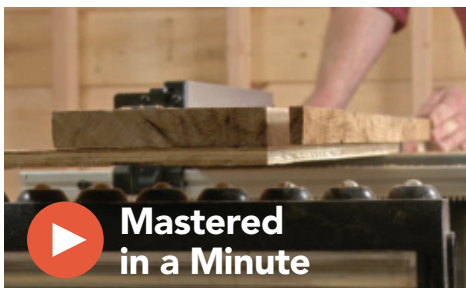
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Builder Jake Bruton demonstrates leak-free window-flashing details for walls with the following water-resistive barriers: Zip System sheathing, exterior rigid-foam insulation, housewrap, and peel-and-stick and fluid-applied membranes.



Mastered in a Minute

Securing a warped piece of wood onto a perfectly square guide board is the key to safely ripping it on a table saw. Give us a minute and we'll show you how.



Ep. 192: Creating a garage workshop

The crew hears from listeners about bogus blower-door results and steel siding, then discusses the best way to convert an uninsulated garage into a comfortable woodshop.



FHB House: Final Finishes

Read about the last stage of the Louisville, Kentucky, build on pp. 64-69, then take a visual tour of the exterior and interior finish details at FineHomebuilding.com/fhb-house.



Kitchens by Design

Get an up-close look at the details that go into designing and building exceptional kitchens in this new collection of online articles at FineHomebuilding.com/design



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contributors

THE VOICES OF EXPERIENCE



BRENT KELOSKY ("Patching a Hardwood Floor," pp. 42-45) is president of Wood Floor Designs, Inc., a second-generation family business in Koppel, Pa. Recognized as a leader in the industry, Brent has received the NWFA Craftsman degree, the NWFA Advanced Installation and Refinishing certification, and the Certified Craftsman designation from Bona. He works closely with architects and designers on both residential and commercial projects.

IAN SCHWANDT ("Tools & Gear," p. 26) is a 2005 graduate of the Southeast Wisconsin Carpentry Training Center. Since relocating to the Northeast in 2007, he has completed projects ranging from hospital operating rooms and new commercial construction to historical restorations, renovations, and custom woodworking. Ian works to keep craft alive by teaching the historical traditions of the carpentry trade and job-site mathematics.



A background in the arts and experience as a woodworker led **JOHN HARTMAN** to a career as a technical illustrator creating scientific, medical, and how-to illustrations; architectural renderings; and 3D animations. He recently contributed illustrations for Nick Offerman's *Good Clean Fun* and Michael Pekovich's *The Why and How of Woodworking*. John's illustrations appear in numerous issues of *Fine Homebuilding* magazine (see "Ask the Experts," pp. 84 & 86).

NOAH RACETTE ("Ask the Experts," p. 88) entered the HVAC field 15 years ago and was fortunate to learn manual sheet-metal layout and fabrication from an old-timer. Noah has worked on everything from geothermal systems and custom residential ductwork to large commercial and industrial systems including furnace exhaust ductwork and industrial dust collection. He currently works as the install supervisor for Logterman Heating and Cooling in Delavan, Wis.



write an article

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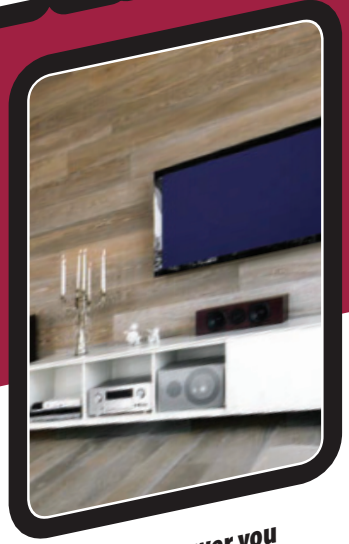
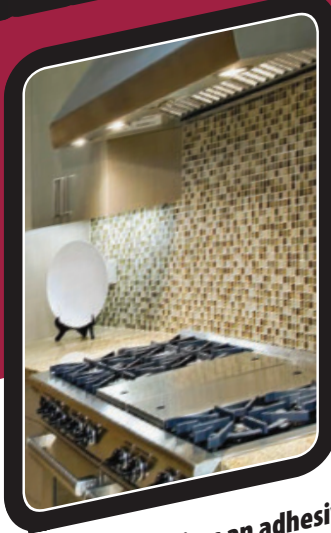
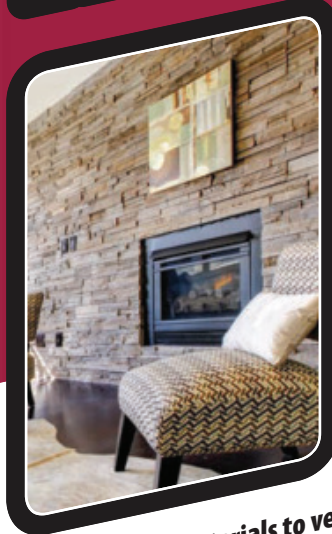
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—JUSTIN FINK
editorial director

Kudos on flipping

I just read the article "House-Flipping How-Tos" (*FHB* #284) and loved it! As many folks likely have as well, I've watched my fair share of house-flipping shows and always wondered what the reality is for those doing it for real ("IRL" as the kids would say). Sean Groom's article was very insightful and an interesting departure from the typical *Fine Homebuilding* content. Thanks!

—RYAN
Redondo Beach, Calif.

What about good old fashioned tar paper?

I was reading Brian Pontolilo's article in *FHB* #285 about all the various water-resistive barriers available, but noticed you didn't include tar paper. If installed correctly, I see nothing wrong with this approach—I have seen this in houses 90 to 100 years old with no problems. Why do we have all this high-tech wrap that oftentimes fails? Tar paper works well, is time-proven, and is cheap. Maybe I am just an old curmudgeon who can't see changing?

—GORDY P.
Seattle

Brian Pontolilo replies: I wouldn't call you an "old curmudgeon" for continuing to use "tar paper" as a water-resistive barrier (WRB). I would only caution that "tar paper," by which I think you mean "felt paper," has become antiquated, and that many of the products available off the shelf today are not what they once were. The only way to be sure that you are buying a product with enough integrity to use as a WRB is to

look for the ASTM D226 rating, which the International Residential Code calls for.

While there will always be a risk when using a new product, and there were some well-documented failures in which early WRBs were damaged by surfactants, I am not aware of any other wholesale WRB failures. In any case, for any WRB (including felt paper) to perform to the best of its ability, you should be installing your siding over a rainscreen gap. If you haven't incorporated this detail into your homes, you may be at risk of becoming an "old curmudgeon" after all.

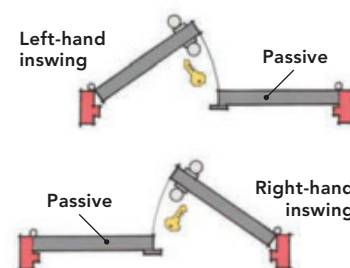
Locked in on the details

While looking at the sketches clarifying door swings and handing designations in "The Ins and Outs of Exterior Doors" (*FHB* #284), I loved seeing the inclusion of a key to help designate which side is the exterior. However, I started to rub my eyes and wonder if I wasn't seeing things correctly. It appears as if the two sketches titled "Left-hand inswing" and "Right-hand inswing" actually show the key on the wrong side of the door. Was there an error in these sketches, or have I been installing locksets wrong these past years?

—JON A.
via email

Creative director Rodney Diaz replies: We scrutinize every piece of art in the magazine in multiple stages—first the preliminary art supplied by the authors, then the illustrators' rough drawings, then the final art, and finally the color proofs of every page. And yet, I didn't

see that the keys were on the wrong side until this issue came back from the printer, when I thumbed through and immediately noticed the mistake. Kudos to you for paying attention to the minute details. Here are the accurate drawings:



Foam it from the top down

In "To vent or not to vent?" ("Ask the Experts," *FHB* #285) A homeowner asks if they should vent a hipped porch roof that now contains enclosed living space. Mike Guertin recommended removing the ceiling to spray foam and then removing the roof to address flashing, as a roof leak with spray foam can be catastrophic over time.

In order to limit cost and intrusion to the homeowner, this can be solved without going inside. Our method is to tear the roof off and have the spray-foam installer apply closed-cell spray foam down onto the existing ceiling finish, then leave a vent channel above the insulation in each rafter bay. This has been a no-ice-dam solution for us. In the homeowner's case, the venting may not be feasible, but the rest of the application may.

—TONY
via email



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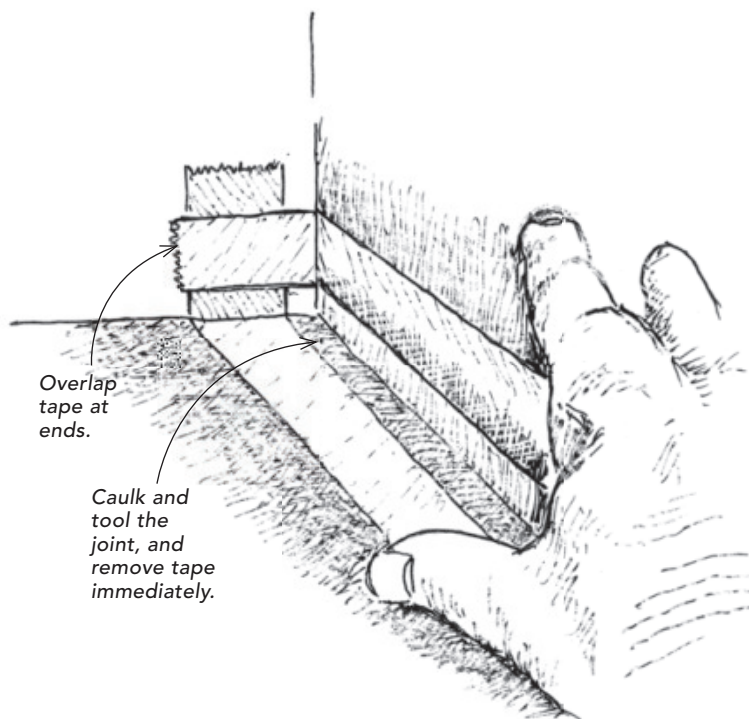
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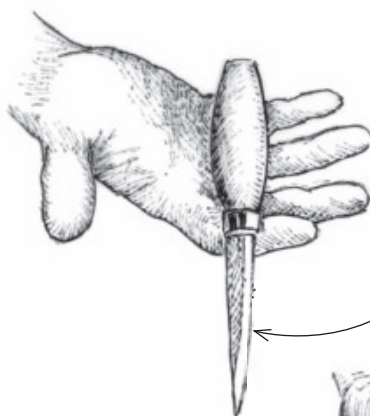


Create the perfect caulk joint

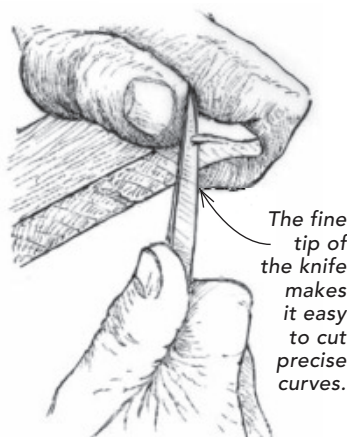
I had to caulk the $\frac{3}{16}$ -in.-wide crack between the bathroom floor and a new shower. I like silicone for this job, but it's tough to get a smooth, even joint. To make it easier, I outline the joint with high-quality masking tape, running one strip along the floor and another along the shower, making sure both edges are firmly set. At the ends I run the strips about 2 in. up and across the wall, overlapping them at a 90° angle and making sure they're well stuck.

I then completely fill the joint with caulk and immediately tool it with my finger. If I'm using latex caulk, I dip my finger in water first. If I'm using a silicone or solvent-based caulk, I moisten it with mineral spirits. Smooth the joint in one continuous stroke if possible. Then immediately remove the tape, starting at one end. Pull both pieces evenly to create a perfect caulk joint. Use this method on any kind of caulk joint where a smooth, even surface is important.

—GRANT LITTS
Norway, Mich.



The sloyd knife's razor-sharp blade is ideal for cutting coped joints.



The fine tip of the knife makes it easy to cut precise curves.

Clean copes

Whether you use a coping saw or a jigsaw, you sometimes need to fine-tune a cope before installation. I have found that a sloyd knife, such as the Morakniv 120 or 106, does the job quickly and quietly. Sloyd knives, which are commonly used in wood carving, have a smooth, continuous bevel that helps produce a finer, more controlled cut than you can get from a utility knife. When trying to clean up curved sections, use the tip of the sloyd knife, which cuts curves quite readily. For straight sections, the middle of the knife works well. Sloyd knives need to be sharp, so sharpen often.

—JON PRONIEWSKI
Menomonee Falls, Wis.

submit a tip

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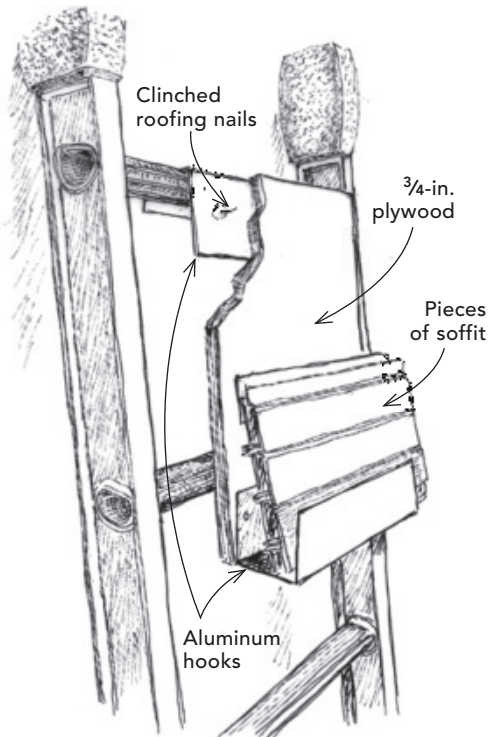
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Ladder helper

I was recently working on a siding job that included a lot of steep gables. There wasn't enough room for pump jacks, so I had to use extension ladders. The challenge: How to keep a stack of precut soffit pieces within reach so I wouldn't have to make as many trips up and down the ladder.

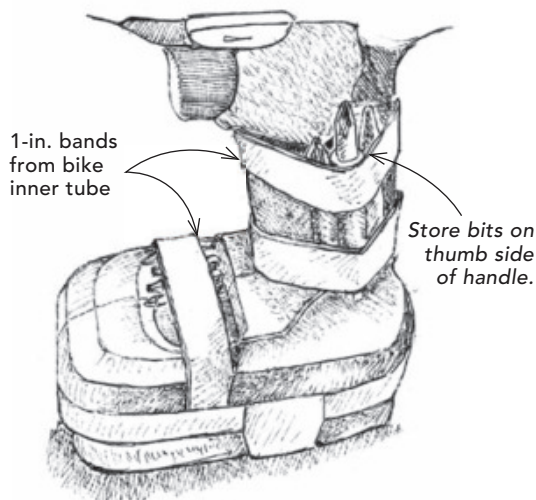
I came up with this simple jig that slips over the top rung of the ladder and holds about 10 pieces of soffit, and it only took about five minutes to make. I folded scrap aluminum into "J" shapes for the top and bottom. A scrap piece of plywood and a few bent-over roofing nails join the parts together.

—CHARLES GRAVEL
Bedminster, N.J.

Driver-bit storage

It always seems that the one hex-driver bit that I need is the one that drops to the ground or falls from the top of the stepladder. So, I've found a handy way to have multiple driver bits always within reach. Simply cut a bicycle inner tube into several bands and put them on your drill's handle or around the battery. One or two 1-in. bands on the handle can hold two to four 2-in. hex bits or magnetic bit holders. A band around the battery will hold four or five shorter bits. Wash the bands with dish soap before use, and soak them in hot water and flip them inside-out if you're having trouble stretching them far enough.

—HARRY BOGOSIAN
Bethlehem, Conn.



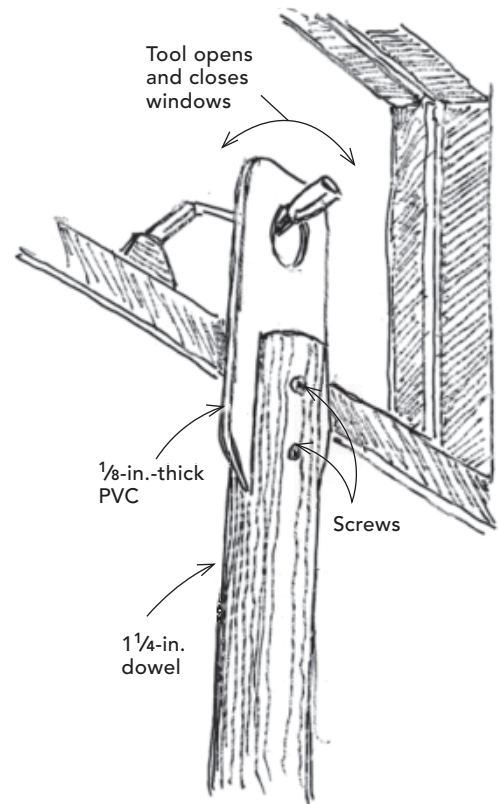
Keep out sewer gases

After removing a toilet, we need to keep the sewer gases from coming into the house. Most contractors simply plug the hole with rags, loose insulation, or whatever they have on hand. Those remedies are messy and marginally effective, and the rag can easily slip down the pipe. My solution is a plastic cup pushed into the hole. Cups are generally tapered, so they self-seal, and there's no shortage of waste cups on most job sites.

—BRIAN FLYNN
Overland Park, Kan.

Open out-of-reach windows

My house has 24 awning windows at the ceiling, 10 ft. to 12 ft. from the floor. When I bought these windows, the manufacturer didn't offer any sort of pole to operate them from the floor. So I took a 1 1/4-in.-diameter dowel and added a piece of 1/8-in.-thick PVC sheet stock that



I drilled, formed, and attached to the pole. A hole in the plastic fits over the window's crank, as shown in the drawing. This allows me to open and close the windows from the safety of the floor.

J. KAYE
Phenix, Va.

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A new old way to vent a kitchen island

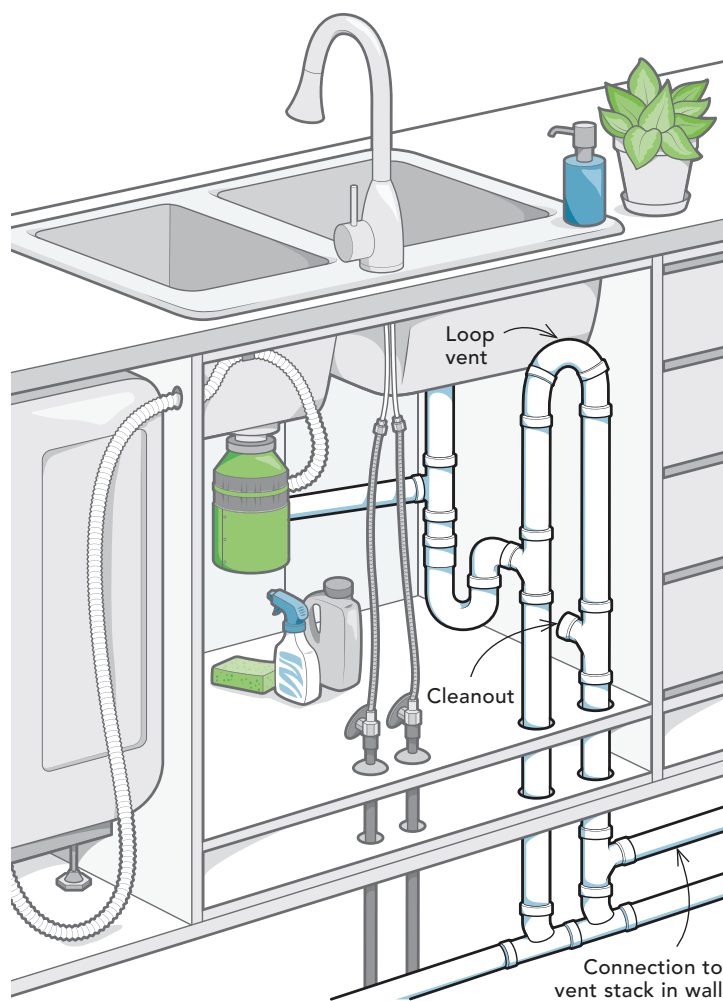
Most builders and plumbers are familiar with two ways to vent kitchen-island sinks: the time-tested island fixture vent, and the newer air-admittance valve, or AAV. Neither method is exactly foolproof—they're allowed in specific circumstances, and their acceptance and design are not universal across municipalities, states, or even code-writing entities. There is an arguably better method of venting kitchen-island fixtures, though—we'll get to that in a minute.

As sophisticated as modern houses are, a simple cup of water is essentially the only thing keeping sewer gases from backing up into our homes. This cup of water sits in what is commonly called a P-trap. Contrary to some assumptions, its name has nothing to do with the kind of liquid in it, but rather the shape of the plumbing, which is similar to a letter P that's fallen on its face. Every time a fixture is used, the water in the trap is cleared and replaced. If the drain isn't adequately vented, the rush of water from a draining sink or bathtub can suck the last bit of water out of the trap. Venting eliminates this siphoning action, ensuring that the last cup or

so of water that enters the trap gets stuck there until the next time the fixture is used. This is tested science. You'd think everything in the code would be determined this way, but that's not always true.

The "old school" method of venting island sinks is appropriately called an "island fixture vent" in IRC Section P3112. This island loop, which first appeared in the Uniform Plumbing Code in 1958, was later recognized in most other model plumbing codes, and has remained largely unmodified throughout the years. With it, some exceptions to standard plumbing rules are loosened for the sake of kitchen design. A vent connects to the trap arm within the standard limitations, but rather than rise through the roof, this vent is allowed to turn horizontal and drop back down below the floor. It can turn before reaching the long-standing minimum height of 6 in. above the flood-level rim of the sink, provided it rises above the drain outlet at the bottom of the sink.

By rising at least above the sink outlet, the sink may drain through the vent, but not completely. If there's a clog, water will remain in the sink to alert the user of the problem. This



THE ISLAND FIXTURE VENT

The oldest approved way to vent fixtures in a kitchen island is with the island fixture vent. The vent first loops up as high as it can under the counter before dropping through the floor, then offsets horizontally to connect with a vent in the wall. This method isn't perfect, and cleanout is required to clear any stoppages that might occur in the vent system.

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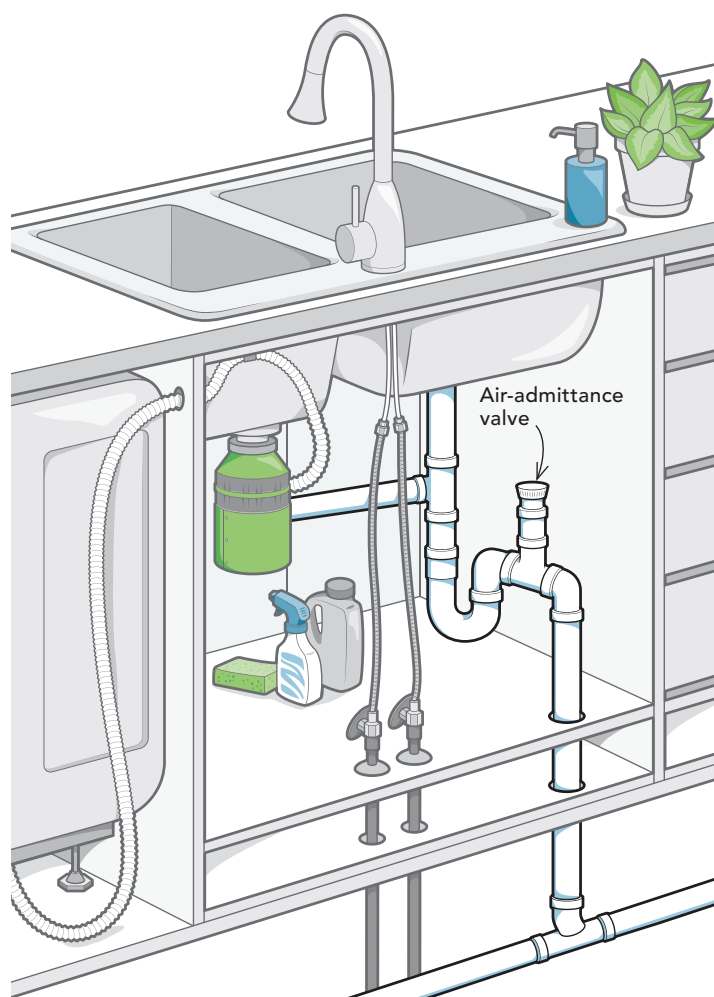
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sort of “alarm” is integral in plumbing design. An island loop vent is allowed to turn below the top of the sink only because cleanouts are required to remove any blockage in the vent. Access for a drain snake takes the place of perfect plumbing design. Clearance to this access is spelled out in IRC Section P3005.2.9 and requires 18 in. measured horizontally in front of the cleanout opening. This generally means orienting the cleanout to face the cabinet doors.

One gripe about the island loop is that it takes up a lot of space in the sink cabinet. It also requires many fittings and a specific geometry, and takes a lot of time and money to install. These shortcomings led to a search for an alternative solution.

That solution—the AAV—was invented in Europe by Sture and Doris Ericson (Stu-Dor), whose “Studor Vent” became common plumbing jargon for the device. AAVs arrived in the U.S. in 1986, but didn’t appear in model plumbing codes until 1995. These one-way valves allow air into the drain to protect the trap from siphoning water, but they don’t let sewer air into your home. Most appealingly, they eliminate the need for a vent to rise vertically through the roof or down below the floor, making them ideal for remodel applications where adding a new vent through the walls and roof of an existing building could be cost prohibitive. And they take up very little space. AAVs can be placed as low as 4 in. above the fixture drain or horizontal branch drain being vented. They have become the go-to for not just island vents or basement sinks far from existing vents, but anywhere else where the cost of



VENTING WITH AN AAV

Many, but not all, jurisdictions allow the use of air-admittance valves (AAVs) to vent kitchen islands. While other venting methods typically rely on outside air, AAVs open under negative pressure to allow air from inside the home into the drain system. AAVs are installed just downstream of the trap and at least 4 in. above the horizontal drainpipe that runs out of the trap.

pipe and labor would exceed the cost of the valve.

They can’t be installed until after the plumbing system has been tested for gas tightness, and, like island loop vents, they must be accessible. Most importantly, they aren’t a universal alternative, as some local codes don’t allow them. It’s not clear why they aren’t universally approved—the IRC and vari-

ous plumbing codes allow the use of AAVs in various applications and there is an ASTM test standard that legitimizes their fabrication and performance. In places where they’re not allowed, it may be an all-too-common case of “we’ve always done it that way.”

But another way to vent kitchen island fixtures has been around for ages, though it’s not

commonly used—the combination waste and vent system (p. 24). This system uses an oversize drain pipe, which pulls double duty as both the drain and the vent. The larger cross section of the drain pipe and its maximum 1/2-in-12 slope in the horizontal sections guarantees that the waste water draining through the pipe never fills it, leaving an air space above the effluent to vent the system. There’s just one vertical pipe—the connection between the fixture drain and the horizontal portion of the combination waste and vent system—which is similarly oversize and can drop down as much as 8 ft. before connecting to the horizontal portion. Unlike some other venting options in the code, the horizontal length of a combination waste and vent system is unlimited.

Of the three methods of venting an island mentioned here, the combination waste and vent system is arguably the simplest. So why hasn’t it caught on? Probably because, until the International Residential Code changed in 2018, you couldn’t connect a food-waste disposer to a combination waste and vent system. Even if you don’t have a dedicated disposer attached to the sink, similar devices are a feature on many dishwashers. For practical reasons, dishwashers are typically installed next to sinks. If you can’t connect a food-grinding dishwasher to a combination waste and vent system, then you have to fall back on other options that allow it. Hence the common use of the island loop and AAV.

The reason behind the prohibition on connecting disposers to combination waste and vent

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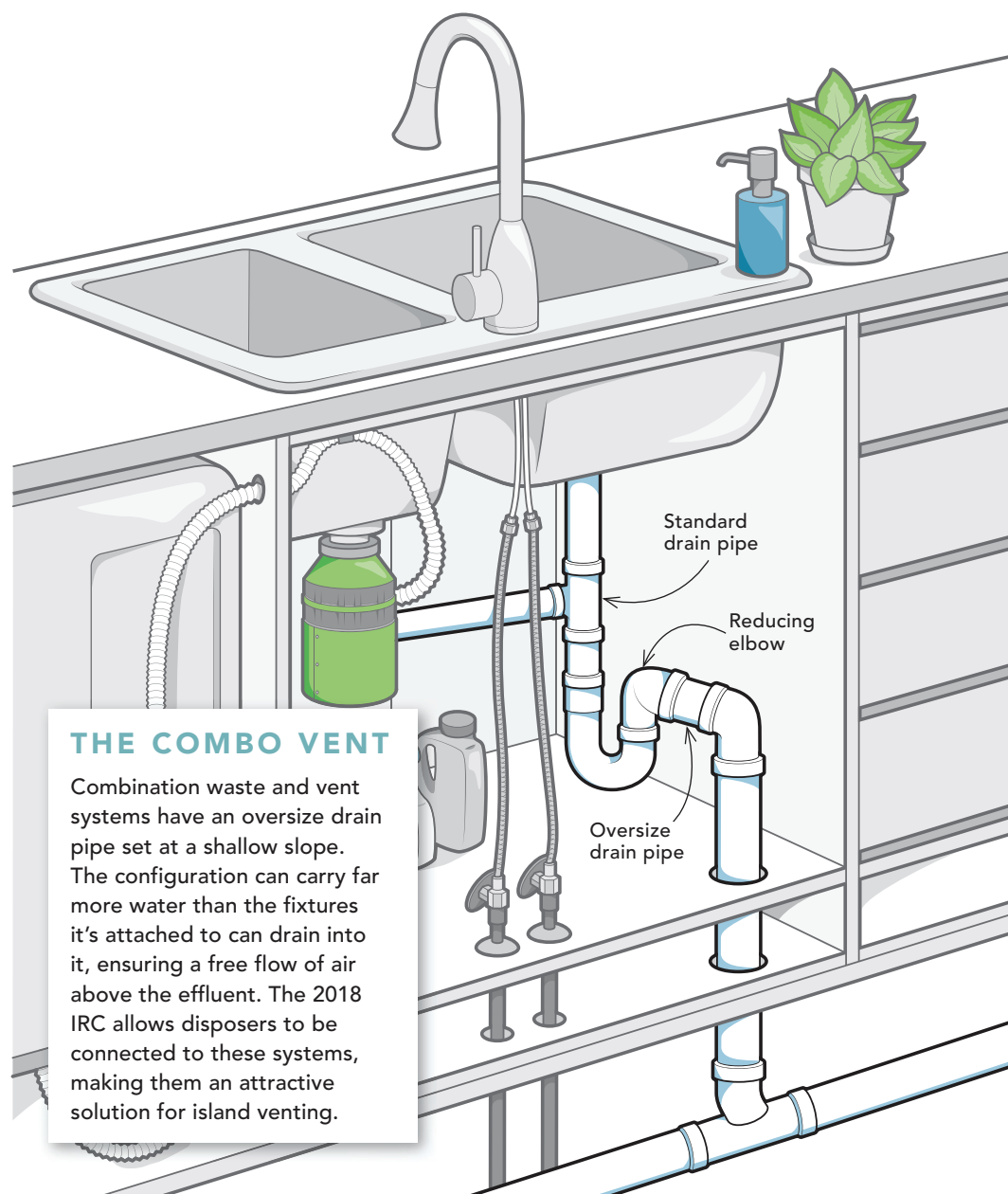


systems is spelled out in the commentary in earlier versions of the code, as in this note in the 2015 IRC: “Because of the low-flow velocities and volumes that occur in these systems, any solids introduced would accumulate, causing blockages and reduction of the internal cross-sectional area of the piping. Therefore, sinks equipped with food waste disposers and fixtures that discharge solid wastes are not allowed to be served by a combination drain and vent.”

This rationale, it turns out, isn’t based on science. It was an assumption. And it is wrong.

When the code is updated, the International Code Council publishes a book of “Significant Changes to the International Residential Code.” The 2018 edition comes clean about the prohibition on attaching disposers to combination waste and vent systems, noting, “When this restriction was placed in the code, there was no research and no field problems were identified to support the limitation.” The American Society of Plumbing Engineer Research Foundation did the research, and, “Their technical findings found no technical justification for placing a limitation on the discharge of food waste disposers to combination waste and vent systems.”

So the IRC was changed. Now, if you’re operating under the newest version, you can connect your food-macerating dishwasher and waste disposer to a combination waste and vent system. But for a clerical snafu, the International Plumbing Code probably would have dropped the prohibition as well—and it will in the 2021 update. This is good news for anyone planning an otherwise



tricky-to-vent kitchen island, especially in jurisdictions where AAVs aren’t allowed.

While it’s a relatively minor change, it may have a major impact on the way builders plumb kitchen islands, making the job easier and less costly. Most states and municipalities

operate on older versions of the code, though, so it may take a while to catch on. And just as certain parts of the code persist on the premise that “we’ve always done it that way,” some tradespeople and states will probably continue to use other methods on the same grounds.

This isn’t to say that the combination waste and vent system is the answer to every kitchen-island-venting conundrum—but it may be preferable to an island fixture vent, and, in locales where AAVs aren’t permitted, a welcome alternative.



For more editions of “Know the Code,” visit [FineHomebuilding.com/knowthecode](https://www.finehomebuilding.com/knowthecode).

Glenn Mathewson is a consultant and educator with [buildingcodecollege.com](https://www.buildingcodecollege.com).



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HEAVYWEIGHT PORTABLE TABLESAW

Even though I'm a small-truck-driving, cordless-tool evangelist, when I set up for a long remodel job, I value having a corded job-site tablesaw. And when there are three apprentices on site to carry around the 96-lb. Grizzly G0870, my cordless table-saw stays behind my passenger seat. Even though the G0870 looks like a newborn fawn standing for the first time, this saw is very stable. In addition to run-of-the-mill ripping and cross-cutting, we've run a few dozen sheets of CDX plywood, rabbeted 1x6 window bucks, and cut wood-fiber insulation board with no stability issues. The outfeed extension does just enough to justify its existence even though the saw cannot be wheeled through a typical 3-ft. door when it's attached.

There's a silver-dollar-size knob above the on/off switch that controls the motor speed from 2000 rpm to 4000 rpm. If you're asking, "What do I need that for?" you're not alone. The Grizzly website says this



Grizzly G0870 10-in. Portable Tablesaw

Table size: 22 in. by 26 $\frac{3}{8}$ in.

Price: \$365, plus \$100 shipping

Zero-clearance insert: \$27

Dado insert: \$22

feature "allows you to cut other materials, laminates, and some plastics." We gave the 2000-rpm setting a workout making a small wooden gutter for a side-door overhang. The G0870 was able to remove about $\frac{1}{16}$ in. of material on each cove pass without scorching or bogging down and managed to direct nearly all of the dust to its 2 $\frac{1}{2}$ -in. dust port.

The motor also has electronic load sensing, a feature meant to maintain constant blade speed under load.

While ripping Douglas-fir 2x framing lumber, we did notice that the sensor was active, though it was difficult to detect a difference. During the same ripping session, the saw's overload protection kicked in and stopped the motor prior to overheating.

After six weeks of daily use, this saw is no worse for the wear and the rack-and-pinion fence track is holding parallel. The G0870 has easily usurped our company's Reagan-era contractor's saw as our go-to saw for big jobs.

Ian Schwandt, a lead carpenter with Hudson Valley Preservation in Kent, Conn.



Large-capacity portability. Grizzly's new job-site saw has a variable-speed motor, a high/low rip fence, and a sensor that maintains blade speed under load. The saw is also available without the stand (model G0869) for \$300.



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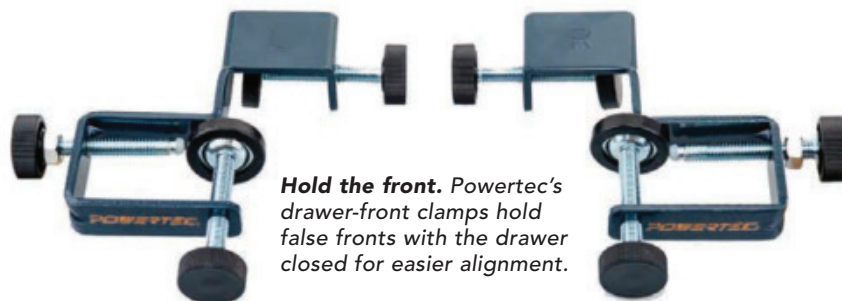
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Clever clamps

Drawer Front Installation Clamps from Powertec (\$25) might just be the best jigs for the money. They allow you to align overlay drawer fronts while the drawer is closed so you can see the front in relation to nearby drawers and doors. Rubber pads on the threaded clamps ensure the face stays in the right spot even when you open the drawer to attach it from the back. Each clamp has three thumb screws—one to attach the clamp to the drawer side, one to clamp it to the drawer face, and a third to make micro adjustments either left or right to get the perfect alignment. If you have several drawers of the same size, the settings will hold in place as you move from drawer to drawer, making for an even quicker setup on subsequent fronts.

Nathan Rinne, a finish carpenter in Roach, Mo.



Hold the front. Powertec's drawer-front clamps hold false fronts with the drawer closed for easier alignment.



RECALL NOTICE

On July 24, 2019, the Consumer Product Safety Commission (CPSC) announced a recall of Porter-Cable Model PCX362010 tablesaws. The saws, which were sold exclusively at Lowe's, have a motor that can overheat and catch fire. According to the CPSC, 258,000 of the saws have been sold in the U.S. and another 990 were sold in Canada. Consumers are asked to stop using the saws and contact the manufacturer toll-free at 877-206-7151 from 7 a.m. to 6 p.m. CT Monday through Friday or online at www.recallrtr.com/PCSaw for a refund and further information.

Semi-pro painter

I'm not a professional painter, so to avoid litigation, I only paint things I own. This limits my canvas, and has made it impossible to justify buying a top-of-the-line spray rig. But my hands cramped up just thinking about all the deck and shed finishing projects I had on tap this spring, so I splurged a little bit on Wagner's Flexio 3000. This is a consumer-grade HVLP sprayer, and it comes with two "nozzles" that include both the spray tip and the cup. The bigger one holds about 1½ quarts of material for larger projects like siding and fences. The smaller cup is meant for small projects and thinner finishes.

The nozzles connect to the hair-dryer-size turbine. The turbine has a variable air-power adjustment, and the bigger of the two nozzles has additional adjustments for material flow, spray width, and spray shape. The smaller-detail finish nozzle is much the same, but without an adjustment for spray width. For \$160, I was skeptical, but coverage and texture were better than I've ever achieved with a brush. Overspray was minimal once I had everything adjusted for the vagaries of the particular finish. The rig does quite well with unthinned latex, so long as it's not too hot out. Thinning reduces clogging, which became a nuisance during hot, dry weather. For the most part, these clogs were easily solved by wiping the tip with a damp rag. I didn't attempt to spray oil-based deck finish without thinning, but the results were similar to latex. When it comes to cleanup, I found it took a bit longer than the five minutes Wagner advertises, but it was nothing compared to the amount of time I saved by spraying. For an entry-level sprayer, it does a good job.

Matthew Millham, deputy editor



User-friendly spraying. The Wagner Flexio 3000 4-lb. spray rig comes in a hard case with additional spare parts. It's corded, and runs on standard 120 voltage.

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Stress-free sander

Like most modern tradespeople, I've switched over the majority of my cordless power tools to a single battery platform for convenience. Now that I'm invested in Makita's 18V system, I've been using their XOB01Z 5-in. cordless random-orbit sander. I love it. Its balance is outstanding, and because of its convenience, I use it more often than I've ever used a sander before. It's perfect for flushing up column wraps, level-

ing plugs, and generally smoothing my mistakes. The sanding pattern is flawless with no little swirls in undesirable places.

The dust collection is adequate, though for a big sanding job, I'd still grab a corded tool—mainly because it's easier to hook up to my existing dust-extraction system. For all

other jobs, the three settings allow me to match the sander's speed to the situation. And even though the highest setting is plenty aggressive, it's also

Makita XOB01Z 5-in. Random Orbit Sander

Price: \$100 (tool only)

Pad size: 5 in.

easy to control. This is one tool I'm delighted to have in my box.

Andy Engel, a lead carpenter with Hudson Valley Preservation in Kent, Conn.

Photo: Rodney Diaz



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Toilet tamer

Pulling a toilet is never fun. The worst part is dealing with the water left in the trap. Even vigorous plunging leaves some behind, and keeping the toilet perfectly level while you carry it by yourself is nearly impossible. Oatey has come up with a solution: LiquiLock, a nontoxic powder that solidifies water. You turn off the supply, flush the toilet, hold down the handle until it quits draining, and empty an envelope of LiquiLock in the bowl. In about four minutes, the water becomes a semi-solid gel. The toilet can then be removed without sloshing water all over. The truly amazing thing about LiquiLock is what happens when you reset the toilet. When you flush the reconnected toilet, the LiquiLock melts and washes down the drain. At \$3 a pop, it's worth it to me to use a packet every time I pull a toilet.

Andrew Grace, a remodeler in Ligonier, Pa.



Photo: Rodney Diaz



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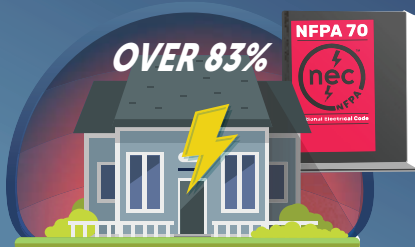


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Deciding on Replacement Windows

Insert units can be a good move for an old home, but only if you avoid the pitfalls

BY ASA CHRISTIANA

Selecting and used properly, replacement windows can be a godsend for older homes with outdated wood windows—installing quickly into existing window frames at less cost than new-construction windows, preserving interior and exterior details, and vastly improving the performance of one of the key parts of the building envelope.

Bought from a hard-sell outfit, however, and installed by lower-skilled technicians, replacement windows can be a big mistake, costing a bundle for a result that looks only so-so, operates poorly, and performs even worse.

To find out when replacement windows make the most sense and learn the critical steps of a proper installation, it's important first to understand how these units work.

Replacement basics

Most of today's replacement windows, also called "pocket replacements" or "insert replacements," include a full frame with sashes inside, very similar to a new-construction window but without the nail fin at the edge. Developed primarily for improving old wood windows, these full-frame replacements are manufactured to order, customized to fit into the existing frame with only a narrow gap around the edges.

Because they add a frame inside the existing frame, replacement windows have smaller sashes than the originals, resulting in less glass and diminished daylighting accordingly. Although replacement windows are most often pushed tight to the

exterior trim, these windows have narrower frames than new-construction windows, so they can be placed at different positions—favoring the exterior side, favoring the interior side, or right in the middle of the jambs—depending on existing trim and other conditions.

Since replacement units are just narrower versions of new-construction windows, with the same sashes inside, they offer the same options for frame material, historical detail, mechanics, glazing, and energy performance.

While the cost of an insert unit is similar to the cost of the same window with a nail fin, they require much less time and labor to install. From removing the old sashes and stops to sealing the old frame, installing the replacement unit, replacing the stops, and weather-sealing the new unit, a window can be upgraded in a few hours or less, with a single drop cloth to catch the mess.

Contrast that with the work involved in installing a nail-fin new-construction window—stripping back the siding, removing the entire window frame and the trim on both sides, breaking into the existing water plane and weather-sealing, and putting it all back together after the window installation—and you can see how a replacement unit might be half the price in the end.

Replacements vs. new-construction windows

Installation is the big story with replacement units, and it cuts both ways. Replacements go in quickly, leave distinctive trim and moldings in place, cost less, improve comfort and performance, and may provide energy savings if installed correctly.

On the flip side, leaving everything in place means there's no opportunity to assess the sheathing around the window rough opening. Stripping everything down to the framing to install a new-construction window lets you look closer for problems, chase them to their root, and apply best practices for flashing, air-sealing, and insulating the entire opening. A new-construction window is almost always your best bet if budget and conditions allow.

At the same time, that level of surgery is not always necessary. If the window frames are sound and no water has visibly intruded, the added measures taken around the rough opening might not be needed. For poorly insulated homes, the dividend delivered by replacement units would be better spent on



KNOW THE STEPS OF A PROPER INSTALLATION

The best window is still only as good as its installation. The following steps are a good guide for what to focus on when evaluating an opening and swapping old window sashes for a replacement unit.

EVALUATE THE EXISTING FRAME

Major signs of rot and water damage are a deal breaker. If you have to pull off trim and cladding to investigate, you might as well go with a new-construction window and update the entire opening. Other deal breakers are window frames that are significantly out of square, more than 1/2 in. in any direction.

MEASURE CAREFULLY

Replacement windows are available in common sizes, and can also be made to order. In both cases, accurate measurements will ensure a window will fit the

opening as closely as possible while accommodating the warping and out-of-square quality common in old window frames. Each replacement unit has its own tolerances for gaps, but 1/8 in. is usually the goal at the sides, 1/4 in. at the top, and no more than 1/2 in. anywhere around the frame. Since the existing sill will be sloped in most cases, the height measurement depends on where the replacement unit will sit in the frame. Always check the window installation literature prior to ordering (some models also require you to measure the angle of the sill). Some installations are easiest from inside out, which means removing the interior stops and pressing the replacement against the exterior ones, or vice versa, pushing the replacement unit back against the interior stops and the stool of the interior sill. Measuring diagonals and checking how straight the jambs are is also critical.

PREP THE OPENING

While the frame stays in place in most replacements, there is still a chance to clean it up and improve it. After the stops come off, caulk any open joints and give the frame a fresh coat of paint. Now is also a good time to address flashing concerns using either flashing tape or liquid-applied flashing on the exterior sill, extended up onto the interior stool and a couple of inches up the jambs. Assume that water will eventually get in, and prep the frame so that it's ready to shed it outward.



If there are sash weights and ropes, remove them and fill their cavities with canned spray-foam insulation. Fiberglass-batt insulation, although once a common choice, does not adequately control airflow.

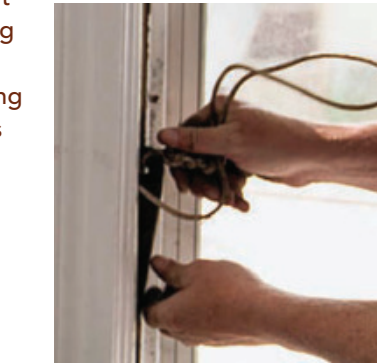
SET THE WINDOW

Before setting the window into place, lay a bead of silicone caulk on the back edge of the exterior trim so the new frame can be pressed against it, completely sealing the joint. Next, shim the window level in the opening without shifting it out of square, and drive screws through the new jambs into the old ones.

FINISH UP

Proper air- and water-sealing usually involves three layers of defense: silicone caulk on the outside, low-expansion foam around the gaps between the window and the existing opening, and some type of sealant on the inside. One excellent choice inside is Prosoco AirDam, with a backer rod inserted into larger gaps.

While the back of the replacement unit is sealed completely against water intrusion, the gap at the front of the sill must be left at least partially open, giving water a place to escape.



energy-efficiency measures with lower cost and higher impact, like insulating the attic.

When replacements make sense

If the sills and jambs are sound in an older home, the head flashing is still working well, and there are no signs of significant water intrusion, there are many situations in which a replacement insert window makes sense.

The most common situation is an older home with siding and trim that is hard to strip away and replace afterward, or hard to replace and match. Some homeowner associations and historical review boards will not allow exterior trim to be touched, or will only approve removal if it can be matched closely. For all of these instances, nicely detailed replacement units offer a cost-effective way to replace painted-shut sashes that have single-pane glass.

"I use them in hard-to-reach areas where there is intricate architectural detail," says Steve Pink, who remodels high-end homes Portland, Oregon. "Inside, you don't have to touch the sill, which can have some nice detail to it. If you are crafty enough and measure right for the replacement unit, you can even reuse the stops you pulled off the frame. Those often have a nice molding profile on them too."

Older homes often have lead paint encapsulated inside layers of latex, and replacement units offer a chance to improve the window without putting lead paint in the air and either reduce or eliminate the need for abatement measures.

Brick and stucco homes are also popular candidates for replacement inserts, where the brick face or stucco covers part of the window frame and new-construction windows would cause major mayhem. Homes with plaster walls and plaster returns inside the window openings are also great candidates.

Beyond the world of high-end remodeling, budget is a big driver for replacement inserts. Longtime Pittsburgh remodeler Andy Grace has installed hundreds of insert windows as a cost-effective solution for the older brick homes common to the area. "I strip off the aluminum storm overlays—which look terrible—pull out sashes that are painted shut and inoperable, keep the wood frame and trim, and put an energy-efficient window back in."

For lower-end jobs like those, Grace goes with a vinyl replacement window from Simonton, which has a reinforced frame to

guard against bowing, a common problem with cheap vinyl replacement products. “It’s a really nice insert I can get for \$169 in any size up to 5 ft. tall. I can have one installed in 15 minutes and be ready for caulk in another 15. It’s less hassle and cost for the customer.”

On historic homes with attractive trim inside and out, Grace turns to aluminum-clad-wood replacement units from Marvin and WeatherSeal, which offer classic, stain-grade appearance inside and low maintenance on the exterior.

When replacements don’t make sense

By and large, replacement units are used in wood window frames only—vinyl and aluminum frames don’t usually provide the broad, flat inner surface that replacement requires.

If a wood frame has significant rot that can’t easily be repaired, or evidence of water penetrating into the interior of the wall, remove it, address problems around the rough opening, and install a new-construction window. (It may be possible to cut out or repair a partially rotted sill in order to make insert replacements work for a home on a budget.)

On full-gut remodels, there is no sense in keeping the trim and jambs intact, and new-construction windows become a no-brainer.

Replacement windows make far less sense for houses with vinyl siding, assuming there are no other layers of siding below the vinyl. In cases where vinyl is applied directly over the WRB, it’s very easy to strip back and reattach the vinyl during the installation of nail-fin new-construction windows. Also, many vinyl-sided houses have vinyl windows that won’t accept replacement units, and most don’t have architectural trim worth saving.

Return on investment is a controversial topic among experts. While replacement windows are economically justifiable—if properly installed—the savings in energy costs is only slightly more than the cost of buying and installing them. From a pocket-book perspective, if you leave the existing windows and add exterior or interior storm windows, the energy savings is almost equal for far less money, which is why in the long run, this route may have the biggest bang for the buck.

Installation is make or break

All of the replacement-window manufacturers I spoke to, from Marvin to Pella to Jeld-Wen, as well as the skilled remodel-

MORE OPTIONS FOR OLD WINDOWS

There are a variety of lower-cost and lower-impact options for improving the performance and energy efficiency of outdated windows.

OVERHAUL THE EXISTING WINDOWS

Don’t toss those old windows without first considering restoration as a viable approach. Old wood windows were designed and built to be easily disassembled and repaired (see “Restore a Wood Window Sash,” *FHB* #273). The work typically includes removing the sashes, scraping and repainting them, and replacing and reglazing the rattly panes. The opening can also be cleaned up and improved by replacing broken sash locks, installing new weatherstripping all around, and ensuring that the sashes operate smoothly all the way up and down, and close fully at the top, bottom, and middle. This will restore proper performance of the window and greatly improve air-sealing, while saving a distinctive part of your home and keeping another old window out of the landfill.



ers, installers, and energy-efficiency experts, were in basic agreement about replacement windows: You get what you pay for with the window unit, but installation is what makes or breaks performance.

“Once customers choose a good window, they assume that installation will be good too,” says Pella’s manager of retail sales, Eric Smithey. If they plan to hire a contractor for

the job, Smithey says, “They need to ask as many questions about installation as they do the window.” Another solid option is buying directly from a reputable company’s local dealer, whose salespeople and installers have been trained by the manufacturer.

“Watch out for installers who say, ‘We’ll be in by eight and out by noon,’” says Eric Klein, longtime installation and field service



SASH-REPLACEMENT KITS

Rather than dropping in a fully assembled replacement window, sash replacements ride in jamb liners that fit inside the existing frame. This low-profile approach maximizes sash size and amount of glass, but sash replacements aren't as easy to install. The jamb liners are held in place by a row of clips, attached directly to the jambs, which are often bowed or out of parallel in older windows. A proper install requires shimming individual clips so the jamb liners are straight and parallel with each other.



INTERIOR OR EXTERIOR STORM WINDOWS

Easily removable in warmer months, storms act much like a second pane in a modern glazing unit, and when paired with sash repair, will deliver energy savings similar to a full window replacement. Exterior storms can be custom-built or made to order, and typically install flush with the exterior to fit the traditional character of an older home, but may need to be opened or vented to the exterior to prevent a buildup of condensation. Interior storms, a popular choice among old-house remodelers, are easily the least visually obtrusive option, and are easy to safely install and remove as seasons change, but block the function of the window when in place.

instructor for Marvin. "Those companies like just popping out one window and popping another one in, sealing the best they can. They are operating on volume, not quality."

When it comes to the windows themselves, one good indicator of quality is the availability of detailed installation instructions. These should be included with every replacement unit. While the windowsills

and exterior caulking should be inspected and repaired every five years or so, as on any window, a well-executed replacement install should last the life of the window unit, which is 30 years or more for a high-quality product.

That said, low-skilled installers make a variety of critical mistakes, bowing or racking insert frames to force them into out-

of-square or poorly measured openings, shimming them out of square, and sometimes holding them in place with sealants and foam alone. In many cases, coiled aluminum pieces are caulked in to close big gaps. In the end, the results of a poor installation can be catastrophic. □

Asa Christiana is a contributing editor.



Patching

a Hardwood Floor

BY BRENT KELOSKY

Two methods for replacing a damaged section of board

My father started our family business, Wood Floor Designs, more than three decades ago. I've helped him manage it for the past 26 years. In that time, we've completed hundreds of floor patches. The hardest part of any patch job is finding a replacement board to match the floor—it needs to be the same species and equal in size, thickness, and grain. There are times when you can hide a repair completely, and other times when it might be more visible, but it need not stand out like a sore thumb. No matter the wood (here we're working with plain-sawn red oak), we use one of two repair methods—one requires a circular saw, and the other a router. The choice depends on how deep the damage goes. □

Brent Kelosky is president of Wood Floor Designs, Inc. in Koppel, Pa. Photos by Patrick McCombe.

REMOVE THE OLD BOARD DOWN TO THE SUBFLOOR

If you know there's rot, it's best to cut out the section of board in its entirety down to the substrate. Termite damage and holes are also good reasons to remove the entire piece. You want to install boards as flush as possible, even if you are going to sand, but it's better if the new board is a little proud than if it sinks below the surrounding boards. If the floor has been finished already, you will need to spend extra time ensuring the thickness of the new board is an exact match, and set it with precision.



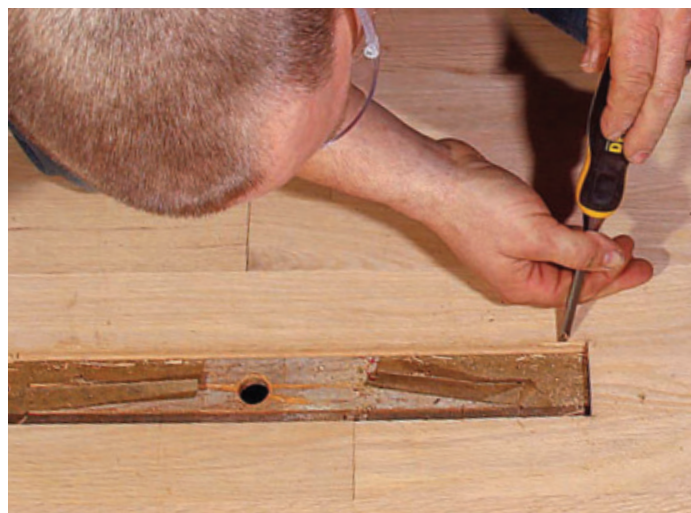
Mark the repair. If it's a long board, mark the section being replaced with a square. Use an oscillating multitool to make the first two cuts at both ends of the damaged area.



Make three cuts. With a circular saw set to $\frac{3}{4}$ in., make two cuts down the length of the board and one at an angle across (an "N" shape). This releases pressure and makes removing the pieces easier. Be sure to make the first cut to the inside of any nails, then move over an inch and make the second lengthwise cut.



Remove the damage. Use a chisel or oscillating multitool to extend the lengthwise cuts to the ends to free the center strips, and remove them; the groove side should come out easily. Use a hammer and chisel to chip away the tongue side, and use a cat's paw to remove any nails.



Pry the tongue. Remove the tongue of the cut board from the groove on the adjacent board.

INSTALL THE NEW BOARD



Modify the groove. In order to tip the tongue-and-groove replacement board into place—tongue-side first—rip the back of the groove with the claw of a hammer to make a rabbeted joint.



Mark, cut, check. Use a utility knife to mark the cut on the replacement board. Cut it to size and dry-fit, laying dental floss or a piece of paper down first to make it easy to remove.



Anchor the board. Apply adhesive (we use Bona, but Liquid Nails or yellow glue work too) to the tongue and groove of the adjacent boards, and slide the replacement piece into place. Do not glue directly to the subfloor.

ANOTHER APPROACH

Take the top off

If the board is not damaged all the way through, another repair option is to use a router to remove the top wear layer. With this method, the original plank stays anchored to the floor and substrate, and gets a shallow mortise to receive a replacement cap. This approach calls for a 1/4-in.-thick piece—resawn or planed down from a full-thickness board. If you use this method with prefinished flooring, you won't be able to sand, so the depth of the mortise and thickness of the patch have to match precisely.



Set a guide. Nail a 3/4-in. plywood template over the area so the router bit and bearing ride on the template without hitting adjacent boards. If the floor is already finished, either tack the template between board seams or use double-sided tape to hold it down. Do a test to make sure the tape won't mar the floor.



Go slow. Use a router to remove the top one-third of the board surface in 1/16-in. increments. Rout down to just above where the tongue and nails sit.



Tamp it in. With a rubber mallet, gently tamp the new board in place. Weight the new board until the adhesive sets up.



Finish it off. If the patch stands slightly proud, sand it into plane. We use an edger, which is more aggressive than an orbital sander.



Check the match. Remove the template, clean up the corners with a chisel, and do a dry fit, gently tapping the replacement piece into place to ensure it is reasonably flush. For final installation, lay in the adhesive, tap the board into place with a rubber mallet, weight it until the glue sets, and then sand if needed.





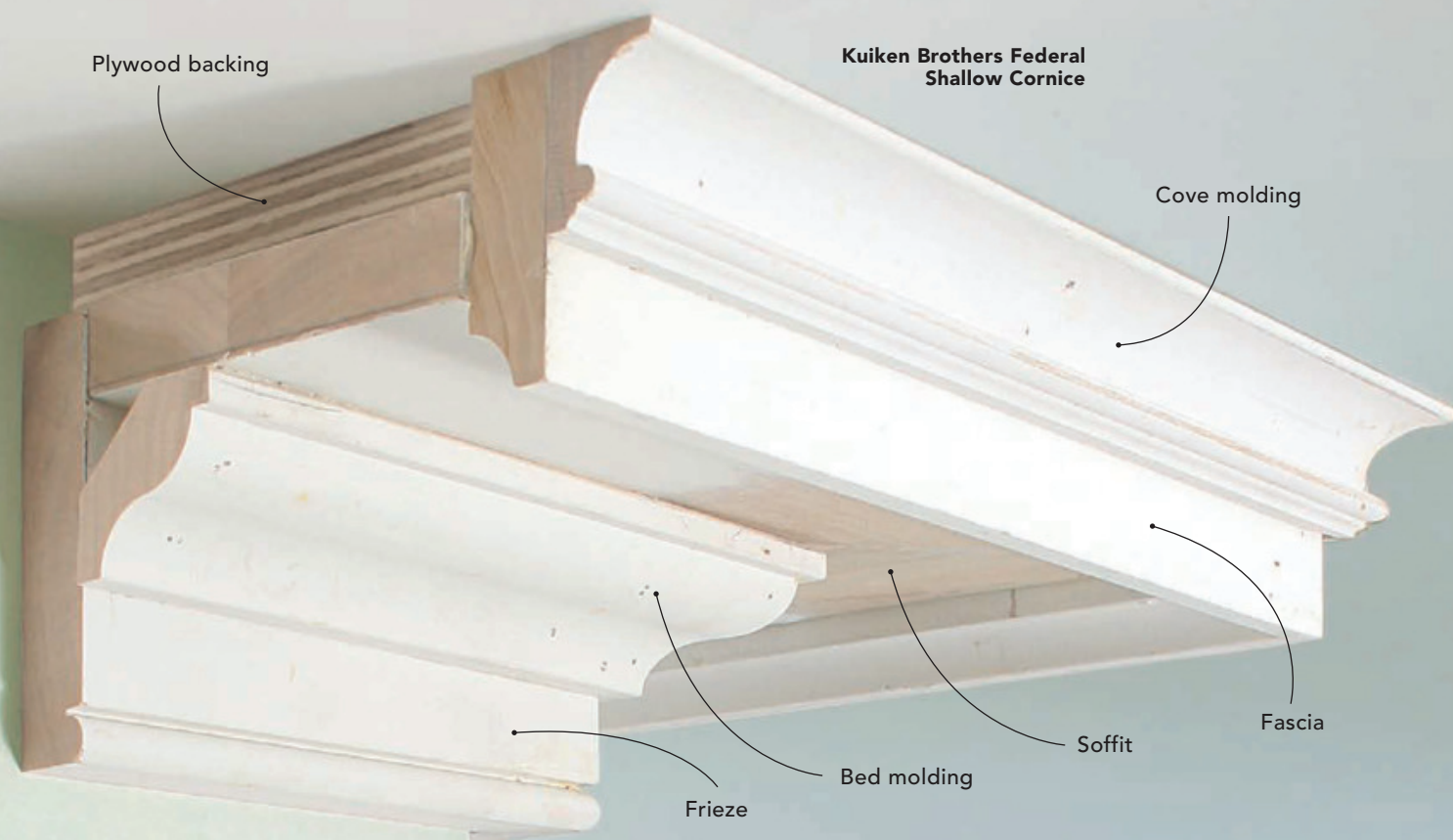
Installing Built-up Crown

A pro remodeler shares his tips for tackling crown and cornice moldings

BY TYLER GRACE

At first glance, installing a built-up cornice or crown molding assembly may seem complex or daunting for even the most experienced carpenters. Whether it's the layers of profiles, blocking, copes, miters, angles, or existing conditions, you are contending with a lot of variables during planning and installation. The

fact of the matter is that when you break down the assembly, it's all just basic carpentry. The most difficult aspect of the entire job may very well be nailing the proportions (pun intended) and properly layering the profiles. Once you inventory the space, locate your pinch points, and determine the layout, you're basically just circling the room one molding pro-



file at a time. Often, at least some of the layers of the buildup can be downright simple. For example, several of the layers used here are installed on reference lines snapped on just the wall or the ceiling.

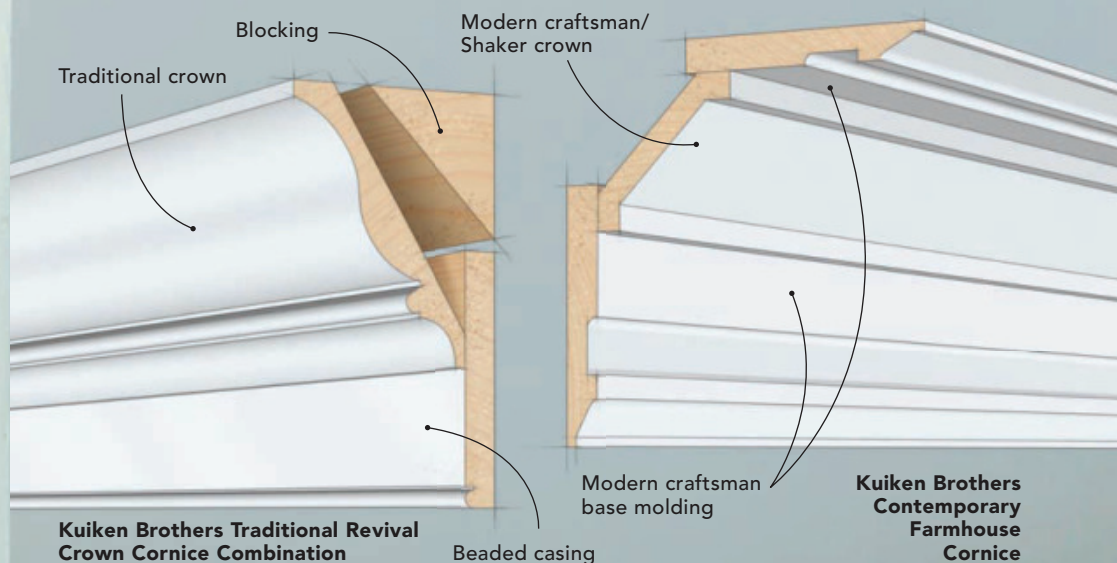
Before touching a saw, take a look at the room, assess what's there and what's going to be there, and figure out what's going to be a problem. Will the molding bump into window or door casing? Will it overlap a can light? In this bathroom, a bath fan near the end of a narrow corridor to a walk-in shower was a potential pinch point. We had to ensure that the buildup wouldn't bump into the fan and that the fan was dead center in the space—otherwise the molding would highlight the asymmetry.

This may be obvious, but is worth noting: As you add layers to built-up moldings, the lengths change. Where you may start with, say, 10 ft. between inside corners, the length will shrink as you add layers to the buildup. Likewise, the lengths between outside corners will grow as you add layers. □

Tyler Grace is owner of TRG Home Concepts in Medford, N.J. Photos by Matthew Millham, except where noted.

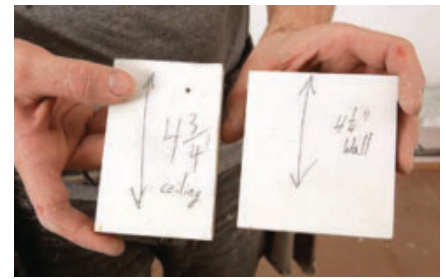
ARCHITECTURAL PROFILING

Layering trim profiles without an understanding of the orders of architecture can have mixed results. As a starting point, look to traditional Greek and Roman architecture for guidance on profiles and their arrangements, and proportion the buildup to the room. Various buildups are made by arranging pieces from families of related moldings (drawings below). There's no shame in outsourcing the molding design to someone who knows what they're doing. Kuiken Brothers, an East Coast building supplier, created the authentic Federal-style cornice featured here (photo above), and scaled it down to work with the 8-ft. ceilings in our 200-sq.-ft. bathroom.



PART 1 THE FRIEZE

Lines snapped on the ceiling and walls help keep everything on track. Use gauge blocks to set reference marks at every corner, but don't mark in between corners. Instead, connect the points between corners. This way, you can establish straight lines even if the walls or ceiling are wavy. The bottom of the frieze aligns with the lines on the walls; the lines on the ceiling represent the front of the blocking for the soffit and fascia.



Gauge down and out. For accuracy, use a sharp pencil and gauge blocks, rather than a tape or combination square, to mark every corner. Bevel the blocks so they make clean contact with the walls and ceiling rather than the wall-to-ceiling joint, where built-up drywall compound can throw off measurements.



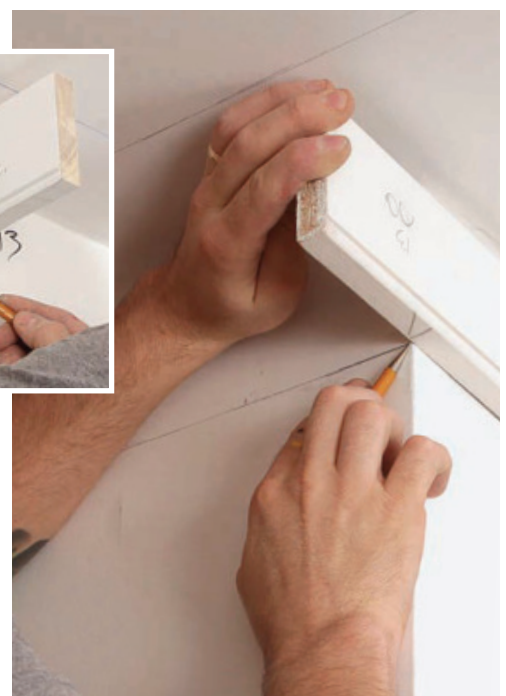
Connect the dots. Connect the gauge-block marks at the corners with chalklines or a level and pencil.



Cope inside corners. Cut the frieze stock to rough lengths, mark each piece, and cut all of the copes in one shot. I rough-cut the cope with a miter saw and jigsaw, and clean it up with files.



Miter outside corners. Mark cuts for outside corners in place, fitting coped joints tightly before marking.





Line it up. Dry-fit joints before fastening the pieces. This often requires having the pieces they intersect at the far ends either installed or dry-fit to ensure the lengths and miters are spot on. A helper or two is required for this step.



Fastened but free. Apply beads of polyurethane adhesive to the back of the piece and to the coped joint to provide reinforcement. Don't fasten the mitered end to the wall until that joint is assembled.

Assemble and nail. Assemble the joints using wood glue and miter clamps, then put two 2½-in. 16-ga. nails in the frieze on both sides of the joint, about 2 in. from the miter. On long runs, continue nailing about halfway down the length, leaving the far end free to fit the next joint.



Screw it. If you need to remove clamps before the glue sets, drill a pilot hole and sink a trim screw.



PART 2 THE SOFFIT

Just as with standard crown, backing and blocking are important elements for a solid installation. If you're able to open up the ceiling, install blocking between joists so you have something solid to nail to on runs parallel to the joists. In the buildup itself, backing fills voids between molding elements and the substrate for a more robust assembly. Moldings that run perpendicular to floor or ceiling joists can usually be fastened to those framing members. Additional backing or blocking is required for some, but not all, buildups on walls parallel to framing.



Back it up. Install strips of $\frac{3}{4}$ -in. plywood to fill the gap between the soffit and the ceiling, creating a solid gluing and nailing surface for both the soffit and the fascia that comes later. Fasten the backer with PL glue and $2\frac{1}{2}$ -in. 16-ga. nails.



Pinch and lever. Use pinch dogs to draw miters tight where traditional clamps can't reach. A stiff putty knife is useful to adjust pieces into plane and hold them there while hammering in pinch dogs or nailing.



Reinforce miters. Biscuit every miter in the soffit, and cut the slots closer to the edge that faces into the room. Glue both slots and the faces of the miters before assembling.



Clamp combo. Install all clamps before nailing off either side of the joint. Clam clamps hold the joint tight and stabilize it; a pinch dog an inch off the back of the miter helps hold the short points tight.

Glue and nail. Fasten the soffit to the plywood backer using beads of PL glue and pairs of 2½-in. 16-ga. finish nails every 12 in. Again, leave the miter end free until the miter is assembled. Note that the backer is slightly narrower than the soffit to ensure it doesn't interfere with the fascia.



PART 3 THE BED MOLDING

Things can get tricky when layers bridge the wall and ceiling planes. If there are irregularities in either surface, you may be tempted to split the difference—don't. Keep reveals between moldings consistent on the wall plane. Here, for instance, the eye will more easily pick up if the bed molding is out of parallel with the frieze than with the back of the fascia. Fasten every 12 in. with pairs of 1½-in. 18-ga. finish nails through the meatier parts of the molding and into the soffit and frieze.

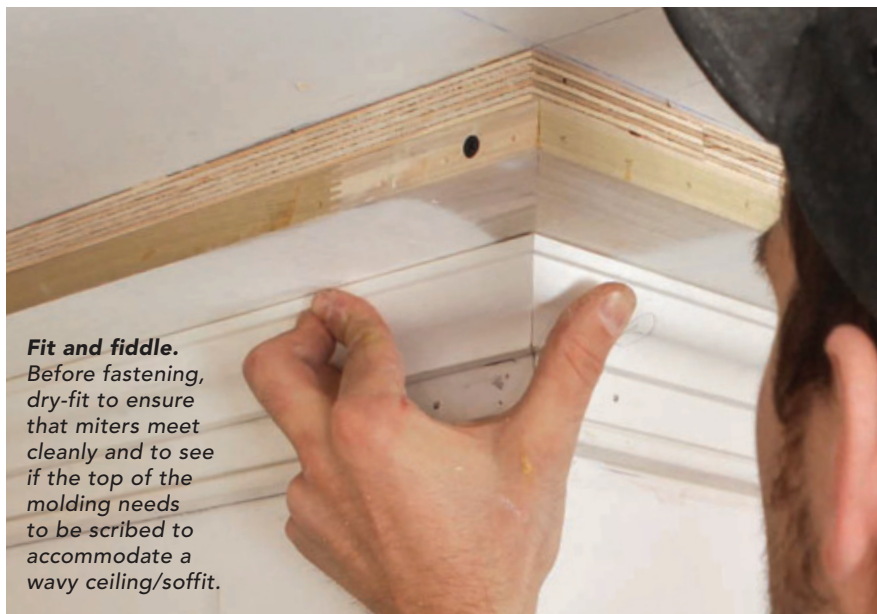
Set control lines. Set a combination square to the distance from the bottom of the frieze to the bottom of the bed molding, and mark this reveal on both sides of every corner and every 2 ft. or so along the frieze. Assemble using the same basic procedure used for the frieze, using wood glue and pinch clamps on outside miters, and nailing only after miters are tight.



Drive to fit. Use a soft hammer to coax inside miters tight before marking the cut for an outside miter and fastening the free end of the intersecting piece.



Sand or be sorry. Make your life (or at least the painter's life) easier by sanding the soffit before installing the next layers. It'll be hard to get in there later.



Fit and fiddle. Before fastening, dry-fit to ensure that miters meet cleanly and to see if the top of the molding needs to be scribed to accommodate a wavy ceiling/soffit.

PART 4 THE FASCIA

When joints are going to get buried behind other moldings, don't waste time getting them perfect.



Gauge and mark. Use an L-shaped gauge block set to the reveal below the soffit to establish the height of the fascia, and mark the reveal and the outside miter cut at the same time.

Rough-cut scribes. After making a scribe in place, cut it quickly using a tablesaw, a sander with rough-grit paper, or a jigsaw. The cuts don't need to be perfect; they won't show.



Dab glue. Apply dabs of PL glue every 12 in. to bolster the fascia's connection to the rest of the assembly.



Clamp inside and out. Use wood glue and pinch clamps on both outside and, because they're accessible, inside miters.



Pin it. Double-check the reveal, then fasten with 1½-in. 18-ga. finish nails into both the backing and the soffit.

PART 5 THE COVE MOLDING

The procedure for installing the cove is similar to the bed molding. At this step, though, I add dabs of PL glue at the joint between the ceiling and fascia to bond the cove to both. Rather than rehash more of the same, here are some additional tips that can work just as well with some, if not all, of the preceding layers.



Wet cleanup. Use a damp rag and toothbrush to clean wood glue squeeze-out from joints while it's still wet.



Shim it tight. When there's not much meat at the top of a molding to scribe it to a wavy ceiling without biting through the profile, shimming above a miter can help bring intersecting moldings into plane. After fastening the moldings, carefully trim the shim in place with a sharp utility knife.



Drive to the line. Use a hammer and beater block to nudge moldings to their marks. This technique works even better with the bed molding than with the cove.

Float it down. Use a combination of floating, scribing, and caulking to make the buildup look perfect. Floating the ceiling down with all-purpose joint compound in one spot means less scribing in another, leaving a more even profile at the top of the cove.



Retrofitting a Home Elevator

Powered by suction, **pneumatic vacuum elevators** are a low-maintenance, compact alternative to conventional lifts

BY KILEY JACQUES

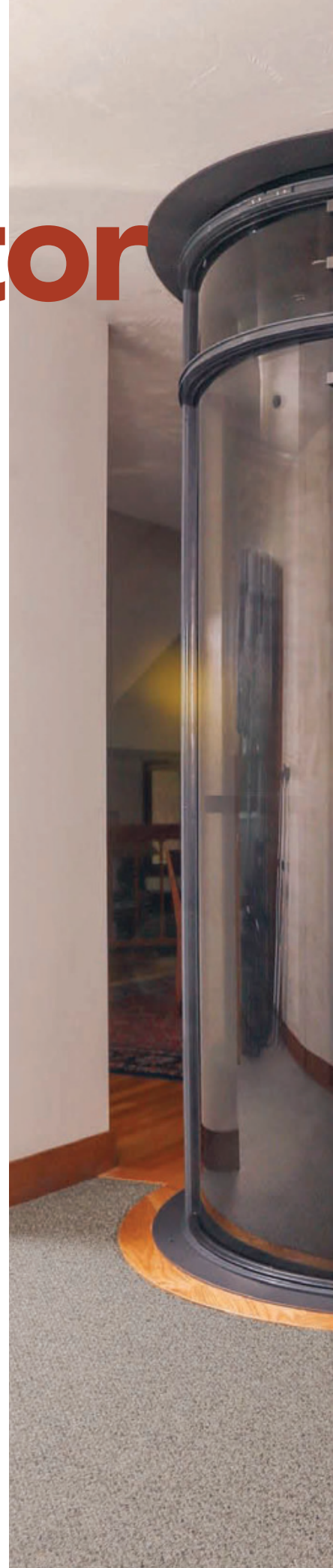
An increasing number of people are outfitting their homes to support aging in place. According to the AARP, nearly 90% of seniors last polled reported wanting to stay in their own homes well into their golden years. In the majority of cases, that means changes need to be made; some minor, others more significant. Among the suggested home modifications to support mobility, safety, and independence are home elevators—a rising trend.

Finding a fit

For this project, the homeowners opted for a pneumatic vacuum elevator (PVE), appreciating its compact fit. Unlike conventional home elevators, PVEs do not need a pit, shaft, or mechanical room. After reviewing the options, they settled



At the openings. To open the first floor, water supply and waste pipes, wiring, and HVAC ducts needed rerouting, which meant removing drywall and adding junction boxes. Floor joists were doubled on either side of the opening and a new header was installed to carry the cut joists. Corner blocking rounds out the opening, and plywood rings cover up the framing.





How PVEs work

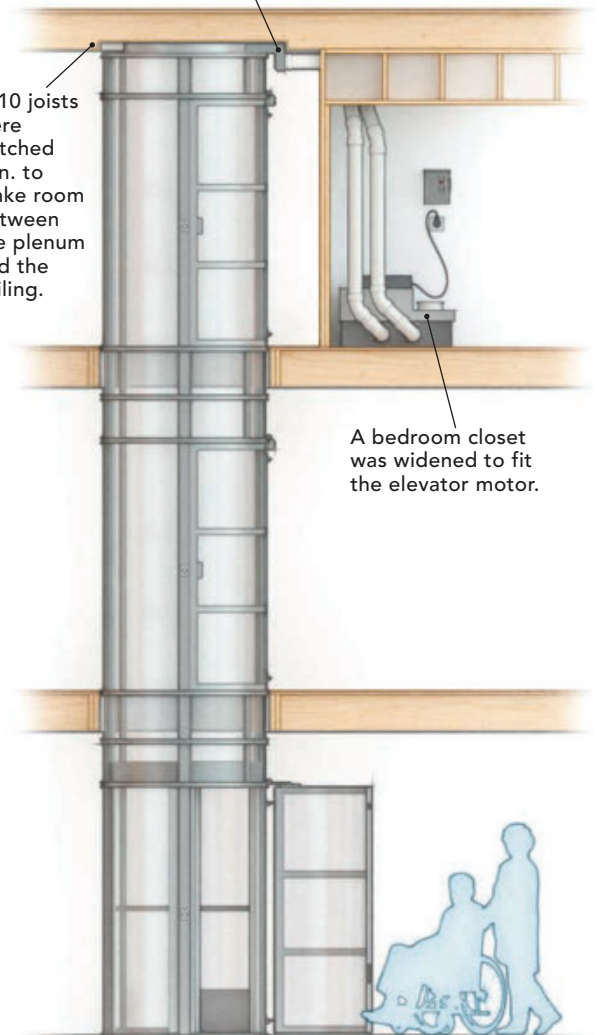
Pneumatic vacuum elevators operate on air pressure—much like the pneumatic tubes you see at a bank window. With an aluminum frame and polycarbonate panels comprising the exterior cylinder and a car made of steel, the self-supporting tube is driven by a suction assembly that houses the turbine engines, valves, and control board. Movement is the result of a high-pressure/low-pressure environment. When turned on, the turbines draw air out of the tube, reducing the air pressure above the elevator cab to pull it upward. Lowering the pressure beneath the cab allows its descent. The cab comes to a stop when the air pressure is equalized and steel brakes are applied, locking it to the landing.

A 7-in. by 3-in. plenum—the place where two 4-in. heavy-duty PVC pipes attach to serve as vacuum tubes—is mounted to the steel top plate.

2x10 joists were notched 2 in. to make room between the plenum and the ceiling.

A bedroom closet was widened to fit the elevator motor.

Maintaining the sightline. The location allows circulation around the entire unit and a clear view of the front pond. Custom finish work includes a 3-in. half-ring of trim around the base. The PVE is quiet when in motion and easily accommodates a wheelchair.





Preparing for lift. The hoist chain is attached to a temporary steel rod, which is fastened to a ring with metal pins.



Starting point. Two crew members are stationed on the basement floor, two on the first, and one on the second to feed the tube sections up one at a time.

on Pneumatic Vacuum Elevators' PVE52 model, which is designed to make two to five stops and carry up to three people or 525 lb.

When determining where to put it, the clients and architect Stephen Lasar talked about having the elevator come up from the garage into the main entry foyer—in that location, they wouldn't have needed to build a lift from the garage to the basement floor. But there was a large air handler in the way, and a significant amount of duct-work would have needed moving. It could have been done, but the occupants nixed the idea because the tube would have been almost in the middle of the dining room. They also discussed putting it behind the garage, but that posed a number of structural complications. Ultimately, they decided to run it from the basement floor through the entry hall and to the second floor. A mechanical lift gets them from the garage to the elevator.

Cutting the openings

Before installation, builder Rob Riebe, owner of Riebe Construction Co., and his crew put in 350 hours of prep time. The team was charged with removing the wall between the

dining area and entry hall, cutting into two floors to create 54-in.-diameter openings, and excavating for the mechanical lift—this last task proved especially challenging when they discovered a huge boulder in the way. On the second floor, the crew moved a wall to gain 9 in. in the hallway, which provides 4 in. of clearance where the elevator comes closest to the wall. It was above the second floor that they needed to add the hoisting support beam. A bathtub located on the third floor made it challenging to install that beam, which had to be supported with stacked studs down to the foundation.

Installing the tubes

When the preparation work was done, an installation team from Connecticut-based Elevator Service Company came to measure the critical dimensions—PVEs have to be within $\frac{1}{8}$ in. When all was confirmed, they arrived in four vans with all parts on board.

The first day was devoted to offloading and assembling the components. Once the cylinder panels were snapped together within the frame, the crew moved the elevator into the house in three sections, starting with the topmost head unit, which houses the



Hoisting in sections. A new support beam was added to the third-floor joists to carry the pulley system and loads as the tube is lifted into position.



Connecting parts. Silicone adhesive secures the rings that sit between each section. Steel pins lock the sections together.



turbines, valves, and control cabinet. Then, they hoisted the first- and second-floor sections to the proper levels and moved them aside. Next, they set the bottom section level and plumb and attached the steel pins that would connect it to the section above. A bead of silicone sealant was applied around the entire top of the tube, and a 16-in. connecting ring was inserted between the floors. This sequence was repeated for each section.

It took the four-member crew six days to finish the job—it was comparatively complex because of the two stops and tight squeeze on the second floor, plus the learning curve

when working with this new type of elevator. After the homeowners' long-anticipated inaugural ride, there was no doubt about the peace of mind their new PVE provides. With it in place, they foresee many mobile years ahead. "Making a home accessible is difficult and requires attention to detail," Lasar says. "It is always good when one can combine accessibility and good design so that a person with a disability doesn't feel second-class." □

Kiley Jacques is design editor. Photos by the author, except where noted.

Clever Fix for a

A two-pronged approach to leveling a balloon-framed floor

BY ANDREW GRACE

Although we also build new homes, my company's bread and butter is updating and remodeling turn-of-the-century houses, most of which have balloon framing. Balloon framing was a transitional method of construction that came between timber framing, which was common until the late 19th century, and the modern platform framing that came into style in the post-WWII period. A balloon-framed house has studs running uninterrupted from the mudsill to the plate under the rafter tails. Second-floor joists are nailed to the bearing walls and supported by a piece of stock called a ribbon board—in this case 1x6 stock—let into the studs (see drawing, right). One of our recent whole-house balloon-frame remodeling projects had a floor so out of level that anyone sitting on the toilet in the future bathroom risked sliding off. Just walking on this part of the second floor was vertigo inducing, never mind trying to make tiled walls look right. The floor had to be leveled.

Take it easy, Jack

In a sloping-floor scenario like this, most remodelers immediately start jacking up the low point—but when a house has sagged this much and has been that way for decades, rarely can you correct the whole amount by jacking. If you try, you may end up breaking framing members or the roof or second floor will start lifting where you don't want it to.

Structural problems like this sagging floor often occur from foundation settlement or other structural deficiencies. Obviously these kinds of things must be corrected before you start leveling the floor. In this case, the 2x10 floor joists sagged because of their 22-ft. span without an intermediate beam or bearing wall, so a big part of fixing this floor was installing an LVL flush beam near midspan. Posts on both ends and another beam already in the crawlspace would continue the load path to the foundation and concrete footings under the crawlspace slab.

Without leveling the overspan floor, the planned bathroom above would have been 2½ in. out of level in a little over 10 ft., which is just too much to jack. The great part about balloon framing is that you don't have to jack the floor the whole way. You can raise the low point, usually at the center of the span, and lower the high point where the floor is attached to the wall. When I explain this process to clients and fellow contractors, they often surmise that lowering part

of the floor must take a long time, but lowering one side of this floor, as shown here, only took about three hours. Compare that to jacking and installing the beam, which took close to a whole day. When we were done, the floor was perfect—and I'm sure our work saved many hours that would have been spent trying to make fixtures and finishes work in such an out-of-level space. It sure looks better, too. □

Andrew Grace is a remodeler in Ligonier, Pa. Photos by Patrick McCombe.

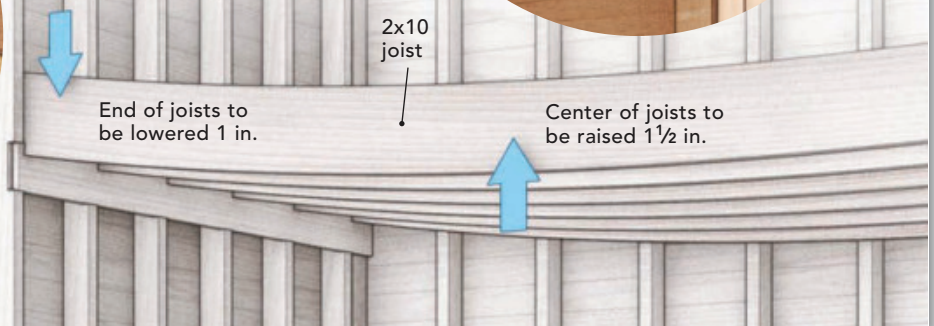
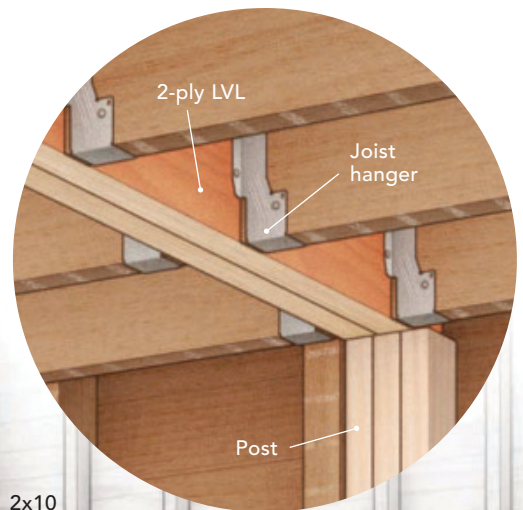
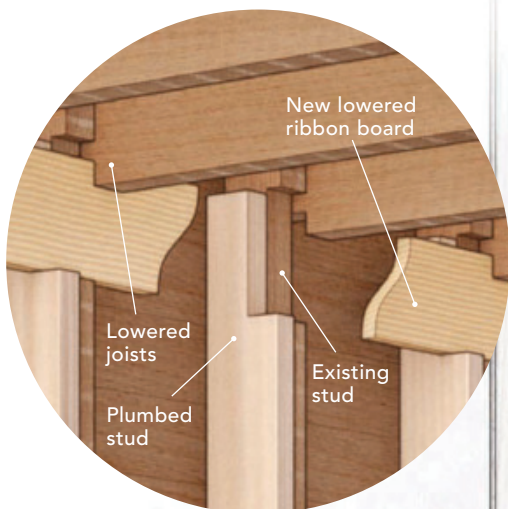


Sagging Floor



JACK IT UP AND DROP IT DOWN

Leveling this floor required jacking up the sag in the middle and adding a midspan beam, and then lowering the floor where it attaches to the exterior wall. Temporary walls support the floor while the beam is placed.



FREE THE FLOOR

With the midspan beam in place and the low point jacked to the maximum, the next step is to lower the high side of the floor. The joists are already nailed to the studs, which is enough to safely hold the floor in place while the old ribbon board is replaced.

Provide support.

Temporary walls support the floor on both sides of the beam until the joist hangers are attached and the beam's ends are supported with posts. The studs are scribed and cut individually to ensure a tight fit.

Leaving off the top plate provides an additional 1½ in. so the studs can be used for partitions later.



Make a level line.

Use a pole-mounted compact laser to project a level line below the floor. Measure up from the laser line to the low point of the floor near the new beam. This shows how much you need to lower the end of the floor—about 1 in. in this case.



Mark new notches.

Before we began work on the floor, we added headers and cripple studs above windows and doors. Using the laser, we then marked all studs for the lowered ribbon-board notches.



Cut new notches. Cut the bottom of the new notches with an oscillating multitool and then remove the waste with a chisel. Both the new studs around the window and the old ones in other parts of the wall can be cut in the same way.





Cut the ribbon. Use a reciprocating saw to cut the old ribbon board on both ends and then use a cat's paw to remove the nails that hold it to the studs.



PREPARE FOR LANDING

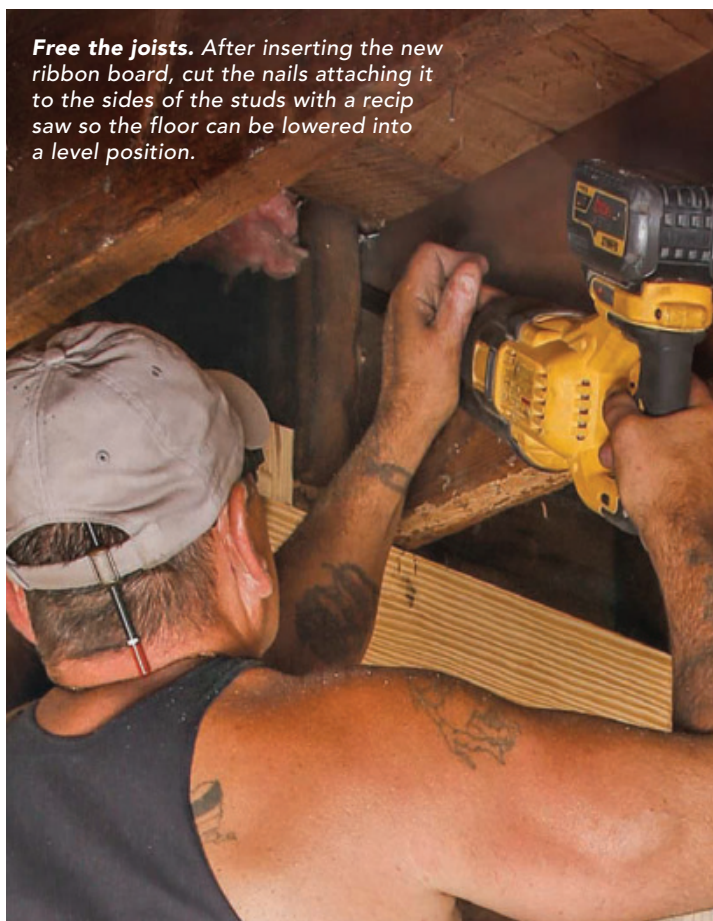
With the old ribbon board removed, a new one can be fit into the lowered notches, and the floor lowered to rest on it.



Nail up new studs. To make it easier to hang the drywall later, we fastened new notched 2x6 studs next to the existing studs, which were 3 in. out of plumb top to bottom. We nailed the top, plumbed the stud, and then nailed the bottom into the plate.



Stair-tread stock is ideal. The new ribbon board is ripped from 5/4 clear vertical-grain yellow pine stair-tread stock—a perfect match for the ribbon board's original thickness. Once fit, tack it in place with a couple of nails, but don't fully fasten it yet.



Free the joists. After inserting the new ribbon board, cut the nails attaching it to the sides of the studs with a recip saw so the floor can be lowered into a level position.



Fine-tune the notch. The joists all have notches of varying depth to accommodate the joists' slightly different dimensions. We don't change the depth of the notch, which keeps the floor in a single plane. But we do make the notch slightly wider so the floor joists easily slip past the new ribbon.



Gentle readjustment. A pair of heavyweight coworkers walking around or a board and sledgehammer lowers the ends of the floor joists, bringing them into contact with the ribbon board and making it level across the span.



Attach the joists. When the floor is settled onto the new lower ribbon board, nail the joists to the sides of the studs.



Fasten the ribbon. Once the floor is lowered, the ribbon board, which was only tacked in place, is fully nailed using 2½-in. ring-shank framing nails.



Leveled out. With the center of the span jacked 1½ in. and the end of the span lowered 1 in., the floor is now level, making the installation of bathroom tile and fixtures much easier.

Updating Traditional

FOLLOW THE BUILD IN THREE PARTS

- Planning & Framing
- Envelope & Mechanicals
- Design & Reveal ◀

In this three-part series, we explore the design and construction of a traditionally styled house in Kentucky.

This installment covers the home's finishing touches, including the exterior details and interior design.



Follow the build at
FineHomebuilding.com/fhb-house
and via our social channels.

Modern accents and a monochromatic color scheme enliven the traditional design of this 19th-century-inspired home

BY JASON BLACK

The Kentucky *Fine Homebuilding* House is also a show house in the Norton Commons development's annual home show. For interior designer Gretchen Black and me, this has been an opportunity to both construct a house that incorporates some of our own ideas for gracious living and to build on the rich traditions of Southern architecture. While the front elevation of the house has to conform to the traditional look of the neighborhood and meet all of the design edicts of the town architect, we were able to infuse the town's traditional design language with some modern touches in the interior and the outdoor space at the rear of the house. □

Jason Black is a founder and owner of Artisan Signature Homes in Louisville, Ky. He has updates of the build on his YouTube channel, Building a Better South. Photos by Tim Furlong Jr.

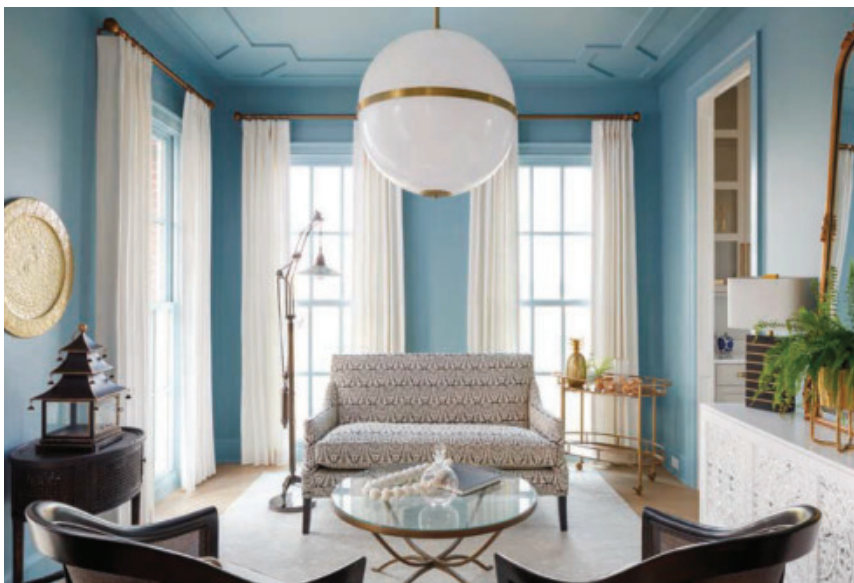


A WELCOME HOME

The concept of New Urbanism involves building neighborhoods with strong communities. A crucial part of achieving this vision is that each house on these densely developed streets has a front porch within comfortable talking distance from the sidewalk. Our double-decker front porches on the *FHB* House function this way, and they are a reference to a historical, urban southern-home style. Our front facade employs several touches from the 19th-century New Orleans homes that inspired it, including a gas light above the front door and operable shutters flanking 8-ft. windows with the sills set at the floor.



CONTEMPLATIVE AND CONVIVIAL SPACES



The 1200-sq.-ft. first floor is divided into two parts. The flex room off the front entry is sheltered from the rest of the house and, perhaps, the most formal of the rooms, influenced by the facade. The four tall windows reference homes of an earlier century. The trim here, including the modified celtic-knot border pattern (often found on a hardwood floor, but here visible on the ceiling), adds visual interest and elegance. The monochromatic paint scheme on the walls, ceiling, baseboard, and casing lends a quiet, contemplative air to the room, which can act as a sitting room, a home office, or even a formal dining room. The space is buffered from the open floor plan at the rear of the house by the long hallway and the butler's pantry.

The rest of the first floor is organized around the kitchen. Throughout the house we've mixed modern and traditional elements, and in the



Want more?

For a slideshow of photos of the finished home, visit FineHomebuilding.com/fhb-house.

kitchen, modern accents enliven the traditional. I wanted to amplify the brass cabinet pulls, which we did by framing the island and the range-wall cabinets with thin brass plating—in effect a metal edgebanding. Because of their size, range hoods are always something of a kitchen's focal point, so integrating the brass banding on the hood seemed natural. These brass accents work with the range backsplash tile and brass bar.

The kitchen is open to the family room, so guests and family can be together while prepping food and eating. This room is perhaps the most traditional in the house, with crown molding and backbanded casings, a traditional built-in display cabinet, and a fireplace. We took a playful approach to the fireplace, with a painted mitered surround and stained shiplap installed in a chevron pattern encasing the chimney.



CONNECTING THE OUTDOORS

Because the houses on each street are an arm's span apart, residents rely on the town's parks and trails for outdoor recreation—yet another opportunity to meet and spend time with neighbors. Yet there are occasions when homeowners want to enjoy the outdoors in the privacy of their own yard, even if it's a small space. We deliberately did not maximize the size of the house on the lot so that we would have a courtyard at the back of the house that can function as an outdoor family room and entertainment space. We framed the garage an extra 6 ft. 6 in. deep to accommodate an enclosed bar on the courtyard side. With a sink, electrical power, a serving counter, and storage, the garage bar and courtyard are ready for entertaining. I like the look of limestone paver patios with trimmed grass growing between the pavers, but that was not in the budget. My compromise was a poured-concrete diamond-grid pattern within a border, with sod laid between the concrete pads.



MEDIA ROOM GETAWAY

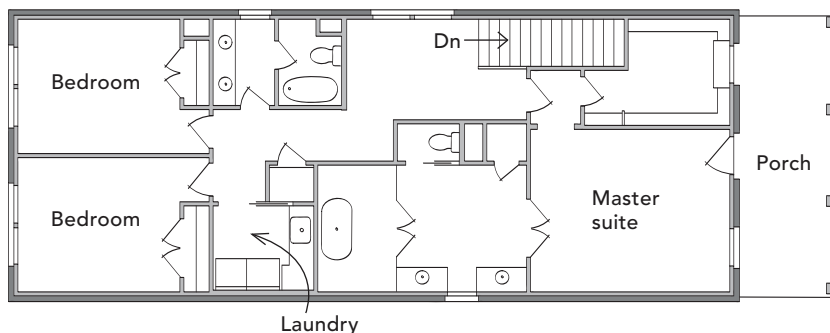
The house has plenty of indoor entertainment space. The basement media room is a place for adults or kids to have fun away from the open plan of the first floor, where noise would filter through the house to the second-floor bedrooms. It includes a wet bar complete with refrigerator drawers and a dishwasher, so there's no need to run up and down the stairs for refreshments during the game or a movie. When the house was being wired, we installed a subwoofer in the wall beneath the stairs and speakers in the ceiling so future homeowners wouldn't have to tuck speakers and soundbars on shelves or behind furniture. I coordinated with the HVAC installer to run the supply and return ductwork around the perimeter of the room so the chases would create a tray ceiling rather than taking the most direct route down the middle of the room.



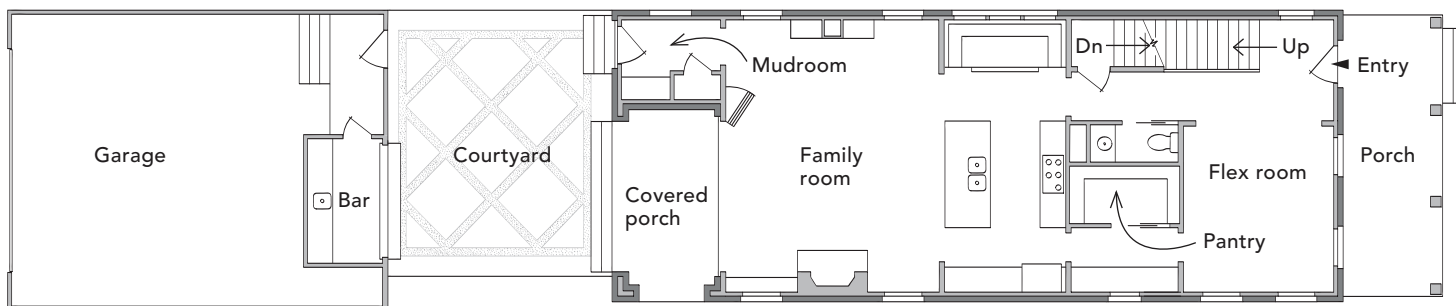
GATHERING SPOTS FOR FEW AND MANY

Working within the confines of a very narrow lot, the *FHB* House delivers three different entertaining spaces that allow gatherings to involve the whole household or be held at a degree of separation from the home's quieter areas. Despite the small footprint, the family-oriented second floor includes a master suite and two additional bedrooms, and there is a guest bedroom in the basement.

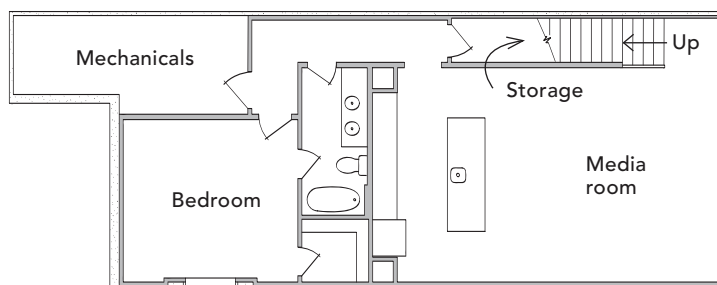
Second floor



First floor



Basement



North

SPECS

Bedrooms: 4

Bathrooms: 3½

Size: 3,485 sq. ft.

Location: Prospect, Kentucky

Architect: C3 Studio

Designer: Grey House Design

Builder: Artisan Signature Homes

0 2 4 8 ft.

A SWEET SUITE

The second floor is the private area of the house. There are two bedrooms served by a bathroom, in which both the toilet and the shower can be closed off from the vanity to maximize usability. The laundry room is located on this level, so clothes can be washed near the location where they are removed and stored. The master suite, though, is the highlight of the second floor. The bedroom itself isn't especially large; it fits a king-size bed and night tables. There's additional space on the private second-story porch, and the lower-than-typical windowsill height visually lends the space of the porch to the room. The bedroom is supported by generously sized spaces dedicated to the other needs of a master suite, including the large walk-in closet and dressing area. The master bath is meant to be the focal point of the suite, with double doors connecting it to the bedroom. The toilet area is set off behind a pocket door for privacy, and the his-and-hers vanities, showers, and bathtub dominate the space. The unlacquered brass DVX fixtures and large-format, marble-like porcelain tile make a statement. The division of spaces in the bathroom and layout of the master suite offer space for two to begin and end their day and also to retreat from the hubbub of other areas of the house either to the bed or to lounge above the street on the porch.



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HOUSES

ARCHITECTURAL CHALLENGES AND SOLUTIONS

BY DESIGN

CURATED BY KILEY JACQUES





ROW HOUSE REVIVED

After years of neglect, the rear of this 1890s Victorian row house was in considerable disrepair. Hill & Hurtt Architects was charged with its resurrection. The goal was to transform the dark, dysfunctional enclosed porch and kitchen into a light-drenched living area that would transition nicely to the roof deck, all in a period-appropriate design. Structural members were reinforced to meet current building codes, and the team reworked exterior trim details to create a new facade that relates to the original house. The kitchen was reoriented for a galley layout, which allows for comfortable circulation to the back, and a breakfast nook/mudroom replaced the existing porch. The north-facing room incorporates tall windows and a French door to give the impression of a traditional enclosed porch. The upper windows and door between the office and the roof deck were reconfigured to relate to the structure below and brighten the interiors, and windows added along the west wall provide even more light. The finishes were selected to blend with the Victorian style and include heated hex-tile flooring and painted PVC trim—a durable product with a historic look and feel.



Designer Hill & Hurtt Architects, hillandhurtt.com

Builder Wall to Wall Construction, walltowallconstruction.com

Location Washington, D.C.

Photos Joshua O. Hill, courtesy of Hill & Hurtt Architects

BACK TO PLUMB AND IN PLANE

The teams behind the restoration of this Greek revival, Sustainable Design and ReDesign Construction, had two key issues to remedy. First, they had to level the top plate of the old timber frame to accept new raised-heel trusses. After identifying the extent to which the frame had shifted out of plumb and out of level, they reduced the distance between the plates by pulling together the existing beams with winches and come-alongs, jacking up extreme low spots, and trimming down high spots. Then they built new sloped cripple walls to level up the rest of the plates to match the highest point on the building. Second, they needed to trim old, out-of-plumb walls with new doorways and doors. Because the discrepancies were more than an inch, they ran the jambs level from the extents of the out-of-plumb wall, and then built out the back of the trim—like a reverse extension jamb—to bring it into plane with the wall and fill the void. Additionally, the team removed the plaster covering the original fireplaces and installed new hearths and timber-beam mantels, leaving the brick unpointed for an aged look. The stone fireplace is new.

Designer Sustainable Design, LLC, sdvermont.com

Builder ReDesign Construction, redesignconstruction.com

Location Chester, Vt.

Photos Christine Glade Photography





“It’s important to find the extent to which your plates are out of level before measuring and ordering your trusses.”

—Josh Wengerd, ReDesign Construction

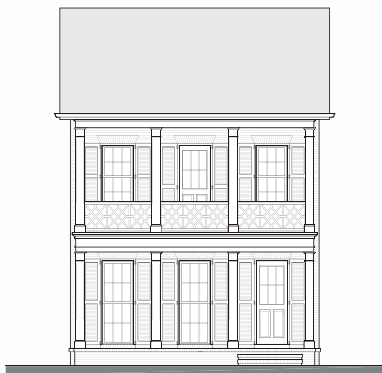


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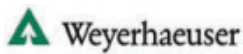
Contemporary Classic

The completed 2019 *Fine Homebuilding House* in Kentucky showcases the impact of subtle, modern updates to a classically inspired home, including the brass-trimmed, open-plan, command-center kitchen.

Follow the build at FineHomebuilding.com/fhb-house

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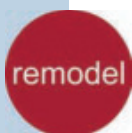


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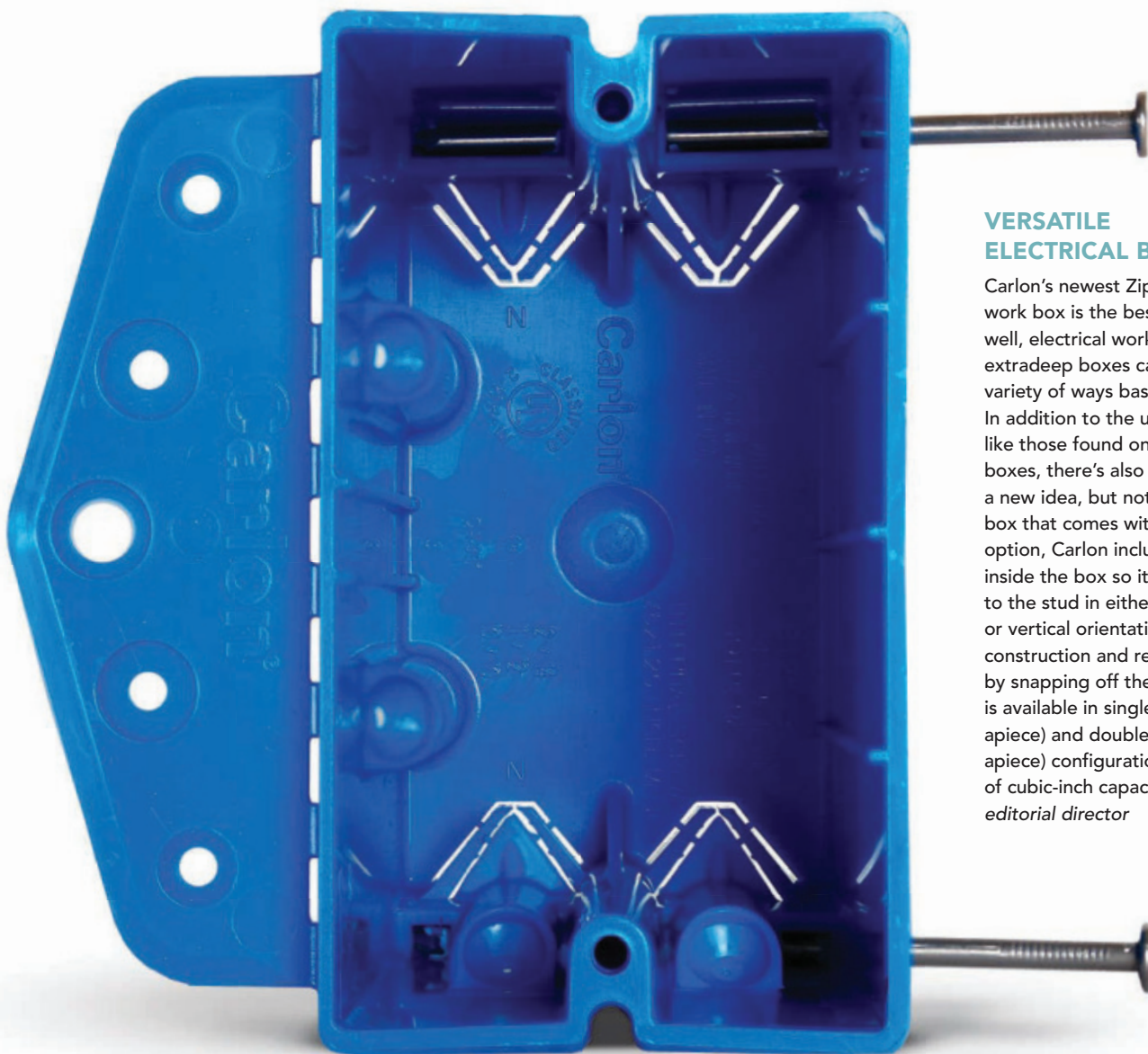
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SPEC

NEW AND NOTABLE PRODUCTS



VERSATILE ELECTRICAL BOX

Carlton's newest Zip Box Blue electrical work box is the best thing since, well, electrical work boxes. The new, extradeep boxes can be installed in a variety of ways based on the situation. In addition to the usual captive nails like those found on most PVC work boxes, there's also a nailing fin—not a new idea, but not usually seen on a box that comes with nails. For a third option, Carlton includes angled holes inside the box so it can be screwed to the stud in either a horizontal or vertical orientation, in both new construction and remodels (the latter by snapping off the fin). The work box is available in single-gang (about \$1 apiece) and double-gang (about \$2 apiece) configurations, with a variety of cubic-inch capacities. —Justin Fink, editorial director

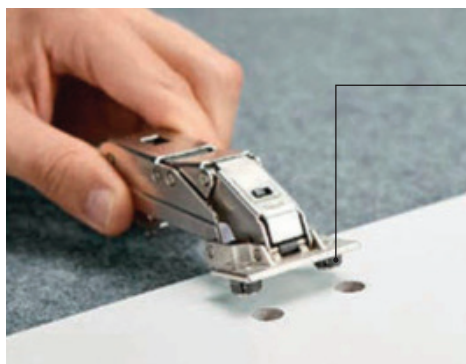
THERMALLY BROKEN STUDS

High-performance exterior walls typically handle thermal bridging at framing members in one of two ways—either the building exterior is wrapped in insulation, or the home is framed with staggered- or double-stud walls. Now there's another option: the Tstud.

Tstuds are an alternative to solid 2x6 framing lumber designed to break the thermal bridge within the stud itself. Each Tstud has two 2x3s on the flat connected by angled wood dowels, and the space between the 2x3s is either left empty (called BareNaked) or filled with closed-cell spray foam. They can be used for pretty much any framing element in exterior walls: studs, jacks, cripples, plates, and headers. They are designed for advanced framing—24 in. on center, with single top plates and two-stud corners. But with this design, Tstuds act like engineered trusses, not solid-sawn lumber, so they need full bearing across the truss. This means, for example, that when used as bottom plates, j-bolt anchors are connected to the Tstud with a metal plate that spans the truss.

When building with Tstuds, care must be taken not to cut consecutive dowels in order to maintain structural integrity. Fortunately, the manufacturer has an excellent installation guide that addresses installation and configuration considerations.

Tstuds are not cheap. One builder I spoke with was spending about \$2.50 per board foot for Tstuds, vs. about \$0.50 for 2x6s. But Tstuds are not a 1:1 functional substitution for 2x6s; and because they are so new and uncommon, I expect pricing may change if the manufacturer is able to take advantage of economy of scale. —Peter Yost, technical director at Green Building Advisor



Thin grip. Rather than wood screws, thin-door hinges attach via short, expanding prongs.



HINGES FOR THIN DOORS AND DRAWER FRONTS

To accommodate designers and cabinetmakers looking to incorporate thin doors and drawer fronts into their designs, Blum has introduced a new line of hinges, lifts, and drawer-box hardware. The thin-front hardware relies on the company's line of expansion fittings, which they call Expando T, to establish a firm mechanical connection. Rather than the usual hinge cups, the prongs of these hinges drop into holes that are just under 1/4 in. (6 mm) deep and are then tightened with a screwdriver. The hardware has been tested and approved for use with doors and drawer fronts between 8 mm and 14 mm thick, made from particle board, MDF, HDF, granite, ceramic, porcelain, and more. A pair of thin-door, 110°, soft-close hinges sells for about \$35 online. —J.F.

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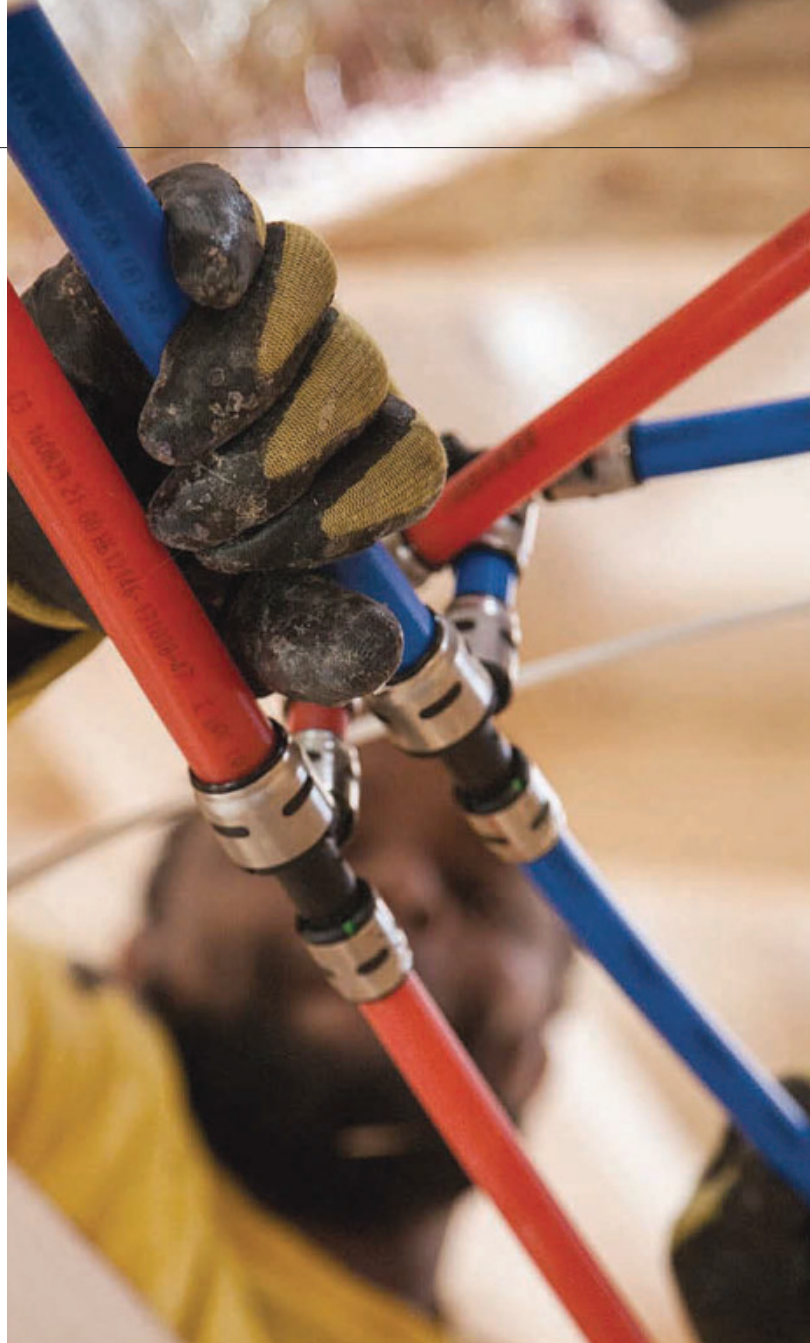


A NEW LINE OF PUSH-TO-CONNECT FITTINGS

SharkBite has introduced a new line of connectors called EvoPEX—with everything from elbows to angle stops—that retain the push-to-connect usability of the universal brass fittings that put the company on the map. But EvoPEX connectors have some differences.

First, EvoPEX fittings can only be used to join PEX tubing, not the wide array of supply-line materials that are compatible with the original SharkBite brass fittings. The brass fittings create a seal at the end of the pipe, whereas the EvoPEX fittings seal around the outside of the pipe as it's pushed into place. Both the original and the new EvoPEX fittings are approved for behind-the-wall applications and direct burial, although the brass fittings require a layer of silicone tape. EvoPEX fittings also include a visual gauge to confirm a good seal.

An EvoPEX 1/2-in. elbow fitting sells for around \$4, which is in line with SharkBite universal brass fittings, as well as the brass fittings available in other systems, such as Viega and ProPEX. But EvoPEX is a plastic fitting; when compared to other plastic fittings in those same competitive systems, EvoPEX components are upwards of four times the price. Considering that EvoPEX connectors eliminate two of the biggest benefits of the universal brass fittings—the ability to work with PEX, copper, CPVC, and more; and the ability to remove and reuse fittings—the higher cost and diminished functionality of these connectors may make them a hard sell. —J.F.



POLYMER-MODIFIED WOOD

In recent years, we've seen a handful of new wood-decking options positioned as alternatives to pressure-treated or exotic wood. The latest contender is Lignia, a company that is impregnating pine with a polymer resin. The terminology conjures images of synthetic decking, but what the process yields is more along the lines of lignin, which is the natural "glue" that binds wood fibers together.

Lignia uses FSC-certified, plantation-grown pine, but after treatment the wood performs more like red oak in terms of density and hardness. It is also highly stable and cuts, fastens, glues, and accepts finish like untreated pine, though it is slightly amber in color under a clear coat.

The lumber is supplied to local distributors as rough-sawn boards, which can then be cut into a variety of specific products for decking, siding, and other uses. Boards are available flat-sawn and in a handsome rift-sawn option that puts pressure-treated lumber to shame. The company also makes a permanently fire-resistant version, offering some competition for fire-treated woods that need re-treatment over time.

Distribution is still limited in the United States. Pricing, which varies by region and supplier, is said to be at or slightly less than the cost of ipe decking. —J.F.



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YOUR QUESTIONS—PRO ANSWERS

Deck-stair landing

Is there an accepted best practice for how to construct a durable, safe exterior-stair landing for a deck or porch staircase that terminates on the ground? I've done them in a mind-boggling variety of ways—from stringers resting on solid concrete blocks over a bed of crushed stone, to treated 4x4s attached to deep (sometimes 5-ft.) piers on wide footings, to other methods too complicated to recount (for a 100-year-old porch where price was no obstacle) or too minimal to admit (for a camper that could pack up and go at any point). For the most part, they've all seemed to work OK. Even if there isn't a one-size-fits-all solution, is there one that's simple, reasonably affordable, and generally repeatable for most situations?

—DAVE
Plainfield, Vt.

Rhode Island builder and Fine Homebuilding editorial advisor Mike Guertin replies: When building a set of deck or porch stairs, you have to address two things where they meet the earth: support for the bottom of the stringers, and landing space. Many decks don't address these critical elements properly. It's hard to say there's a "best practice," but the building code gives some guidance on good principles that should be followed to ensure a safe and long-lasting set of exterior stairs.

Regardless of the stair run and number of treads, the stairway needs a footing at the bottom to support the stringers—they can't just rest on the ground. The footing (or footings) needs to be sized to support the

SAFE, SUPPORTED STAIRS

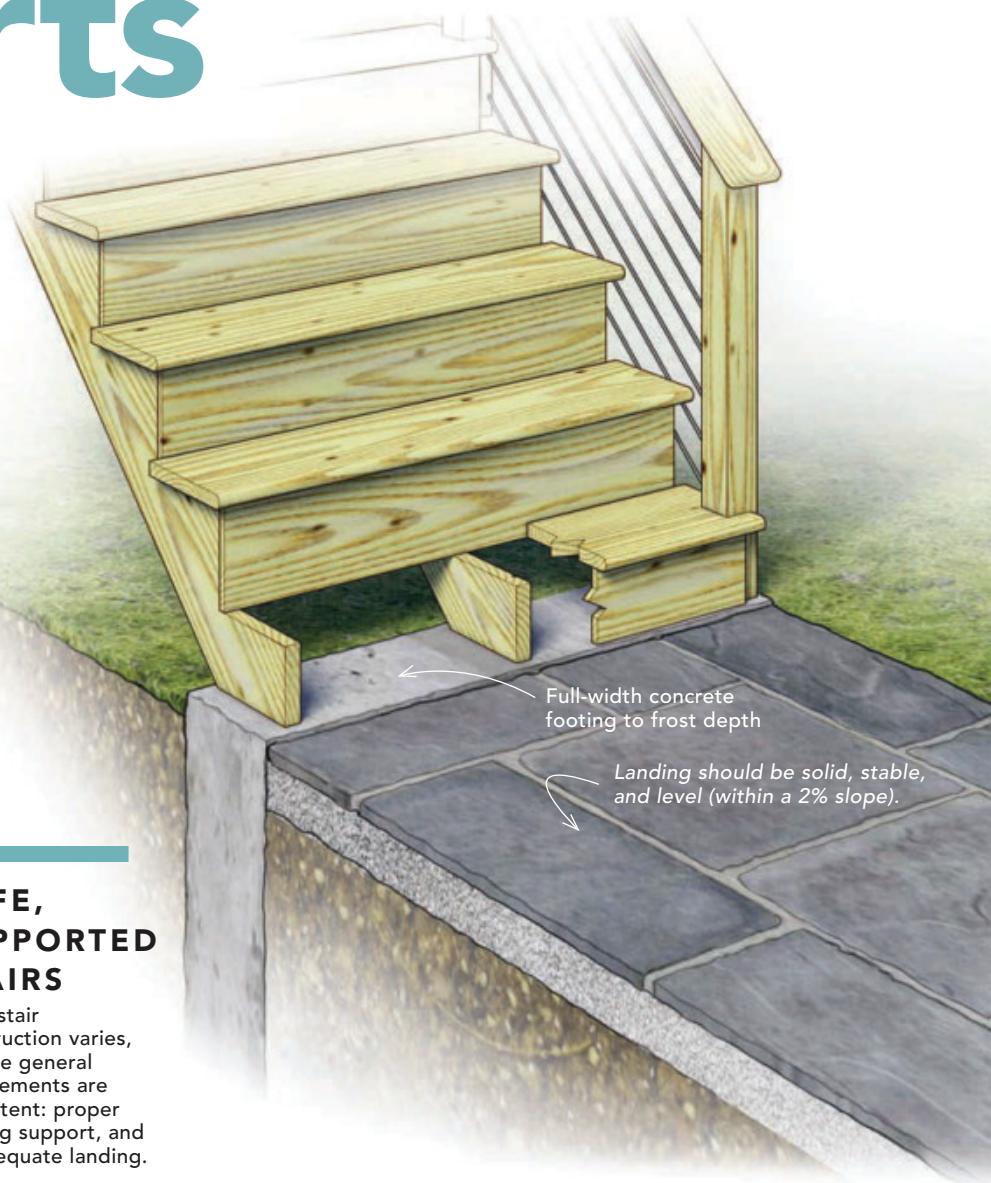
Deck-stair construction varies, but the general requirements are consistent: proper footing support, and an adequate landing.

load on the stairs, which the International Residential Code quantifies as 40 lb. per sq. ft. (psf) live load and 10 psf dead load. If you're in an area where the ground snow load is greater than 40 psf, then the footings will be sized to meet the total of the snow load and dead load.

Then, you have to figure out how deep the footings have to be. When the deck or porch is connected to and supported by the house—usually via a ledger—then the stair footing must be set to the frost depth or deeper for your area. When the deck is free-standing and not connected to the house, then the stair footing (and all other footings for the deck) only needs to be 12 in. deep.

The IRC doesn't give us any prescriptive designs for footings at stairways, but there are a number of options. The Design for Code Acceptance (DCA) 6 Prescriptive Residential Wood Deck Construction Guide published by the American Wood Council gives one solution in figure 34. It shows 4x4 guardrail posts alongside the stringers. The 4x4s bear on top of concrete footings placed either at frost depth or the 12-in. minimum depth—whichever is deeper. Jack studs are fastened alongside the 4x4 beneath the bottom of the stringer to transfer the stringer load to the footing.

I usually dig and pour a concrete footing the width of the stairway from frost depth to



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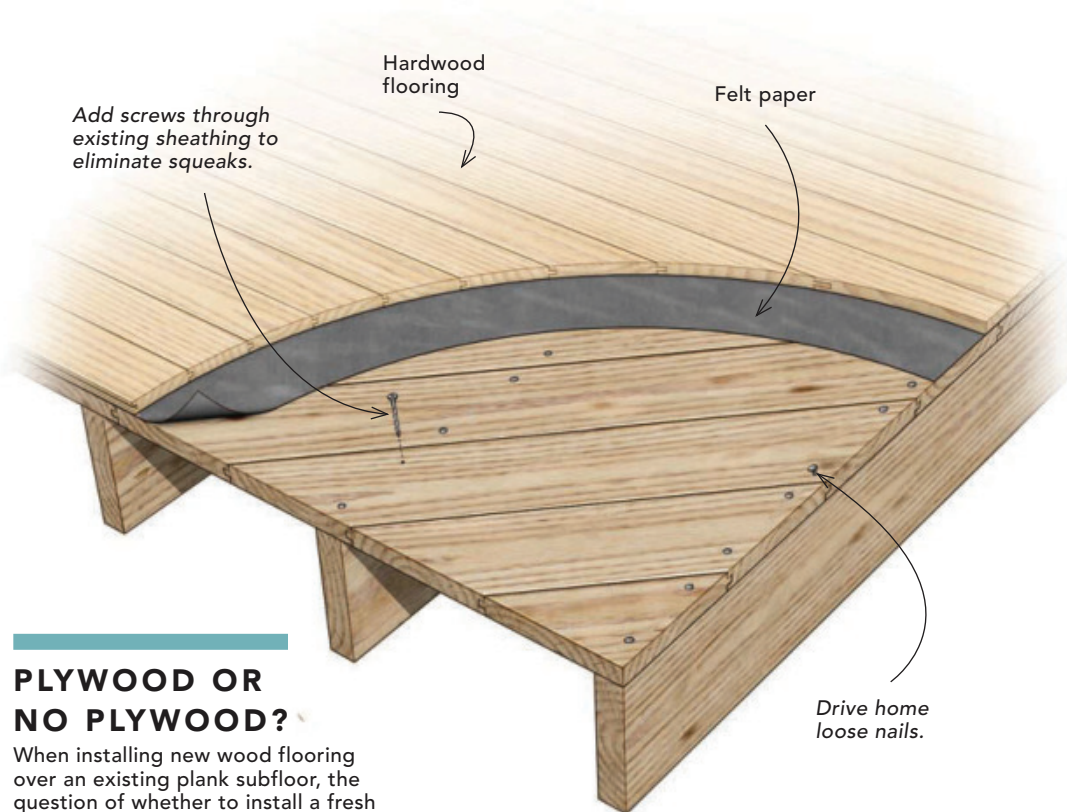
grade for the stringers to bear on directly. It's not that much more work to dig the little extra earth between individual stringer footings, and often simpler, though pouring concrete to grade will take more time and materials than burying posts. And there are other proprietary footing systems that can be used to support the stairway.

As for landings, Section R311.7.6 of the IRC addresses those. It says that there needs to be a landing at the bottom of the stairs that is at least as wide as the stairway and at least 3 ft. long from the nose of the bottom tread to the outside face. So what constitutes a "landing"? A building official friend recently queried the ICC for a definition of a landing, and they replied that the code doesn't define it. In places where the code is silent on a subject, we have to look to the intent of the code. There are two clues in the IRC that give us something to lean on when deciding what materials can be used for a landing. First is R311.7.7—Stairway Walking Surface. "The walking surface of treads and landings of stairways shall be sloped not steeper than one unit vertical in 48 inches horizontal (2-percent slope)."

Since the code defines the maximum slope of a landing, that implies the use of a material that can be measured for slope and would not be subject to change. The slope of a lawn, mulch, gravel, crushed stone, compacted stone dust, and other soft and/or displaceable materials can't be presumed to be stable for a long period of time, even if their slope can be measured.

The second clue comes in R311.7.5.1—Risers. It reads, "The greatest riser height within any flight of stairs shall not exceed the smallest by more than $\frac{3}{8}$ inch." This is for safety—a larger variance could create a tripping hazard. It stands to reason that the landing material must be stable enough that the distance from the landing to the top of the first tread remains within the limit. Unstable materials may compress or erode if the riser height exceeds the $\frac{3}{8}$ -in. deviation—or even exceeds the maximum riser height.

All this is to say, I think a solid stable surface is the code intent. And since the



PLYWOOD OR NO PLYWOOD?

When installing new wood flooring over an existing plank subfloor, the question of whether to install a fresh layer of plywood depends on the current condition of the subfloor.

code doesn't define it, I define a landing at the bottom of a deck or porch stairway as a solid, stable, level (within the 2% slope limit) surface that isn't subject to significant wear or movement. Acceptable materials to me would include pavers, stone slabs, ground-contact decking fastened to sleepers buried in the ground, concrete slabs, or some other solid material placed on a prepared, stable base of well-drained and compacted gravel or crushed stone.

Ultimately, since the code is silent on specific materials, it's up to the local official what will be approved—and not approved.

Flooring over plank subfloor

We will be installing engineered wood flooring over an old tongue-and-groove plank subfloor. The subfloor is in good condition, but we are thinking of putting plywood over it before installing the flooring. Is $\frac{1}{4}$ -in.-thick plywood okay, or do we need something thicker? And should we

use rosin paper between the plywood and subfloor?

—DAVID
via FHB.com

Rudy Kelosky, owner of Wood Floor Designs, Inc., responds: Depending on the condition of the subfloor, you may not need the plywood at all. Solid-board subflooring should be $\frac{3}{4}$ -in. by $5\frac{1}{2}$ -in. group 1 dense softwood such as Douglas fir or larch. Check the current subfloor for flatness, protruding fasteners, and squeaks, and reattach any loose boards. If the board subfloor is in poor condition, use plywood as a clean, flat surface to glue down $\frac{1}{2}$ -in.-thick engineered flooring. If the subflooring is in good shape, nail it down without the plywood, assuming the engineered wood is of good quality and $\frac{1}{2}$ -in. thickness or more.

If the current subfloor has tongue-and-groove hardwood planks, check to see if it is attached directly to the joists or if it's on top of another subfloor. If it is attached to

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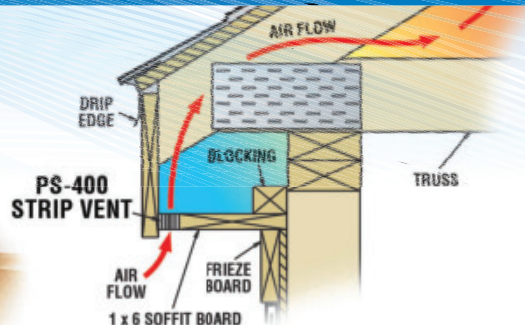


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the joists, you can use the 1/4-in. plywood to establish a flat surface and separate the two hardwood surfaces to avoid the expansion and contraction differences between the two hardwoods. If it's on top of another subfloor, remove the tongue-and-groove hardwood to get down to the lowest subfloor level. Check for squeaks and flatness, and install plywood if needed.

As for the rosin paper, it may help with squeaks between the subfloors, but you are better off addressing the root cause, which

glow when warm. It's why CFLs can take a while to reach full brightness (the phosphors are heating up) and glow after being turned off (the phosphors are cooling down). Combine that with the ballast and you could get some flickering.

Some dimmers will let a little bit of electricity through even when "off," which can lead to a flicker in both LED and CFL bulbs. Static electricity could also trigger it. The phosphors take so little electricity to glow (hence the energy-saving nature of

noticed water dripping from the fan after showering. I poked around the attic and found the flex duct for the vent is attached to the furnace's concentric vent, which exhausts via a pipe running through the middle, and takes in outdoor air through a larger pipe that surrounds it. It's this outer intake that the bath vent is connected to. Am I right to think this is crazy? What are the potential problems here, and how would you fix this?

—SEAN
via email

"The phosphors in the bulb take so little electricity to glow that they can be momentarily set aglow by static electricity, even that which you hold in your hand."

is proper installation of subfloor and hardwood. Follow the manufacturer installation recommendations, and inspect the subfloor and fix the squeaks before installing the flooring. It is best to use #15 felt paper as a moisture barrier between the subfloor and hardwood if nailing down, or between the subfloors if gluing.

Phantom flickering bulbs

Something spooky seems to be going on with my table lamp. Even when off, the compact fluorescent bulb inside it flickers—sometimes even after the lamp has been unplugged for days. What's happening?

—KILEY
via email

David K. Warfel, a lighting educator and designer, responds: All compact fluorescent lamps (CFLs) have an electronic ballast contained in the plastic part of the base. This can store up electricity that is used to jump-start the bulb when you turn it on. After turning it off, it may still have some electricity stored and try to turn itself on.

Fluorescent lamps also have phosphors coating the inside of the glass—like glow-in-the-dark chemicals—and these can

the bulbs) that they can be momentarily set aglow by static electricity, even that which you hold in your hand. It's like rubbing a balloon on your hair and then touching the bulb instead of a metal object—instead of a shock, you get a flash of light.

Now, if you take the lamp out of the socket and it flickers continuously for a long time, there may still be a simple explanation. All light is electromagnetic radiation. Visible light is on the same spectrum as WiFi, cell-phone signals, radar, and ultraviolet light, to name a few common examples. Electric current flowing through the wires in your walls also emits electromagnetic radiation. Any of these sources—or even just putting a CFL in the sunlight—could cause it to slowly gain electrons. Long-lasting specialty induction lamps rely on this principle and have no wires connected to the inside of the bulb. I suppose sunspots and solar flares could also produce the flickering (up north they call it northern lights). I can see why Tesla and Edison were so captivated by electricity. It's pretty amazing.

Dripping bath fan

My in-laws had an exhaust fan installed as part of a bathroom remodel, and they've

Noah Racette (@HVAC_artisan), an HVAC installer in Delavan, Wis., replies: You are definitely right to think this is crazy. I would say this is a classic example of why it's important to hire a reputable contractor to do the work and make sure they are using qualified subcontractors. Based on your description of the issue, this installation would not meet manufacturers' specs for either the bath fan or the furnace.

There are several things that could be causing the water to drip from the fan, but the root of the problem is condensation. If the flex duct isn't insulated and is routed through a cold space, the warm, damp air venting out can condense on the inner walls of the duct and drain back through the vent. It's also possible that the duct is constricted where it enters the concentric vent termination, which might also cause water in the air to condense and dribble back through the vent.

I can see no reason why, under any circumstance, it would be appropriate to terminate a bath fan into the furnace intake. If the furnace is running while the bathroom exhaust is operating, the furnace would be drawing extremely humid air for combustion, which could lead to the deterioration of the burners, and water dripping inside the furnace cabinet could potentially damage other furnace components. The correct fix would be to install a separate roof jack to terminate the bath-fan exhaust. If this work was done recently enough, it's worth contacting the contractor and demanding that the issue be remedied and a separate exhaust termination be installed correctly.

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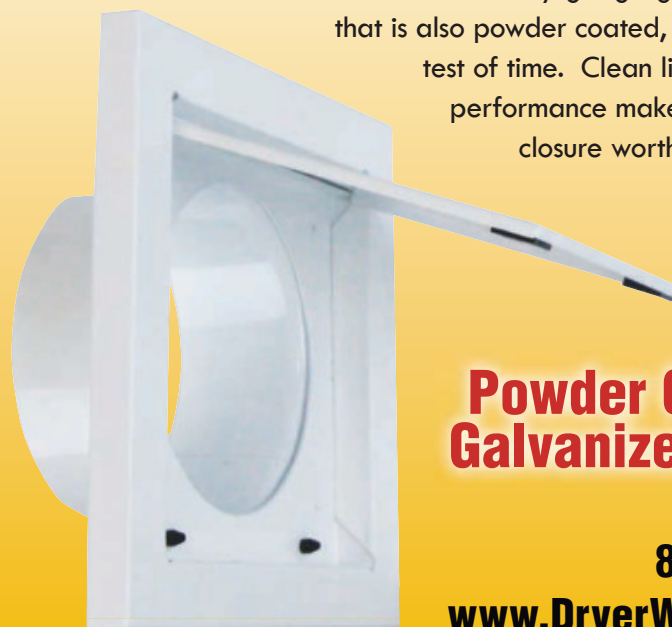
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Doors in thick walls

In the last issue, we looked at installing windows in thick-wall assemblies. In this installment, we'll focus on doors. In high-performance envelopes—those with thick walls and other details that allow for extra insulation and air-sealing—installing standard doors poses challenges that builders don't typically encounter on more conventional builds. The placement of the door relative to the depth of the opening can affect the swing and the threshold details, and thermal bridging can be an issue. There's no single solution, but I've had luck with the details shown here. They can be adapted to work with imported doors, which are slightly different than what most North American builders are used to, but they're based on standard door and jamb profiles.

Contributing editor Michael Maines is a designer and builder in Palermo, Maine.

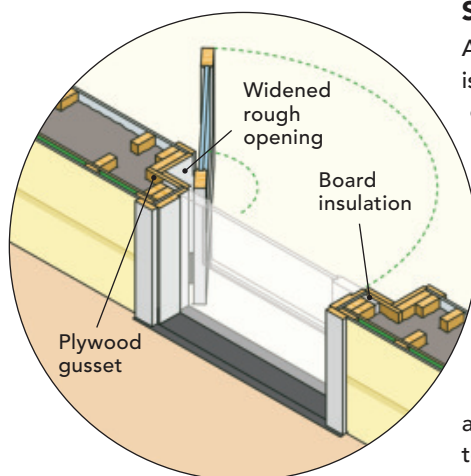
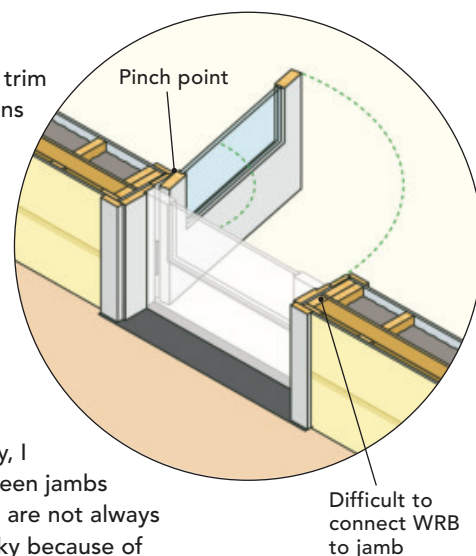
GAUGING THE SWING AND SETBACK

Thick-wall assemblies can affect the degree to which a door opens as well as how easy or difficult it is to tie the water-resistive barrier (WRB) and air barrier into the jamb. Below are three approaches to consider.

Thick-jamb solution

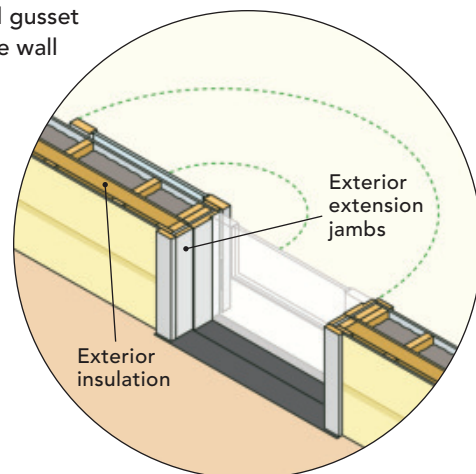
A standard door installed to the exterior makes for simple trim details, but it requires interior extension jambs, which means the door can only open a bit more than 90°. If there's no perpendicular wall to open against, the door will bind against the trim, which can loosen hinges and damage both door and trim. Plus, the WRB and air barrier are typically at the sheathing, which makes it complicated to tie the door frame into those layers because they will align toward the middle of the door jamb.

Ideally, order a door with thicker jambs. There are 6⁹/₁₆-in. jambs available off the shelf—perfect for 2x4 construction with 2 in. of exterior foam—or you can build your own or buy custom for thicker wall assemblies. Locally, I can get builder-grade doors with 9¹/₈-in. jambs, and have seen jambs up to 11¹/₈ in. from other suppliers. But even those depths are not always enough, and if there's a rainscreen, the details can get tricky because of the added thickness on the exterior side.



Stepped situation

Another option—especially suited for a double-stud wall—is to create a stepped opening. Make the outer rough opening normal size and the inner opening wider than normal. This won't enable the door to open a full 180°, but it will significantly increase the opening angle, and you can flare the inner portion for even wider access. A downside is that it reduces the amount of insulation near the door, though you can break the thermal bridge at the framing by adding a layer of rigid-board insulation on the interior side. Adjust the width of the inner rough opening and use a plywood gusset aligned with the wall to tie the two walls together.



Interior installation

My preferred method is to hold the door to the interior so it can open 180°. When there is continuous exterior insulation, this makes it easy to tie in the WRB and air barrier, provided they are located at the sheathing layer. To do this, use exterior extension jambs and a sill extension of some sort. Continuous exterior insulation is a natural fit for exterior extension jambs and sill extensions, though both require thoughtful and well-executed flashing details.



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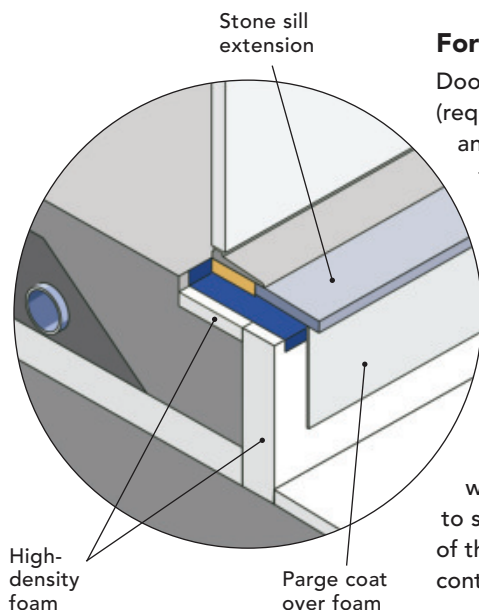
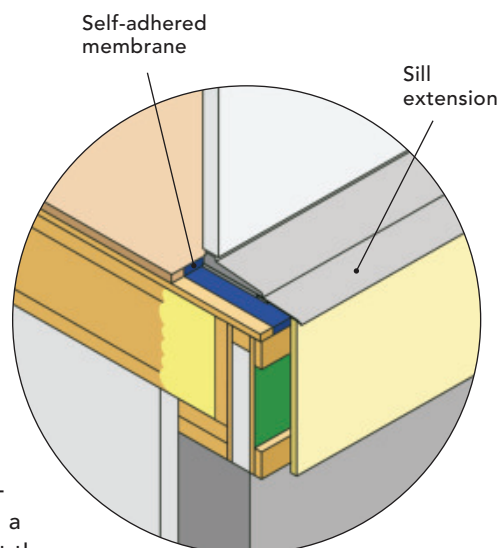
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SITUATING THE SILL

A deeply set door calls for an equally deep threshold, which can be achieved by fabricating an aluminum or stone extension. With a concrete-slab foundation, locating the sill where it will get maximum structural support is key.

Deep extensions

Door sills or thresholds can be a problem in thick walls when you locate the door at the interior side of the wall. If your door manufacturer doesn't offer an aluminum sill deep enough for the full depth of the wall, you can make an extension using commercial ramp stock—Pemko is a reputable brand. Their ramp stock comes in different shapes and sizes, so you may need to cut any that are too deep—fortunately, aluminum cuts easily on a tablesaw. The sill extension should be sloped to drain to the exterior. You could recess the outer portion of the subfloor assembly, but I think it's easier in this case to raise the entire door on a $\frac{3}{8}$ -in. to $\frac{1}{2}$ -in. shim. Make the shim continuous to meet door-installation requirements. Seal the joint between the factory sill and the sill extension with a high-quality sealant, and be sure to use a self-adhered-membrane sill pan so you don't get the thermal bridging and condensation at the interior that you would get with a metal pan. The same approach also works well when using European-style doors with narrow sills.



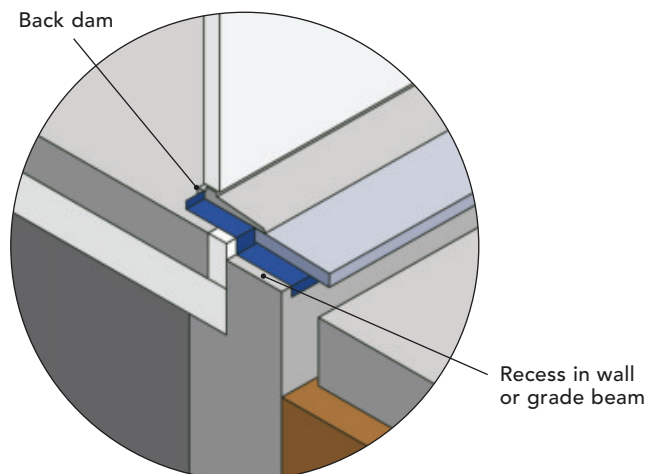
Formed recess

Doors installed on thickened-edge slabs have two main problems: The exterior insulation (required in climate zones 4 and higher) does not provide structural support for a sill extension, and if the door is held to the interior, then there is a significant thermal bridge through the top of the sill into the concrete. One solution is to create a formed recess in the slab under the door location, and fill the recess with high-density foam topped with framing lumber to support the door. Standard 15-psi foam would compress too much for the tight tolerances necessary at doors, but 40-psi foam is stiff enough to prevent excessive deflection. (I use borate-treated EPS because it is insect-resistant and the blowing agents have less environmental impact than those in XPS.) Plan ahead and special-order a sheet.

Use a membrane sill pan with a back dam to cap the foam. For the sill extension, you can use metal, but a nice upgrade that can be more affordable than one might think is stone, either from a local hardscape supplier or from a countertop supplier's scrapyard. A slightly textured surface is preferable for slip resistance. (In my area, slate and bluestone with naturally cleft surfaces are readily available.) Just set the stone in a sloped bed of mortar to shed water, and add 25-psi foam to the exterior, solidly adhered to the vertical face of the slab. That will be stiff enough to support the sill extension as long as the extension is continuous and relatively stiff.

Elevated slab

Similar details work for a raised slab, which is a slab with a frost wall or a grade beam. The perimeter foam at the slab reduces thermal bridging, so there's less need to form a recess in the slab below the door, but you will need to include a recess in the wall or grade beam. This installation should always include a sill pan, including a back dam (which can be concealed with a small piece of interior trim), because doors are apt to leak in time.



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Trading in your hammer for a clipboard

Most project managers start out as workmen, at least on the residential side of construction. If you're a young carpenter with a modicum of intelligence and reasonable people skills, you will likely one day be asked to step into the role of lead carpenter and, eventually, project manager. For many of us it's not a conscious decision—it just happens. One afternoon you realize that your hammer hasn't come out of its loop all day because you've been yakking and pointing and calling and counting since 7 a.m., so you take off your tool belt and hang it on a nail. And there it stays. Congratulations—you're a boss.

The material you will be working with in your new role isn't wood or steel or concrete. It's information. Just as you gathered an assortment of physical parts and organized and shaped them into a coherent assembly, you must now do the same with the mandates that come down from the decision-makers above you—the designers, the owners, and the contractors. Then you must

communicate that information to the crews, the subs, and the suppliers. It all sounds very logical, but in the chaos that is a building job, you will be doing most of this on the fly. That's OK; if you were able to concentrate on framing a wall when there was snow falling and the nail gun jammed and Donny never showed up, then you're no stranger to confusion. The main thing is to keep calm and fall back on familiar steps: Double-check the RO dimensions and figure out a lifting strategy for the manpower you have. In other words, never stop flying the plane.

But now you have a new assignment with different equipment and tricks, so you'll need to figure out which tools

work

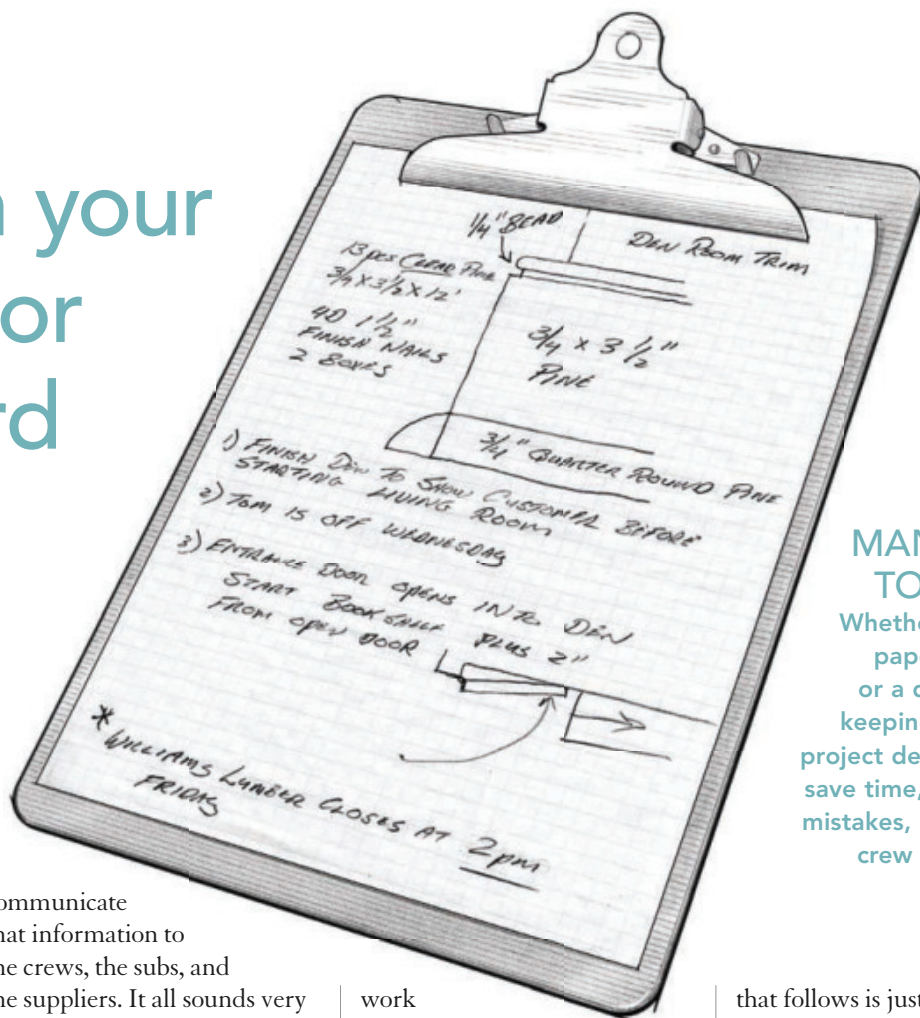
best for you.

Some of that is generational. I had my own business long before smartphones arrived, so I'm comfortable with paper-based systems. I can write faster than I can peck at a keypad, and I like having the ability to toggle between writing and drawing without switching applications. But I can see the advantage of having everything stowed away in one brightly lit phone or tablet. I'm sure there are digital versions of the paper "devices" that I depend on—a clipboard and a memo pad. If they work better for you, by all means use them, and understand that the advice

that follows is just as applicable regardless of whether you are old school or new school.

The shortest pencil beats the longest memory

The first and most important hurdle to overcome when transitioning from hands-on to managerial work is to understand that you will be processing a much larger and more fluid volume of information. As a carpenter, you might be able to keep the details for a particular task in your head. But now you are gathering information for many tasks to be done by many people. As a result you must write (much) of it down. I say "much" because



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the reality is that you can't write it all down. There will be times when the pressure is such that the best you can do is pass along a directive by mouth and trust that it gets done properly. But the less you depend on your own memory to deliver the message—and the hearer's ability to remember and interpret that message—the better off everyone will be. Yes, jotting down a note on paper or in your device takes a few minutes, but avoiding one serious mistake will pay for those minutes many times over. "She wanted an outswing entry door? I could've sworn she said inswing..."

So, whether you write on a clipboard or a tablet, in shorthand or chicken scratch, in English or Spanish—just write it down. When I'm cruising the job, I assign places on the page for the most common lists so I can sort details as I go. For instance, "Questions for architect," "Supplies from yard," and "Tasks for laborers" will almost always have entries. Sorting them at the gate saves time untangling them later.

The chief limitation of a clipboard or tablet is when you need both hands for carrying something or climbing on a scaffold. That's why I carry a memo pad in the inside breast pocket of my fishing vest. As a carpenter, I used the memo pad for measurements and sketches, but now I use it mostly to capture those elusive thoughts that might not stay in the front of my brain until I get back to my clipboard. It's also a quick way to snag the contact info of a tradesman or a potential customer when I bump into them on the street.

By the end of the day the clipboard will be a mess. There

"There's an art to cross-examining a carpenter to make sure he or she 'gets it' without making them feel like an idiot. It takes time and patience."

will be many items that didn't fall into the usual categories, as well as sketches, receipts, and product literature. If left in this condition, a clipboard soon becomes useless. To freshen it, the first step is to file away the collected paperwork to the appropriate subfolders in the job file, such as "Stairs," "Kitchen," and the like. Then you need to convert today's incoming notes and lists into tomorrow's outgoing e-mails and work assignments. Instead of doing this in the afternoon (when I'm tired), I tackle yesterday's notes first thing in the morning as the birds chirp and the java courses through my system. Then it's easy for me to see who needs to answer what questions and who needs to accomplish what tasks. If I have to compose an e-mail, the words come easily.

Manage the meeting

Meetings with clients and designers are essential to a happy outcome, but they can be difficult to arrange and are costly in terms of lost production. So as the pivotal person in a meeting, you need to come in fully primed and loaded. All

of the questions that couldn't be resolved by e-mail should be waiting on your clipboard as a carefully combed-through, typed list. Double-spacing the list gives you room to make notes. Incorporating probable choices into the wording of the question is helpful so you can quickly circle the winner instead of writing: "The front door should be in-swing or out-swing?" Whatever the method, record the answer somehow. You think you will remember, but you won't.

The order of questions should be in sync with a walkthrough that you have already planned in your head. At each stop on the tour, the questions should be prioritized, moving from the major thorny issues to the minor items.

The delicate dance of communication

Once you have the answers, you need to pass them on to the crew. A task list is a good place to start, but don't depend on it to get stuff done right. One picture is worth at least ten thousand words, so a sketch, even a crude one, will help to form a picture in the mind of

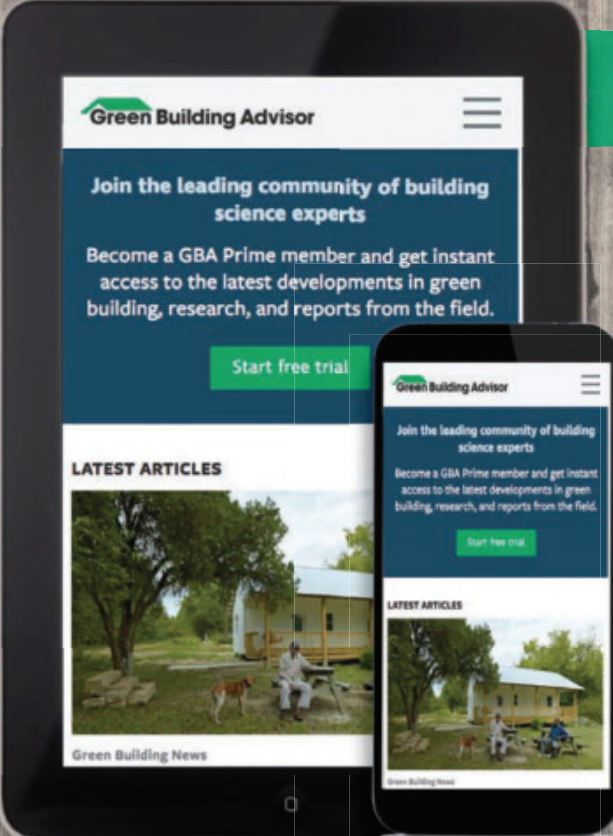
your carpenter that aligns with the image in your head. Don't be shy about making notes on the sketch to stress fine points or avoid pitfalls: "Front edge of gutter must align with plane of roof!" What happens to the sketch after you hand it off is important, too. You don't want it stuffed in a pocket and forgotten about. I often mount sketches and printed drawings on scraps of plywood that can be tacked to the wall for easy viewing. Spray adhesive works well for mounting the paper, and you can preserve the board by laminating it with clear packing tape if moisture is an issue. This may sound over-indulgent, but it sends the message that you need to get these details right.

After providing a list and a drawing, you still need to talk the job through. There's an art to cross-examining a carpenter to make sure he or she "gets it" without making him or her feel like an idiot. It takes time and patience. You may be running late for a meeting and have a million other things on your mind, but you need to create a safe space where confusion can be expressed and ideas exchanged. Everybody benefits. My carpenters often point out subtleties I'd overlooked. We discuss any special tools or processes, and I try to remember to mention where I left those toggle bolts (note: write it down). We chew on the plan for a few more minutes until the conversation peters out. For now my job is finished. I have loaded my rider's saddlebags and set him on a swift horse. It's time to let him run.



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CELEBRATING PASSION FOR BUILDING



Ethan Harrison has a goal. He wants to open his own furniture studio, where he can produce one-of-a-kind pieces that satisfy his passion for design and challenge his woodworking skills. The path to his dream, he knows, will require more than just youthful ambition. He'll need to hone his skills—a lifelong endeavor he's already begun.

Ethan jumped fully into woodworking after a shop teacher told him that he had true talent. He took the encouragement and quickly became a rising star within SkillsUSA, the organization that works to ensure the United States has a skilled workforce and with which *Fine Homebuilding* has a dedicated Keep Craft Alive scholarship. Within SkillsUSA, students train and compete in a variety of trade disciplines. Ethan has competed in cabinetmaking and has done so well that he represented the U.S. at the WorldSkills Competition in Kazan, Russia, this summer.

To meet his goal, Ethan will need to understand how to run a business as well as he can cut dovetails. He's already spent time working in a cabinet shop, and is seeking a position within an architectural millwork firm. He graduated at the top of his class with the intention of one day going to business school. It's all in an effort to strengthen his background, so that years from now he'll be well positioned to step into his own shop with confidence.

At an age where endless opportunity exists for those who seek it out, Ethan is patient beyond his years. In life, as in his work, he's specific in his movements, taking only careful, measured steps. It's the life of a craftsman.

— Rob Yagid, executive director, Keep Craft Alive

**"A craftsman puts their heart
and soul into what they do.
You can really see it
in what they make."**

ETHAN HARRISON
STUDENT AND WOODWORKER
BLACKFOOT, IDAHO



Keep Craft Alive is our campaign celebrating those who have chosen to passionately pursue a career in design, building, and remodeling. Find out more and show your support by visiting [Keep CraftAlive.org](http://KeepCraftAlive.org), and use #KeepCraftAlive to share your passion for the cause.

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