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On the cover: The crew of New England Soundproofing, based in Waltham, Mass., installs a "mass-loaded vinyl" membrane that helps keep airborne sounds from traveling through a stairwell wall between condo units. Photo by Ted Cushman

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Reader Feedback
The following excerpts are taken from comments in response to the JLC articles referenced.

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Letters

"SYNTHETIC STUCCO WITHOUT FAILURES," BY MARK PARLEE (DEC/14)

Chrishoppepe: Great article, but I would like to comment on the counterflashing where a roof meets a sidewall. Photos 4 and 5 in the online version of the article show a nice rigid counterflashing above the step flashing. This will allow the shingles and step flashing to be replaced in the future without damaging the stucco. In photo 7 online, it looks like a peel-and-stick membrane was used as counterflashing, which would make it almost impossible to remove and replace the step flashing in the future. Please give roofers a break and make sure that roofing can be replaced in the future without removing the siding. This is true at membrane roofs, too, where the life cycle may only be 20 years.

Mark Parlee responds: Thanks for your comments and observations. You bring up a really important point that was not discussed in detail in the article, but warrants attention. You have to understand that these particular jobs were stucco. This one is a "direct applied" stucco, but the same applies to EIFS and traditional three-coat stucco as well. You can't remove the step flashing *or* the rigid metal counterflashing at the time of reroof without damaging the stucco. Stucco's too brittle and won't suffer any amount of flexing when you're trying to free the flashings.

Instead, we have to think forward, not only about the initial installation, but to the next roof. In anticipation of the roofer's work, we install the step shingles with a shim between each step, so you can slip each course of shingles in between the steps. We don't expect the roofer to interleave step flashing as he installs each course of shingles. Doing it as shown in the photo below (photo 4 in the online version of the article) takes care of job sequencing problems, as well. The step shingles are made from 24-gauge galvanized metal with a Kynar coating. This is both much heavier and much smoother than what is often used for step flashing, and if correctly installed, will allow the shingles to be placed after the flashing.

The condition shown in the photo is the exact same condition that will exist down the road after the roofers strip the roof. They will remove the old shingles from between the steps, without disturbing the counterflashing or the stucco, and will then lift each step to slide their new shingles in, just as we initially did on this project. I've worked carefully with my roofer (he's a good friend of mine) to figure this all out. It is a key detail, and I appreciate that you brought it up, giving us a forum here to provide more information.

It's also worth noting that the peel-and-stick membrane you see in photo 7 online is included by design. There is peel-and-stick on the roof deck that turns up the side of the wall. Laid over that are the step shingles, and over the kickout we place another piece of peel-and-stick as an added defense against all the water that will be splashing up once it hits the upturned edge of the kickout. Finally a rigid metal counterflashing will be applied to this, as well. Redundancy is the name of the game to keep that water from getting behind all the layers and rotting out the sheathing and framing.

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Q As a carpenter, I occasionally need to create elliptical shapes for things such as door transoms. I've tried the nails-and-string method, but driving nails isn't always an option. Is there another method I could try?

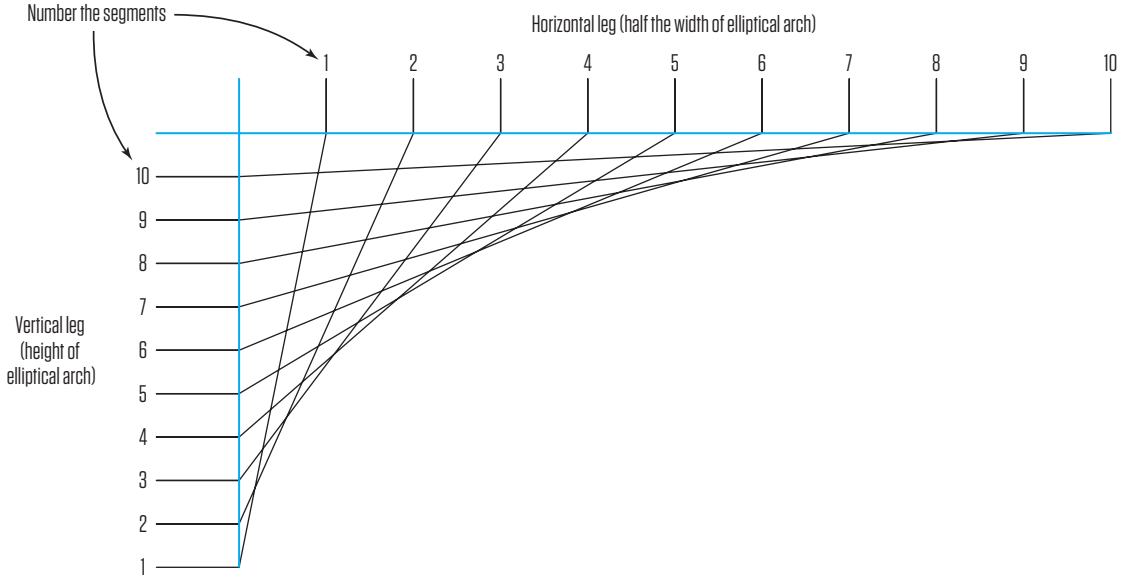
A Mike Patterson, owner of Patterson Builders and Remodelers, in Gaithersburg, Md., responds: I can never seem to remember the nails-and-string method, so I use a technique that I learned back in Cub Scouts that uses a series of straight lines to make an elliptical shape.

I first establish the height and width of the elliptical shape I need (which for a door transom with an elliptical arch would actually be just half of an ellipse). I lay out the elliptical shape on a piece of cardboard, plywood, or whatever works for the size I need, typically drawing only half of the arch, and then reversing that piece to trace the other half.

To create the ellipse, I start by drawing an "L" shape, where the vertical leg equals the height of the elliptical arch, and the horizontal leg represents half of the ellipse's width. Next, I divide each of those lines into the same number of segments. The more segments I use, the more accurate the shape will be (see illustration, below). Then I number the segments "1" through whatever number of segments I've decided to use. On the horizontal leg, the numbering begins at the mark closest to the intersection of the two lines. On the vertical leg, though, I start the numbering at the mark farthest from the intersection.

I connect the same numbers on the two legs—1 on the vertical leg to 1 on the horizontal leg, 2 to 2, and so on—with straight lines. Joining the points creates something that looks like a spider web, with the straight lines intersecting and overlapping to form short straight segments of the ellipse's circumference. With a pencil, I fair the segments into an elliptical curve, and then cut out the shape. I use this pattern to mark one side of the arch and simply flip it over to mark the other side.

Making an Ellipse (Straight-Line Method)



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Q When mixing concrete for post footings, my crew always disagrees about what makes for stronger concrete: a looser, more soupy mixture or a drier, stiffer mix. Who is right and why?

A Bill Palmer Jr., an engineer and the editor-in-chief of *Concrete Construction*, a sister publication of *JLC*, responds: The strength of the concrete is inversely related to the amount of water in the mix—essentially, drier mixes are stronger and wetter mixes are weaker. If you add 30% more water than what is recommended, you will reduce the concrete's compressive strength by about 40%. But compressive strength is seldom an issue with concrete for footings. Typically the load is spread out on the footing and is seldom high enough to exceed the strength of the concrete—even if you are using a wet mix.

For successful footings, always properly compact the soil under the footing. It's a good practice to dig the hole a little deeper than required, then add a few inches of gravel or crushed stone and compact it thoroughly with a piece of lumber before placing the concrete.

A more common problem with footings is improperly consolidating the concrete. A dry, stiff mix can be difficult to consolidate well, and a poor job can result in voids and honeycombing in the concrete. Those defects can cause the concrete to crack, which compromises the strength of the footing. Regardless of the mix you use, it's a good idea to consolidate the mixture with a piece of rebar or a trowel as you fill the form.

Bottom line: I always recommend a mix that allows for easy placement and consolidation of the concrete, but that isn't too soupy. It may seem a bit obvious, but for best results, just follow the manufacturer's mixing instructions on the bag, which typically call for 3 quarts of water for an 80-pound bag of concrete mix.

Q In a kitchen I'm building for a client, the dishwasher drain line would need to pass through a drawer cabinet to connect to the sink drain. The waste line for the sink passes under the floor directly below the dishwasher. Is there any problem with running the dishwasher drain directly into the waste line?

A Mike Casey, a licensed plumbing contractor and co-author of *Code Check Plumbing*, responds: Whenever possible, it is always best practice to connect the dishwasher drain hose to the kitchen sink drain. Most drawer cabinets have a 3-inch to 4-inch space below the drawers, or space at the back of the cabinet behind the drawers, where the hose can be located.

Nothing in the code specifically prohibits you from connecting a dishwasher drain directly into a waste pipe below the floor, but doing so creates many potential problems. First, the drain line should always have a high loop (at least 20 inches above the finished floor) to prevent waste water from backing into the dishwasher, so you would need to loop the drain hose over the dishwasher and back down to the waste line. Second, the drain must connect to a proper fitting with a trap that prevents sewer gases from backing into the dishwasher. This trap arrangement already exists at the kitchen sink, but it would need to be duplicated if you made a separate connection directly into the waste line. Finally, when a drain connects to a waste line below a point that is 20 inches from the kitchen floor, an air-gap device—which must be installed above the rim of the sink—is required for the drain.

So again, while there is nothing in the code that says you can't run the drain directly into the waste line, it is almost always easier and certainly less complicated to connect the dishwasher drain hose to the drain at the kitchen sink.

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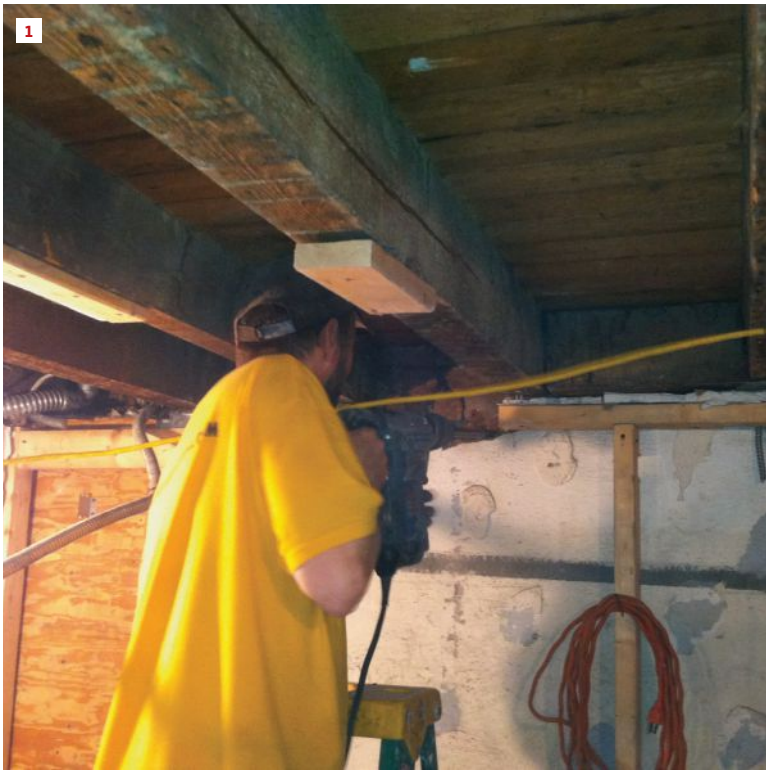
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A Flush-Framed Floor to Maximize Space

Recently, I was asked to remodel a four-story, two-family brownstone in Hoboken, N.J. The owners used to share half the building with tenants but needed more space to raise their growing family. They hired an architect and settled on a plan to occupy most of the home except for a small basement apartment, which would give them some rental income and maintain the home's two-family zoning status.

The scope of this project included a complete gut-rehab of two of the four floors. In this article, however, I'll focus on the structural work related to the basement apartment and the first-floor entry.

During design, the clients were concerned that the apartment's 375 square feet would feel small. The basement's low 7 ½-foot ceiling and a dropped box beam supporting the first-floor joists impinged on the space. And an existing brick pier supporting the dropped beam landed smack in the middle of the apartment's main room. The solution: Eliminate both the dropped beam and brick pier to maximize the perceived volume of space. Working with the architect, we came up with a plan to flush-frame the existing first-floor girders. We'd clear-span the width of the building with a couple of steel beams running parallel to the existing floor joists. This steel would support new Microlam headers in the floor to support the floor framing (see "First Floor Framing Plan," next page). It seemed a simple enough plan, but I knew better. A Hoboken brownstone is like a box of Cracker Jacks: There's always a surprise inside.

Right away we discovered numerous structural issues with the house while demoing the basement. These issues centered largely on the stairway: On a previous renovation, the builders didn't install a box header for the stairs; the existing floor joists were cut and left hanging

Photos: Rob Corbo

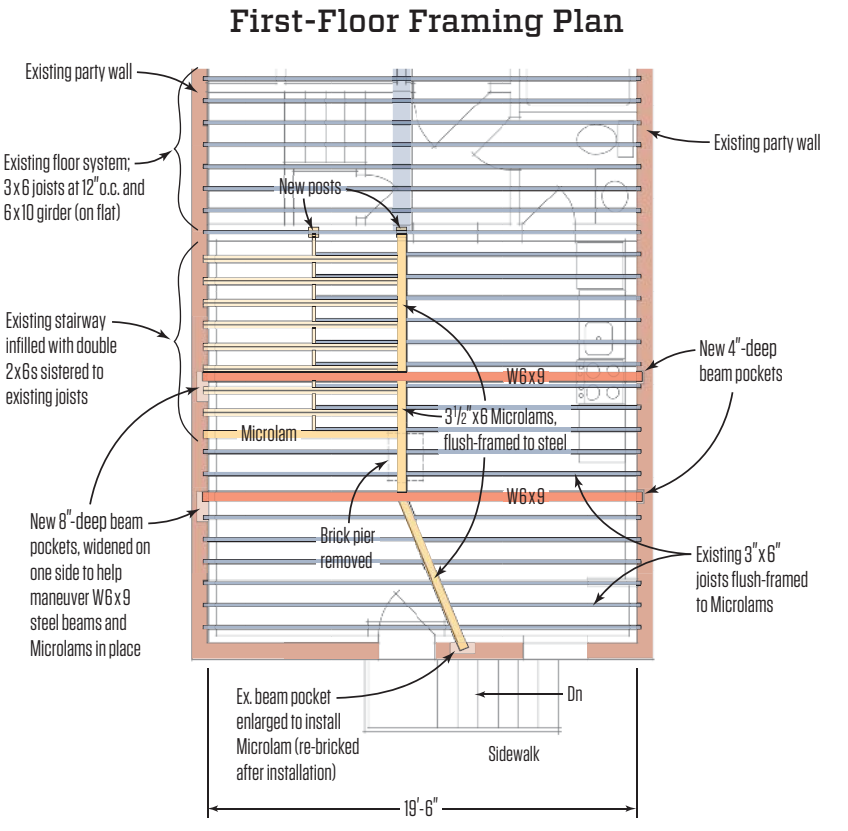
without proper bearing. Also, the wall at the stairwell—a bearing wall that ran from the roof to the basement—had been built on the slab without a proper footing to support it. And we discovered a few hidden point loads we needed to address.

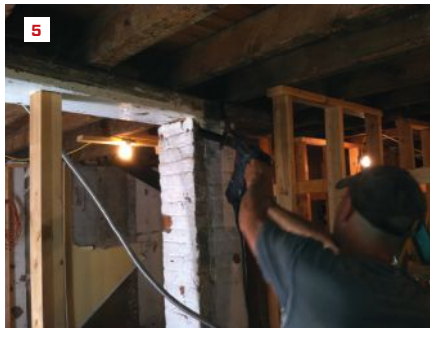
Steel beams. After redirecting the gas line, sewer pipe, and electrical wiring, we began work on the floor system. Lead carpenter Danny DuCouto hammer-drilled out four new beam pockets for the steel in the existing brick party walls **(1)**. The interior span between the two walls was 19 feet 6 inches, so we ordered two 20-foot-long W6x9 steel beams—long enough to provide 3-inch bearing on both brick walls. (Though if there are no width constraints, we usually like to have 5 to 6 inches of bearing.)

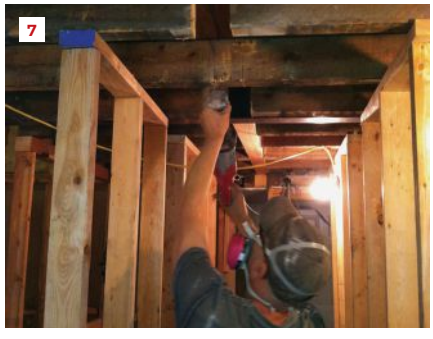
The W6x9 I-beams weighed 180 pounds each, so they weren't too heavy; the main issue was their length **(2)**. We managed to move the beams inside through an existing street-side window. It took three of us to put them roughly in place, setting one end up in the 12-inch-wide pocket we had chiseled out of the party wall **(3)**. The walls were three brick-wythes wide (12 inches thick), so Danny cut the new beam pockets two wythes deep (8 inches) on one party wall and one wythe deep (4 inches) on the other. We needed the extra depth to slide the beam into place. Danny also cut them wider than needed, for extra maneuvering room.

We shored up the existing floor system with temporary 2x4 stud walls, placing them around the steel **(4)**, then started removing the dropped beam and the brick pier **(5)**. We lifted the W6x9s in place, pushing them into the 8-inch-deep pocket and at a slight angle along the horizontal plane at the wider, chipped-away side of the pocket **(6)**. We then moved on to installing the Microlam beams.

Microlams. In order to flush-frame the three new 3½-by-6-inch Microlams, we had to cut away the existing 3x6 joists **(7)** and notch the ends of the Microlams so they would fit between the flanges of the W6x9. We started at one end of the room and worked toward the street side. We cut the joists, then fit the first Microlam into place, posting it up at one end. The widened beam pocket allowed us to sledgehammer the steel into place, nudging it toward the







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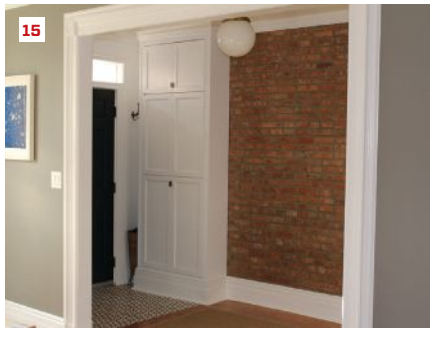
Microlam until the web of the steel I-beam flushed up with the Microlam's notched end. We did the same for the second Microlam **(8)**. This time we had to insert the Microlam's leading end into the first W6x9, then pound the second W6x9 into place.

The third Microlam followed the path of the removed girder, which angled over to avoid the door opening on the street-side brick wall. To install it, we had to remove a couple of feet of brick under the existing beam pocket. We lifted the last Microlam in place at an angle, placing the leading edge into the steel, then temporarily posted it up at the wall until we re-bricked the pocket. With steel and Microlams roughly in place, we shimmed the steel level and applied non-shrink grout at the beam pockets. We connected the existing joists to the Microlams with joist hangers and clip angles, then removed the shoring **(9)**.

Sistered joists. In an effort to create clear space in the apartment below, we removed the existing bearing wall at the stairwell **(10)**. We infilled the stair opening with new double 2x6s sistered to the existing 3x6 joists with through-bolts. Where we needed to pick up point loads from above (avoiding posts and pilasters in the basement), we swapped out a few 2x6s for Microlams **(11)**, then installed solid 2x6 blocking to help stiffen the floor **(12)**. In order to redirect the floor and roof loads from above—leaving the new steel to support just the first floor—we used a 5 ¼-by-14-inch LVL beam in the second-floor framing and posted down to new footings in the basement. Once new subflooring covered the infilled opening, we started framing the powder room and closet **(13)**.

Finishing up. With the structural work complete on the first floor, we moved on to the other floors, juggling the clients (who stayed in the house during construction) from space to space. The finished basement, though small, looked pretty slick **(14)**. The dedicated entry on the first floor featured a powder room, closet, and new 6-foot opening to the living room. We cleaned and sealed the existing brick party wall and installed a built-in closet to hide the electrical panel by the new front door **(15)**.

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



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BY MELANIE HODGDON

When the Customer Is the Owner

It happens all the time. Work is slow, so the construction company owner decides to put the crew to work on his own home, or on his mom's house. How this is handled on the accounting side can produce a variety of effects on the company financials.

SETTING THE SCENE

For the sake of simplicity, let's assume that all the work performed occurs within the company's tax year. Let's further assume that the project was set up as a job and costs were recorded in exactly the same manner as if it were a "real job." In this case "real job" refers to the fact that the cost to produce will be offset by income that exceeds the costs by a margin adequate to cover overhead and allow for profit.

IDENTIFYING THE COSTS

It should be possible to run a report showing all the costs for the job. This will only be true if the costs (including time that was incorporated into payroll) are consistently recorded for the job.

EFFECTS ON THE FINANCIALS

While it may feel like there's nothing wrong with having the crew perform personal work, the result will be to reduce the achieved margin. In the example below, let's assume that there are four "real jobs" that each cost exactly $35,000. Let's further assume that they have been sold at a reasonable markup and that the average margin on the four jobs is 30.35%. Things are looking pretty good, right? OK, now let's add a fifth job with the same cost. Because there is no income to offset the costs, the overall margin of the five jobs drops by more than half, to just under 13%.

Many business owners then think, "Well, all I have to do is charge myself (or my mom) exactly what the work cost. That's still a bargain and because my production costs are covered, my overall margin shouldn't be affected." But there's a problem with this reasoning, as shown below. The margin still is significantly reduced because the "sale price" of Job 5 doesn't include markup. The overall margin still drops by nearly 5%, to just under 26%.

WHAT TO DO ABOUT IT*

Option 1: Invoice for the costs and accept the reduction in profit. This means that the owner will appear to owe the company the invoiced amount. If desired,

Accounting for the Boss's Home Remodel

	Job 1	Job 2	Job 3	Job 4	Total jobs 1-4	Job 5	Total Jobs 1-5
Income	$50,000	$48,750	$52,500	$49,750	$201,000	$0	$201,000
Costs	$35,000	$35,000	$35,000	$35,000	$140,000	$35,000	$175,000
Gross Profit	$15,000	$13,750	$17,500	$14,750	$61,000	-$35,000	$26,000
Gross Margin	30.00%	28.21%	33.33%	29.65%	30.35%		12.94%

	Job 1	Job 2	Job 3	Job 4	Total jobs 1-4	Job 5	Total Jobs 1-5
Income	$50,000	$48,750	$52,500	$49,750	$201,000	$35,000	$236,000
Costs	$35,000	$35,000	$35,000	$35,000	$140,000	$35,000	$175,000
Gross Profit	$15,000	$13,750	$17,500	$14,750	$61,000	$0	$61,000
Gross Margin	30.00%	28.21%	33.33%	29.65%	30.35%		25.85%

Accounts Receivable can then be credited and offset to draws or distribution (depending on the nature of the business: partnership, corporation, and the like).

The final result will be:

- Costs and income that remain on the financials
- Job profitability of $0 (on the financials and job cost reports)
- The owner will owe nothing
- The costs will eventually be classified as income on the owner's personal tax return*

Option 2: Remove the costs from the financials by entering an adjustment to reclassify the dollar value of the work as a draw or distribution (depending on the nature of the business: partnership, corporation, and the like). This will probably eventually show up as income on the owner's personal tax return.

The final result will be:

- Exclusion of the job from the financials since the costs were adjusted to equity and the work was never invoiced
- Job profitability showing a loss (job cost reports only)
- The owner will owe nothing
- The costs will eventually be classified as income on the owner's personal tax return*

*Seek the advice of a qualified tax accountant before implementing any of these suggestions.

FINAL THOUGHTS

There's nothing wrong with using the company's resources for personal use. After all, taking a draw is the only way a sole proprietor can pay himself, and even corporate officers take distributions in addition to paychecks. The key is to recognize that having the company perform work for the owner isn't essentially any different from taking money out of the company, and this fact should be reflected in the way it's recorded in your financials.

Melanie Hodgdon is owner of Business Systems Management and regularly speaks on business topics at JLC Live. She is co-author (with Leslie Shiner) of the book, A Simple Guide to Turning a Profit as a Contractor. *melaniehodgdon.com*

/CONNECTED CONTRACTOR/

An App That Changed the Way I Work

BY ROBERT POST

The financial crisis of 2008 kneecapped our company and was a game-changer. I'm a remodeler in the Philadelphia area, and our volume decreased by 70%. I was forced to take a hatchet to overhead and had to let go of employees and give up office and shop space. Fast-forward six years: My business has stabilized and sales are fairly predictable, but I now do things very differently. I don't have a full office staff anymore and must wear several hats. But with the help of a few clever apps that are inexpensive, available on smartphones, and cloud-based, I can handle common tasks such as scheduling, tracking employee hours, estimating, and invoicing. What these apps lack in integration, they make up for in affordability and ease of configuration for a small business with just a few employees.

In this article, I'll look at Genbook (genbook.com), an online scheduling app that allows prospects to set up an initial consultation from their phone or computer, 24/7.

Over the years, we've tried three scheduling apps and have found Genbook to be the best. It offers easy website and social media integration and is straightforward for homeowners to use. Regularly, my prospects comment that they like the scheduler—and that helps set the tone for a great customer experience. Genbook collects the data you need and automatically sends confirmation and reminder emails to your prospects. We set up a customized reminder email that lets prospects know about all our services and encourages them to make a comprehensive list of their home's needs for our meeting. It also syncs with most calendars and works as a standalone app on your device of choice.

I set aside one day a week for sales. With Genbook, I predetermine six time slots for sales calls on that day. You can configure these time slots for any day or time you like so you are "driving the boat" on your availability. When clients log onto Genbook via our website or Facebook page, they see available dates and simply choose the time slot they want. You can configure Genbook to send you notifications of new appointments by email or text. I still appreciate opening Genbook the night before my sales day and seeing all the appointments and client data ready to go.

While its core offering is appointment scheduling, Genbook offers other features as well, such as customer reviews and analytics. While we don't use these features, you may find them of value.

As with most productivity apps, Genbook offers a 30-day free trial. After that, its plans range from $20 per month for one staff member up to $70 a month for six or more users. This is a good value when compared with other online appointment apps.

Robert Post owns Post Remodeling & Handyman Services, in Oreland, Pa.

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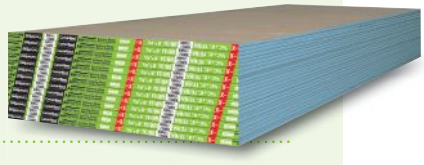

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Incorporated? It's Not Enough

BY CHRISTOPHER G. HILL

In the construction world, many businesses are family owned and almost indistinguishable—from a practical standpoint—from the owners. So it's particularly important for contractors to incorporate. In addition to possible tax benefits, incorporation protects personal assets (such as your house) from judgment and collection actions.

Incorporation works—as at least a partial shield—because the company and the owners are separate entities from a legal perspective, and a contract with one entity can't be enforced against another. This same logic applies in the context of corporate versus individual actions (that is, the actions of one person cannot be legally attributed to another person). By extension, an individual's assets can't be collected to satisfy a purely corporate debt or judgment.

But simply registering with your state's corporation commission or secretary of state and getting "Inc." or "LLC" added to your company name isn't enough. Not only do you need to form the company, you need to act as if the company is a separate entity from its owners, in order to keep that protection intact.

Simple things like separate bank accounts—one used to pay only corporate debts and one to pay personal debts—go a long way toward showing the separate natures of you and your company. Don't take money out of the business account for personal expenses or to pay "salaries"—use a separate payroll account or processing system. Keep up your registrations, annual reports, and the like to show maintenance of the company.

Observe the corporate formalities, even where it seems a bit silly. You'll be glad you did.

Christopher G. Hill is the owner of The Law Office of Christopher G. Hill, PC, in Richmond, Va. This article is for informational purposes only and should not be construed as legal advice.

Adapted from the September 2014 issue of REMODELING, *a sister publication of* JLC.

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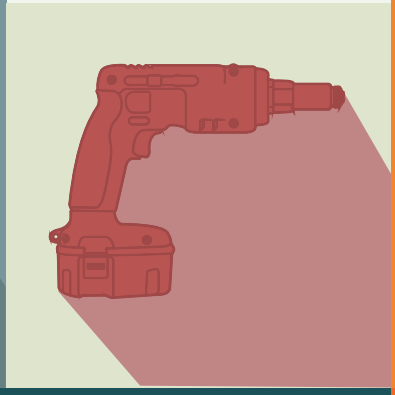

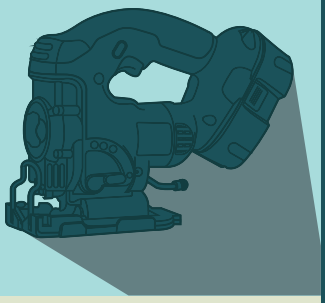

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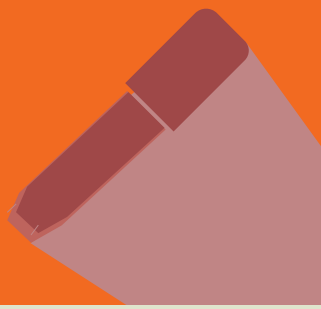

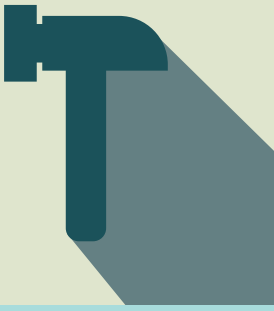

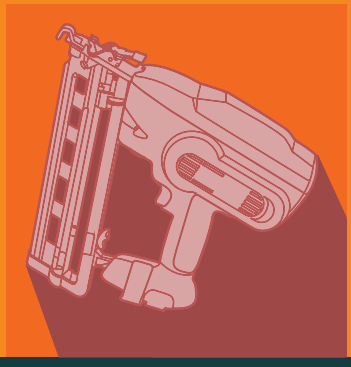

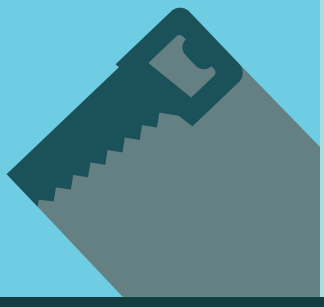

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BY GLENN MATHEWSON

Photos: Glenn Mathewson

Planning Ahead for Combustion Air

Sometimes troubleshooting involves preventing trouble from arising in the first place, such as making sure that sufficient combustion air is provided for fuel-burning appliances. Without enough oxygen, combustion will be incomplete and as a result, not only will appliances run inefficiently, but dangerous carbon monoxide will be produced instead of carbon dioxide.

The furnace and water heater are often installed in the middle of an unfinished basement **(1)**, with access to the entire volume of air in the basement for combustion. Once a basement is finished, however, the furnace and water heater are usually isolated in a small mechanical or utility room, which limits the available combustion air and requires a different strategy.

The IRC and the IFGC (International Fuel-Gas Code) list four ways to provide combustion air: inside, outside, combination, and mechanically assisted. These methods offer a lot of flexibility for creating a code-compliant design, but they can be confusing. No matter which method you choose, each begins with the total input Btu per hour (Btu/h) rating of all the equipment in question. A common arrangement would be a 100,000-Btu/h furnace with a 40,000-Btu/h water heater, so I'll use a total figure of 140,000 Btu/h for the examples in this article.

INSIDE AIR

All homes leak air to some degree, and homes more than 10 years old are likely to leak a lot. These leaks occur at construction joints and penetrations of exterior walls and ceilings, as well as through doors and windows and along pathways such as dryer vents and kitchen exhaust systems. This air infiltration is looked at in relative proportion to the volume of the spaces within the house. Specifically, 50 cubic feet of interior

air (that communicates with the fuel/gas appliances) provides enough combustion air for 1,000 Btu/h. So for our 140,000-Btu/h example, we would need 7,000 cubic feet of volume, or an 875-square-foot unfinished basement with 8-foot ceilings. But the situation changes when a mechanical room is built to hide the furnace and water heater.

Transfer air grilles are one option for putting a furnace out of sight, but not out of compliance. These openings in the mechanical-room walls allow the air outside the mechanical room to communicate with the air inside. With this method, one opening must be placed within 12 inches of the ceiling and one within 12 inches of the floor, to promote thermocycling—the natural movement of air due to temperature differentials—in the room. Thermocycling is key for ventilation around the equipment.

Each opening must be sized individually and have at least 100 square inches of "free area"—the actual open area of the grille not including any mesh or other screen or louvers. (For a metal grille, the free area is typically 75% of the area of the grille, and for a wood grille, only 25%). If the opening is through a wall, it must provide 1 square inch of free area for every 1,000 Btu/h of all the appliances (140 square inches for our example). The upper opening can also communicate through the ceiling to the space above, but then it must have 2 square inches of free area for every 1,000 Btu/h.

Using fully louvered doors on the mechanical room is one solution. The bottom half of the door acts as the low opening and the upper half as the high. Even with a paltry 25% of actual free area, louvered doors are usually big enough to meet the overall size requirement.

Place transfer air openings so they won't be highly visible in the finished basement and make sure they won't be blocked by furniture. For design flexibility, the high and low transfer air openings don't have to be in the same part of the wall, as long as they both communicate with the same volume of space. Transfer air grilles cannot take combustion air from bedrooms or bathrooms.

OUTSIDE AIR

If fuel-burning appliances are in a dedicated room that's completely isolated from the rest of the home, outside air is a good option for providing combustion air. In this situation, the walls and ceiling should be insulated to thermally isolate the outside air in the mechanical room from the conditioned air in the rest of the home. There are a number of ways to use outside air for combustion.

When the mechanical room is adjacent to an outside wall, openings for combustion air can be direct to the outside **(2)**. When high and low openings are used (as with inside air), they need to have only 1 square inch of free area for every 4,000 Btu/h. So in our 140,000 Btu/h example, the high and low openings would each need to be just 35 square inches (or 7 inches in diameter). This same size would also work for vertical ducting to transmit outside air from above or from a ventilated attic or crawlspace. Inside the room, direct or vertical openings must terminate right where they enter the room.

If air travels through a horizontal duct to the appliances, a different sizing method must be used. In this case, the area of the ducts must be twice as large as with the direct and vertical methods—1 square inch for every 2,000 Btu/h, which would increase the diameter for our example to 10 inches. Air moving horizontally through a duct encounters more resistance than air moving vertically, but curiously, the code doesn't place limits on the duct's length.

Remember that air just needs to be introduced to the basement or mechanical room, not brought directly to the equipment **(3)**. Don't duct outdoor air to a natural-draft combustion appliance. In colder regions, air brought directly to a natural-draft appliance can have an adverse effect on the flue, and the cold air can freeze nearby water pipes **(4)**.

In some basements, a plenum space in the ceiling framing or above a dropped ceiling can be used as a combustion air path, if the openings to the exterior are big enough. But this means subjecting those ceiling areas to cold outside air, which then translates to cold floors above—a situation likely to make the homeowners unhappy.

Yet another design option for drawing


2


3

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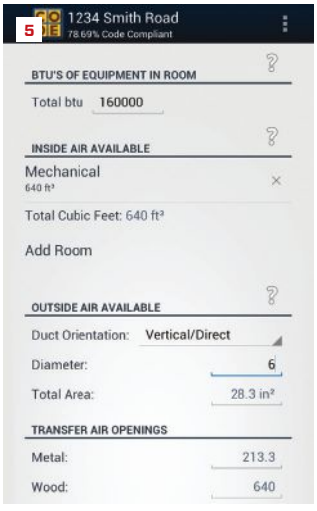

combustion air directly from the outside is the single-opening method, which allows you to use just one upper opening, either direct, vertically ducted, or horizontally ducted. This method reduces the thermocycling potential in the room, so a 1-inch minimum clearance space is required around all sides of the equipment to keep it ventilated, something that's usually not difficult to achieve. Also, 1 square inch of opening is required for every 3,000 Btu/h, and the single opening cannot be smaller than the combined area of all the vent connectors from each appliance.

This method originated in one of the three pre-IBC legacy codes and isn't always consistent with the other methods. For example, the minimum size for a single opening that's horizontally ducted is smaller than the minimum size for each opening in the method using two horizontal ducts. Because of this discrepancy, many local jurisdictions have amended this method out of their adopted code.

COMBINATION AIR

If the inside and outside air options are not sufficient on their own to provide combustion air for your appliances, the code allows you to use a combination of the two. While providing some design flexibility, the combination method is not necessarily an energy-efficient option. If the mechanical room communicates with both inside and outside air volumes, then the two volumes also communicate with each other via the mechanical room—not a wise choice in anything but moderate climates.

Calculating the weighted values for the two methods and summing them to comply with code can be tricky. I suggest buying the Combustion Air Calculator, a $0.99 app from codecalculators.com, which makes easy work of the calculations for all the methods, including sizing air openings and grille reductions for free area **(5)**.

MECHANICALLY ASSISTED AIR

The fourth option for providing combustion air is the mechanical method. Geared more toward large equipment with significantly greater Btu/h needs (such as commercial installations) or for situations where large openings are not possible, this method uses a fan to blow outside air into the room. The fan must provide .35 cfm for every 1,000 Btu/h (49 cfm in our example), and it must be interlocked with the appliance so the appliance burners operate only when the fan is operating.

CAREFULLY LOCATE OTHER APPLIANCES

Appliance location also makes a difference when you're planning for combustion air. If the air volume provided for combustion communicates with exhaust fans or dryer exhaust, make-up air must also be provided so that the negative pressure created by the exhaust does not steal air meant for combustion. Designs that put the laundry (including a dryer) in the mechanical room should be avoided **(6)**.

If it seems impossible to meet combustion air requirements, replacing an appliance with a high-efficiency model can often eliminate any issues. High-efficiency equipment reduces the amount of wasted heat carried out the vent and also provides a sealed combustion chamber with the option for a direct-vent installation. If equipment upgrades are planned for the near future, it might be wise to install the horizontal PVC pipe for direct venting before the ceiling is closed up. Until that time, combustion air must still be provided as described in this article, but those openings can easily be sealed up after the appliances are upgraded.

With direct venting, a dedicated combustion-air inlet pipe runs directly from the exterior to the sealed combustion chamber, completely separating the air inside the home from the air outside—a huge benefit that allows greater flexibility not only in combustion air, but also with appliance location. Direct-vent appliances can be installed in places where other appliances can't be, such as in a closet adjacent to a bedroom or bathroom. For some basement finish projects, that flexibility can often satisfy the owner's demands when the code otherwise gets in the way—something it does at times.

JLC Live speaker Glenn Mathewson is a certified code professional and building inspector for the city of Westminster, Colo.

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BY ALLISON BAILES

Commissioning a Home Ventilation System

The best-designed ventilation system in the world may not help your clients much if it's not properly installed. But how do you know if it's installed correctly or not? Can you just look at it and tell? Listen to it? Ask the contractor who installed it?

No, it needs to be commissioned. We don't talk about commissioning a lot in the residential world, but it's a word that needs to gain a foothold there. An example of commissioning you may be familiar with is a HERS (Home Energy Rating System) rating. When a HERS rater rates a new home, especially if the process includes a pre-drywall inspection and minimum thresholds for things like insulation grade and duct leaks, he or she is commissioning the home to determine if it's likely to work as well as it should. Similarly with a ventilation system, its design and installation should be followed by commissioning so it has the greatest likelihood of doing what it's supposed to do. And it's not nearly as difficult as it is important.

WHAT TO LOOK FOR

Here are some of the major areas to address in the commissioning process for residential ventilation systems.

Design. Was the system installed the way it was designed? Make sure that the proper type of system was installed, with the inlets and outlets in the appropriate places. Do a thorough visual inspection of the system as well.

Controls. Do the controls for the ventilation system do what they're supposed to do? Are they accessible to the occupants? Will the occupants be able to figure them out? Are the controls labeled? At a minimum, the occupants should be able to turn the system off so it doesn't run when it's not needed (for instance, when the windows are open).

Source of ventilation air. Where is the ventilation air coming from? It needs to come from outdoors, not from another unit (in a multifamily building), a garage, an attic, or other buffer space. Are the inlets separated from exhaust outlets for combustion appliances, dryers, and other fans? Are they high enough off the ground or the roof?

Air flow. Does the system move as much air as it was designed to move? Flow hoods (balometers), anemometers, and even garbage bags can be used to measure how much air moves through the system. (See "Garbage Bags and Laundry Baskets," by Iain Walker in *Home Energy Magazine*, homeenergy.org, to learn more about using garbage bags to measure air flow.)

Balance. In the case of an ERV or HRV, is it really balanced? You have to measure the air flow to find out. There's no guarantee that every system in the "balanced" category is indeed balanced. The air flow through the two sides is determined by the fan and the ductwork attached to it. Having two identical fans doesn't mean you have identical air flows. A kink, a malfunctioning wall cap, or a greater length of duct on one side than on the other can make a big difference. It might be necessary to install and adjust balancing dampers to get the air flow right.

Duct insulation. A run of uninsulated rigid duct above the drywall in the basement ceiling will give your clients an unwelcome surprise come winter: water spots on the ceiling. These will be evidence of condensation caused by the relatively humid indoor air coming into contact with the cold duct. (I found this out the hard way.)

Sound. Is the system making noises it shouldn't be? Is it obnoxiously loud? Systems that are deemed too loud are often turned off by the occupants.

A calibrated fan box, such as the Energy Conservatory's Exhaust Fan Flow Meter, is a relatively simple way to measure the actual air flow through an installed exhaust fan.

Photo: Energy Conservatory

Local ventilation. Don't forget that the bath fans and rangehood are important parts of the home's ventilation. It's easy to measure the flow of bath fans with a manometer and a calibrated box, such as the Energy Conservatory's Exhaust Fan Flow Meter (see photo, page 39).

Filtration. If the ventilation system is not an exhaust-only type, the outdoor air should be filtered. Check to see that a filter is properly installed and in the right place. ERVs, HRVs, and standalone supply-only systems will need filters. A central fan integrated supply system will use the filter that's already in the heating and cooling system.

Comfort red flags. Even when a system is installed according to the design, it can still cause comfort problems. You don't want cold ventilation air blowing directly on people, so make sure that the ventilation outlets are placed so they will ensure mixing without hitting people directly. Also, if you're using a system that tempers the air before delivering it, how tempered is the air being delivered? You may need to adjust dampers to get it right.

BREATHING EASIER

That should give you a few places to start, though, of course, the devil's always in the details. You can find more assistance online. Even if you're not having the house certified in the Energy Star new-homes program, you can use its materials. Download the program requirements and inspection checklists at energystar.gov (search "Version 3 Program Requirements"). The California Energy Commission, energy.ca.gov, also has a good document on residential ventilation systems (search "Indoor Ventilation: Minimum Best Practices Guide").

Indoor air quality is as important as energy efficiency. A good ventilation system design, competent installation, and proper commissioning will allow the occupants to breathe easier.

Allison Bailes owns Energy Vanguard, a home performance and training firm in Decatur, Ga. Visit jlconline.com to see the entire Whole-House Ventilation Series by Allison Bailes, including links to helpful resources relating to this article.

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Hanging Drywall Smart
Don't expect the taper to fix it

BY MYRON FERGUSON

There's one myth about drywall that I hear all the time: "The taper will fix it." It's used time and again to justify poor cutting and hanging. A lot of guys believe that mud is the answer to making everything look good after they botch hanging the drywall. But the reverse is true: When you're hanging drywall, you should be making it as easy as possible for the taper by keeping the number of seams to a minimum and locating the butt joints in easy-to-hide locations. This also means using the right number of fasteners, which is far fewer than most people think, and installing them correctly. Doing these things—along with being precise with cut-outs and with cutting and fitting panels—does not just make the taper's life easier, it's the only way to achieve a long-lasting, high-quality interior finish.

In this article, I'll cover some basic techniques for cutting and hanging boards and a few tips for working efficiently without sacrificing quality. The basis for this article is the "High-Performance Drywall" demonstration that I do at JLC Live and other trade shows.

USE THE RIGHT MATERIAL

If there's one concept I try to get across, it's *plan ahead*. Many times, contractors call me a couple of days in advance, finally ready for drywall and thinking I'll be able to drop everything else.

Photos: Linda Ferguson

I often have to say no, which I don't like to do, but I can't be in two places at once.

If it's a big job, I usually pull in a crew to hang it, and I'll do the taping. Most of the jobs I hang are small jobs, such as additions or kitchen and bath rehabs. The small jobs are the most demanding. The number of nail pops and cracked seams allowed is zero, whereas on a whole house, you can get away with one or two pops and cracks without trashing your reputation. But customers often have super-high expectations on little jobs, where they can scrutinize every inch of wall. Hanging the boards correctly to begin with is imperative. If your fasteners miss studs, or you try to fill in overcut electrical boxes, or you haven't minimized and hidden butt joints, you're going to have failures. Mud is not very strong. On the other hand, if you give it a solid base, it performs exceptionally well for a long time.

One of the most important reasons to plan ahead is so you can get the right material. Drywall isn't just 4x8 sheets. These days, drywall comes in a wide range of types: regular; lightweight, fire-resistant (Type X); water-resistant; abuse-, mold-, and impact-resistant; sound-absorbing; VOC-absorbing; paperless; foil-backed; lead-lined; shaft liner; and more. And most of these come in 24-, 48-, and 54-inch-wide panels in 8-, 9-, 10-, 12-, 14-, and 16-foot lengths. If you're buying at the right place—a contractor yard that specializes in materials for the drywall and commercial interior trades—all these sizes will be in stock. Yes, some of these boards are more expensive, but if you've taken the time to familiarize yourself with what's available and matched the material to customer expectations, you'll deliver a better job.

The range of sizes is important to delivering not only better work, but often a lower job cost. Plan for as few seams as possible. Take this simple example: a wall that's 14 feet long by 9 feet tall. If you use standard 4x12 sheets, you'll end up with 37 feet of seams to tape. But if you use 14-foot-long by 54-inch-wide "fat boards," you will have just 14 feet of seam: one long run between tapered edges. Those bigger boards may cost $.05 more per square foot, but you would spend a lot more than that taping out all those seams. And with fewer seams, the risk of callbacks is nil.

Lightweight drywall. For ceilings, I almost always use lightweight drywall. It's still a full ½-inch-thick (or a full ⅝ inch if a Type X board is required by the fire code) but it's 30% lighter. That 30% makes a big difference. I've often installed it on 2-foot-on-center joists and have never had a problem with sagging between the framing members. But when I fasten the panels, I am also careful that I don't create a sag.

HIDING BUTT JOINTS

To minimize the number of butt joints, I start by using the right size material. If I can't eliminate them, I place them as inconspicuously as possible. For example, I place them on the hinge side of a door and avoid placing them directly opposite a door where they might be seen as someone enters the room.

A lot of guys don't like placing butt joints over a window or door,

but I do it all the time. Of course, you shouldn't break a sheet along a king stud, because the seam is likely to crack from the movement created by operating the door. Instead, I lap over the opening 8 to 10 inches and notch out one corner of the panel, which results in a much shorter butt joint than if I lap the sheet over the entire opening and create a full-width (48 or 54 inches) butt joint somewhere past the opening.

While reducing or hiding butt joints is my first option, I also float all my butt joints, back-lapping the joint with what are popularly called "rock splicers" (butthanger.com) or "butt boards" (trim-tex .com). These are lengths of MDF or particle board that have a wide groove routed into the face or are sawn with a shallow V in one face. With these, don't secure the butt end of each drywall panel to the framing **(1)**. Instead, let it fall in between studs or joists. As you screw the panel's butt end to the backing, it draws the edge in slightly, creating a recessed joint **(2)**. It finishes almost as well as one between tapered edges, and the result is a much flatter ceiling or wall (a huge advantage for kitchen cabinets and countertops, as well).

Framing transitions. Avoid seams at framing transitions. For example, a room with a cathedral ceiling typically has a gable end that's framed with top wall plates about 8 feet off the floor. Don't locate any drywall seams near those top plates. There's too much structural movement at this transition, and usually there's a bump in the wall that is next to impossible to hide.

The same problem exists in a stairwell. Span the framing transition with the drywall, or better yet, use an expansion joint. If you forgo an expansion joint and span the joist area with panels, don't fasten the drywall to the wide dimension of the floor joist. Instead, fasten only to the edge of the studs above and below the joist area. As lumber takes on humidity or dries out, it will expand or contract the greatest amount across the wide dimension. You want to isolate that dimensional change as much as possible—not put a screw into it that will move up and down at the finished surface. The same goes for flush girders in floors. Avoid seams that break on the girder, and fasten the drywall to the joists, not to the girder.

FASTENING PANELS

The first rule of fastening drywall: Don't use more fasteners than you need to. With ceiling panels, put a screw at each edge and three screws in the field along each joist (five screws total). With walls, two screws in the field and one at each edge is plenty (three total). This assumes a regular joist or stud layout at 24 or 16 inches on-center.

You don't need to fasten the drywall to every stud or joist. Often there will be extra studs closer than the standard layout where an interior partition ties in—let these go. Most people think: the more fasteners, the better. But it's the opposite. The more fasteners you have, the more chances there are for problems.

A good way to reduce the number of fasteners is to use drywall adhesive. It makes for a better job: You not only use fewer


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fasteners, but you also get a little bit of shear strength. Using adhesive, though, takes time and extra effort. So if you insist on the drywall crew using it, be prepared to pay a little more; it's a valid cost. Customers' expectations are very high when it comes to drywall work, and if I can do anything to eliminate screw pops, it's worth it. (Of course, some customers with high expectations often want the low bid, too. It may take a little education to bring them around.)

Avoiding sag. Fasten across the sheet. I do this along studs and joists to flatten the panel against the framing, but it's critical on ceilings **(3, 4)**. Don't put one screw in one corner and then jump to the end and fasten it in the opposite corner.

Of course, when you're hanging a ceiling, there's a tendency to want to pin it in place and then come back and fasten along each framing member. If you're doing a ceiling, you do need to hold up the drywall, but if you pin the corners it is likely to sag in the center. I use a drywall lift **(5)**, which is an efficient way to drywall ceilings and can be rented if you don't own one. With the lift, I don't need to worry about pinning the sheet in place. The lift will support the sheet against the joists, allowing me to fasten down the line of every joist **(6)**. Without a sag, I'm going to have fewer chances for fastener pops. This particularly helps when insulation above a ceiling pushes against the drywall.

(It's worth noting here that insulation can be a real problem. Often when I walk a jobsite to scope out the drywall, the insulation hasn't been installed yet. I always ask how it's going to be insulated because I want to use the right material to prevent pops and bellies in the drywall. If the cavity will be blown with cellulose or oversized batts are going to be used, I will have to use ⅝-inch material.)

Close to edges. At windows and door openings, you often have plenty of framing to fasten to. But keep the fasteners close to the opening so they will be covered by the trim **(7)**. The same applies at the base of walls. If the baseboard is a short clamshell, keep the fasteners fairly close to the bottom edge so that they get covered. It helps to know what trim will be installed so you know your tolerances. Every screw that gets covered by trim reduces the chances of one popping.

Floating corners. When hanging the top sheet on a wall, I usually secure the bottom edge of the sheet and then work my way up each stud, to keep the panel flat to the framing. At the top of the walls, I don't ordinarily screw into the top plate. Instead, I hold my last screw down 6 or 7 inches and let the corner float. This will keep that edge straighter, particularly if hurricane clips are used along the top plate. These can create quite a bump if you force the edge down with screws around them. By allowing that top edge to float over the clips, they remain inconspicuous.

TIPS FOR HANGING DRYWALL

Before I hang a sheet, I always bring it over to where I'm going to hang it and lean it against the studs, positioned on the floor but lined up with the studs. If there's a light fixture on the wall, I mark it out on the sheet. I also mark the stud location right on the panel—no need to mark the ceiling. I know a lot of guys who don't mark the ceiling or the panel because they've developed a good eye for following the stud. But marking doesn't take much time compared with missing a stud. You have to stop and dig out the screw, and then you're left with a fuzzy hole that doesn't fill neatly and sometimes will show through the paint. Be sure you do stop, though. Whenever you have a miss, remove it right then and there. Don't just bend it over and bury it in the drywall or it will eventually work its way loose and come out the face.

Hanging sequence. Always hang the ceiling first before the walls. The ceiling panels should be tight to the perimeter walls. That way, the wall sheets can support the perimeter of the ceiling.

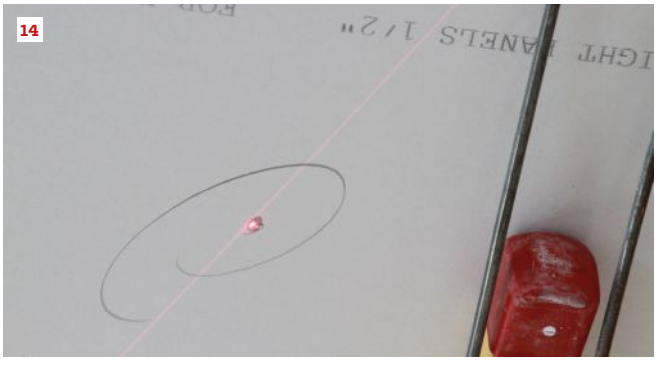
When hanging the walls, install the top sheet first, lifting it up and keeping it tight to the ceiling panels. Minimize the space at the top to create a good corner, but leave a space at the bottom. This gap will be hidden by baseboard. If the wall is less than 8 feet, hang a full sheet at the top and put your rip along the bottom edge.

Applying adhesive. I apply the adhesive to the edge of each stud just before I'm ready to hang a sheet. I never apply more than I can cover with one sheet. If you get too far in front of it, the adhesive starts to cure and won't provide good adhesion. Put a generous bead on every stud. When lifting the sheet, focus on getting one upper corner into place, keeping the sheet away from the wall so you don't smear the adhesive across the back of the panel **(8)**. Once the corner is set, you can tip the panel against the studs and fasten it in place.

TIPS FOR HANDLING & CUTTING DRYWALL

Store drywall flat on the floor. It's OK to have a sheet here and there leaned against the wall, but don't lean multiple sheets. It's too easy for them to fall over. Someone will get hurt. I don't put my drywall on stickers because they will cause the bottom sheets to deform.

Long rips. When you're working by yourself, the long rip on a bottom sheet of a wall can be tricky because the weight of the sheet collapses the cut before you've finished it and you end up ripping the paper on the backside. To avoid this, I score the face as usual, but when cutting the paper on the backside, I start cutting an inch in from the end. The inch or so of paper will hold that piece attached until you're ready to snap it off. One guy can manage these cuts on panels up to 12 feet. Bigger sheets, though, will require two guys.



Keep it short. When cutting panels to length, I tend to undercut the length by about ¼ inch. Usually there's a bumpy edge that I knock down with the rasp edge of my drywall knife, but you need space to deal with any out-of-plumb framing. If you try to jam the piece in, it'll bust and you'll have a big repair to deal with. I'd rather have a little gap. Small gaps I can fix; it's the gross overcuts on electrical boxes and lots of extra seams and conspicuous butt joints that I really care about eliminating.

Cutouts. On a wall, most of the cutouts are going to be in the bottom sheets for outlets. Once a sheet is cut, I position it in front of the outlet. I don't need to hold the sheet up, since I'm just marking the approximate center of the box. I simply eyeball the center and poke my hole saw through to mark the location **(9)**.

I make the actual cutout with a drywall router after I lift my sheet and screw it off to each of the studs. I install the top line of screws so that the sheet is hanging. Using the router **(10)**, I plunge in at my mark, move the bit to the edge, jump over that edge, and cut out the box in a counterclockwise direction (opposite the rotation of the bit so it won't "run" on you).

Just before I come to the end of my cut, the weight of the panel will be noticeably pushing on my cutout. To keep it from busting out before I'm done, I reach down to the bottom edge and pull the sheet out a little from the wall to relieve the pressure.

Keep in mind that the outlet cover won't hide anything. The size was originally made for narrower steel outlet boxes and has never been enlarged (no one seems to like the look of an oversize plate), so you need to keep the cut close to the perimeter of the box. When using a router, guys have a tendency to rush, and they compete over the fastest cutout. But if you take your time carefully cutting the outlets, and they are all precisely done, you are going to save time on the job overall—because you won't need to waste time making repairs on each miscut box.

Ceiling boxes are a bit more difficult to locate because you can't get your head above the sheet to eyeball the location. I measure the distance of the box from each wall and mark the location on the subfloor **(11)**, and then I use a small laser **(12, 13)** to project a dot on the ceiling to find the box location. Since you're aiming for the center, you have a lot of leeway and don't need to be precise; you just need a mark that will allow you to plunge the router bit somewhere in the middle of a box **(14)**. Of course, do all the measuring and marking before you start hanging, so you know that the layout is correct.

Myron Ferguson is a drywall contractor in Galway, N.Y. Be sure to look for this feature online for added information, including a video series of his JLC Live presentation and tips for using drywall for sound control.

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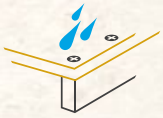

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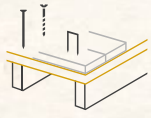

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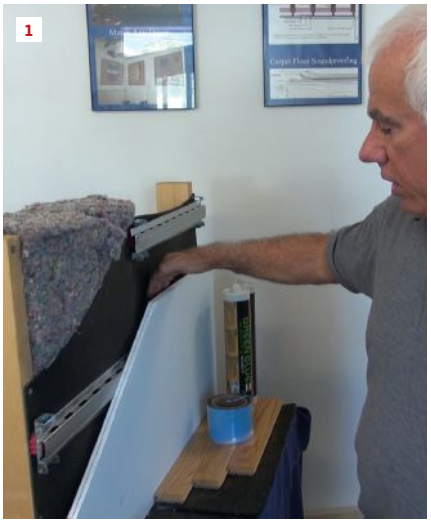
Retrofit Soundproofing
Practical solutions for quieting homes

BY JOSEPH DRAGO

I've been a renovation contractor in the Boston market for more than 26 years. Roughly 15 years ago, I noticed that more and more people were asking me about noise problems—perhaps a loud neighbor or a bothersome air conditioner compressor. Many of these people had done research online about soundproofing materials and would ask me to implement some method that they had learned about. As a result, we started to do more of that work, and now soundproofing accounts for a major share of what we do.

None of those materials are produced in our local area, and nobody around here stocks them either. So I had to order the materials shipped in from out of state on a job-by-job basis. That was expensive, but as long as the customer was willing to pay for it (which many were), we did it.

Then about five years ago, my oldest son, Steve, graduated from college and wanted to join my company. I said, "Here's an idea: Do some research on soundproofing materials and techniques. We can start distributing that stuff as well as installing it, and you can run that division." Today our soundproofing division, New England Soundproofing (based in Waltham, Mass.), is an integral part of our business. We stock materials in quantity to get a better price. We distribute materials, we do jobs ourselves, and we train other contractors in how to do the work using materials we supply. But we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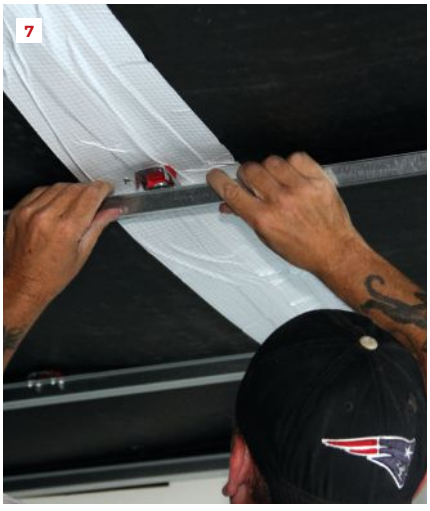
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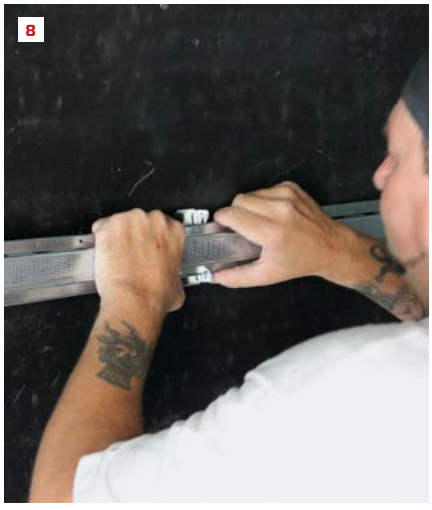
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still do general remodeling—kitchens, baths, additions, and the like. So when we install soundproofing, we also take care of any demolition, framing, drywall, trim, and painting that is part of the job—whatever the customer needs.

Before I learned about soundproofing, I used to simply install cavity insulation when I thought there was a need to block sound. Since then, I've learned that doesn't really work. Insulation helps a little, but there's a lot more to a complete sound-control solution. In this article, I'll describe some of the materials and systems we recommend to prevent noise intrusion, looking at the most common building assemblies we encounter.

WALL & CEILING ASSEMBLIES

Photo **1** shows a model that we take to home shows and that we use to teach our contractor classes. If you were to hold the wall mock-up over your head, it could be a ceiling mock-up—the principles are the same for both assemblies. Our model represents a wall whose other side is the neighbor's property, where we can't change anything. We want to block noise on the neighbor's side from traveling into our client's side.

Insulation. Starting with bare studs, we place sound-blocking insulation in the stud cavities—either Roxul rock wool or Quiet Insul, a cotton insulation made from recycled blue jeans. Both carry the same fire rating and have the same soundproofing value. We tend to use Quiet Insul for overhead situations because rock wool sometimes breaks apart and exposes the workers to irritating fibers. But in terms of cost and performance, they're equivalent. Cavity insulation is a minor part of the assembly. It prevents sound from echoing around inside the stud bay, and it slows down the sound wave. By the time the sound moves through the insulated cavity and hits the next layer of material, it has lost some energy. But that benefit is small.

Sound barrier. The next layer is the sound barrier—a heavy, black "mass-loaded vinyl" (MLV) membrane **(2)**. We have our own MLV product, named "Sound Barrier." It's the workhorse for stopping airborne sounds such as loud voices, radio and TV, or clanging pots and pans. Sound Barrier comes in two thicknesses (⅛ inch and heavy-duty ¼ inch). The thinner version weighs 1 pound per square foot (psf), and the thicker version weighs 2 psf. Either one is best installed a bit loose, rather than taut, so that it can absorb and deaden the sound waves by flexing along the plane of the material.

Applying a 130-pound roll of Sound Barrier is heavy work for the crew. Obviously it's even more work to roll it out across a ceiling (see photo, page 51) than onto the wall. We've been working on various rigs and jigs to solve this problem, but usually it just calls for muscle—at least three men to get a roll nailed into position. We secure the material to studs or joists with wide-head roofing nails, using a roofing nailer.

It's important to tape all the joints in the Sound Barrier to prevent sound from bypassing it. We seal every seam, typically using a special tape made of the same MLV material with a blue release paper. All seams—including seams between sheets in the field—at the edges **(3)**, and in corners **(4)**, must be tightly sealed.

On ceilings, we're not always confident that the adhesive of the seam-sealing tape will hold and that the tape won't tear. So we've developed a tougher cord-reinforced tape, which we apply over the top of the standard Sound Barrier tape **(5)**. We had to work with the tape's manufacturer and try several different pressure-sensitive-adhesive (PSA) formulas before we found a PSA that would reliably stick to the Sound Barrier. The product we finally settled on comes to us in 4-foot rolls that we cut into a 5-inch or 6-inch width for use on the job (we also distribute this tape along with the rest of our soundproofing products).

Once the Sound Barrier is up, the crew can cut around wall receptacles or light fixtures with a drywall knife and tape the membrane to electrical boxes. Another critical step is sealing the electrical boxes with mass-loaded soundproofing putty. Otherwise, sound will infiltrate the room through air holes in the boxes.

Furring. The next component in this assembly is drywall furring composed of clips and hat channel. The channel we use on ceilings is stiffer than the kind we use on walls because the heavy-duty ceiling channel has to support the gravity load of drywall. The clips fasten to the studs with screws through a plastic washer or bushing **(6, 7)**. The washer decouples the studs from the clips (the screws touch the studs and the washers, but they don't touch the metal of the clips). Then the hat channel snaps into the clips **(8)**. This component absorbs vibrations that come from the studs and keeps the sound from passing into the drywall. It also creates an air space between the drywall and the MLV sound barrier where sound can disperse and dissipate and get absorbed, instead of being transferred to the drywall. The channel we use on ceilings is stiffer than the kind we use on walls because the heavy-duty ceiling channel has to support the gravity load of drywall.

We lay out the clips on a staggered pattern, skipping every other stud on each course and alternating between courses. That way one vibrating stud won't transmit sound into the drywall because the studs that flank it will absorb and dampen the sound energy.

It's helpful to be precise when you snap the lines and attach the clips, especially with the ceiling hat channel. If your clips aren't quite lined up, the channel will fight you all day as you're trying to squeeze it into the clips.

If space is tight, one option is to attach strips of ¼-inch QuietWalk (MP Global Products)—a resilient sound-absorbing pad underlayment made of recycled tires—to the studs before installing the drywall. This makes for a thinner assembly, but it will not decouple the drywall as effectively as clips and channel. Still, it does somewhat dampen the vibration of the studs, and it creates a thin air space behind the drywall that helps attenuate sound.

Drywall. The final layer in the assembly is the drywall itself. We use two layers of ⅜-inch drywall laminated together with Green Glue, a viscous elastic adhesive. You can also buy the sound-deadening drywall already laid up, under the brand name QuietRock. We use regular drywall and Green Glue because it costs less than QuietRock for basically the same thing. The mass of the drywall deadens the energy of the sound waves that make it that far, while


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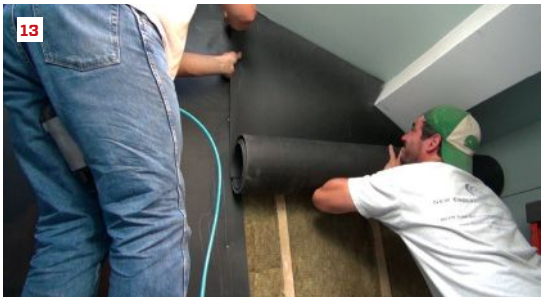
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the viscoelastic adhesive absorbs even more sound energy and decouples the two layers of drywall from each other.

As a final step, we seal drywall joints at panel edges and wall corners with an acoustic caulking. Omitting any of these steps can seriously degrade the wall's performance.

WALKING SURFACES

Floors, like walls, may allow airborne noise to pass through from the room above to the room below, or vice versa. As discussed, the floor/ceiling assembly is insulated and has a sound barrier and isolated drywall on the ceiling below. But a bigger problem with floors is structure-borne noise, particularly the sound of footfalls.

If the floor is carpeted, we can install a special soundproofing carpet pad. This quiets the sound of footsteps on the floor, of people dropping things, and the like. The pad has a top surface of Sound Barrier and a sponge-like bottom layer. The Sound Barrier absorbs the sound of voices or other airborne noise in the room and blocks the sound waves from traveling into the floor. But the Sound Barrier also soaks up the energy of footsteps or other floor impacts, and the sponge layer further disperses the impact energy. The composite carpet pad also suppresses noise that originates downstairs and prevents the sound energy from entering the upstairs room.

Under wood or tile flooring **(9)**, we apply QuietWalk on top of the Sound Barrier. The exact installation of the QuietWalk varies, however, depending on the finish flooring material. Floating engineered laminate flooring or ceramic tile can be glued directly to the QuietWalk underlayment with flooring adhesive or tile mastic. But for conventional nail-down hardwood strip flooring, we advise gluing another layer of ¾-inch plywood subflooring on top of the QuietWalk material, then nailing the flooring to the plywood. That way, flooring nails won't short-circuit the sound-deadening membranes and transmit sound energy directly into the structure below.

STAIRWELL PARTY WALLS

Retrofit soundproofing of the party wall between two condo units has become our bread and butter in recent years. Typically in this scenario, there is another stairwell on the other side of the wall, belonging to the unit next door, but because we are working for only one party, we can treat only one side of the assembly.

This work is labor-intensive. On the project shown here, we had to put down cardboard and plastic to protect the existing stairs, and we had to set up and take down our working staging every day because the owner was living in the unit while we did the work. Obviously, it would have been cheaper and better to build the wall with effective soundproofing in the first place.

Because it was a retrofit, we started with demolition. The crew tore off the existing drywall by hand **(10)**, making occasional cuts with a recip saw **(11)**. The existing drywall was tight to the skirtboard running along the wall, and there was no space available for building out the wall with clips and channel, as previously described. This meant we had to tear out the existing spray foam insulation by hand **(12)**, taking care not to damage existing plumbing or wiring in the wall.

ASSESSING THE PROBLEM

We get a lot of calls from customers in recently built Boston condos who are hearing too much noise from the unit next door. There are rules now in the building code about soundproofing in condominiums and apartment buildings, but the code doesn't tell you how to build an assembly, it just tells you the rating you have to achieve.

Party walls, floors, and ceilings are rated according to a "Sound Transmission Class," or "STC," that indicates how well they impede the passage of sound. The higher the STC, the better the element performs (that is, the less sound is transmitted). By code, walls between multifamily dwelling units should have an STC of 50 (if measured in the laboratory) or 45 (if measured on site in the field).

For a price, you can test any space to find out if it complies, but if the building fails the test, it's still up to you to figure out how to make it pass.

Our company can perform the tests to measure the noise in an existing building and find out if the dwelling passes the STC 45 rule. But I don't push this, and here's why.

First of all, the code-required STC, like everything else in the code, is only a minimum. STC 45 or 50 is not very good. In a condo that just passes the code, you can still hear loud conversations, loud televisions, or thumping and bumping from next door. And how much a person is bothered by any kind of noise is subjective; it depends as much on somebody's sensitivity to noise as it does on the measurable sound.

Another problem is that the engineering to scientifically measure sound is expensive—testing takes all day and costs thousands of dollars. (A full description of the testing procedures is beyond the scope of this article, but you can get an idea of what's involved by reading about ASTM E90 and ASTM E989 and related field testing, as well as RT-60 reverberation testing.) If the clients are heading to court with a lawsuit, at the end of the day, they'll have an engineering

continued on page 56


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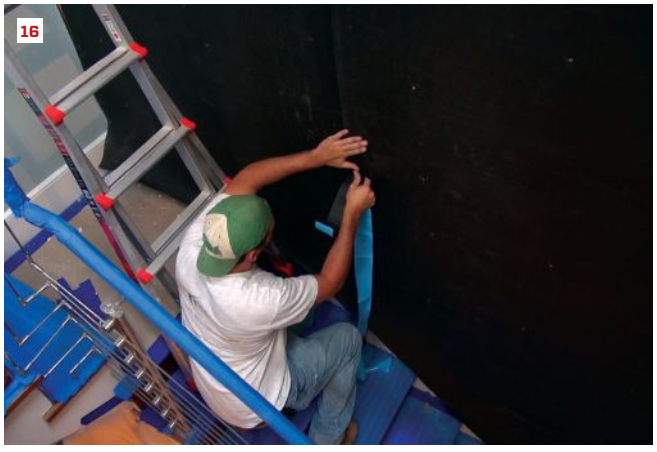
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We replaced the foam insulation with special acoustic rock wool fiber batts. (We don't have an official sound-abatement contribution for either open-cell or closed-cell plastic foam insulation, but experience tells us that the relatively dense foam increases sound transmission through walls.)

Once the wall was stripped and de-nailed, we applied our Sound Barrier material, carefully fitting it around any complicated shapes, such as the ceiling beams **(13)** and other bump-outs. At 1 or 2 psf, the mass-loaded vinyl is heavy, taking a lot of effort to apply, particularly when it needs to be carefully fitted. On the other hand, the material cuts easily with a drywall knife **(14)**, making it simple to shape.

We nailed off the Sound Barrier **(15)** and taped all the seams **(16)**. This last step is critical: Open seams in a sound barrier are like holes in an air barrier—they significantly reduce the barrier's effectiveness.

Joseph Drago is the founder of New England Soundproofing, based in Waltham, Mass.

continued from page 55

document that they can take with them. But even if they were to win their lawsuit, it would probably only require bringing the house up to the minimum code, which may not make them happy. Finally, the testing isn't that helpful for planning the construction—our experience tells us much more about solving the problem than expensive instruments can. So unless a customer is dead set on going to court, I don't recommend the engineering tests.

Instead, when I visit a building where a customer has a noise complaint, I listen to get an idea of the problem. At the same time, I judge how sensitive the client is to noise. I've had people say, "There! You hear that?" when my decibel meter wasn't reading a thing. With couples, sometimes a certain type of sound bothers one partner, but the other doesn't even notice it. It's important to understand the client's perception of the noise, early on.

We also have to understand the nature of the noise. There are different kinds of sound, and they travel differently. Voices or amplified music travel through the air. To stop those, we use a combination of air-sealing and sound-absorbing material.

Footsteps, on the other hand, are an example of "impact sounds" that travel through structural framing, not air. (Bass notes from a subwoofer also travel through framing.) Structure-borne noise is harder to stop because it requires the framing to be isolated from other framing or from the space in the room.

Sometimes, we can stop one type of sound but not the other. So I may have to tell a client, "Yes, I can quiet things down, but I can't eliminate all the noise. You might not be completely satisfied."

And of course, there's the budget: It may be possible to eliminate the problem by tearing out walls or floors and reframing, but most clients don't want to spend $30,000 to do it. So the trick is to understand the source of the noise, its mode of travel, and the occupant's sensitivity, and to communicate with the client about what our methods can achieve given the budget.

Lateral Bracing for Decks

Clear guidance on the code's messy lateral-load provision

BY JIM FINLAY

The 2009 IRC, which is the building code in my area, requires that a deck connected to and supported by its primary structure be "designed for vertical and lateral loads as applicable" (2009 IRC, R502.2.2).

The IRC's vertical load requirement is clear: 50 pounds (40 live plus 10 dead) per square foot. Using a deck's dimensions, you can easily calculate its vertical load on the connection between the deck ledger and the house band, and then refer to the code to find connection details and attachment configurations.

However, the IRC's lateral load provision—intended to prevent a deck from being pulled away from its supporting structure—is anything but clear, as most contractors who build decks know.

Instead of quantifying general lateral load requirements, the code offers a single solution with a specific design capacity: You are "permitted" to install the mechanism drawn in IRC Figure 502.2.2.3—two Simpson Strong-Tie DTT2s (strongtie.com) connected by a threaded rod, with one fastened to a deck joist and the other to a house joist (see Deck Attachment for Lateral Loads, page 60). Two of these mechanisms, each resisting 1,500 pounds, must be installed, regardless of the deck's size or shape.

Note that the IRC does not require this detail, nor does it set a lateral load requirement of 1,500 pounds. That load is merely what the

Photos: Jim Finlay

allowed "hold-down device" should resist.

Unfortunately, installing this device poses numerous difficulties, especially after a house is built. Not only is it labor-intensive, it's arguably unnecessary for many decks (see Bad Solution to a Nonexistent Problem, facing page). In fact, lateral load requirements are slated for revision in upcoming versions of the IRC.

MORE THAN ONE OPTION

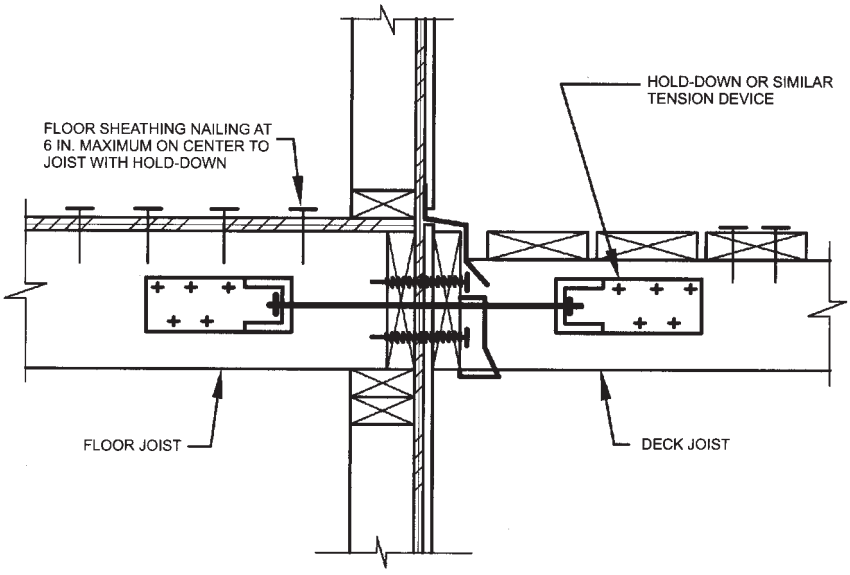
If you dislike the lateral-load anchor currently permitted by the IRC, what are your options? The code allows alternatives, but offers none. In this article, I'll describe a few solutions for resisting lateral loads that my deck-building company has successfully employed on its projects.

In my area, and probably in yours too, enforcement of the lateral brace provision is inconsistent. Of the 21 towns where I build decks, just one requires the code-specified bracket or an engineer-stamped solution. Four of the towns want "something reasonable," and the rest ignore the provision altogether. So I've organized my alternative solutions into two categories: "engineered solutions," which have been formally tested or stamped by an engineer; and non-engineered "informal solutions," which are versatile details we've been able to use when the inspector doesn't require an engineer's stamp—but that may or may not be approved by your building inspector or engineer.

ENGINEERED SOLUTIONS

Diagonal foundation brace. The first alternative lateral-load anchor for a deck I ever designed consisted of a double 2x10 diagonal brace anchored to the deck framing with ½-inch through-bolts and to the foundation wall with a beefy 6-inch by 4-inch by 12-inch-long L-bracket fabricated from ⅜-inch steel (see Diagonal Lateral Brace, facing page). My engineer approved it—and I expect yours would too. It's well-suited to larger decks. Unlike the code-approved solution, this anchor can be installed without accessing the building's interior. Not only that, it allows the deck to be installed 6 or 7 inches below the elevation of the house floor, a common detail in wet or snowy climates.

Deck Attachment for Lateral Loads



The lateral-load anchor "permitted" by the current IRC requires access to the interior house framing. In an existing house, it's impossible to verify that the subfloor attachment meets requirements without removing finished flooring.

Materials for one diagonal brace cost about $72 (since two are needed, total cost is $144). Installation labor is roughly one hour per brace, depending on the age and density of the concrete foundation. Once installed, each brace will resist 1,500 pounds of lateral force, just like the "permitted" hold-down device.

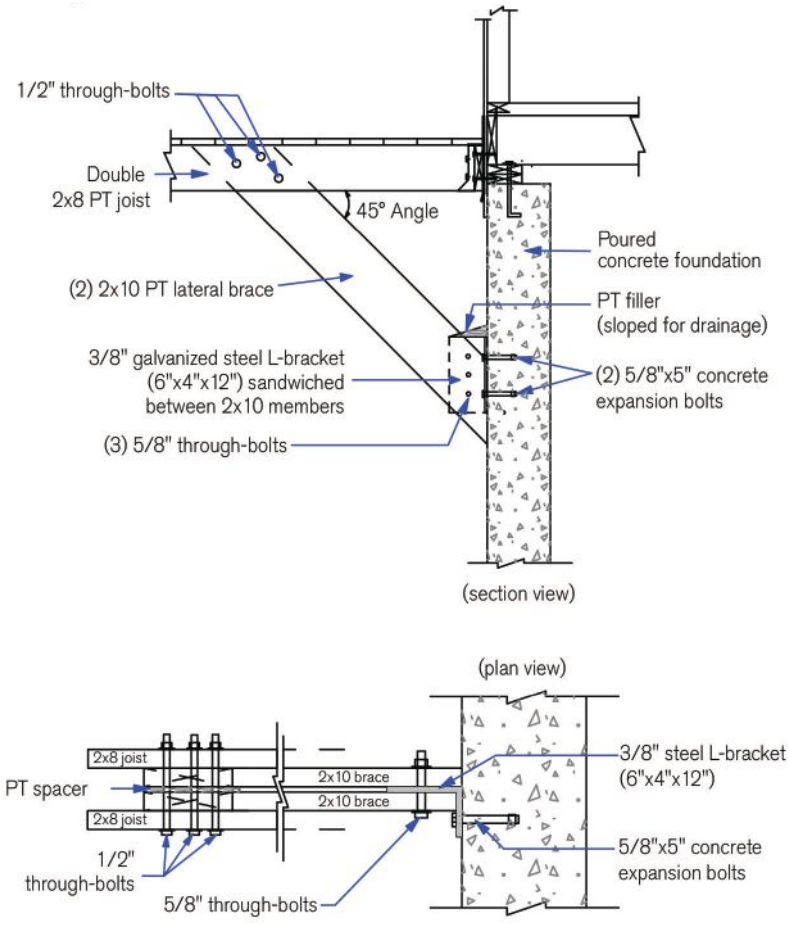
L-bracket. To further simplify anchor installation, I've also designed an L-bracket that doesn't require a diagonal 2-by brace **(1)**. My local steel fabricator cuts 3-inch by 18-inch strips from standard ¼-inch-thick steel plate and bends them 90 degrees into L-brackets with two 9-inch legs. After drilling the holes, he has the brackets hot-dipped galvanized. Because of the set-up time involved, the more I buy, the lower the unit cost; so I order three dozen at a time, which brings my cost down to about $20 per bracket.

To connect a bracket to a doubled joist, I use six 4½-inch HeadLok (fastenmaster.com) screws (see 1,800-pound L-Bracket, page 62). The screw manufacturer has formally tested this configuration in shear, parallel to the grain of wet #2 pressure-treated SYP, for a double 2x8 joist. In testing, the connection exceeded 1,500 pounds in shear, even after factoring in a 3x safety margin. Though the brackets are galvanized, we isolate them from treated joists with a piece of Bituthene or Vycor (graceresidential.com) or a similar self-adhering membrane.

There are several options for bolting the bracket to the concrete. For example, a galvanized ½-inch-diameter by 4¼-inch-long Red Head Trubolt wedge-type expansion anchor bolt (itwredhead.com) embedded 3⅜ inches into concrete can safely resist more than 1,900 pounds of withdrawal force, or more than 2,900 pounds in shear. Other concrete fastening options include sleeve anchors (available in stainless steel), strike anchors (available in yellow-dichromate-plated steel only), and epoxy-bolt systems.

The size of the anchor depends on the density of the concrete. Since that is virtu-

Diagonal Lateral Brace



This engineered brace provides 1,500 pounds of resistance to lateral loads and can be installed from the exterior. The diagonal brace is installed at a 45-degree angle and measures 5 feet from long point to long point, requiring that the deck be more than 3½ feet above grade.

The author designed a second custom L-bracket for use without a 2-by brace. It's fabricated from ¼-inch-thick steel plate, with each leg measuring 3 inches by 9 inches. The brackets are hot-dipped galvanized for corrosion protection, and when installed, are isolated from treated framing with self-adhering flashing.

BAD SOLUTION TO A NONEXISTENT PROBLEM?

Installing the code-permitted lateral-load device is disruptive and complex, especially when house joists are perpendicular to deck joists. Because the detail requires the house subfloor to be attached to joists with nails 6 inches on-center (rather than the standard 12 inches on-center), the finished floor would need to be removed in order to verify or remediate the attachment. The deck also must be level with the house floor—a bad practice where rain and snow is common.

Often overlooked in discussions about lateral loads is that lag bolts and ledger screws that transfer a deck's vertical load to the house also resist withdrawal forces: 582 pounds for each ½-inch-diameter lag bolt, and 420 pounds for each LedgerLok screw embedded 2 inches into an SPF house-framing member. This means that a 16-foot-wide deck with two ledger screws per 16-inch joist bay would have more than 10,000 pounds of lateral resistance.

One explanation I've heard for the lateral-load requirement is that it prevents a deck from pulling the band joist or sill away from the house under a severe lateral load. But I've never heard of this occurring, except when the deck ledger has been fastened to an overhanging cantilever, where the issue is vertical rather than lateral loads. Recent testing at Washington State University confirms this. There, people moving in unison were able to create a maximum total lateral load of only 1,750 pounds—875 pounds at each end of a model deck. Even under artificially created lateral loads of 7,000 pounds, the joists split and failed massively but the lag screws at the ledger held firm—without lateral braces. There was no observed damage to the house frame (see "Lateral Loads on Decks" by Don Bender et al., originally published in *Wood Design Focus*, Summer 2013, and reprinted with permission at deckmagazine.com/structure/measuring-lateral-loads-on-decks_o.aspx). This testing suggests that real-world lateral loads are relatively small and that even artificially created loads that are four times real-world scenarios are easily handled by standard attachments that follow IRC connection requirements.

ally impossible to test, I generally assume (in the absence of visual deterioration) that foundation concrete has a compressive strength of 2,500 psi, the weakest allowed by code (2009 IRC, Table R402.2).

It's also critical not to install the anchor bolts any closer to the edge of the concrete than the manufacturer recommends. When the upper hole of the L-bracket would be too close to the top edge of a foundation (within 3 ¾ inches for ½-inch-diameter Red Head Trubolts, for example), I use a 2x4 PT spacer to lower the bracket, and I upgrade the joist-attachment screws to 6-inch HeadLoks **(2)**.

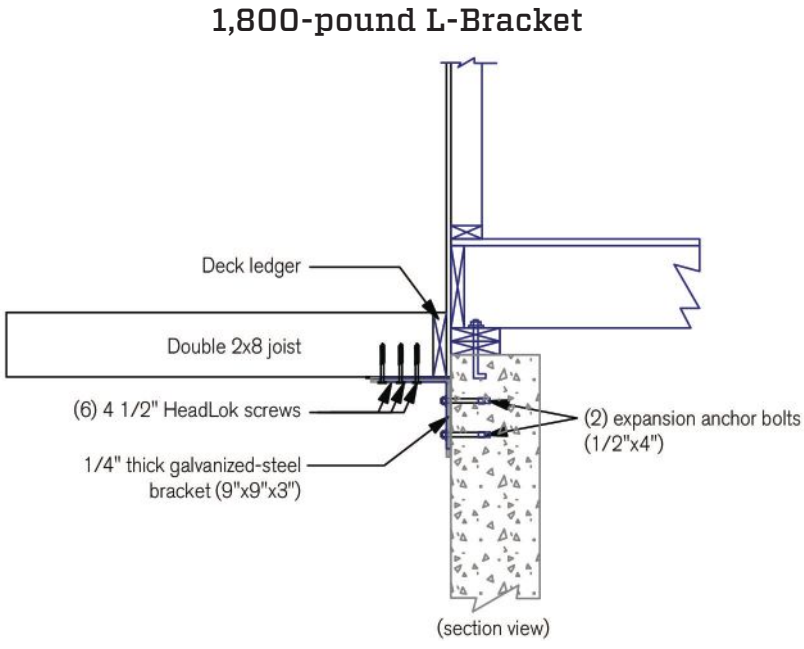
Materials for this anchor cost about $41, including the $20 bracket and the second joist. Installation takes less than 30 minutes. As a bonus, this L-bracket provides vertical support in addition to lateral strength.

Note that the diagonal-brace and L-bracket details connect to poured concrete foundations, which are common in my area. Hollow concrete-block foundations, however, pose a challenge, because their thin walls offer considerably less withdrawal strength. For instance, Simpson Strong-Tie's ETSP plastic screen tubes provide just 300 pounds of withdrawal strength and require 8-inch spacing. I suppose that threaded rods could be used as through-bolts, with a 2x6 PT block mounted inside as a big "washer," but that, of course, would require access to the inside of the house.

Side strap. When the deck is aligned with the edge of a house, significant lateral loads can be resisted with a simple strap that connects the deck's outside joist to the house frame **(3)**. We've used Simpson's 1¼-inch by 30-inch MSTA30 straps nailed to the deck and to the second story of a house, a solution that has been stamped by my engineer.

To ensure that the strap is fastened to solid house framing, some siding and sheathing has to temporarily be removed during installation. But once installed with 11 hanger nails in the house frame and another 11 in the deck's double joist, this connection resists more than 1,800 pounds of tension in SPF framing, according to the manufacturer's specifications (see Side Strap Lateral Brace, facing page).

The cost of materials for this solution is

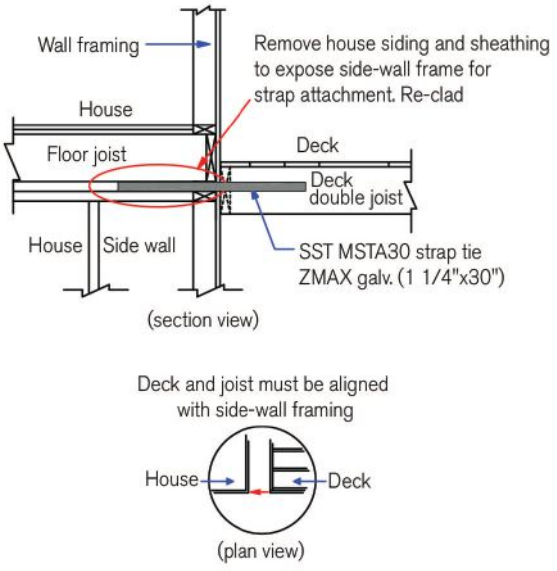


When installed as shown above, the author's custom-fabricated ¼-inch-thick steel brackets provide 1,500 pounds of resistance to lateral loads.

Sometimes blocking is required to avoid installing concrete anchors too close to a foundation edge. In those cases, the author uses 6-inch instead of 4½-inch-long HeadLok screws to attach the bracket to the doubled joists. The bracket in the photo was fabricated from ½-inch-thick angle iron (the steel was manufactured as a 16-foot-long angle bar with two 8-inch flanges). While the steel is much thicker than necessary, it was readily available and the fabricator could just cut off 3-inch-wide pieces of the angled steel.

When the deck framing is aligned with the house framing, a simple metal strap can provide sufficient strength to meet lateral load requirements. On existing construction, the siding and sheathing must temporarily be removed to gain access to the framing.

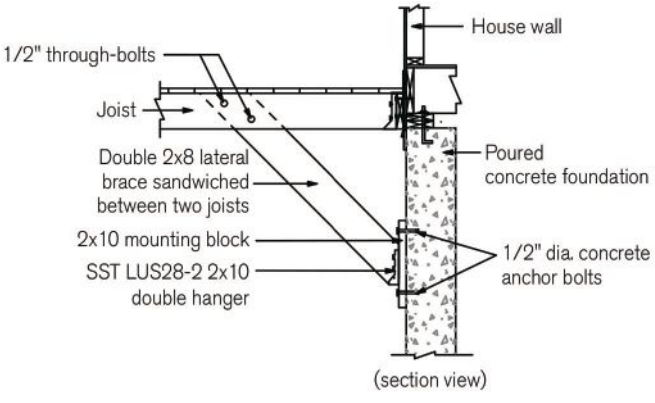
Side Strap Lateral Brace



When installed as shown above, Simpson's MSTA30 strap ties offer 1,820 pounds of allowable tension loads in SPF framing, more than enough to meet the IRC's 1,500-pound lateral load requirement for permitted devices.

While this lateral load anchor hasn't been stamped by an engineer, it may be an option that would be approved by your building inspector. Here, a single 2x8 diagonal brace is through-bolted to a joist and fastened to the foundation with a joist hanger attached to blocking.

Diagonal Foundation Brace ('Lite' Version)



Joist hangers (shown here) or angle brackets can be used to anchor diagonal bracing to a poured concrete foundation wall. Like all of the lateral-brace options shown in this article, this detail would need approval from your building inspector.

modest, just a few dollars for the strap and nails. Of course on existing construction, labor can run two hours or more, depending on the house siding.

INFORMAL SOLUTIONS

Because my engineer is known for being very conservative, some of the building inspectors we work with will accept scaled-down and unstamped versions of his engineered brackets and braces.

Simple diagonal brace. In the "lite" version of our diagonal foundation brace **(4)**, we've substituted joist hangers or pairs of 16-gauge angle brackets for the more robust—and more expensive—⅜-inch and ¼-inch steel L-brackets used in our stamped designs. This detail can be built with either a single or a double 2x8 diagonal brace, which is through-bolted to a doubled deck joist and anchored to the concrete foundation as shown (see Diagonal Foundation Brace, page 63). Materials cost about $32 for each brace, and it takes about 45 minutes to install one of them.

While we've had two or three inspectors accept this brace as "reasonable" without asking to see any engineering data, the weak link in the design is the metal hardware. We typically use Simpson LUS28-2 double-joist hangers—which have a 1,315-pound allowable load capacity—or Simpson L70 angle brackets, which have a load capacity of 445 pounds each (for a total capacity of 890 pounds for a pair of brackets) in treated lumber, though the load capacity may need to be reduced since the brace is configured diagonally. If a lateral load requirement of, say, 750 pounds is added to future versions of the building code, this alternative configuration using off-the-shelf hardware would probably meet that lower standard.

House-frame bracket. On older homes with fieldstone foundations, lateral braces can't be fastened to the foundation. But on a recent project—a classic New England house with solid 4x6 sills—the inspector suggested I anchor our custom L-bracket lateral braces to the sill.

I rotated the brackets so that they were horizontally instead of vertically oriented, and drilled another hole through each bracket for a third through-bolt **(5)**. After flashing the brackets with Vycor, I fastened each one to doubled 2x10 PT joists with three ½-inch-diameter galvanized-steel through-bolts. The brackets are anchored through the deck ledger and house sheathing into the sill with six 6-inch HeadLok screws per bracket.

Is this anchor strong enough? According to my calculations, each of the three through-bolts holding my bracket to the double joist will resist 620 pounds of shear—more than 1,800 pounds total. According to the screw manufacturer's ESR (Evaluation Services Report 1078), the withdrawal strength of a HeadLok screw embedded 2 inches into a hem-fir sill is 360 pounds; therefore, six such screws should resist 2,160 pounds of withdrawal (6 x 360 = 2,160).

Including the bracket and the second joist, materials for this detail cost about $48. Installation takes about 30 minutes.

At the suggestion of his building inspector, the author rotated one of his custom L-brackets horizontally and fastened it to a solid 4-inch by 6-inch sill with HeadLok screws. The bracket needed to be fastened to the doubled joist with three bolts instead of two, which required an additional hole drilled through the bracket.

FASTER & CHEAPER

Both the engineered and "informal" devices I've described in this article have several major advantages over the lateral brace "permitted" by the IRC. Installation is easier and less expensive, since my details require no access to the interior flooring, basement ceiling, or floor joists. And they allow us to set our decks 6 or 7 inches below the interior house floor—a practical detail that helps keep rain and snow outside.

Are all my lateral anchors as strong as the code-permitted solution, which depends on special hardware, extends deep into the house, and attaches to the floor framing? Some of them are and some of them aren't, but I'm not too worried that my decks would experience an arbitrary 1,500-pound lateral force on the ledger that would pull the rim joist or sill away from the framing, through the house sheathing, and onto the ground.

Jim Finlay is the construction manager and owner of Archadeck of Suburban Boston, a member of the Archadeck franchise system. This article originally appeared in Professional Deck Builder *(deckmagazine.com).*

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* — In-depth coverage
L — Letter to the editor
Q — Question and answer
P — Product information

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BY LAUREN HUNTER

Slide It Wide

Available in a range of configurations and sizes, Marvin's Ultimate Multi-Slide Door is designed to let homeowners bring the outdoors in. As the door slides open, the panels stack smoothly, or designers can opt for a pocket version. Panels range from 3 to 5 feet wide and 7 to 12 feet high in unidirectional or bi-parting configurations. Pricing varies. marvin.com

Thin-Film Radiant Heat

Take the chill off tile floors with MP Global's Perfectly Warm Peel and Stick Radiant Heat. The flexible thin film provides both radiant heat and crack isolation and uses just 12 watts per square foot. It requires a licsensed electrician to make final connections to a thermostat. Four pre-cut mat sizes cost around $9 per square foot. mpglobalproducts.com

Cleaner Flush

American Standard's Optum VorMax toilet uses just 1.28 gallons per flush as its powerful water jet scrubs the bowl clean. The rim doesn't have traditional water delivery holes where dirt can build up, while a permanent EverClean finish inhibits stain and bacteria growth. Contractors will appreciate the easy-install design. Price: $288. americanstandard-us.com

Solve for X

By pressing a building project key on Calculated Industries' Construction Master Plus EZ (CMP EZ) calculator, users can scroll through a series of prompts for quantities, measurements, placement, materials, and other inputs. The CMP EZ calculates more than 140 solutions for rafters, stairs, balusters, compound angles, and more. Available for $90. calculated.com

Pile It On
When designs call for structural pilings, try Simpson Strong-Tie's Strong-Drive SDWH Timber Hex-HDG screws. Replacing bolt-washer-nut assemblies, the hot-dip galvanized screw has an integral oversized washer and a SawTooth point to eliminate pre-drilling. The .267-inch-diameter SDWH Timber Hex-HDG screw comes in five lengths from 4 to 12 inches and has a 3/8-inch hex head. Pricing varies. strongtie.com

Color Commentary
Wellborn customers are looking on the bright side. The brand's ColorInspire program lets designers choose cabinetry paint colors from an extensive deck of hues from Benjamin Moore, Sherwin-Williams, and Valspar. The program is available for Wellborn's Estate Collection and for its Elegant Bath inset door cabinetry. Pricing varies. wellborn.com.

Hot Lines
Heatilator's Crave fireplace is designed to fulfill a growing trend for clean-lined linear fireplaces with low profiles. The fully customizable Crave lets designers choose from decorative fronts and glass finishes, adjustable LED light beds, reflective porcelain liners, or options such as natural log sets or colored glass. Prices range from $3,300 to $5,000 depending on size, single- or two-sided design, and other options. heatilator.com

Whatever the Weather
For use under tile, slate, and metal roofing, Atlas Roofing's WeatherMaster TU Ultra SE peel-and-stick SBS-reinforced 60-mil-thick underlayment comprises modified asphalt and woven polyester. It has a 260°F melting point, bonds with all-foam roof adhesives, and won't slip under stacked tiles; a 3-inch selvage creates a waterproof bond between courses. Pricing varies for the 3-by-72-foot rolls (200 squares). atlasroofing.com

Moisture Management
In HouseGuard's Wall Ninja system, TruDry waterproofing and Dow foam board work with the maker's Ninja channel to manage moisture and energy loss. With a concrete floor poured on top of the Ninja channel and against the foam board, moisture migrating through the wall is directed behind the board, under the channel, and under the floor to the sump pit. The system achieves R-5 to R-15 insulation values. houseguard.com

Raise the Roof
In addition to providing daylight and fresh air, new Velux GXU roof access windows swing open to an 87.5-degree angle to satisfy egress requirements for emergency escape. Constructed from polyurethane molded around wood, the windows can be hinged on either side and are available with blinds and insect screens. They come in two sizes, both priced near $800. veluxusa.com

Aged-Look Decking
Ashwood is the latest color addition to the TimberTech Legacy Collection. Available in 12-, 16-, and 20-foot lengths with coordinating fascia and risers, Ashwood lends the look of aged, hand-hewn lumber to the capped composite decking material. The Legacy Collection offers scratch, stain, and fade resistance backed by a 25-year fade and stain warranty. timbertech.com

Fuel for the Fire
When your highest-end clients want to do up their outdoor kitchens, Kalamazoo Outdoor Gourmet has a Hybrid Fire Grill to suit their designs. Ranging from $10,000 for a two-burner model to twice that price for one with four burners and a side burner, the grills use gas, wood, and charcoal interchangeably. Custom grates, a rotisserie, and an easy-to-clean finish will please the most discerning outdoor chefs. kalamazoogourmet.com

Weigh In!
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Milwaukee M18 Fuel 7¼-inch Circular Saw

BY JOHN SPIER

My crew and I evaluated the 18-volt Milwaukee M18 Fuel and 36-volt Makita 18V X2 LXT circular saws for the September 2014 issue of *JLC*. Cordless circular saws have proven their worth for intermittent tasks such as cutting soffits, rafter tails, and window openings. But ads claimed that the new 6 ½-inch Milwaukee and the 7 ¼-inch Makita could also do serious production framing, from gang-cutting plywood to trimming LVLs. Although we were impressed by both saws, neither one will be replacing our speedy corded sidewinders for production framing.

Milwaukee has since introduced the 18-volt, 7¼-inch M18 Fuel, which is also supposed to handle the most demanding applications. After using it for a couple of months and running some serious speed tests, we're comfortable with sharing our opinions.

QUICK TOUR

The new 7 ¼-inch saw is clearly related to Milwaukee's 6 ½-inch version. Both kits include the same 4-amp-hour batteries, which have built-in fuel gauges and take almost 1 ½ hours to fully recharge. Both saws have the same brushless motor and identical gearing. And both saws have magnesium shoes and blade guards, easy-to-read depth and bevel scales, a well-designed pivoting rafter hook, an on-board blade wrench, and an LED headlight. But the 7 ¼-incher is a blade-right rather than a blade-left saw. And although both saws generate 5,000 no-load rpm, the larger blade circumference of the new saw yields a faster speed at the cutting edge. Both saws use advanced electronics to protect against overloading, overheating, and overdischarging, but Milwaukee says it built a unique electronics package for each saw to achieve peak performance.

Like other cordless circular saws, the new 7 ¼-incher has a safety that you must press with your thumb before pulling the trigger. Cordless saws are often used in awkward positions where the extra thumb action is a pain, so I wish manufacturers would eliminate this feature.

POWERING UP

We've been using this new sidewinder constantly for small jobs, and we love having it on our framing jobs as an extra saw that we can carry around for quick cuts without a cord. It's easy to adjust and comfortable to hold. The blade guard works well, although, like most, it gets hung up and needs a helping thumb on the lever when the saw is making a bevel cut at an acute angle. The saw bevels to a bit over 51 degrees and can cut through a 2-by at that angle. I've found the bright LED headlight to be a blessing for interior work. It has a 10-second afterglow when you release the trigger.

According to Milwaukee, the saw can crosscut 233 2x4s per charge under optimal testing conditions, which is similar to the performance of the Milwaukee 6 ½-inch and Makita 7¼-inch cordless saws we tested a few months ago. Obviously, battery runtime is normally not an issue with these efficient new cordless saws. But my instincts have always told me that cordless saws just aren't as fast as their corded counterparts. With manufacturers now claiming equality for their new cordless offerings, I decided it was a good time to test this new 7 ¼-inch saw against our go-to corded framing sidewinders: a 15-amp, 7 ¼-inch Milwaukee Tilt-Lok and a 12-amp, 6½-inch Ridgid Fuego. For good measure, I also tested the cordless 6 ½-inch Milwaukee and 7¼-inch Makita.

Assisted by a helper with a stopwatch, I

EDITED BY BRUCE GREENLAW

Unlike some competing cordless models, this saw has a built-in rafter hook.

The author's speed testing revealed that the saw can compete with other top-of-the-line cordless models, but is still significantly slower than his corded framing sidewinders.

counted the number of freehand crosscuts I could make per minute with each saw through a well-seasoned, full-dimension 2x10 spruce staging plank with consistently scattered small knots, repeating the test several times for each saw and averaging the results. I equipped each saw with a new Diablo 24-tooth framing blade and fully charged all the batteries.

Among the cordless saws, the Milwaukee 7¼-incher cut 13 to 14 slices per minute, the Milwaukee 6½-incher cut 12 slices per minute, and the Makita 7¼-incher cut 15 to 16 slices. On the other hand, our corded Milwaukee 7¼-incher easily cut 30 slices per minute and our corded Ridgid 6½-incher cut 26, making it clear that corded saws still definitely rule for production framing.

THE BOTTOM LINE

Despite the marketing hype for cordless tools, corded saws are still the best choice for production framing. The top corded models cut significantly faster than the latest cordless ones, and running a cord to a pile or a cutting station is at least as easy as setting up a charger and swapping batteries. But cordless saws have become indispensable for small jobs and for all those awkward cuts that you need to make in place, and the 7¼-inch Milwaukee M18 Fuel is our new favorite. That's partly because I already own a fleet of Milwaukee M18 tools with compatible batteries and chargers. But more important, the saw resembles a traditional 7¼-inch corded sidewinder, can cut anything that our corded saws can, is very comfortable, and has a handy rafter hook and an LED headlight. The whole crew loves it.

We tested the two-battery kit, but you can also buy a one-battery kit for $100 less or the bare tool for $200 less.

2731-22 Specs

Blade diameter: 7¼ inches
RPM: 5,000
Weight (with blade and battery): 9.2 pounds
Cutting depth at 0°: 2½ inches
Cutting depth at 45°: 1⅞ inches
Cutting depth at 51°: 1 11/16 inches
Price: $430
Included in kit: two 4-Ah batteries, charger, blade, blade wrench, tool bag
Warranty: tool, 5 years; battery, 3 years

John Spier is a builder on Block Island, R.I.

SUPER-SMALL FLASHLIGHT

It's hard to imagine a simpler flashlight than the Pak-Lite. It's a plastic cap equipped with two LED bulbs and a toggle switch that snaps to a standard 9-volt battery, which serves as the handle. The whole thing is small enough to fit in the coin pocket of my pants, which is where I've packed one for the past seven years. It doesn't roll when I lay it down, and it can stand upright. I can even grip it with my mouth to free up both hands. I've dropped it on concrete and run it through a washing machine with no harm done.

My Pak-Lite Super has white LED bulbs rated to burn for 100,000 hours, a low/off/high switch designed to toggle 100,000 times, and a glow-in-the-dark cap. According to the Oregon-based manufacturer, the standard alkaline battery will power the low beam for 600+ hours and the high beam for 30+ hours. I haven't counted hours, but my alkalines have lasted more than two years. With a lithium battery, the figures jump to 1,200+ and 80+ hours, respectively. Depending on the battery, the Pak-Lite Super costs $25 to $30 plus shipping at 9voltlight.com. *—Bruce Greenlaw is a contributing editor to* JLC.

Photos: top right, Scott MacGillivary

Bosch Mortar Knives

BY JOHN CARROLL

Whether you're repointing cracked and crumbling mortar, adding a new window or door in a masonry wall, or joining a new masonry wall to an existing one, the first (and often most challenging) step is to grind and chip out the old mortar. This is particularly hard to do when you need to remove bricks or stones to "tooth in" the new work to the old pattern. Doing this without damaging the surrounding masonry units is a job that requires more than a hammer and a flat chisel.

For years, I've used a grinder or a circular saw equipped with a diamond blade, a rotary hammer, and a plugging chisel that I strike with a 2-pound hammer. The diamond blade takes care of the long, straight joints, but it doesn't fit into short joints, such as the head joints in brickwork. In those tight spots, I've used the rotary hammer to perforate the mortar, then used the plugging chisel to knock it out.

I've often wondered why tool manufacturers didn't offer a chisel shaped like my plugging chisel that I could use with my SDS-plus rotary hammer set in chiseling mode. But I can stop wondering now that Bosch has introduced the SDS-plus Mortar Knife. It's available in convenient thicknesses of ¼ inch and ⅜ inch, and like my plugging chisel, it's designed to force the chipped mortar out the face of the joint rather than into the masonry units on both sides of the joint—lessening the possibility of breaking or damaging the unit.

So far, I've used the mortar knives to repair a stone wall and a brick staircase, and I would guess that they saved roughly 25 percent in labor time. At that rate, they can easily pay for themselves in one job.

The ¼-inch version (model HS1400) costs about $18, and the ⅜-inch version (model HS1401) costs about $20. I like having both sizes, but I could get by with just the smaller size—if necessary—because it fits into narrower joints but still works on the wider ones.

John Carroll is a remodeling contractor in Durham, N.C.

DEWALT 14-OUNCE FRAMING HAMMER

In the February 2014 issue, I reported that I loved the new Stanley FatMax Anti-Vibe framing hammer and had started using it full-time for production framing. The head of this hammer weighs just 17 ounces, which is in line with the trend toward lighter steel heads designed to compete with costlier titanium ones. I had already incrementally moved from a 32-ounce hammer to a 22-ouncer to reduce my wear and tear, and I initially couldn't imagine framing with a 17-ouncer. But I discovered that the Stanley has all the driving power I need. I also liked the magnetic nail starter up top, which makes it easier to start nails with one hand. A few months ago, however, the head loosened and I needed to replace the hammer.

Sticking with the concept, I decided to try the welded-steel DeWalt model DWHT51138, which has an even lighter 14-ounce head and a magnetic nail starter. So far, I like this featherweight even better than the Stanley. It drives nails just as fast, has a comfortable grip, and feels perfectly balanced. It cost me $50 at The Home Depot, which is a fair price for a good hammer. We'll see how it holds up in the long run. Regardless, I'll never return to a heavy framing hammer.

—Terry Goodrich is a framing contractor in Scappoose, Ore.

Photo: top left, Judy Smith

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Classifieds

BY JON VARA

1. Workers assemble a floating island on a waterway in Singapore. **2.** Floating islands are often used at wastewater treatment facilities—like this one in New Zealand—to reduce dissolved nutrient loads. **3.** Caspian Terns on Oregon's Sheepy Lake find protected nesting sites on a 50,000-square-foot island anchored offshore.

Floating Islands

Real estate salespeople like to claim that no one is making any more of what they have to sell. But don't tell that to Bruce Kania. His Montana-based company, Floating Island International, has overseen the construction of dozens of artificial islands, the largest of which is more than an acre in size.

The basic structure of these islands is a thick, three-dimensional plastic mesh made from recycled plastic water bottles. Individual modules—which vary in size from 40 to 150 square feet—are joined at the edges with cable and metal plates and layered vertically as needed to build the required thickness. Initial flotation is provided by marine-grade closed-cell foam that's injected into the base material in a grid pattern.

Once the island is afloat, its porous structure is quickly colonized by microbes and associated marine life, which generate gas bubbles that serve to steadily increase its buoyancy. Rooted surface vegetation extends its roots downward to the water and produces organic matter that eventually becomes soil.

If all that sounds unlikely, consider that natural peat-based floating islands function the same way and can be durable and long-lived. One 30-acre natural floating island in Wisconsin's Chippewa Falls Flowage—where Kania once worked as a fishing guide—is at least 80 years old and is thickly covered with trees up to 50 feet tall.

So far, most of Floating Island International's projects have been designed to enhance water quality by taking up phosphorus, nitrogen, and other dissolved nutrients. But according to Kania, there's no technical reason why floating islands couldn't also provide space for housing. "For an open-ocean marine environment, you'd probably need an island about 12 feet thick," he says. "I look forward to retiring to my own country someday."

JLC contributing editor Jon Vara lives in Cabot, Vt.

Photos: courtesy Anne Kania, Floating Island International

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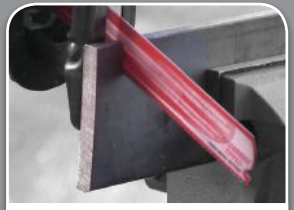
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