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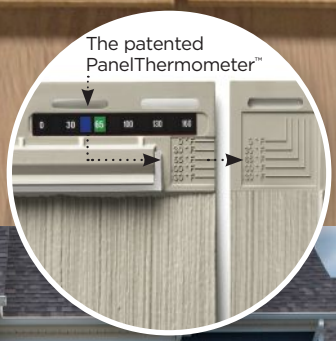


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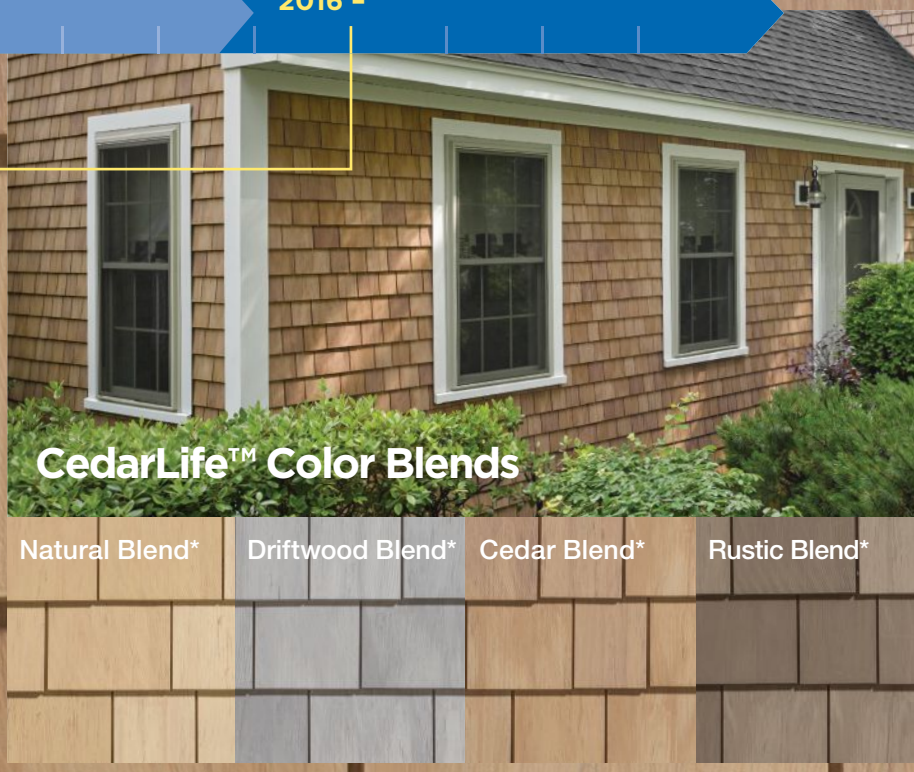

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# Contents




On the cover: A technician with Edge Energy (Beltsville, Md.) blows insulation over a sealed duct as part of a home-performance upgrade. Photo by Chris McKenzie. See the story on page 23.

## FEATURES



## DEPARTMENTS



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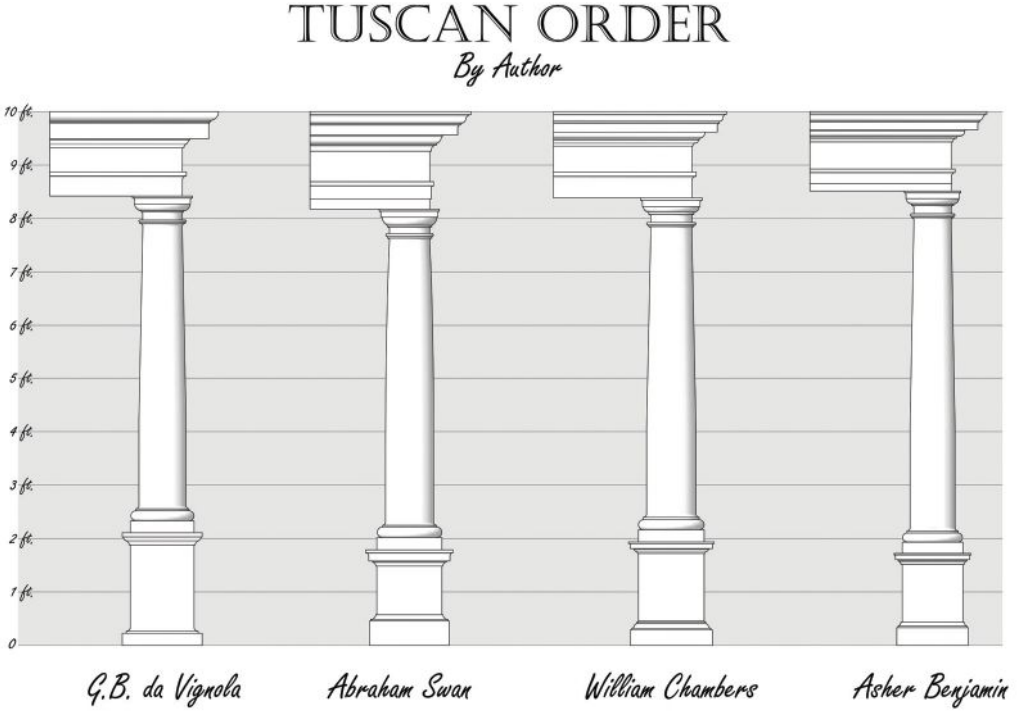
## Q What's the correct height for chair rail and wainscot?

A Gary Katz, editor of *ThisIsCarpentry* and a presenter at JLC Live, responds: The short answer to this question is, somewhere between 26 to 32 inches. The long answer might make you regret asking the question.

The height of wainscoting and chair rail depends on many things: the style of the home, the size of the room, the height of the ceiling, as well as your personal opinion of what looks good. For all these items—other than your own aesthetics—there are rules and rules and more rules. But unlike some rules—such as which fork to use or to always wash your hands after using the bathroom—design rules can be interpreted in many different ways, which means they aren't really rules, but rather more like guidelines.

### CLASSICAL ORIGINS

The placement and proportions of the moldings we install in our homes are meant to replicate those of a classical column. Wainscoting (also called a dado or dado wall paneling) is supposed to mimic the pedestal of the column. Chair rail represents the molding that caps the top of the pedestal. Contrary to what many people think, the height of chair rail should not match the height of a chair back just because it's called "chair"




Four architectural authors—G.B. da Vignola, Abraham Swan, William Chambers, and Asher Benjamin—each produced a slightly different interpretation of the proportions in the Tuscan Order.

Illustration by Todd Murdoch



In a classic historic home, the wainscot, or dado, is at the same level as the window sill, for a continuous line around the room **(1)**. Tall paneling is not considered to be wainscot, but rather wall paneling with a plate rail on top **(2)**.

rail. In fact, nothing could be further from the truth, because the height of chair rail (and of wainscot) follows the rules of classical proportion.

These rules have been interpreted in different ways by different authors over time, and the results are still remarkably similar. In most cases, the top of the wainscot and the height of the chair rail is much lower than the back of a typical chair. To find out why, let's first take a quick look at how the classical orders came about. These orders are loosely based on the human form. I underscore the term "loosely" because there is no perfect human form—there are tall people and short people, people with long legs and people with stubby legs, heavy-set folks and folks that are skinny. So you can't simply measure someone's foot at random and say that it would represent the perfect diameter of a column. Yet starting with Vitruvius (who published the earliest known book on architecture, more than two millennia ago), many writers have offered their own take on the rules of proportion based on the classical orders.

## CLASSICAL INTERPRETATIONS

All of the classical orders are important in architecture, but let's use the Tuscan order as an example because it is the simplest and least adorned of the group. In the illustration on the previous page, we see how four major architectural authors—Giacomo Barozzi da Vignola, Abraham Swan, William Chambers, and Asher Benjamin—interpreted the rules of proportion and design for the Tuscan order. Some authors stipulate that the pedestal, or dado, should be one-fifth the height of the order (or room), while others say that the pedestal should be one-third the height of the column. In this group, da Vignola's pedestal is the tallest and Swan's pedestal is the shortest. But because Swan's entablature is also the lowest, his column is proportionately similar to da Vignola's. Asher Benjamin borrows Swan's pedestal design and then creates his own unique entablature.

So who's right? I believe the truth is closer to what William Chambers said in his *A Treatise on the Decorative Part of Civil Architecture*, published in 1791: "With regard to the proportion which their height ought to bear to that of the columns they are to support, it is by no means fixed, the ancients, and moderns too, having in their works varied greatly in this respect, and adapted their proportions to the occasion, or to the respective purposes for which the pedestals were intended." In other words, do what looks best in whatever room you're working on, which means your wainscoting should be a suitable height for your room.

Personally, I tend to favor Abraham Swan's design, maybe because he started as a carpenter and joiner and became an author only after he had gained sufficient experience in the field. In his 1757 work, *Georgian Architectural Designs and Details*, Swan explains: "There is hardly a greater error in architecture, than in disposing the dadoes and the entablature to the height of the rooms. When the entablature is too large, and the dado too high, the room appears lower than it really is, whereas a light entablature, and the dado of a moderate size, gives height to the upper panel." The translation: When wainscot is taller than it should be, it makes the ceiling seem lower that it actually is.

One truly wonderful thing about the pragmatic Mr. Swan was his recognition that dado height also determines the height of the window sills (or vice versa). In the 18th century, chair rail was actually window stool. As builders of Georgian homes attempted to follow the rules of classical design, they placed window sills or stools at the same height as the dado, resulting in one continuous line of molding around the room defining the top of the pedestal and the bottom of the window **(1)**.

In most colonial homes, including neoclassical designs from the

Photos: 1, Gary Katz; 2, Roe Osborn

Georgian and Federal periods, the wainscot cap and window sills share the same profile and height, again creating one continuous line at pedestal height around an entire floor. In the photo, taken at the Gardner-Pingree home, in Salem, Mass., the two parlors share the same stool and wainscot cap, creating a single line that visually connects the two spaces.

In some historic homes I've visited, particularly those with very tall triple-hung windows, the wainscot is barely 2 feet off the floor. In one home in the Southeast, the wainscot was a mere 21 inches from the floor (I measured it). And I worked in one colonial home in Los Angeles, of all places, in which the wainscoting was 23 inches above the floor. In each of those instances, the wainscot seemed visually proportionate to the rest of the trim details and to the height of the room.

Coming from a carpentry background, Abraham Swan explained simply and practically that if the wainscot—and the stool—is too high, it spoils the view. Visitors must stand right next to a window in order to see the ground outside the building. His solution expressed in the book referenced earlier is the best and most basic approach that I've found: "If the Room be 10 feet high, I should think about 2 feet 5 inches would be a moderate height for the dado; and for every foot that the room is higher than ten, let 3/4 inch or 7/8 inch at most, be added to the dado. This method has had a good effect, and has been much approved by some skillful judges and persons of good taste."

## FAST FORWARD TO THE PRESENT

Of course, Swan's clear-cut answer typically does not solve the problem of wainscot height in contemporary homes, which are notorious for confused interruptions in every elevation. We have all visited homes where the tops of doors and windows aren't even in one straight level line, often with an inch or more difference in the window and door heights. I rarely see a contemporary home where the windows share the same sill height throughout an entire floor or even in a single room, and in most homes built these days, the wainscot is higher than the window sills.

This situation presents a variety of design and molding installation complications for finish carpenters, such as how to resolve the chair rail directly into the window casing. Finish carpenters' lives could be a lot less difficult if they just adopted the classical rule of keeping the sills and the wainscot at the same height.

And what about all that so-called "wainscot" we see in contemporary houses that is 4, 5, and even 6 feet from the floor **(2)**, and the "chair rail" that caps that detail? Actually, that wall treatment is not a dado or wainscot at all. That detail is known as wall paneling and is often capped by a plate rail—which is traditionally a flat, narrow piece of trim with a groove cut into it for displaying plates. In some Arts & Crafts homes, corbels or modillion blocks support that rail. But Swan's visual rules still apply here: If you run the wall paneling high, the ceiling will seem lower than it is, an effect that can be purposeful.

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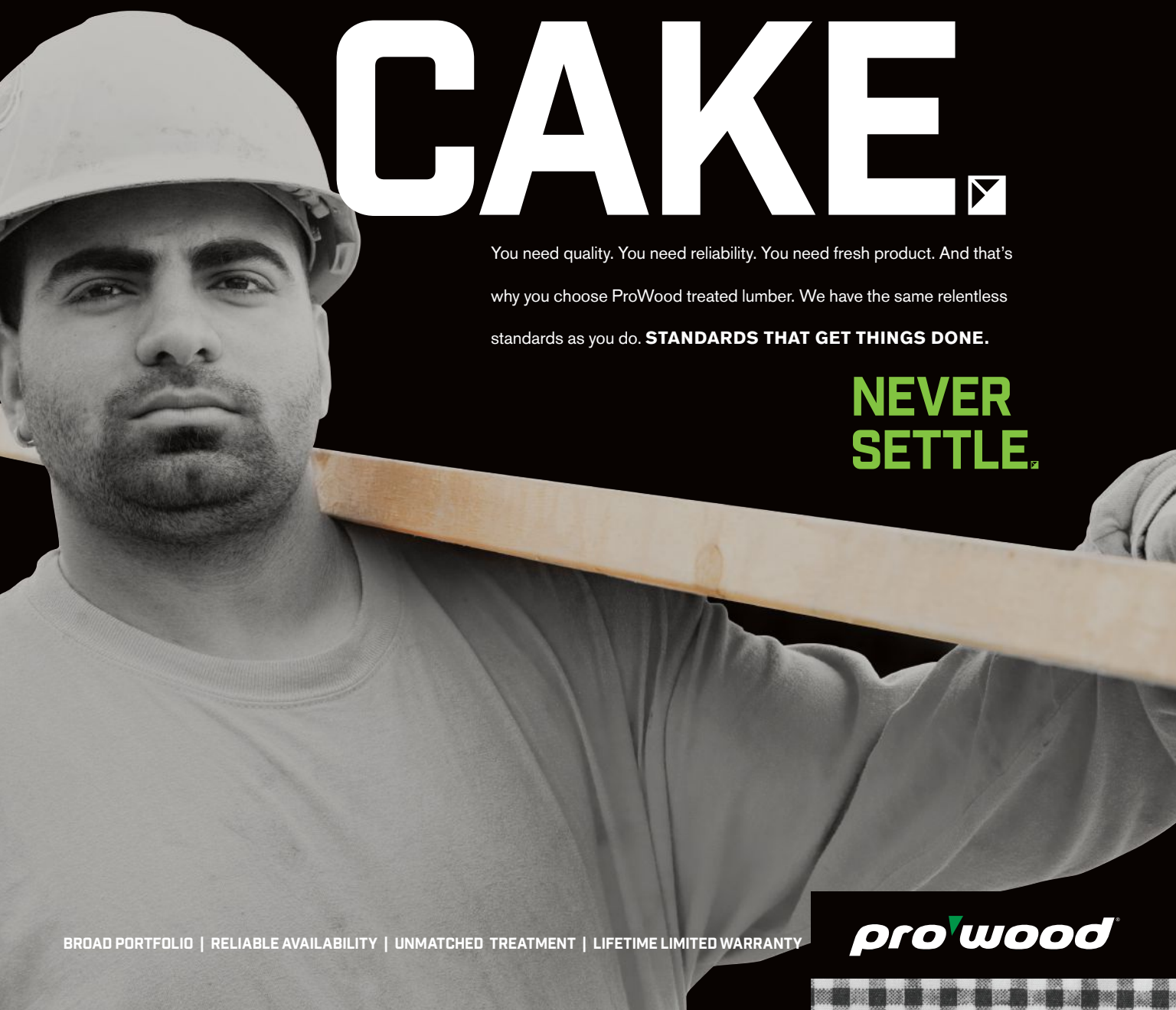

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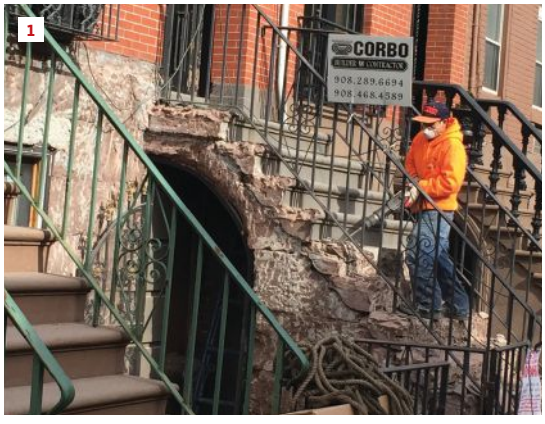



The typical stoop on a brownstone row house was built with an open stringer. Here, a worker begins a repair by chipping off all of its brownstone finish with a rotary hammer **(1)**. Some stairs were designed with closed stringers composed of a brick and brownstone mixture **(2)**.

Photos by Rob Corbo

# Refinishing a Brownstone Stoop

**I've written a number of articles** for *JLC* on renovating Hoboken, N.J., row houses. One topic I haven't discussed but that's often part of our scope of work is refinishing a home's entry stoop.

In a typical Hoboken row house, the entry stoop provides two means of egress from the home. The door at the top of the stairs enters into what's often referred to as the "parlor level" and serves as the home's formal entrance. There's also a door under the stoop's landing; this door provides access to the "garden level" and usually serves as the home's main egress. It's not uncommon for the small, covered space beneath the stairs to be used as a storage area (for bicycles, snow shovels, and so on), and it is typically gated and locked. Technically, the city owns the area from the street to a building's front façade, but it takes no responsibility for maintaining the stoops or the areas on either side of them.

## BROWNSTONE HISTORY

Entry stoops in Hoboken were traditionally made mainly from New Jersey brownstone. They were commonly built as open-stringer stairs **(1)**, but occasionally have closed stringers composed of a mix of brownstone and brick **(2)**. Extracted from nearby quarries around the turn of the century (most of Hoboken's row houses were built between 1880 and 1900), brownstone—a type of sandstone—was an inexpensive substitute for marble and limestone. The growing urban middle class at the time could afford something a little more architecturally sophisticated than the usual brick façade, and brownstone offered a reasonable upgrade—it was easy to cut, carve, and transport.

Brownstone quickly became known for its tendency to deteriorate, however; the qualities that made brownstone appealing as a building material (ease of cutting, carving, and transporting) also made it vulnerable to the harsh, Northeast weather. It was rarely specced for new construction after the early 1900s. Water combined with salt (which is applied liberally here in the Northeast during winter) easily penetrates sandstone and has the potential to wreak havoc on weather-exposed entry stairs.

The options for repairing brownstone are limited. Though my clients typically make good money working in Manhattan, their incomes are offset by steep housing and living costs. They rarely have the budget or desire to replace damaged brownstone with real brownstone, or to replace entire façades of brownstone veneer with

more-stable masonry products. Because the local preservation commission is still pretty low-key about rehabbing these façades—unlike in some of the historic districts in Brooklyn and Manhattan where builders commonly have to abide by strict restoration rules and regulations—we are usually able to make use of concrete stucco. It provides a harder wearing surface, making for a more durable resurfacing material for a stoop than traditional brownstone would provide.

### REFINISHING THE STOOP

Resurfacing a brownstone stoop is a maintenance repair, much like exterior painting or re-roofing. The lifetime of the repair depends on the quality of the original work (the structure that forms the underlying substrate for the wall cladding and the stoop) and the quality of the re-build. My clients should expect to get 15 years out of the resurfacing; longer if they stay on top of repairing surface damage (such as that caused by a heavy flower pot being dropped on the steps, or by an enthusiastic snow shoveler who gets a little overzealous chipping ice).

In addition to repairing the stoop, we often rehab a home's entire façade. We set up scaffolding for any pressure-washing, brick repointing, and painting that needs to be done, and we cover it with netting to protect pedestrians from falling items. The garden-level façade adjacent to the stoop is typically a brownstone veneer with brick above it, and we usually have to tie any entry-stoop repair work into this façade. Along with our project foreman, Danny DoCouto, our masonry sub, Victor Bezama, of FPV Contracting Co., coordinates all this work.

### RESTORATION COAT

At the start of the job, Bezama's crew begins by chipping away 1/2 to 3/4 inch of the stoop's surface down to solid brownstone with rotary hammers (see photo 1, previous page). They also chip away the garden-level façade's veneer; roughing up the surface to promote the bonding of what I call the "restoration" coat.

With the chipping complete **(3)**, the demoed surface gets pressure-washed to remove dust and debris. Bezama's crew lets the surface dry before using a fast-setting cement-based repair mortar called MasterEmaco N 424 (master-builders-solutions.basf.us) for the restoration coat. They mix this repair mortar with water (it comes as powder in 5-gallon buckets) until it reaches the consistency of damp beach sand—and only as much material as they can install without it prematurely setting up. Working from the top down, they lightly wet the work area to a saturated-surface-dry standard and apply a thin bond coat, consisting of a diluted mix of the repair mortar.



Modern repair of a brownstone finish relies on three-coat concrete stucco—a more durable material than the traditional sandstone. After the old material is chipped off, reducing the stairs to a rounded but stable substrate, the repair crew builds back the stairs using a "restoration coat" of a fast-setting cement mortar. With little more than trowels and straightedges, the skilled crew sculpts a new set of stairs from a well-compacted build-up of the repair mortar.

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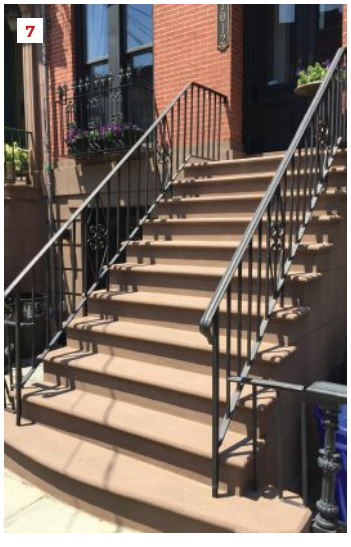

7

The finish coat—a color-tinted cement-based mortar—goes over the scratch coat and is finished with trowels, levels, and sponges **(5)**. Ironwork is an important but extremely expensive part of a stoop repair. Usually, the old ironwork is salvaged with wire brushes and new paint, but occasionally the author has a chance to replace it entirely to good effect **(6)**. When cured, the finish coat needs to be power-washed with a weak solution of muriatic acid to even out the color **(7)**.

The crew applies the repair mortar in firm, 1/8- to 1-inch lifts to get good compaction, building out the material beyond what's needed. After a few hours, they "shave" off the semi-dry excess material, a little bit at a time, to the desired profile. The shaved waste falls off like grains of sand and is considered dead material that can't be re-used.

I'm always amazed by the skill Bezama's crew exhibits at this stage—they basically sculpt out the stairs using only trowels and hand levels **(4)**. They're able to precisely recreate the stair's bullnose and scotia molding on each tread, while maintaining riser-height and tread-depth uniformity, and providing a 1/8-inch-per-foot slope on the treads and landing for drainage. On the adjacent façade, they make the linear lines simulating brownstone blockwork with longer, 4-foot levels. The ability to shave the Matrix mortar allows them to create sharp edges on these faux-blockwork lines. When they've formed the entry stoop (and adjacent façade), they let it cure, then apply the scratch coat.

## SCRATCH AND FINISH COATS

For the scratch coat, Bezama's crew uses a two-part sand, one-part Portland-cement mix, which they apply 3/8 inch thick with notched towels to create a smooth, grooved surface. They let it cure for one to two weeks to harden up, or longer if the schedule allows. It must cure well, as it acts as the only moisture infiltration barrier on the facade.

For the finish coat, the crew uses a cement-based repair mortar called Matrix (conproco.com/matrix) that's color-matched to the brownstone and is mixed and applied similarly to the MasterEmaco N 424 repair mortar. They apply it 1/4 inch thick, using trowels, levels, and sponges **(5)**. After this top coat dries, they power-wash it with a weak solution of water and muriatic acid as needed to achieve a uniform color **(7)**.

## IRONWORK

Decorative railings can be a real budget buster; I've gotten quotes up to $40,000 for a stoop's wrought-iron work alone. We try to re-use the existing railings as much as possible, simply removing and storing them during the job, then reinstalling and painting them in place. However, on some jobs, we've needed to have them sandblasted, primed, and painted off site.

When the budget allows, new railings and guards look awesome **(6)**. We work with Joe Monga, of Decorative Ironworks, in Paterson, N.J. He has catalogs and pictures of different styles that clients pore over, but we often have to rein them in; newel posts alone can cost $8,000 apiece.

*Rob Corbo is a building contractor based in Elizabeth, N.J.*

# A GAME-CHANGER FOR GREEN HOME CONSTRUCTION

An interview with Green Building Consultant Carl Seville of SK Collaborative on exterior continuous insulation

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*Carl Seville is a green building consultant with SK Collaborative in Decatur, GA.*

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**A** Working with our clients from as early in the design process as possible, we recommend products and systems that will help our clients' building perform better while maintaining budget pressures. We provide energy modeling services to assist in determining the most appropriate products for each project, weighing building envelope and system efficiencies for highest performance.

**Q** **Talk to us about the building science of managing condensation within walls, and why this is important for professionals or homeowners seeking to build an energy-efficient home?**

**A** The key to managing condensation is a combination of air sealing and vapor retarders where appropriate. Air leakage is the main cause of interstitial condensation — either from the exterior or the interior, depending on the climate. In most U.S. climates, vapor retarders are not recommended in walls since walls tend to dry to both the interior and exterior, depending on the season. In extreme cold climates with limited or no air conditioning, vapor retarders can help avoid condensation in walls. In moderate climates, air sealing, particularly from the exterior using products such as ZIP System® sheathing and tape, helps keep airborne vapor out of structures.

**Q** **How do prescriptive code changes in the 2015 IECC guidelines address the issue of thermal bridging, which impacts energy efficiency?**

**A** The 2015 IECC requires continuous insulation for thermal and moisture management in exterior wall cavities using the prescriptive path in climate Zones 6 and above. In Zones 3, 4 and 5, using continuous insulation with R-13 cavity insulation allows for a thinner wall than meeting the requirement of R-20 in a cavity. Using foam insulation helps keep the interior surface of the sheathing warm in cold weather, reducing the possibility of condensation on this surface, between the insulation and the sheathing. Cold sheathing without continuous insulation has a high risk of interstitial condensation of any vapor moving from the interior of a home through the exterior walls. In a typical wood framed wall without exterior continuous insulation, thermal bridging occurs at each stud, plate and header, reducing the effective overall R-value of the wall well below the rated value of the cavity insulation. By adding a layer of continuous insulation, the thermal bridging is eliminated, improving the overall efficiency of the wall higher than the rated value of the cavity insulation.

**Q** **How long have you used products from Huber Engineered Woods? How about ZIP System® R-sheathing and tape, specifically?**

**A** I have seen and worked with AdvanTech® sheathing for many years. My first experience with ZIP System® sheathing and tape was during the renovation of my current house in 2013. I used it on the exterior walls and roof and was very pleased with the weather and air barrier properties. The house I am currently building will use ZIP System R-sheathing with built-in R-3 insulation on the exterior walls, and ZIP System® sheathing on the roof and on the top of the second floor ceiling joists; this is a passive house style technique that will allow me to create a complete air seal on the exterior surface of the walls and ceiling, avoiding problems with ceiling penetrations, such as lights.

**Q** **What building methods did you use before you made the switch?**

**A** The last house I built used OSB on corners where needed for structure and 1/2" XPS on all other exterior walls. Prior to this new home, I typically used or suggested my clients use spray foam on rooflines to create a well-sealed building envelope. This project will be using ductless HVAC systems, eliminating the need for a conditioned attic. In this project, I will be using fiberglass insulation, limiting the use of spray foam to miscellaneous sealants.

**Q** **How has using ZIP System® R-sheathing and tape changed your approach to designing and building the outer shell, or building envelope, of homes?**

**A** ZIP System R-sheathing allows builders to create a tight building envelope prior to installation of drywall. With the appropriate design, it is possible to test for envelope leakage before any insulation or drywall is installed, identifying leaks before it is too late to seal them properly.

**Q** **Why is a product like R-sheathing — that provides structure, thermal resistance, air leakage protection and moisture resistance — a "game-changer" for green home construction?**

**A** In any situation where continuous insulation is necessary or desired, the one-step method using ZIP System® R-sheathing is significantly simpler and less costly than installing multiple layers of OSB and foam to achieve the same results. In addition, eliminating the separate weather barrier further reduces installation cost.

**Q** **Why did you choose this product for this particular house? (Or, what type of impact do you expect R-sheathing to have on the performance of this home?)**

**A** LEED and ENERGY STAR certification require either advanced framing or continuous insulation. I will be incorporating both; however, even the most advanced framing cannot eliminate all thermal bridging, so the use of continuous insulation will make a well-insulated building envelope as is practical in my relatively mild Zone 3 climate. Traditionally, continuous insulation is installed on top of a home's structural sheathing in separate steps, requiring multiple trips for the crew around the building. One step to install the sheathing, another to install the rigid insulation and another to install the weather barrier. Using ZIP System® R-sheathing allows a crew to install the insulation, structural sheathing and weather barrier in a single step.

**Q** **What are the benefits of using R-sheathing in a Southern market compared to its insulation benefits in Northern climates?**

**A** In cold climates, installing continuous insulation such as R-sheathing can significantly reduce thermal bridging at framing members, significantly improving the overall thermal performance of exterior walls, particularly during periods of severe cold. The benefits of R-sheathing are not as significant in warmer climates, nor during moderate weather in cold climates, since the delta T (temperature differential) between the interior and exterior are relatively small. There are moderate benefits year-round, and the combination of continuous insulation and comprehensive air sealing will help maintain indoor temperature during severe cold weather. R-sheathing provides a level of passive survivability should a home lose electricity during a severe cold snap.

**Q** **Why did you decide to certify the house as LEED Version 4?**

**A** The city I live in, Decatur, Georgia, included a requirement for green certification for all new buildings and major renovations in a comprehensive development ordinance adopted recently. Options for homes include LEED, EarthCraft and NGBS. Having done numerous projects in the second two programs, and several LEED V2009 projects, I decided it would be educational to certify under LEED V4, before we are asked to provide this service for our clients. Having been one of the main contributors to the LEED reference guide, it is interesting to now be using it to certify my own house. There are some significant improvements in the new program — obviously the USGBC learned from their experience with the earlier version. I will likely also certify under EarthCraft and NGBS as well.

**For more information on ZIP System® R-sheathing, visit ZIPSystem.com/R-sheathing.**
**Learn more about SK Collaborative at SKCollaborative.com.**



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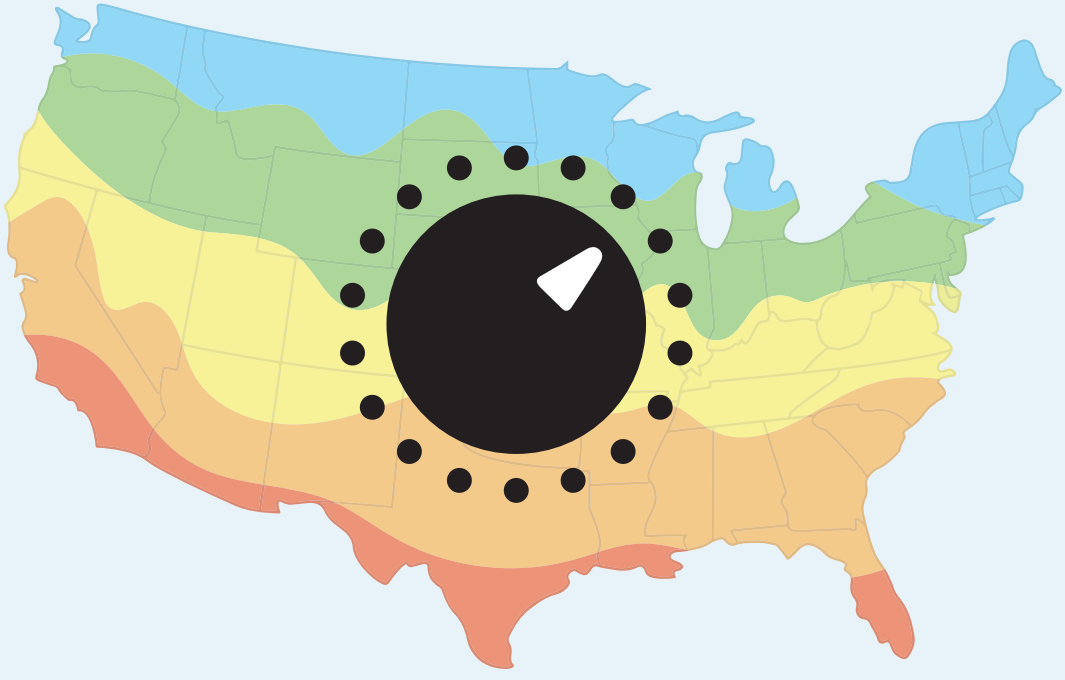

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BY MELANIE HODGDON

# Where's the Cash?

**First, what is profit?** Let's say when you look at your profit and loss statement, it shows a net profit of $50,000. The logical assumption is that you have at least $50,000 sitting in your various bank accounts ready to use, right? Well, as usual in accounting, things aren't quite that simple. In addition to the profit and loss statement, there are two other primary financial reports—the balance sheet and the statement of cash flows—and each has a different purpose and tells a different part of the story. Let's look at a simplified example to see how the reports all contribute to the story of how much money you have.

Financial Reports: Example Year 1

| Profit & Loss | December 2016 |
|---|---|
| **Income** | |
| **Net Income** | |

In this example, the business owner has taken $10,000 of his own money to open a business checking account. There is no activity on the profit and loss statement.

| Balance Sheet | As of Dec. 31, 2016 |
|---|---|
| ASSETS | |
| Current Assets | |
| Checking Account | $10,000.00 |
| Total Checking/Savings | $10,000.00 |
| Total Current Assets | $10,000.00 |
| **TOTAL ASSETS** | **$10,000.00** |
| LIABILITIES & EQUITY | |
| Equity | |
| Paid in capital | $10,000.00 |
| Total Equity | $10,000.00 |
| **TOTAL LIABILITIES & EQUITY** | **$10,000.00** |

On the balance sheet, the checking account has increased by $10,000, and paid in capital shows $10,000

| Statement of Cash Flows | Jan – Dec 2016 |
|---|---|
| FINANCING ACTIVITIES | |
| Paid in capital | $10,000.00 |
| Net cash provided by financing activities | $10,000.00 |
| Net cash increase for period | $10,000.00 |
| **Cash at end of period** | **$10,000.00** |

The statement of cash flows shows $10,000 net cash increase for the period.

## PROFIT AND LOSS

A profit and loss statement (P&L) records the coming in and going out of money for a specific time period (say January through December of a given year) as a result of conducting a business. The incoming money is income (which could include incoming dollars from the sale of a project, accumulated interest from savings accounts, and so forth). The outgoing money is divided between the costs associated with the production of projects (cost of goods sold) and the necessary costs to maintain the company (overhead). The P&L will not include loan payments or capital investments (such as the purchase of equipment or a vehicle). So if you put $5,000 down on a new van, don't expect to see that on your P&L.

A P&L can be run on either an accrual basis or a cash basis. When viewing one on an accrual basis, you will see everything you've invoiced to customers, whether or not you've received payment for the invoices; similarly, you'll see all the bills that have been entered, whether or not you've paid them yet. If, for example, you invoiced a customer $15,000 in December of last year and she paid you in January of this year, the $15,000 would appear on last year's P&L.

Viewing the P&L on a cash basis means that you will see only those invoices and bills that have been paid. You'll see payments made in the current period for bills entered in both current and prior periods, and you'll see customer payments in the current period for invoices entered in the current and prior periods. So the $15,000 in the example above would appear on a P&L for this year.

While a cash-basis P&L may be useful in terms of seeing net cash figures for each reporting period, it's not an effective management tool. After all, if you decide not to pay your bills in February and then view a P&L for February on a cash basis, you will appear to have loads of cash and low costs when in fact you may have $30,000 in bills that you're just not seeing. On the other hand, an accrual-basis P&L lets you compare what you've invoiced with the costs you've incurred—instead of simply showing when payments came in or went out—so that you can judge whether or not you're invoicing a sufficient amount to cover your costs each month.

## BALANCE SHEET

A balance sheet records a company's assets, liabilities, and equities.

- **Assets** are things that the company owns, such as cash in the bank, accounts receivable (which will be converted into cash as soon as customers pay), inventory (if any), and fixed assets (stuff you can touch) like vehicles, large tools and equipment (more than $2,500 in value), office furnishings, and the like.
- **Liabilities** are things that the company owes, such as accounts payable and credit-card debt (which will reduce your cash as soon as you pay your vendor bills and credit cards), payroll taxes, and loans.

Financial Reports: Example Year 2

| Profit & Loss | Jan – Dec 2017 |
|---|---|
| Income | |
| Project Income | $729,788.45 |
| Total Income | $729,788.45 |
| Cost of Goods Sold | |
| Project Costs | $536,664.18 |
| Total COGS | $536,664.18 |
| Gross Profit | $193,124.27 |
| Expense | |
| Overhead Expenses | $153,677.99 |
| Total Expense | $153,677.99 |
| **Net Income** | **$39,446.28** |

| Statement of Cash Flows | Jan – Dec 2017 |
|---|---|
| OPERATING ACTIVITIES | |
| Net Income | **$39,446.28** |
| Adjustments to reconcile Net Income to net cash provided by operations | |
| Accounts Receivable | -$54,788.45 |
| Accounts Payable | $21,586.75 |
| Line of Credit | $30,000.00 |
| Net cash provided by Operating Activities | $36,244.58 |
| INVESTING ACTIVITIES | |
| Vehicles: Vehicle #1 | -$40,000.00 |
| Vehicles: Vehicle #2 | -$38,500.00 |
| Net cash provided by Investing Activities | -$78,500.00 |
| FINANCING ACTIVITIES | |
| Vehicles: Vehicle #1 Loan | $30,109.80 |
| Vehicles: Vehicle #2 Loan | $27,071.80 |
| Net cash provided by Financing Activities | $52,181.60 |
| Net cash increase for period | $9,926.18 |
| Cash at beginning of period | $10,000.00 |
| **Cash at end of period** | **$19,926.18** |

| Balance Sheet | As of Dec. 31, 2017 |
|---|---|
| ASSETS | |
| Current Assets | |
| Checking/Savings | |
| Checking Account | $9,926.18 |
| Savings Account | $10,000.00 |
| Total Checking/Savings | $19,926.18 |
| Accounts Receivable | |
| Accounts Receivable | $54,788.45 |
| Total Accounts Receivable | $54,788.45 |
| Total Current Assets | $74,714.63 |
| Fixed Assets | |
| Vehicle #1 | $40,000.00 |
| Vehicle #2 | $38,500.00 |
| Total Vehicles | $78,500.00 |
| Total Fixed Assets | $78,500.00 |
| **TOTAL ASSETS** | $153,214.63 |
| LIABILITIES & EQUITY | |
| Liabilities | |
| Current Liabilities | |
| Accounts Payable | |
| Accounts Payable | $21,586.75 |
| Total Accounts Payable | $21,586.75 |
| Other Current Liabilities | |
| Line of credit | $30,000.00 |
| Total Other Current Liabilities | $30,000.00 |
| Total Current Liabilities | $51,586.75 |
| Long Term Liabilities | |
| Vehicle #1 Loan | $30,109.80 |
| Vehicle #2 Loan | $27,071.80 |
| Total Long Term Liabilities | $57,181.60 |
| Total Liabilities | $108,768.35 |
| Equity | |
| Opening Balance Equity | $10,000.00 |
| Owner Draws | -$5,000.00 |
| Net income | $39,446.28 |
| Total Equity | $44,446.28 |
| **TOTAL LIABILITIES & EQUITY** | **$153,214.63** |

■ **Equity** is what's left after you subtract liabilities from assets. This is also where draws and distributions (monies withdrawn by owners, partners, or officers from the company for personal use) are recorded.

Unlike the P&L, the balance sheet includes all of the company's activity through a certain date. So if the company started in January 2010 and you run a balance sheet as of December 31, 2018, the report will reflect activity for eight years.

Like the P&L, the balance sheet can be run on a cash or accrual basis but is most revealing to view on an accrual basis. For example, you can check to see if your current assets (like cash and receivables) are sufficient to cover your current debt (payables, payroll taxes, and so on). This can help you see when you're getting into a cash crunch.

## STATEMENT OF CASH FLOW

The statement of cash flow is a report that "reconciles" the number of dollars you have in cash at the end of the reporting period. It includes a starting cash balance, then records the net income (from the P&L), investing activity such as the purchase of a new jobsite trailer (from the balance sheet) and the paying down of loans (from the balance sheet). This is the report that will show you where your cash went. The simplified sample reports shown above reflect all the typical kinds of entries you're likely to see.

## A SIMPLE EXAMPLE

Let's assume that you are the owner of a startup company and that you took $10,000 of your own funds and opened a business checking account on December 31, 2016. That was the only business

activity for 2016, so at the end of the year, the three reports would have looked like the examples on page 19.

**One year after.** Now let's check back exactly a year later. In 2017, the company was actively engaged in business. The relevant facts about this company's activity are shown in the three financial reports on the facing page; here is a summary provided by these statements of the business in 2017.

**1. Net income.** The company "made" $39,446.28 according to an accrual-basis P&L.

**2. Adjustments to reconcile net income.** But wait! Some of your customers haven't paid yet, so you're missing $54,788.45 in cash. That deducts from your cash.

**3. Unpaid bills.** Wait again! You haven't paid some of your suppliers yet, so you still have $21,586.75 of cash in unpaid bills. That adds to your cash.

**4. Line of credit.** But wait yet again! You took a $30,000 draw on your line of credit and that adds to your cash as well.

**5. Investing activities.** Even though you only put down a small bit of cash on each of the vehicles, they are now considered company assets and this report shows the value of the vehicles ($40,000 and $38,500) subtracted as if you had paid entirely in cash. The financing loans appear in a different part of the report.

**6. Financing activities.** Because you financed both vehicles, you should see the loan amounts adding to your cash since you didn't actually have to shell out the full purchase price. But because you made a bunch of payments on the loans, the current balance for Vehicle #1 Loan has been reduced from $37,500 to $30,109.80 and the current balance for Vehicle #2 Loan has been reduced from $35,500 to $27,071.80. Finally, the owner withdrew $5,000 from the company for personal use. In accounting terms, that money is also included under "Financing Activities."

**7. Cash at end of period.** When you start with net income and then add and subtract the adjustments, investing, and financing activities, you end up with a cash increase for the period of $9,926.18. Because this company started with $10,000 in cash, the cash balance at the end of the year should be $19,926.18. Checking the balance sheet, we see the total cash is indeed $19,926.18.

## WHERE'S THE MONEY?

So the answer to the question, "Where's my cash?" is more complex than it appears on the surface. While most people are comfortable using and interpreting the P&L, it doesn't show the full story—it doesn't include investments made (such as purchasing vehicles and equipment), payments on loans, and withdrawals from the company for personal use. Next time you look at your bottom line and wonder where the cash is, check out the statement of cash flows report; it will tell you exactly where your money went!

*Melanie Hodgdon, president of Business Systems Management, provides management consulting and coaching for contractors.*

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## ThruLOK® Carriage & Through-Bolt Replacement

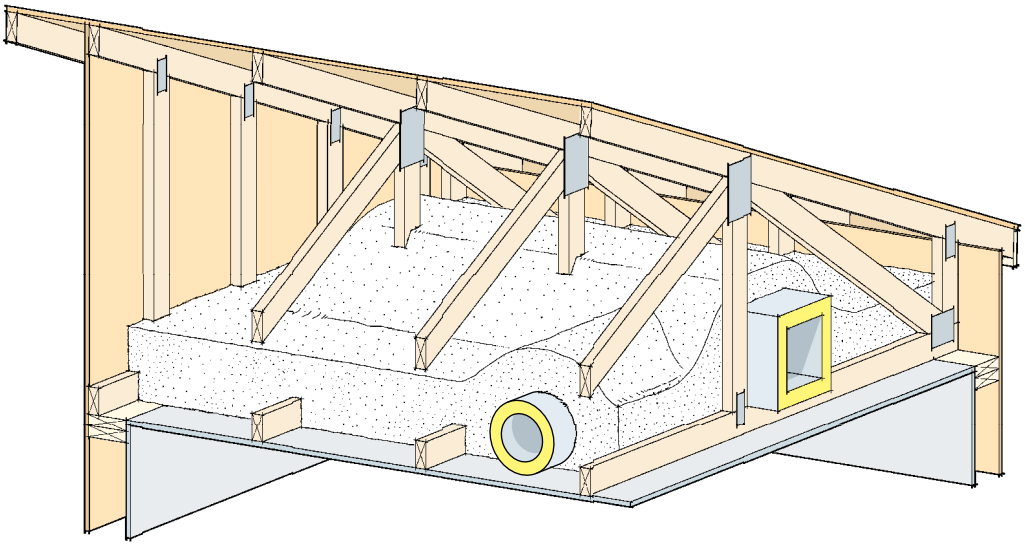
BY TED CUSHMAN

# Buried Ductwork In the Energy Code

**These days, when you see ductwork** in the attic space of a truss roof, it's likely to be the economical solution: insulated duct-board trunk lines and distribution boxes, with insulated flex-duct supply or return lines that lead to registers or grilles in the conditioned rooms. Typically, the flex duct will be hanging from the truss webs or chords, suspended by plastic straps.

If the house is air conditioned, you may have wondered, why is all this flex duct located up next to the hot underside of the roof sheathing, instead of down on the attic floor where the ducts could be covered up with blown insulation? By the same token, in a cold climate, you might have wondered why heating ducts should be suspended up in the air in a cold vented attic, rather than lying on the nice, warm attic floor under a blanket of blown insulation.

Those questions have also occurred to Craig Drumheller, the director for construction codes and standards at the National Association of Home Builders (NAHB). When Drumheller asked a local building official why the flex duct in his own house was up near the roof in the hot attic, the answer was that code required it—but, Drumheller says, the reason wasn't completely clear.



The 2018 IECC will allow low-lying ducts in attic space, with rules for each climate zone that specify insulation coverage above and below the ductwork. For builders following the performance path, buried ducts may be considered as insulated to R-25, and sufficiently well-sealed ducts may be treated as located within the conditioned space.

Illustration: Tim Healey

An Edge Energy installer seals a trunk line in an existing home before burying the duct with blown cellulose—a safe and routine practice in mixed climates, says Gary Boyer.

Photo: Robert Champ III

Later, in a brainstorming session with NAHB members to gather ideas for amending the International Energy Conservation Code (IECC), a member suggested allowing duct runs to be located on the attic floor and buried under blown insulation. Says Drumheller: "Since I already had the issue in the back of my mind, I thought, absolutely!"

After working on the idea with builders, contractors, and industry experts, Drumheller proposed a code change at an International Code Council (ICC) meeting, and the council voted to accept it. Starting with the 2018 IECC, buried ductwork will be explicitly allowed in the attic. If you're following the performance path, your calculations can treat buried ductwork as being insulated to R-25, as long as it's covered by an R-19 layer of insulation in addition to the R-8 duct wrap. And if you meet a strict duct airtightness criterion (1.5 CFM25 of leakage per 100 square feet of occupied space), you can even consider the ductwork as equivalent to ducts located inside the conditioned envelope of the building.

Just to be clear: Buried ductwork may already be allowed in your jurisdiction. Previous editions of the code did not explicitly prohibit buried ductwork, and in general, codes tend to be permissive; things that aren't prohibited are often considered to be allowed. But enforcement varies from one place to the next, and code officials in some jurisdictions have traditionally required ductwork to be suspended above the attic floor.

## CONDENSATION CONCERNS

Depending on the climate, there could be good reasons not to bury ducts under insulation. In hot, humid climates, air in the attic can be very humid, and there's a significant risk of that moisture condensing on the cold surface of a duct carrying cold air—or even on the exterior vapor barrier skin of a flex-duct insulation sleeve.

If cold ducts are buried under blown fiber insulation, the duct surface may be even colder than if it were exposed, making condensation more likely. Moisture could soak the insulation, stain the ceiling below, and support mold and mildew.

But there's persuasive research to support the idea that flex duct insulated with R-8 duct wrap and buried under insulation is safe from condensation problems in most U.S. climate zones. In a field study by Home Innovation Research Labs in Beaufort County, S.C., supply and return trunks made with R-8.7 duct board and branch ducts made with R-8 flex duct were buried under blankets of R-30 blown insulation. Over the course of a hot, humid summer with an air conditioner operating, temperatures measured at the flex-duct and duct-board surfaces remained safely above the dew points for those locations. And as the study author, David Mallay, points out, summer conditions in Beaufort County are not much different than in cities farther south, such as Jacksonville, Fla., New Orleans, and Houston.

Mallay's report is consistent with research by Steven Winter Associates that documented the performance of ductwork encapsulated with spray foam and buried under blown insulation. The research team reconfigured three existing vented attics in Jacksonville, Fla., by removing the insulation, relocating the ductwork to the attic floor, spraying the ducts and distribution boxes with 1.5 inches of closed-cell spray polyurethane foam, and then burying the ducts with a fresh application of blown fiberglass. Measured energy savings in the houses were dramatic, as predicted. Instruments also confirmed that there was no condensation on the ducts delivering cold air to the living space.

Gary Boyer, an energy rater with home performance contractor Edge Energy, says his field experience in Maryland and Virginia is consistent with those research results. In retrofit work, Edge Energy crews routinely seal ductwork with mastic (or, if the ducts are not accessible, using the Aeroseal latex aerosol process), then bury the ducts under a deep blanket of blown cellulose insulation. Says Boyer, "I have yet to see a low-lying duct that is buried in insulation that has had condensation, either in the retrofit or in the new-construction areas."

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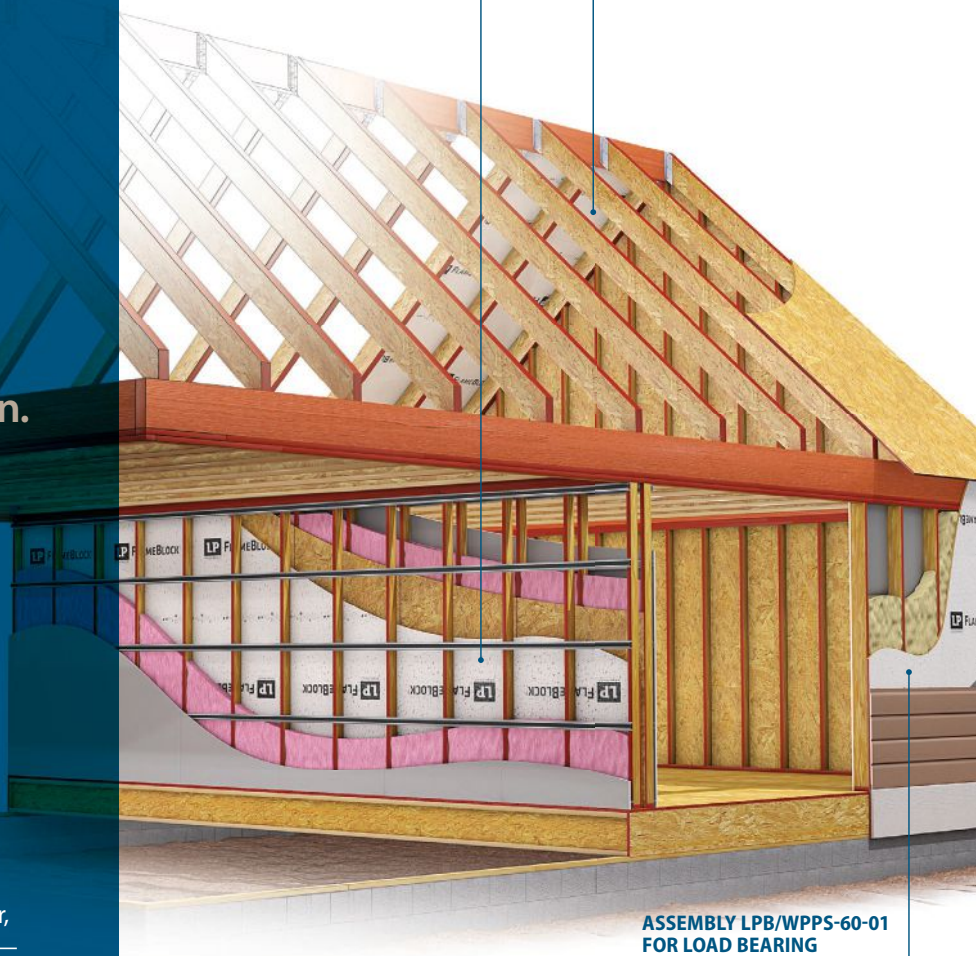

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Contractor Curt Kinder in the encapsulated attic of a custom home in Jacksonville, Fla. Compared with ducts buried under blown insulation, the "civilized space" of a sealed attic allows easier maintenance and quality control, argues Kinder, and makes the area under the roof available for storage.

Photo: Ted Cushman

But Maryland is not Florida—and in considering the building code amendment, the ICC took the elevated risk in hot, humid climates into account. Under the new provision, in climate zones 1A, 2A, and 3A—which covers most of the Southeast, including Florida, Georgia, Alabama, Mississippi, and South Carolina—ductwork will have to be insulated to R-13 if it's buried under insulation. "If we go to R-13 in the hot-humid climates," says Drumheller, "it will push the dew point far enough out that there shouldn't be any significant condensation."

**PROCEED WITH CAUTION**

Not everyone is convinced. Jacksonville, Fla., air-conditioning contractor Curt Kinder is a skeptic. First of all, Kinder points out, there's currently no such thing as R-13 duct wrap or R-13 duct board. "The only reason we can even buy R-8 flex duct here is because it's required across the state line in Georgia," he says, "and even so, it's hard to get." The Steven Winter Associates' Jacksonville study used spray-applied polyurethane to achieve the specified R-13 duct insulation level, but as Kinder notes, that approach introduces a whole new trade coordination, scheduling, and quality-control problem.

"R-13, successfully implemented on the ducts themselves, passes the 'sniff test' for me," Kinder says. "But foam encapsulation seems difficult to ensure in the field. Foam guys have enough problems with simple planes—how are you going to ensure consistent coverage under ducts?" (And in fact, even in the Steven Winter Jacksonville pilot study, researchers noted thin coverage on some elements of the ductwork assemblies.)

Kinder points out non-energy benefits to his preferred approach of sealing the entire attic with closed-cell spray foam on the roof underside: "Additional strength, an improved vapor barrier, civilizing the volume for storage, reducing outdoor contaminants, and preventing pest entry."

But conditioned attics cost much more than buried ductwork. And in predominantly heating climates in the north, or in dry cooling climates out west, the moisture risk is a relatively insignificant issue, while the energy-saving opportunity is real—and the required R-8 insulated duct products, while they may not be on local shelves, are at least being manufactured. Craig Drumheller says he doesn't expect builders to take up the buried ductwork practice casually, but he says it's good that the code will now allow the option. And conversations with suppliers lead him to expect that eventually duct board and flex duct that can meet the new R-13 criterion will appear in the marketplace.

Drumheller doesn't expect builders to rush into things, he says: "I would encourage any builders that are going to make a major change in the way that they build their houses, whether it's structural, or energy-saving, or a new technology, to proceed with caution. If this is the way you choose to build, I encourage you to do your research and make sure that it is something you are comfortable with. Because at the end of the day, it's the builder whose reputation and money are on the line."

"But we're not shooting from the hip here," Drumheller says. "This is based on research. This provision does not force this on anybody, but it puts it in play as a responsible new option, first, to bury the ducts, and second, if you're burying them, to get credit for them. It's an opportunity for builders to save money and to save energy."

*Ted Cushman is a senior editor at* JLC.

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BY CHRIS DEBLOIS

# Framing Trouble Spots

**In my 30 years as a structural engineer,** I've designed framing for hundreds of houses. The new houses and big renovations that come across my desk today are nothing like the colonials, ranches, and capes of years past, where things stacked nicely. Today's architects and designers seem to have decided that stacking and aligning is no fun and that span lengths can be almost unlimited.

The International Residential Code tells me what loads to design for and how much deflection I'm allowed under those loads, but it tells me almost nothing about framing layout. Which way should the joists run? How far is too far? Is it better to support a bearing wall with a beam parallel to the joists, or to sit that wall across a series of joists with all of them providing a little support? These can be tricky questions. Answer them wrong and you may end up with noticeable humps, sags, or slopes in your floors.

I've learned to avoid these problems by watching for four common pitfalls: changes in loads, changes in spans, changes in direction, and changes in support.

## CHANGES IN LOADS

Anything heavy can cause problematic load changes. Kitchen islands are a common example. The joist next to an island might have a dead-load capacity of 10 pounds per square foot and a live load of 40 pounds per square foot, which means only 20% of the predicted deflection happens right away—the rest happens only when the kitchen fills with people.

The joists under the island will likely have the same code-mandated capacity, but in reality might have to support a dead load of 40 or 50 pounds per square foot, including that 20-pound-per-square-foot granite countertop. In other words, those joists will see a full 50% of their predicted total deflection before ever encountering the 40-pound live load.

If the kitchen joists span 20 feet and the allowable total deflection is 1 inch (if we were willing to design for that much movement), the aisle joist would deflect less than 1/4 inch and the island joist about 1/2 inch. That creates 1/4 inch of slope between two adjacent joists—way too much.

Bottom line: When you have heavy dead loads, provide more or stiffer joists than the code requires.

## CHANGES IN SPANS

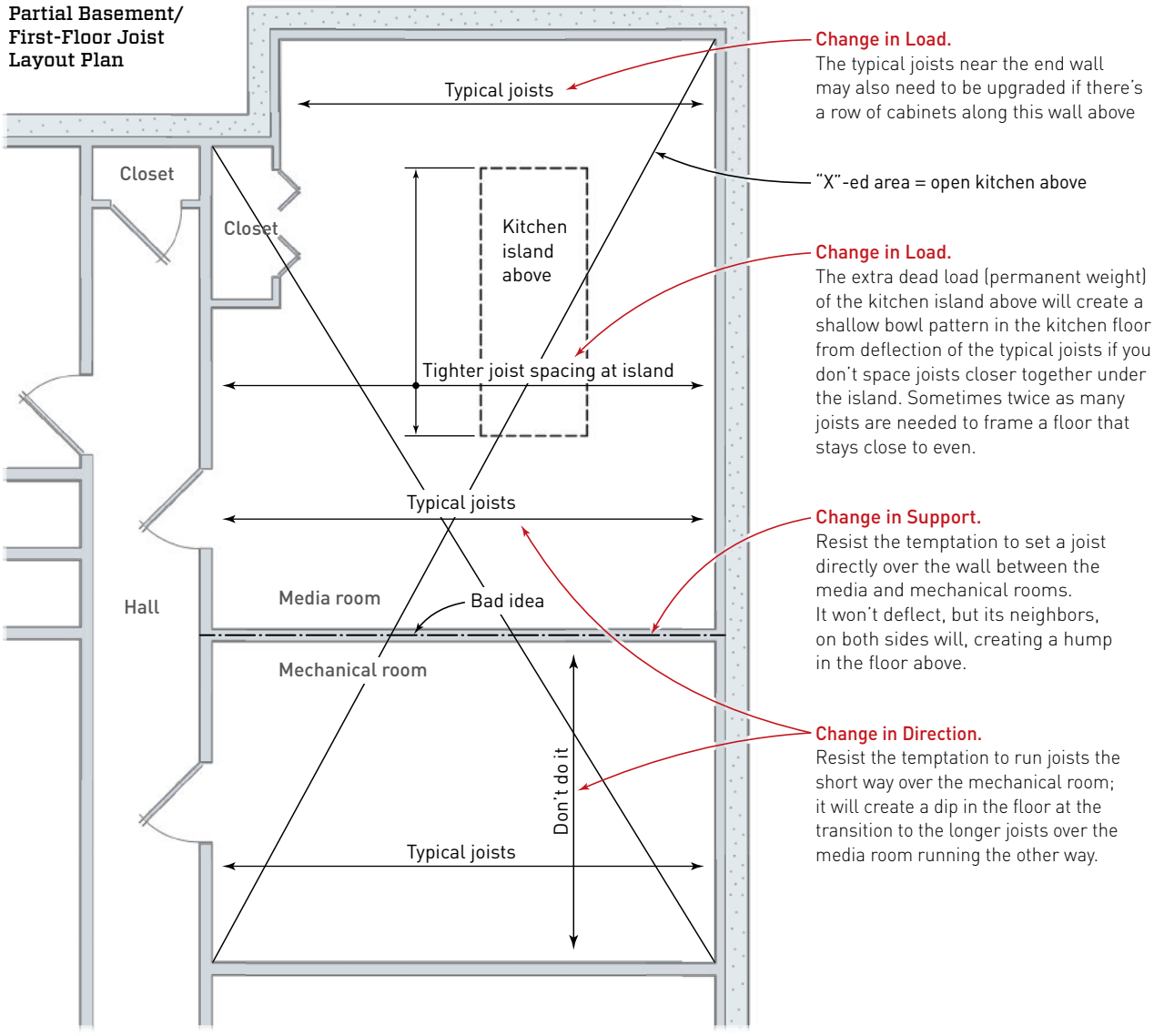
I see many examples where two adjacent joists have radically different spans, such as in a stairwell where the joists running parallel to the opening on either side might span 18 feet while those that end on the opening's header span only 10 feet. You need to keep the extra deflection on those longer joists from being noticeable. Options include extending the stairwell header to break up those longer spans or stiffening the long joists up by doubling them.

## CHANGES IN DIRECTION

There are many reasons why running all your joists in the same direction is usually a good idea. I try not to change joist direction without a really good reason, especially under the middle of an open room or where walking through a door would drop me right at the mid-span of a long joist, as doing so could create a 1/4-inch or 1/2-inch slope over 16 inches.

A simple example is where you walk out of a second-floor room onto a balcony looking over a

## Floor Framing Trouble Spots




**Floor-framing challenges.** The partial basement plan shown above poses a number of potential problems, depending on the joist layout. At the top of the drawing, there are two potential changes in load—from kitchen cabinets and from a kitchen island. Both might call for a tighter joist spacing to avoid extra deflection in the kitchen floor, depending on the extent of the loads. At the wall separating the media room from the mechanical room (middle of drawing), it's important to remember not to set a single joist directly over the wall. Doing so would create a hump in the floor along the line of the wall below. Finally, resist the temptation to change the direction of the joists over the mechanical room or you risk creating a dip in the floor.

Illustration: Tim Healey

two-story great room. If the walkway joists run the long way, you may be stepping out onto the mid-span and may feel a noticeable slope in the floor. I prefer to either cantilever the room joists out over the walkway or frame to a substantial beam running the length of the walkway. Either way provides much more gradual slopes and deflections.

### CHANGES IN SUPPORT

Sometimes extra support can be a bad thing. I saw a good example of this once when I was doing a framing walk-through, as a favor to the builder, for a house I didn't design. It was a fairly open plan, with long spans on the left side of the first floor and with joists running side to side over the basement.

There were two bedrooms under the stair area with a wall between them that the framers had set one joist directly over. All but one of the joists were free to deflect under load, while that one joist on top of the basement studwall stayed proudly level. The result was a noticeable hump in the floor.

It would have been better if the builder had not set a joist on top of the basement bedroom wall—it wasn't a load-bearing wall, so the joists could have straddled it. To fix the problem, the builder chose to add more beams to reduce the span of the first-floor framing, rather than tearing out the wall and reframing the joists—both of which had already been plumbed and wired.

When you're laying out floor framing, of course you need good support for all spans and all bearing walls. But if you're also careful with changes in load, spans, and direction, you can avoid a lot of headaches.

The International Residential Code tells me what loads to design for and how much deflection I'm allowed under those loads, but it tells me almost nothing about framing layout. Get the details wrong and you may end up with noticeable humps, sags, or slopes in your floors.

*Chris DeBlois, PE, is Principal of CFD Structural Engineering, in Roswell, Ga.*

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# Safe Scaffolding, Production-Style
## On a multi-employer jobsite, who's responsible?

BY TED CUSHMAN

Starting last spring, *JLC* has been following the work of the Southern California Builders Safety Alliance (SCBSA). The group's members include many of the top production builders in the Southern California market, along with representatives from Cal/OSHA Consultation and from trade contractors in the area.

After several years in existence, SCBSA has evolved a systematic approach to its work, organized around a quarterly calendar. Each quarter, teams go into the field to inspect jobsites, with tablet computers to record their observations and with "Safety Mojo" spreadsheet software for organizing and tabulating the results. After discussing what the data reveals, the group chooses an area of focus for the quarter and conducts a formal training session on that topic for site superintendents, trade contractors, and employees.

Not every builder in the local market, it should be noted, is on board with the Safety Alliance's efforts. Multiple builders are active in most area developments, and a superintendent with one SCBSA member builder told *JLC* that he often sees trade contractor employees walk across the street to a competing builder and take off their hard hats and safety gear before getting to work.

Obviously, it's a problem for builders who have strong safety programs if their safety message is contradicted by other builders who employ the same trade workers. Still, the safety message is gaining ground, said Rod Plunkett, a member of the Safety

Photos by Isaiah Cushman





Base plates **(1)** are mandatory on any scaffold, inside or outside. When set on soil, the base plate also should be securely attached to a mud sill, as shown here. The base plate should be pinned to the scaffold as provided by the manufacturer, unless the plate is snugged up directly under the pipe of the scaffold frame leg; in images **(2)** and **(3)**, the installer is digging out the ground and placing an extra sill block to hold the plate against the frame. Pins for the base plates shown in this example need to be placed into the holes provided; the pin in the foreground in image **(4)** is correct, but the pin at rear, set underneath the pipe, is a violation that has been known to cause failures and injuries.

Alliance who works as a safety officer for Shea Homes. "In our last quarterly audits, we visited 11 communities involving five different builders, and we noticed two framing companies in particular were doing a great job on safety," said Plunkett. "We like to give positive reinforcement, so we gave recognition plaques to United Production Framing for its fall-protection system and to a framer named Frank Gavlin, with R&D Framing, for having a proactive approach and making an outstanding effort."

Last March, *JLC* attended a Safety Alliance training session on heat-injury prevention at the Green River Golf Club, in Corona, Calif. (see "Working Safely in Hot Weather," Jun/17). That session was prompted by Cal/OSHA enforcement sweeps focusing on heat illness, but it turned out to be a timely topic, given the heat waves that have hit the nation this summer. In May, we went back for a training session on scaffolding—this time, the topic was prompted not by Cal/OSHA, but by the Safety Alliance's own surveys of builder-member jobsites. *JLC* also went on site, to take a look at the situation in the field.

## THE MULTI-EMPLOYER JOBSITE

Scaffolding safety is a complicated management challenge for production builders. In Southern California, where cement stucco is the predominant exterior cladding, scaffolding is a necessity; it's hard to apply three-coat stucco without scaffolding. But once the scaffolding is up, other trades on site also like to use it—for setting windows, for installing trim, for painting, and more.

In a production environment, where trade contractors—often pieceworkers—do all the actual construction, this means that

Scaffold planking should be stamped as "scaffold grade" lumber **(5)**, not regular dimensional lumber. By rule, the working platform should be fully planked; missing planks **(6)** will draw OSHA's attention. Cross braces can be used as top rails or mid-rails, but only if the crossing point of the braces falls within the correct range of heights. But the management problem of scaffolding goes beyond the fine points of the rules. Workers had already begun to use the partially completed scaffold above **(7)** , even though it had no end rails in place. In the example shown, the builder's superintendent who noticed the situation stopped the work and "red-tagged" the scaffolding as off-limits, using caution tape.

multiple employers are responsible for ensuring safety on the job. OSHA, at the federal level as well as at the state level, defines most construction sites as "multi-employer job sites." And OSHA considers all employers on the site to be responsible for safety, not just for their own employees, but often for other companies' employees too.

In practice, this means that if an OSHA inspector sees a scaffold violation, more than one employer could face a citation and a penalty. On a multi-employer site, the rules define four classes of employer: the "creating employer"—the one that first created a jobsite hazard; the "exposing employer"—the one whose employees are exposed to danger; the "controlling employer"—the company that runs the jobsite and has actual control (such as a builder or general contractor); and the "correcting employer"—any company tasked with fixing a hazardous condition.

Scaffolding on production jobsites may be set up by specialty contractors. If they put the scaffolds up incorrectly, they could be cited as the "creating employer." An employer such as a stucco contractor who puts his workers on the improper scaffolding could be cited as an "exposing employer." The builder on the site, who has authority to stop the work and to order the scaffolding fixed, could be cited as a "controlling employer." And if someone is told to fix the scaffolding, but doesn't, he could be cited as the "correcting employer."

But it gets even more complicated. Suppose the scaffolding is set up in full compliance, but then a sheet-metal contractor moves some planks out of his way as he sets counterflashing for a roof, and then the painter—possibly a pieceworker who's trying to work fast—gets on the scaffold and gets to work without replac-





Above, a worker for the scaffold-erection contractor sets a toe board **(8)** above an access point to the building, to prevent falling objects from striking workers as they go in and out, then wires the board in place **(9)**. Older planks that won't pass inspection on the working platform might still do good service as toe boards **(10)**. The danger posed by objects that could fall off the scaffold is real **(11)**: In this example, workers loading a pallet of corbel trim blocks onto the scaffold have removed the mid-rail. This situation, which the superintendent corrected during his inspection, created multiple risks for workers using the work platform, as well as for workers passing beneath it.

ing those planks. Now the painter is the "exposing employer," but the sheet-metal company rather than the scaffold erector is in the role of "creating employer." But if the builder ignores an obvious violation in plain sight, it could also be cited in its status as the "controlling employer."

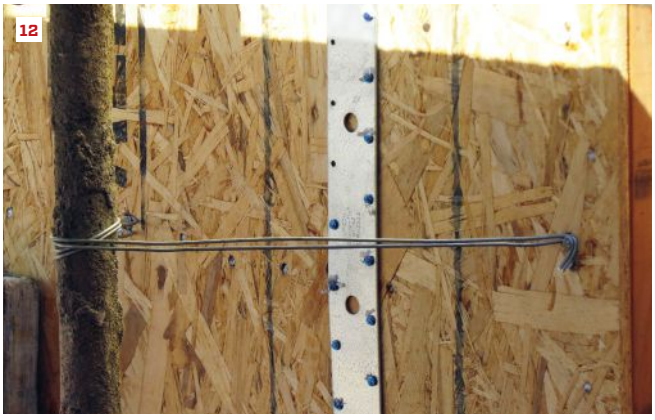
In this dynamic environment, it seems pretty obvious that a busy jobsite is only going to start out safe and stay safe if the builder—the "controlling employer"—stays on the case every day. And it's going to work best if all the builders in the area are on the same page and giving all the various trade contractors the same message: Safety matters, and everybody needs to follow the rules. And that, in a nutshell, is the mission of the Southern California Builders Safety Alliance: to send a consistent safety message to every trade employer across all the communities in the region.

Scaffolding is complicated. There are a lot of pieces and parts, and a lot of opportunities to violate the standards. There are also a lot of ways to get hurt. "I've been told that Cal/OSHA standards are 'written in blood,'" Rod Plunkett told *JLC*. "If it's in the standards, it's because somebody has been hurt or killed."

The examples mentioned here represent only a fraction of the issues that can come up with scaffolding. So if you use scaffolding, it's worth studying the topic in greater depth. One of the best ways to learn is to work with OSHA's consultation program, which offers expert instruction without the risk of being fined.

## BASE PLATES

Indoors or outdoors, scaffolding requires base plates (see photos, page 34). They're useful for leveling the legs, but they're vital for







Multistory scaffolds require wire ties to secure them against toppling **(12)**. To place the ties, the scaffold erector drives duplex nails partway into the framing, wraps the wire loosely around the scaffold and the nails, then drives the nails home to tighten the wire **(13)**. Wire ties create an ongoing inspection problem for the jobsite superintendent. Trade workers should not remove any wires while installing building paper or stucco **(14)**, but sometimes wires get disconnected **(15)**. If a wire is in the way of trim work, another wire should be installed before the problem wire is removed or cut.

stopping the legs of scaffolds from sinking into the soil or punching through a floor. Like any manufactured gear, they should be used according to the manufacturer's instructions—if they come with pins and holes for connecting to the pipe scaffolding, the pins need to be set into the holes as directed.

When placed in contact with earth, the base plates need to be supported by "mud sills," which, in California, should be at least 2 inches thick and 10 inches square, or equivalent (though a 10-inch-by-10-inch piece of 1⅛-inch plywood is a compliant alternative).

## PLANKS AND RAILINGS

Scaffolds come in light-duty, medium-duty, and heavy-duty types, as well as special-duty varieties for unusually heavy loads. For exterior use on a jobsite, you probably need heavy-duty scaffolding, meaning that the planks should support 75 pounds per square foot. Planks must be "scaffold grade," which is stronger than ordinary framing lumber, particularly across the plank's thickness. California allows heavy-duty planks to span 7 feet, but federal OSHA rules restrict that span to 6 feet, according to the U.S. Department of Labor website.

Planks should also be inspected for soundness. Photo 10 (see facing page) shows a convenient use for a plank that is no longer in good condition—it's now being used as a toe board (toe boards are required at doorways or other access points to the building, in order to prevent anything from sliding off the platform and striking a worker below).

Scaffold working platforms need top rails and mid-rails at specified heights. Cross-bracing (also required) can serve as a rail, but



The back of the work platform requires railings, but the front side remains open to allow access to the work. However, the side next to the building must be kept within a specified maximum distance of the wall, which can pose a problem at pop-outs **(17)**. Outriggers **(18)** are one way to extend the platform closer to a wall.

in that case, the cross point of the braces must also fall within a prescribed range of heights above the working platform. You can probably count on professionally erected scaffolding to comply with those rules, but making sure the railings stay in place is another matter; in photo 11 (see page 36), workers have removed a mid-rail to load components onto the scaffold, creating a citable hazard.

## TIES

To prevent toppling, scaffolds should be tied to the building at the scaffold ends and at intervals in between (the horizontal and vertical spacing depends on the height of the assembly). It's a good idea to install extra ties, since some may get cut during the course of work. Superintendents on multi-employer jobsites should keep an eye out for ties that have been cut and not replaced.

## DISTANCE FROM THE WALL

OSHA rules set a maximum allowable distance between the work platform and the wall. In California, that distance is 16 inches, although the federal requirement is 14 inches.

This rule creates practical problems when the wall being worked on has jogs or pop-outs. In those situations, outriggers may serve to get the working platform closer.

Details like these—and there are many more—would be problems to solve even on a slow-paced custom-home site where much of the work was being accomplished by the builder's own employees. On a busy production building site, with multiple trade contractors or even multiple builders at work, the challenges are multiplied.

*Ted Cushman is a senior editor at* JLC.

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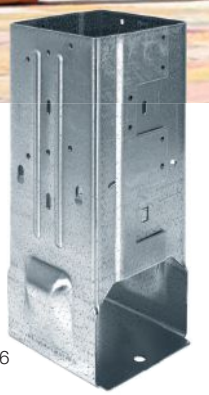

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# The Portal Frame Option
## This site-built assembly supplies proven bracing for openings

BY MARY UHER

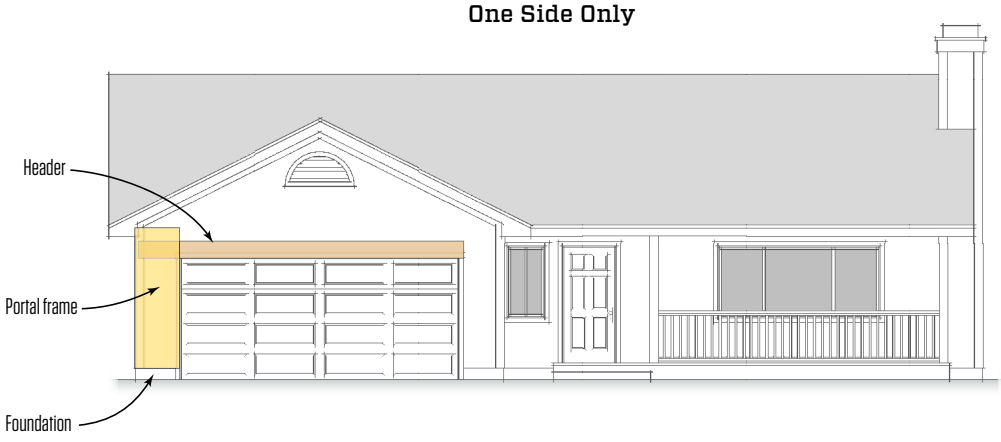
As an engineer with APA - The Engineered Wood Association, one of my jobs is to help study the damage from extreme weather events such as tornadoes. Often, APA teams see buildings that were damaged or destroyed by winds of less than the design wind speed specified in the building code (see "A Texas Tornado: Lessons Learned," May/17). Occasionally we even see a house that has been severely damaged by straight-line winds from a thunderstorm—the kind of wind pressure that a modern wood-frame house should be able to handle. Often we conclude that a damaged home most likely would have stood up to the storm if the builder had applied code-required structural details such as wall bracing and anchor bolts.

If a wall has only a few small openings, bracing it is easy. But large openings such as garage doors can complicate the problem. That's why APA developed a code-recognized wall bracing method called the "portal frame," which is commonly used to frame garage doors, but which you can also use as bracing at other door or window openings. In a portal frame, the header extends past the opening and is tied to its wall with overlapping plywood or OSB to stiffen the joint. The panels are attached to the wall studs and to the header with closely spaced nails, and the sill is bolted to the foundation.

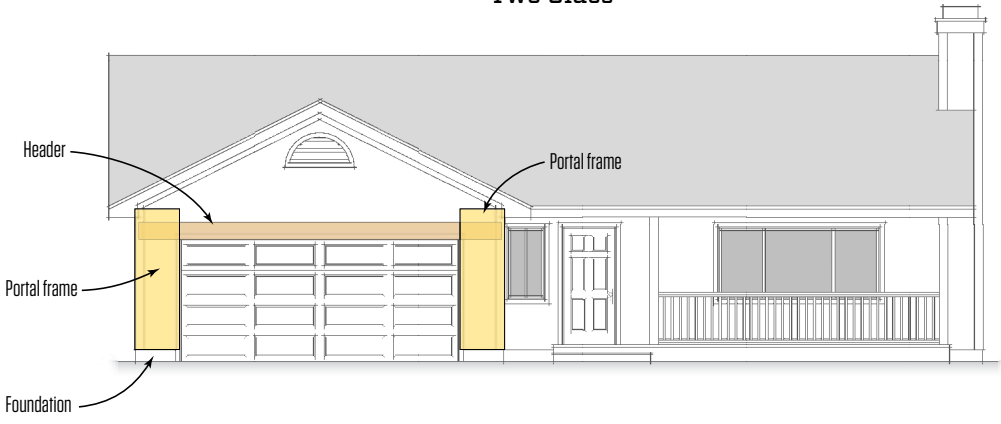
Portal frames are easy to build on site, using common, familiar materials. They are easy to inspect for quality control, and they resist loads that may otherwise be neglected.

## Portal Frame Scenarios

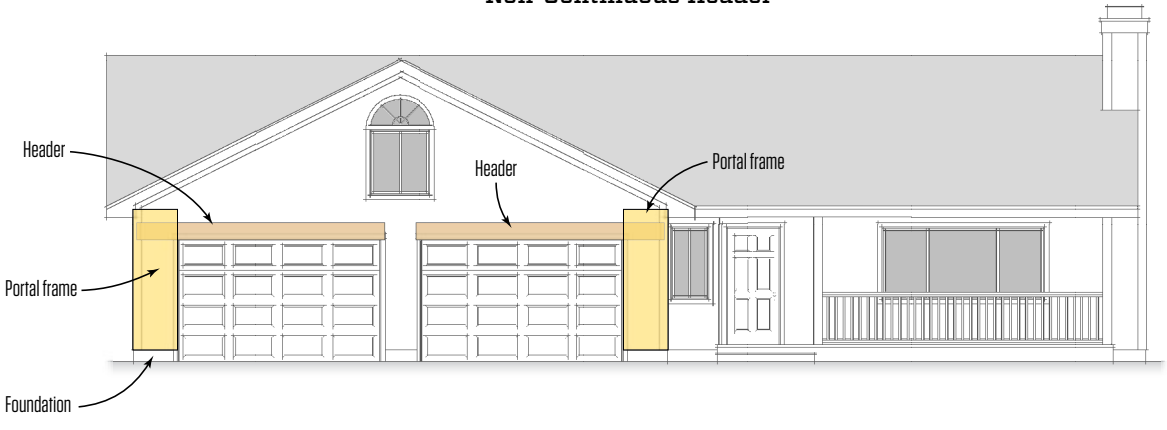
### One Side Only




### Two Sides

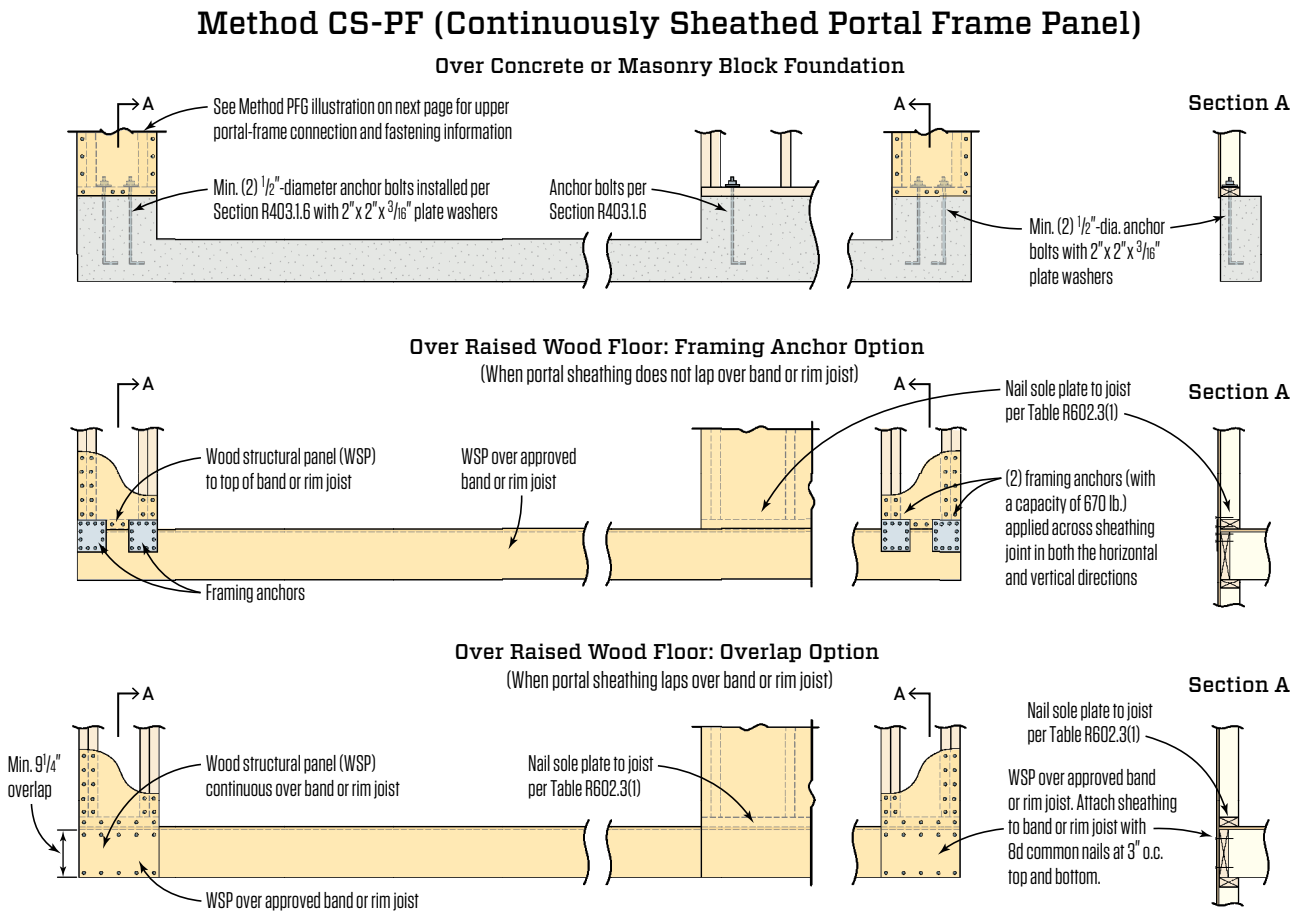



### Non-Continuous Header




In a house design where some main walls may have many openings, portal frames can be the key to providing code-compliant wall bracing. The examples above illustrate a portal-frame solution with just one reinforced corner (top), two reinforced corners on a single garage door (middle), and two reinforced corners flanking a double garage door. The two-garage-door assembly could also have a portal frame in the center, but either way, the header should not be continuous.

Illustrations by Tim Healey




The Continuously Sheathed Portal Frame is allowed only if the builder has sheathed the entire exterior wall system with plywood or OSB. But this method can be anchored to a wood floor frame using either overlapping sheathing or a properly detailed steel connector, allowing portal frames over basements and crawlspaces, or even on upper stories of multistory buildings. Wall-to-header attachment details are the same as for the PFH, as drawn on page 45.

## PORTAL FRAME POSSIBILITIES

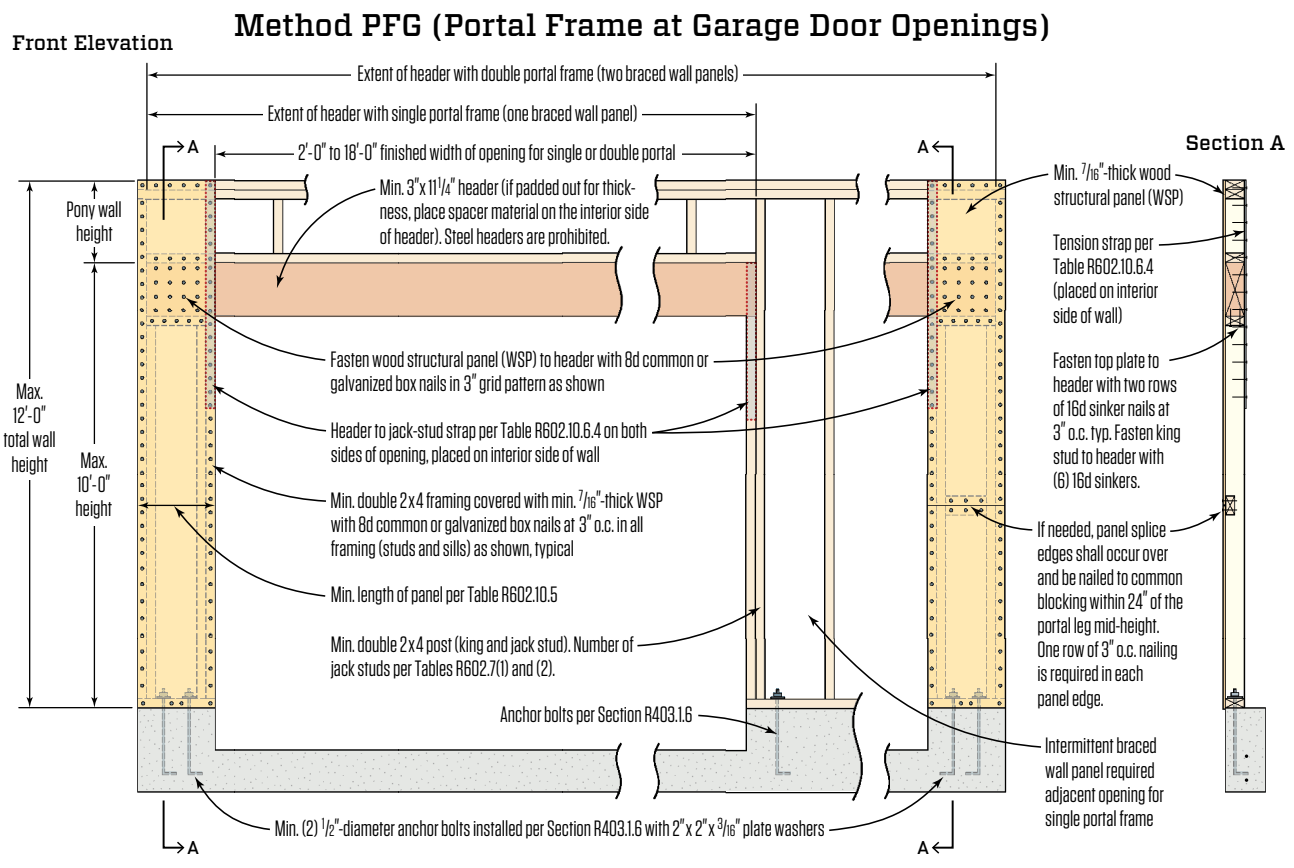
The drawing on the facing page illustrates portal frames incorporated into several different wall configurations. In each example, using a portal frame provides bracing capability, where otherwise you would need a wider wall or a proprietary system.

In case A, just one side of the opening receives the reinforced portal frame corner. In case B, both sides of the opening are detailed as portal frames, which increases the wall's capacity. In case C (a garage wall with two door openings), the two outer corners are shown here as portal frames. The center support between openings could also be constructed as a portal, or not; but either way, each of the openings should have its own header (the header should not be a single continuous member across the two rough openings).

To make the best use of portal frames, you need to consult the building code. In the 2015 International Residential Code (IRC), portal frames are included as one of many prescriptive bracing methods for braced wall construction (Sections R602.10 and R602.12). The different methods use different materials and have different requirements, and so the length of braced wall required for any situation varies, depending on the method employed.

Wood structural panels (WSP)—that is, plywood or oriented strand board (OSB)—are one of the higher-capacity bracing materials when combined with continuous sheathing. Compared to other assemblies, walls continuously sheathed with WSP resist lateral loads with a lesser amount of wall, and so they simplify the design problem by offering more flexibility in terms of the size and location of wall openings.

A code-compliant portal frame gives you even more design flexibility, because portal frames provide bracing in areas where the walls are too narrow for other methods.



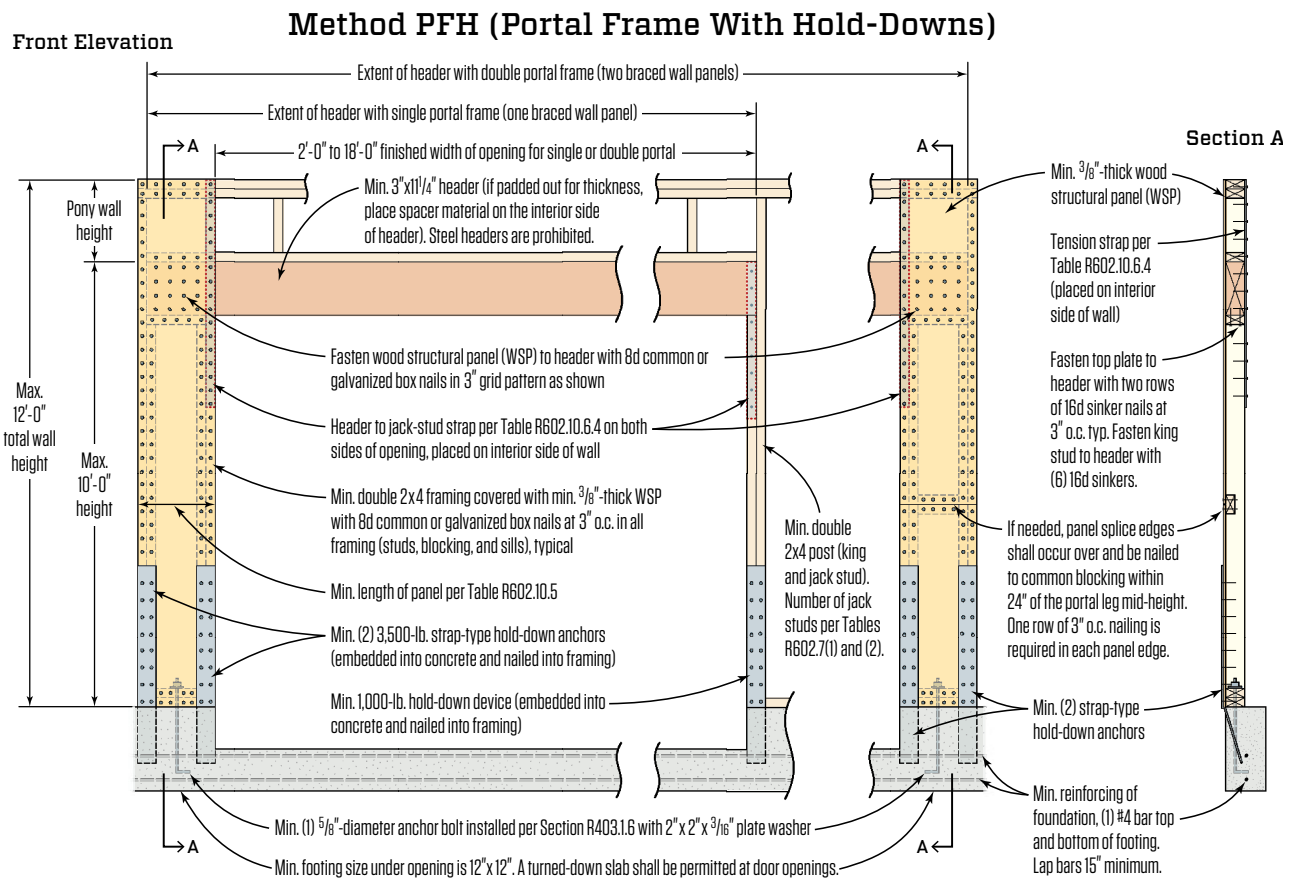

Method PFG is commonly used to supply wall bracing at garage door openings. Supporting walls may be as narrow as 2 feet in length, depending on door-opening height, and each portal frame earns credit for braced panel length of 1.5 times its actual length. Any sheathing joint must be placed within 24 inches of the portal leg height, nailed to a common piece of blocking.

## DESIGNING TO CODE

The building code allows three different types of portal frame: the CS-PF, or "continuously sheathed portal frame" (see illustration, page 43), the PFG, or "portal frame garage" (see illustration, above), and the PFH, or "portal frame with hold-downs" (see illustration, facing page). The anchoring methods at the base differ, but most other requirements are similar with only minor differences in fastening and WSP sheathing thickness.

Once you're familiar with the three types of portal frames, you'll be able to take advantage of their capacity when you're getting your plans approved at the building department. The plans should include "braced wall lines," defined as "a straight line through the building plan that represents the location of the lateral resistance provided by the wall bracing," as well as "braced wall panels," defined as "a full-height section of wall constructed to resist in-plane shear loads through interaction of framing members, sheathing material and anchors." A 4-foot length of OSB-sheathed wall with anchor bolts is one example of a braced wall panel. Portal frames also count as braced wall panels; for each portal frame in a wall, you get credit for a specified length of braced wall panel, as spelled out in IRC Table R602.10.5, "Minimum Length of Braced Wall Panels." So if you don't have room for 4 feet of sheathed wall next to your garage door, you can get credit for the equivalent bracing by constructing a portal frame, whose supporting wall might be as narrow as 16 inches, depending on the situation.

The IRC wall-bracing provisions are a common source of misapplication and confusion. It's helpful to study the topic. One excellent resource is *A Guide to the 2015 IRC Wood Wall Bracing Provisions*, published jointly by the International Code Council (ICC) and APA, and available as a $39.95 PDF download (see www.apawood.org/walls).



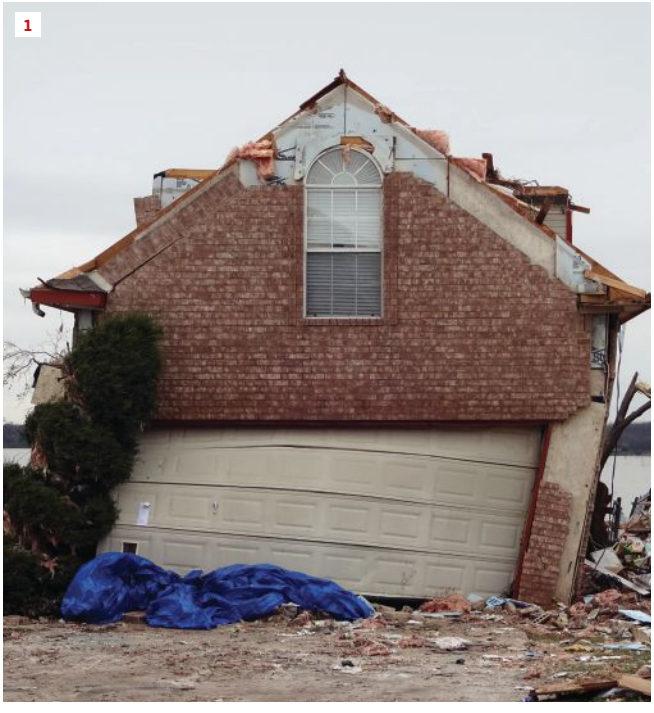

Built using correctly installed hold-downs of the code-specified capacity, the PFH can supply credit for greater bracing than a PFG. Supporting walls may be as narrow as 16 inches in length, and the assembly earns credit equivalent to a 48-inch ordinary braced wall panel. As with all portal frames, nail spacing specifications must be strictly followed.

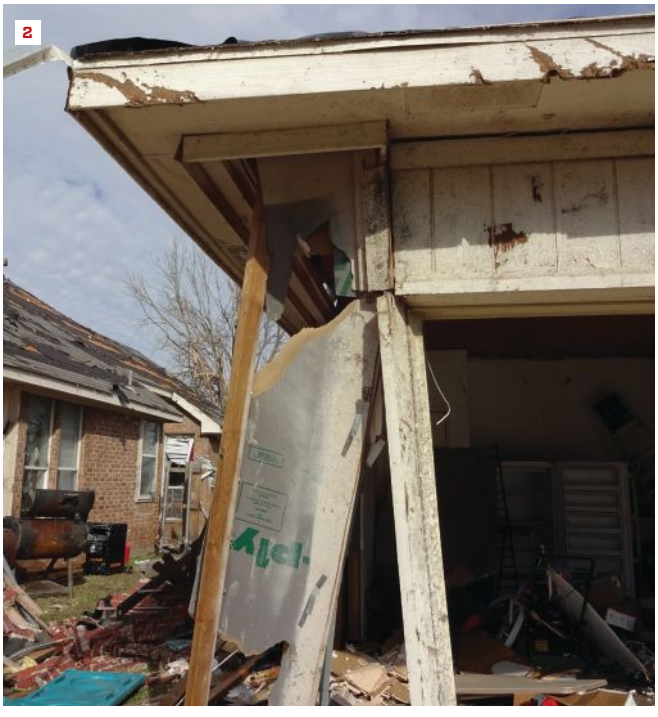
## CHOOSING A SOLUTION

As you consider bracing, one question is whether your building is continuously sheathed with wood structural panels. In the building code, this is bracing method "CS-WSP," and it provides the greatest bracing capacity for either wind or seismic loads. With this method, you may also use the continuously sheathed portal frame (CS-PF), in which case the wall supporting your header could be as narrow as 16 inches, depending on wall height.

Unlike method PFG or method PFH, which have to be anchored to a concrete foundation, method CS-PF can be attached to a wood floor frame at the wall base. You can do that either on the first floor level (over a basement or crawlspace foundation), or even on the uppermost stories of a taller building. You can tie the base of the CS-PF to the wood floor framing either using an approved metal connector, or with properly nailed overlapping plywood. This makes the CS-PF suitable for second-story situations such as the sliding door for a deck, a large bay window, or just a wall with so many window openings that it's hard to find enough sections of sheathed wall of the required minimum length to brace the structure adequately.

If the building isn't continuously sheathed with wood structural panels, then you can't use method CS-PF. However, you could still use method PFG. With that method, however, your supporting wall must be at least 24 inches in length for an 8-foot-tall wall (and wider for taller walls), and it must be bolted to concrete. If your design requires narrower walls next to an opening and you're willing to install hold-downs, you could choose method PFH. The hold-downs boost the bracing capacity, and the walls may be as narrow as 16 inches (if supporting just a roof), while still providing a bracing contribution equal to a 48-inch length of WSP-sheathed wall.




In what has become a classic failure mode, the upper corners of this garage **(1)** have rotated, unable to withstand the lateral force of strong winds (note the bad location of the panel joint at the upper right hand corner). Another example **(2)** shows the same pattern, as well as the failure of a garage door. In both cases, properly designed and installed portal frames would have likely improved the performance of the homes.

## WHY PORTAL FRAMES MATTER

The photos above come from APA investigations of tornado damage. To an engineer, these failures are not surprising: Conventionally-built stud walls this narrow just can't provide sufficient shear capacity to withstand the force of the expected wind on the side wall of the building. Properly constructed portal frames at these openings likely would have improved their performance.

The materials used in these examples aren't as strong as plywood or OSB either. But on the back walls of these garages, where there are few openings (or no openings), that's less important, because 8 feet of sheathed wall is enough to resist that shear. That's why the rear walls of the garages didn't experience the same failure as the front.

In these examples, even though these structures experienced very high wind speeds, extending the header all the way out over the flanking walls and tying the header to the walls to make a portal frame would have likely minimized the damage to the structure.

## CRAFTSMANSHIP AND QUALITY CONTROL

Portal frames are a tested assembly. To verify the capacity of the portal frame, APA engineers designed the walls based on engineering calculations, built full-sized assemblies, tested them to failure according to the applicable ASTM standards, and analyzed the results to obtain a structural capacity. If you build a portal wall on site, as long as you stick to the code-prescribed design, you know the wall will withstand the loads.

But if you don't follow the instructions, you may not get the full capacity. In my work, I spend a fair amount of time on jobsites looking at construction details and advising builders. In some parts of the country, builders and trades are becoming familiar with portal

Photos Courtesy APA - Engineered Wood Association




Typical construction errors shown here would reduce the strength of the portal frame: breaking the structural panel joint below the header **(3)**, which reduces the elbow's resistance to rotation; making a panel joint near to the bottom of the supporting wall **(4)**, which weakens the wall's resistance to shear; and locating anchor bolts away from the ends of the wall **(5)**, which weakens the wall base's resistance to overturning forces.

frames, and I don't see many mistakes or quality concerns. But other times, I see portal frames being built wrong. The photos on the facing page show some common construction errors.

In photo 3 (above), the sheathing joint occurs at the wall-to-header framing joint. This defeats the purpose of the portal frame; the joint between the wall and the header has to be rigid in order for the assembly to work. At the top corner of an opening, it's important to carry the sheathing material all the way up the wall and across the header, to the top of the wall. (This same condition can be observed in the damaged garage in photo 1 on the facing page, where the joint has rotated in response to the lateral pressure of wind.)

If you need to have a joint in the sheathing, that joint should occur within 2 feet of the middle of the wall, as shown in the drawings on pages 44 and 45. The wall in photo 4 has a joint just one foot above the foundation—a mistake that weakens the assembly.

Nailing details are also important. The portal frame requires the wood structural panel to be fastened with 8d common or galvanized nails into all framing members at 3 inches on-center, and a 3-inch on-center grid of nails at the header. Anything less will not provide the wall's rated capacity. Framers often miss this detail because they don't understand that the heavy nailing is a critical factor in keeping the corner joint stiff to prevent racking.

Anchoring details also matter. Each portal frame needs two anchor bolts, and they should be as close to the edges of the wall panel as it's practical to place them (not both on one side, as seen in photo 5, above). The anchor bolts should have 2-inch square plate washers and nuts, not round washers as shown in the photo here.

*Mary Uher, P.E., is a regional manager with APA - The Engineered Wood Association's Field Services Division.*

Photos Courtesy APA - Engineered Wood Association

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# Durable Brick Walkways

## Lasting success requires precision detailing at every step

BY JOHN CARROLL

In the world of residential design, brick walkways don't get much respect. Most people see them as a way to keep their feet clean when walking from the car to the house. But as one of the first things visitors see, a paved walkway can significantly enhance the visual impact of a home's exterior. Recently, I was hired to build two brick walkways leading to the entrances to a 1928 house just a block away from Duke University.

There are two very different approaches to brick paving: flexible and rigid. With flexible paving, bricks are set dry in a layer of stone dust over a compacted aggregate base. The joints between the bricks are small and filled with dry sand after the bricks are installed.

For this project, I opted for rigid paving, in which the bricks are set in a bed of mortar on top of a concrete slab with fully mortared joints. Rigid paving is more durable, but it can be unforgiving to movement, with any deformation in the slab showing up as a crack in the finished brick surface. Grouting the joints can also turn into an unholy mess if you're not careful and patient.

### LAYOUT FOR THE WALKWAY

The walkways started at brick gate posts that were 78½ inches apart and ended at steps 98½ inches wide. Because neither dimension worked with a 4-inch brick layout, I opted to make the walk 80 inches wide, notched around the brick posts and flared out the last couple of feet in front of the steps. The 80-inch width meant that I wouldn't have to cut bricks for every course on the walk.

Where the walkway met the stairs, the finished surface measured one riser height (about 7 inches) down from the first tread. At the other end, the walk had to be flush with the city sidewalk. Working down from the walk surface, I allowed 4 inches for the concrete slab and 4 inches for a layer of washed gravel. We excavated to that level and mechanically compacted the soil base. After setting up forms, we compacted the layer of gravel and were ready to pour the slab.

*John Carroll, author of* Working Alone, *is a builder who lives and works in Durham, N.C.*

Photos: Mike Moore (3); Brett Arnold (19–27); all others, John Carroll





**Getting ready for the bricks.** Prep work begins with installing a concrete slab to serve as a foundation for the brick walkway. The author excavates down about 8 inches and compacts the subsoil before placing 4 inches of washed gravel. Next, he sets the forms for the concrete and compacts the gravel layer **(1)**. Angled gussets reinforce the forms that create the flare **(2)**. After the concrete is placed, a mag float smooths the surface of the slab **(3)**. An absolutely smooth and flat slab is not necessary. The morning after the concrete pour, the author uses a circular saw with a masonry blade to cut control joints in the concrete. These joints make it more likely that if the concrete cracks as it cures or settles in the future, it will do so in a straight line **(4)**.

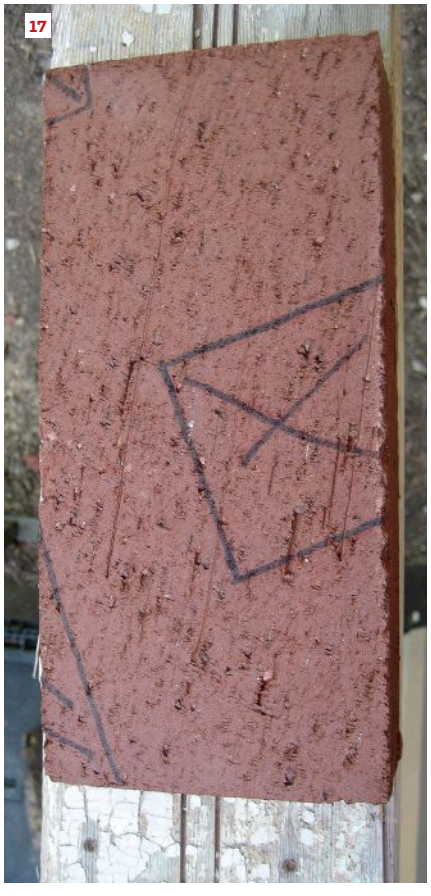
**Border bricks.** The first bricks to go in are along the edges of the walkway. Layout starts at a control joint to avoid having bricks span the joint and be subject to cracking **(5)**. The gap between the bricks that are on either side of the control joint will be filled with flexible sealant, instead of mortar, to allow the bricks to move slightly without cracking the joint between them. Mason's twine stretches the length of the walkway to guide brick placement. To keep the bricks following a perfectly straight line, the author installs them at precisely measured and laid-out intervals along the edge **(6)**. Then he adds a brick next to his first group and taps it into place, leveling over to the next brick in the sequence **(7)**. He leapfrogs in the opposite direction and adds a brick on the other side **(8)**. He completes the installation to the control joint and repeats the process from there **(9)**.





**Fashioning the flare.** After running the border bricks near the flare in the walkway, the author draws a layout line for the bricks along the flare's border. He uses squares to lay out the angle of the bend, and bisects this angle to define the cut angle for the bricks **(10)**. Next, he places a brick-size cardboard template at the intersection and uses a straightedge to transfer the angle **(11)**. He cuts the template—minus half of the mortar joint—along the cutline **(12)**. The template transfers the angle cuts to the bricks at the pivot point of the flare **(13)**, and the rest of the bricks can then be laid out for the edge of the flare.





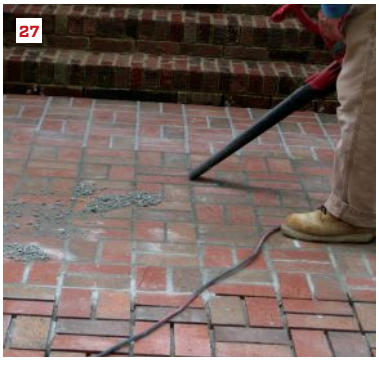
**Finicky fitting.** To fit odd-shaped areas like the one around the railing post, the author first rough-cuts a brick-shaped cardboard template to fit against the steps and around the post **(14)**. Then using a small piece of aluminum angle against each of the flat surfaces of the post, he transfers the exact shape to the template **(15, 16)**. He places the template on a brick, lining up the piece of aluminum angle on the line drawn on the template and marking the other side of the angle to lay out the exact shape that will be cut out **(17)**. A 4 1/2-inch grinder with a diamond blade makes fast work of odd-shaped cuts such as this one. The cut brick then takes its place as the final piece in the flare border. Other bricks receive straight angle cuts to square off the rest of the flared section to the field tile **(18)**.



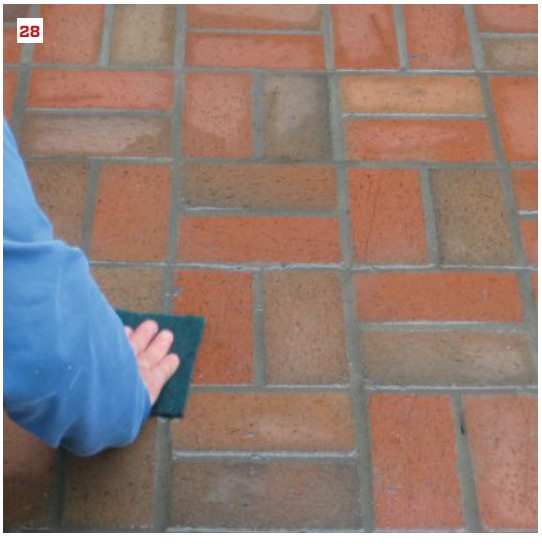

**Paving process.** The recipe for brick-laying mortar is two-and-a-half parts masonry sand to one part Type-S masonry cement plus water **(19)**. After combining the sand and the water together in a mixing tub, the author mixes in the masonry cement, stirring the mortar with a mixing paddle on a heavy-duty drill. When it's thoroughly mixed, he slowly adds water until the consistency is right. To ensure that the basket-weave pattern will be perfectly straight, he stretches masonry twine between the edges and staggers the first bricks, as he did with the border bricks **(20)**. For each brick, a layer of mortar goes down first **(21)** before he presses the brick into place **(22)**. Then using a mallet and a short heavy-duty level, he taps the brick into plane with the bricks on either side **(23)**.








**Grouting and jointing.** A narrow tuck-pointing tool delivers and presses narrow strips of mortar into the joints between the bricks **(24)**. When the joint is full, a concave jointing tool creates the finished surface of the mortar joint **(25)**. At this point, the excess mortar is left to dry on the walkway surface. Once the mortar has set up, the excess is scraped off the surface **(26)** and blown off with a leaf blower **(27)**.






**Finishing up.** After the mortar has cured overnight, a course scrub pad cleans off any residual mortar **(28)**. The final step is filling the brick joints over the control joints in the concrete slab. The author tapes the edges of the bricks, pushes foam backer rod into the joint **(29)**, and then fills the joint with a polyurethane-based caulk made specifically for use with concrete and masonry **(30)**.

# Products

BY LAUREN SHANESY

### 1. Time-Saving Shingles

Roofing contractors can now cover more area in a shorter amount of time with the new HP42" shingle format from Atlas Roofing. The company says that the 42-inch-wide, 14-inch-high shingle is the largest on the market and reduces installation time by up to two hours on a standard 40-square job by requiring 320 fewer shingles and 6,000 fewer nails. The system comes with a 130-mph wind warranty with a four-nail install. The HP42" became available in July and is the new standard for the Atlas StormMaster Shake and Pinnacle Pristine shingle lines. The price differs by region and distributor. atlasroofing.com


### 2. Hurricane-Resistant Windows

Sierra Pacific has designed a window said to withstand even the toughest coastal storms. The new H3 FeelSafe windows meet Zone III ratings and marry the best of two other Sierra Pacific lines: H3's high-tech design and FeelSafe's impact-rated strength. These windows integrate extruded aluminum, vinyl, and solid wood; design choices include varying colors, hardware, and SDL bars. Pricing varies by configuration. hurd.com


### 3. Green Building Blocks

Comfort Block is a fully-insulated, self-contained 16-inch-thick concrete block wall system that replaces wood and drywall, offering an alternative for builders looking to use energy-efficient products. The blocks are reportedly fire-resistant and mold- and pest-free, and require only thinset or concrete glue to secure in place, cutting down installation time and labor costs. Once set, the blocks are covered by plaster on the inside and stucco on the outside. Current pricing is $10.50 per square foot installed. genest-concrete.com


### 4. Hassle-Free Mortar

1-2-3Mortar is a polymer-enhanced sand and cement mortar preblended for easy and fast application. Contractors simply add water to the applicator bag, mix, and apply from the bag when laying block, brick, and stone—no extra tools required. The company says the product's strength "allows for thinner joint application and higher yields." One 11.3-pound bag is enough to lay 30 blocks. Pricing starts at $11 for a 5.5-pound bag. 123mortar.com

5

6

7

8

### 5. Soft-Close Cabinet Hinges

New from Hardware Resources, the 7390 Series Dura-Close Compact Soft-Close hinges have spring-arm sleeves for reduced friction, wear, and noise, and their one-piece assembly allows for six-way adjustability and a 105-degree opening angle. Designed for traditional face-frame cabinets and ANSI-certified to perform for more than 100,000 opening and closing cycles, the hinges come in overlays ranging from 3/8 inch through 1 1/2 inches. Each hinge costs $2.54. hardwareresources.com

### 6. Customizable Airflow for a Healthy Home

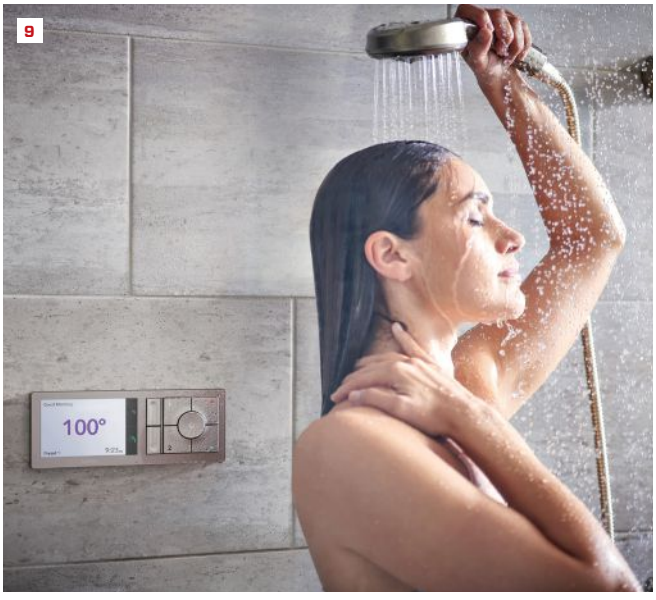
The Intelli-Balance 100 ERV is reportedly suitable for use in any climate. The unit has dual brushless DC motors, customizable airflow—allowing balanced, positive, or negative pressure at variable speeds from 50 to 100 cfm—and a built-in ASHRAE 62.2 timing function that helps ensure code compliance and energy efficiency. The system can be connected to existing ductwork or used as a stand-alone, whole-house ventilation solution. Pricing begins at $1,500. us.panasonic.com/ventfans

### 7. A Fluid-Applied Weather Barrier

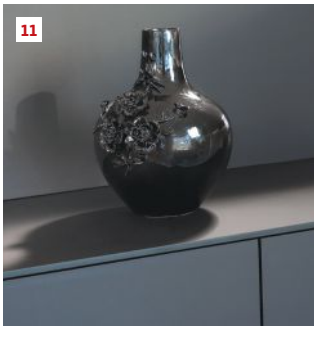
The DuPont Tyvek Fluid Applied WB+ System is made using a silyl-terminated polyether (STPE) and can be sprayed or pressure-rolled on to help protect building envelopes from air and bulk-water infiltration. DuPont says the material provides more coverage per gallon than older, acrylic and bitumen-based products. The company also says the material experiences minimal shrinking or cracking while curing, can be applied to concrete or gypsum, withstands nine months of UV exposure, and is vapor permeable. Check with local distributors for price. dupont.com

### 8. Safety Gear for Cordless Tools

Bosch Power Tools has introduced the GDE18V-16 Cordless HEPA Dust Collector attachment for the Bosch GBH18V-26 Rotary Hammer. The attachment mounts on the rotary hammer when needed and has a HEPA filter for a fully-integrated dust-collection system. It has its own motor, which is supplied with power by the rotary-hammer battery, and has auto power-off. The Dust Collector comes with one HEPA filter and costs $130. boschtools.com/us









**9. A Shower With Programmable Preferences**
The WiFi/cloud-based U by Moen shower includes a digital valve that offers thermostatic temperature control and enables the user to connect up to four shower devices such as showerheads, hand-showers, and body sprays. Its digital controller has a 5-inch LCD screen that provides feedback on the system's status; as water temperature changes to reach the set point, the screen changes colors, indicating that the system is warming up or cooling down. The package is listed on Moen's website for $1,225. moen.com

**10. Hardware for Extra-Large Sliding Doors**
The LIN-X1000 Lateral Door Opening System from Sugatsune provides soft-close and smooth movement for doors weighing up to 200 pounds. The hardware has four-way adjustability for a flush look when doors are closed, and it allows doors up to 43 5/16 inches wide to open in a much smaller radius than you'd have with a regular hinge. The LIN-X1000 features a clip-on system and has only three parts—a lower arm, cover section, and connecting bar—for easy installation, says the company. The door system retails for $2,200. sugatsune.com

**11. Traceless Laminate Countertops**
Wilsonart has introduced a new laminate countertop surface that is reportedly resistant to the pesky smears, smudges, streaks, and fingerprints that occur daily. The company says its Traceless Laminate line is durable and heat-, impact-, and scratch-resistant, and has a UL Greenguard Gold certification for low chemical emissions. The surface is available in five colors and comes in 4-foot-by-8-foot and 4-foot-by-10-foot sheets in a thickness of 0.039 inch. Prices range from $3 to $5 per square foot before installation. wilsonart.com

**12. A Heavy-Duty Concrete Screw Anchor**
Simpson Strong Tie's new Stainless Steel Titen HD (THDSS) heavy-duty screw anchor for concrete and masonry is made using a bi-metal design that combines the corrosion resistance of Type 316 stainless steel with the undercutting ability of heat-treated carbon-steel cutting threads. To protect the surrounding concrete from cracking caused by corrosion (and thus expansion) over time of the metals in the anchor, the use of carbon steel is confined to the helical-coil thread that's brazed into the stainless steel shank of the anchor. Pricing varies by distributor. strongtie.com

# August Advertising Index

| Advertiser | Page |
|---|---|
| Boccia, Inc. | 63 |
| Calculated Industries | 7 |
| CertainTeed Insulation | IFC |
| CertainTeed Siding Products Group | 2-3 |
| Chief Architect | 21 |
| DeckWise | 31 |
| Diablo | 4 |
| Dryer Wall Vent | 8 |
| FastenMaster | 22 |
| Georgia-Pacific Corporation | OBC |
| GKR Industries, Inc. | 63 |
| Greenbuild | 28 |
| Home Depot, The | 27 |
| Huber Engineered Woods, ZIP | 16-17 |
| Innovis Corporation | 63 |
| Integrity Windows & Doors | 63 |
| Kozy Kollar Manufacturing, Inc. | 63 |
| LP Building Products | 25 |
| Makita USA, Inc. | 1 |
| Mark E Industries, Inc. | 11 |
| MAX USA Corporation | 8 |
| Panasonic Home & Environment | 18 |
| PPG ProLuxe | IBC |
| Protective Products | 63 |
| ProWood | 12 |
| Remodelers Advantage | 32 |
| Remodelers Summit | 48 |
| Simpson Strong-Tie | 39 |
| Tando Building Products | 40 |
| Tjernlund Products, Inc. | 63 |
| ZIPPKOOL | 7 |

# Makita LS1019L Miter Saw

BY CHRIS ERMIDES

**Makita has a new** 10-inch miter saw on the market, with some features that displace the earlier LS1016L from the "premium" spot in the company's lineup. Like its predecessor, the new LS1019L is able to cut 6 5/8-inch crown molding nested, 5 1/4-inch speed base vertically, and a 4x4 in one pass. The LS1019L has a soft-start 15-amp direct-drive motor, which provides direct power transfer with no belt to slip, wear, or replace, and the saw's electronic speed control is designed to maintain a constant speed under load, which reportedly makes for smoother cutting.

The two-rail sliding system is of particular note. It allows the new saw to sit tight to the wall—the rails are fixed and run to the front of the saw. The motor housing and blade ride back and forth on these fixed rails, instead of the rails sliding back and forth. This setup also includes a front-mount bevel adjustment; the only time you need to reach to the back of the saw is to unlock the stop to tilt the blade to the right.

At 58 pounds, the LS1019L isn't light—it weighs about the same as Makita's larger, 12-inch dual slide compound miter saw. The extra weight is likely due to the housing for the two-rail system that mounts on the back. The table is large, as well.

An integrated upper and lower fence combine to provide a total of 4 3/4 inches of vertical support for material. The upper fence needs to be removed completely for bevel cuts to either side; the fences are designed to clip on the metal side arms so they store out of the way. The saw miters 0 to 60 degrees to the left and right, and bevels 0 to 48 degrees in either direction (there are positive stops at 45 degrees, left and right, with a detent override should you need to bevel past 45 degrees to 48 degrees). A built-in laser can be turned on and off (via a dedicated switch) or micro-adjusted to read on either side of the blade.

Makita has provided a larger dust-collection mouth at the back of the blade. A dust-collection bag is included with saw, as well as a separate elbow that mounts on the side of the slide mechanism. This elbow connects a short hose to the saw's vacuum port, so when the saw is in slide mode you're not pulling on the vacuum's hose. A 36V (dual 18V) cordless version of this saw will be available in the fall. Cost: $550. makitatools.com

*Chris Ermides is a senior editor at* JLC *and editor of* Tools of the Trade.


**Fixed rails make a flush fit.** The newly designed two-rail system comprises a fixed arm that mounts to the back of the saw and rails that run to the saw's front. A locking knob in front of the rails controls the bevel. Because the rails are fixed, the saw can be pushed up tight against a wall—a useful feature for the jobsite or a small shop where space is limited.

**Makita LS1019L Specs**

**Blade diameter:** 10 inches | **Arbor:** 5/8 inch
**No-load speed:** 3,200 rpm
**Amps:** 15.0 | **Weight:** 57.9 lb.
**Max. crosscut at 90 degrees:** 2 13/16 inches by 12 inches
**Max. crosscut at 45-degree miter and bevel:** 2 13/16 inches by 8 1/2 inches
**Max. baseboard cut on the vertical:** 5 1/4 inches
**Max. crown vertically nested**: 6 5/8 inches
**Miter:** 0 to 60 degrees, left and right
**Positive miter stops at:** 0, 15, 22.5, 31.6, 45, and 60 degrees, left and right
**Bevel:** 0 to 48 degrees, left and right
**Country of origin:** China
**Includes:** Tool, 10-inch 60-tooth micro-polished blade, vertical vise, triangular ruler, dust bag, wrench

**Weigh In!**
Want to test a new tool or share a tool-related testimonial, gripe, or technique? Contact us at JLCTools@hanleywood.com

# Two Affordable Workboots

BY TIM UHLER

**When I bought my first work boot** as a teenager, all the guys on the framing crew swore by a wedge-sole moc-toe boot. It's a staple among iron workers, and over the last couple of years, among hipsters too. It seems that hipsters have an affinity for Red Wing, and I know commercial guys who swear by them. I have purchased both expensive and mid-range boots for work, but I don't buy expensive, more-than-$200 boots anymore. Work boots can get trashed so quickly, I can't justify spending more than that.

It has been a few years since I wore a wedge-sole moc-toe boot, but I decided it was time again, and reached out to Golden Fox shoes. I had seen them on social media and saw they were selling at a good price. The company sent me a 6-inch non-safety-toe boot. At the same time, my co-worker decided to try wedge soles. He bought Thorogood 8-inch safety toes because they were available locally where he could try them on.

**Golden Fox 6-inch Moc Toe Wedge Pro Work Boot.** This boot features "oil full-grain leather," a pigskin collar, and a polyurethane wedge sole that is oil and slip resistant. It has a PVC welt (the piece that forms a sort of gasket between the upper boot and the sole ) and uses Goodyear welted construction (a technique for stitching the upper leather, lining, and welt to the sole-insole assembly). According to Golden Fox, a PVC welt holds up better to liquid elements like water, but doesn't do as well in snow and freezing temperatures.

The features of this boot are straightforward. What I noticed after taking the

**Golden Fox 6-inch Moc Toe Wedge Pro Work Boot** features full-grain leather uppers, a pigskin collar, and a polyurethane wedge sole. The author instantly found the boots comfortable, and they have held up well to four months of abuse on the job.

**Thorogood 8-inch Moc Toe Safety** features Goodyear Storm Welt construction. This type of boot provides a good water seal where the sole is stitched to the boot's upper. The author's co-worker has found these boots to be comfortable, as well.

Photos: Tim Uhler

boots out of the box and wearing them around the house is how instantly comfortable they were. I've been abusing these boots for four months and wore them in pouring rain and my feet stayed dry—though they are not technically waterproof. What I really like about wedge-sole boots is there is no heel shock, as there is with a boot with heels. I also find that when walking walls or girders, I have better balance with the wedge sole.

The Golden Fox runs about $135 and is made in China. The size fits true (I wear a 10 ½ and they were right on the money). I doubt I'll get more than a year out of them, but that's OK with me. Boots become less supportive as they age, and because I'm on my feet all day every day, I need the support. So I'm fine with getting a new pair every year.

**Thorogood 8-inch Moc Toe Safety.** My co-worker, Kyle Davis, bought these boots after trying them on locally. They're similar to the Golden Fox in that they feature a Goodyear Storm Welt (which uses a wider welt that allows for a better water seal between the sole and the upper boot), a removable footbed, and a polyurethane wedge sole. Davis went with a safety toe, which can feel narrow and uncomfortable to some users, but he hasn't had that experience with these. After wearing them the last four months, he's sold on the comfort and quality of these boots. He will easily get a year out of them. His aren't waterproof; if you frequently work in wet weather, we recommend going with the waterproof version.

The Thorogood runs about $190 and is made in the U.S.A. These boots, too, fit true to size. He went with a slightly smaller size because the store carried only whole sizes, but they've stretched nicely and he's very happy with the fit.

Both of us noticed—and I suspect this is true of other wedge-sole boots—that they don't stick well to roof sheathing. Walking a 6:12 roof with OSB, both of us felt less sure, and I slipped a few times. Other than that, neither of us has any trouble recommending these boots.

*Tim Uhler is a lead carpenter for Pioneer Builders in Port Orchard, Wash. He is a contributing editor to* JLC *and* Tools of the Trade.


**Ultra convenience.** The Graco Ultra Cordless runs off of DeWalt's 20V Max battery platform. The kit comes with two 2.0-Ah batteries; each will deliver about a gallon of paint on a single charge. Both corded and cordless models will work at any angle, including upside down.

## GRACO ULTRA HANDHELDS

**Prep-to-Finish pro painter Scott Burt** recently reviewed Graco's new Ultra handheld sprayer line, which comes in a couple of reasonably-priced options particularly suited to remodeling contractors. Burt likes the convenience of handheld sprayers for small jobs like built-ins, doors, and spindles, or anything else that would otherwise take a longer time with a brush but doesn't necessarily justify pulling out a large sprayer setup.

Available in either a cordless or corded version (and a cordless Ultra Max, for hot solvents), the Ultra handhelds deliver 2,000 psi without the hoses. Burt likes the two-component cup assembly of this series—an open housing that holds a disposable, clear flexible liner makes priming a simple as squeezing the air out through a small valve on top of the cup. Because of this setup, the sprayers can be used at any angle, including upside down. The FFLP tip—a new tip series from Graco particularly useful to pro painters because of its compatibility with other airless sprayers—allows users to work at a lower pressure, producing less overspray and a better-defined fan pattern. Pressure can be dialed in between 500 to 2,000 psi, offering extra control.

The Ultra Corded model (17M359) comes with a case, an RAC X FFLP 514 tip, and four liners. Cost: $400. The Ultra Cordless model (17M363) comes with a case, an RAC X FFLP 514 Tip, four liners, two DeWalt 20V Max batteries, and a charger. Cost: $500. Burt says you can expect to deliver about four cups (approximately one gallon) worth of paint on a single charge. *—C.E.*

BY ROE OSBORN




A photo from 1906 shows Naumkeag, in Stockbridge, Mass., with the original decorative shingling **(1)**. Elaborate staging allows the crew to reach the gable peaks **(2)**. The restoration crew replicated the curved scalloped shingles along the gable eaves **(3)**.

# Shingle-Style Restoration

**On our way home** from a trip to western Massachusetts this spring, my wife and I decided to visit Naumkeag, a historic house in Stockbridge known primarily for its expansive gardens. As we drove in, I saw pipe staging next to the house and immediately noticed fresh cedar shingles applied in intricate and unexpected patterns to one of the gables. As we walked through the gardens—which were as gorgeous as advertised—I kept looking over my shoulder at the crew working on the house.

When Stanford White, of architectural firm McKim, Mead & White, designed Naumkeag, he took "shingle-style" to another level. White combined brick and stone with natural wood shingles to create multiple gables, towers with conical roofs, and hip-roof dormers whose sides flare out as they meet the roof. He designed the roof shingles to curl softly from the roof plane to the wall plane without a hard intersection, and extra shingle courses were blended in to accommodate the change in exposure from roof to wall. Mark Wilson, Naumkeag's curator from The Trustees of Reservations, told me that the roof reshingling completed in 2014 had been done in Alaskan yellow cedar.

The company on site for the sidewall shingle work was LaRochelle Construction, from South Hadley, Mass. Wilson said that the crew was fast and efficient, faithfully following photos and drawings of the original shingle work, including one shingle at the peak of the south gable that seems to stick out at an odd angle (see photo, bottom left). That gable—along with every other gable on the house—features scalloped shingles that curve gently from the surface of the gable wall to the gable fascia. A LaRochelle crew member also told me that they hand-cut each of the scalloped shingles and built up multiple layers of shingles to achieve the concave curve. The crew member said that one of the biggest challenges was setting up staging tall enough to reach the gable peaks.

The original sidewall shingles on the house were cypress. Wilson said that after consulting with a preservation architect as well as with the Massachusetts Historical Commission, The Trustees of Reservations opted for red cedars on the walls because of cedar's availability. He said that two porches on the house had been enclosed in later renovations with the original cypress shingles left intact; in their protected environment, those shingles will forever stand as a monument to the craftsmen who built Naumkeag.

*Roe Osborn is a senior editor at* JLC.

Photos: 1, The Trustees Archive/Naumkeag; 2 & 3, Roe Osborn

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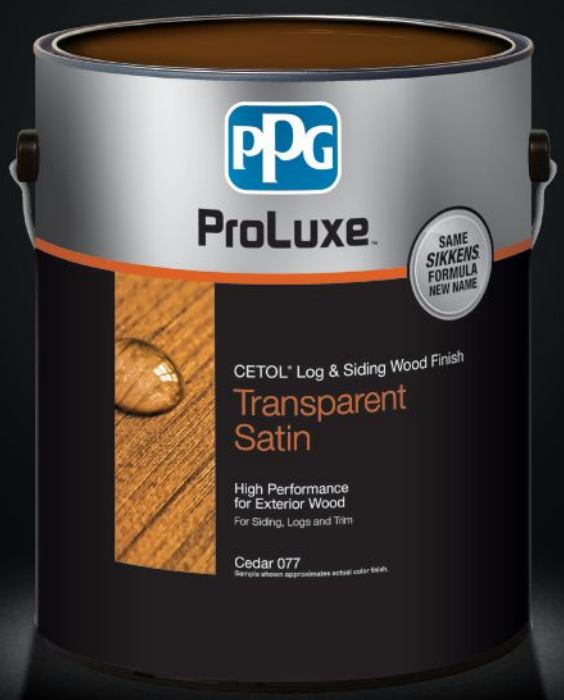


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