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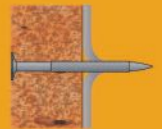
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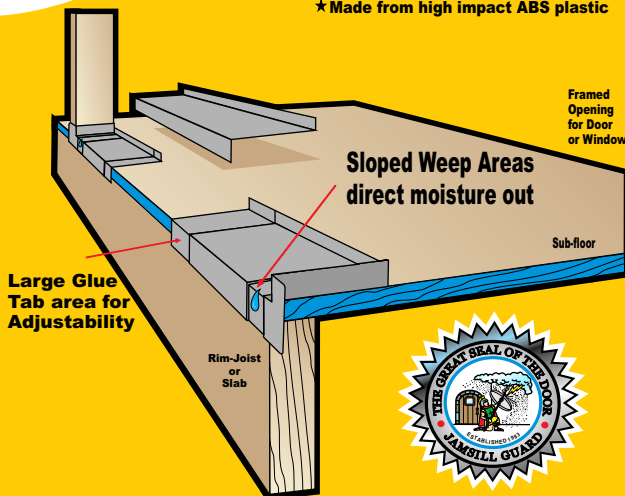
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Letters

RRP Discussion Continues

In his answer to my letter (“Interpreting the RRP,” 4/12), Shawn McCadden writes that “there seems to be a lot of confusion surrounding the EPA definition of ‘demolition’” (“Lead Paint Rules Require Context,” 5/12). No kidding! But he stirs the pot again, by first correctly stating that the RRP rules apply to both painted and coated surfaces but then incorrectly assuming that paneling materials would need to be disturbed during demolition, writing that “demolition of those materials would fall under the rule unless it has been established by testing that there is no lead present.”

Not so fast! I have been remodeling for 30 years and have removed thousands of square feet of paneling by barely disturbing the finish at all. I would venture to guess that between all the remodeling jobs I have ever done that involved removing paneling, I still haven’t disturbed more than 6 square feet of finish. Most paneling and trim can be removed wholly intact because it’s fastened with light-gauge finish nails or brads.

William Wiehe Jr.
Vice Versa Builders
Fairfax, Va.

Multi-Tool Needs Better Attachment Selection

As a tile contractor here in Sacramento, Calif., I have used a Fein SuperCut tool for years. When my trusty Fein finally gave up the ghost, I decided not to replace it — at least not until the economy improves.

In the meantime I bought an inexpensive Craftsman multi-tool for less than \$100; it’s not powerful, but it works fine and has a good selection of blades, plus it will accept aftermarket blades from Oshlun. But after reading your review of the Porter-Cable oscillating multi-tools (*Toolbox*, 3/12), I purchased one, looking forward to the using the toolless blade-change feature.

However, though your article was well-written, I take exception to the author’s statement that “the company

offers a generous collection of sanders, scrapers, grinders, and cutters.” In fact, even the light-duty Dremel tool has a wider selection. For example, in my work, I need a rough rasp; diamond blades for grout removal; some wide, aggressive blades for wood cutting; and a range of narrow wood-cutting blades. I called Porter-Cable to find out whether additional blades would be forthcoming and was told that there were no plans to enlarge the selection at present.

So until my work picks up and I can afford another Fein, for now I typically reach for the Craftsman.

Stu Goldberg
Stu’s Tile Plus
Sacramento, Calif.

Positive Change

Thank you for the interview with Robert Criner (“Proactive and Positive in the Face of Recession,” 3/12). Your questions and his insight were excellent. Although he works in a different market, the article certainly inspired me to look at changing how we are currently running our business. Keep up the good work.

Dean Rofkar
Rofmann Builders
Bellingham, Wash.

Keeping On

Your magazine keeps on keeping on; I like your well-rounded approach and the way you clearly present topics that many of us are not familiar with. For example, the recent issue contains an article on replacing 18th-century windows — not a job I’m likely to do here on the West Coast. But the story is well-composed and full of good information from a knowledgeable carpenter. Likewise, the articles about writing contracts, straightening a stone wall, and the Passive House on the raft slab all add up to a “must-read” publication.

I bring these magazines to my job sites with colored sticky notes attached so I can quickly refer to an article that I want to share with various tradesfolks. A digital edition wouldn’t work as well for these informal meetings.

Robert Dorazio
General Contractor
Avila Beach, Calif.

KEEP 'EM COMING!

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Q. Flooring an L-Shaped Porch

What's the best way to frame a T&G fir floor on an L-shaped porch to get sufficient slope for drainage in both directions?

A. *Scott McBride, owner of Mustard Seed Master Builders in Sperryville, Va., responds:* There are two good ways to deal with this situation — by running floorboards into a separate meeting strip (see top photo, below), or by weaving their ends together in a herringbone pattern (bottom photo, below).

The framing is the same in either case: Run a triple 2-by girder on a diagonal from the corner of the house to the outside corner of the porch, and tie the porch joists to the girder. The joists should lie parallel to the house walls, so that water will run off along the length of the floorboards, rather than across them. Since a porch floor is typically pitched $\frac{1}{8}$ to $\frac{1}{4}$ inch per foot, the girder will need to be



pitched as well, much like a very shallow hip rafter.

To fabricate the meeting strip, select a straight piece of flooring — preferably with vertical grain to minimize shrinkage — and glue a spline into the grooved edge, which will give you a floorboard with tongues on both sides. Fasten the meeting strip on top of the hip girder with construction adhesive and blind nails, then start laying the full-length boards from the end of the floor farthest from the corner, tongues toward the meeting strip. When you reach the transition, miter the inboard ends of the boards and groove the mitered ends with a router to engage the tongues on the meeting strip. Cut the boards long by an inch or two and let the outboard ends run wild, trimming to a chalk line after all the boards are laid.

In the herringbone method, the floorboards are chopped square, grooved across the ends, and laid alternately so that each end-groove engages the tongue of the preceding board. Practice with a few scraps to get the hang of it. Because opposing floorboards lie slightly out-of-plane with each other — owing to the change in direction of pitch — a little belt-sanding will be required to smooth the finished surface.

A limitation of the herringbone method is that the zig-zag falls along a 45-degree intersection, so it can only be used where the adjoining porches are of equal widths. It's also more time-consuming than using a meeting strip, but the finished look is terrific. The herringbone pattern is accentuated because the alternating grain causes the light to reflect differently from the two surfaces.

Q. Curbing Conductive Heat Loss Through a Glulam Beam

I'm remodeling a house that has two exposed 6x12 glulam beams that extend from the open-plan living space into an attached sunroom, which cools to near the outdoor temperature at night. Is there a good way to eliminate conductive heat loss through the exposed beams?

A. *Steve Baczek, an architect in Scituate, Mass., responds:* There are several ways to deal with the problem directly. For instance, you could insulate the beam on the inside to minimize its ability to take on heat from the indoor air, then box it in with some sort of finish material. That will reduce heat loss, though some or all of glulam's

Q&A

top surface — where it makes contact with the floor joists above — will probably have to be left uninsulated. Also, the bulked-up appearance of the resulting beams may look awkward.

Another option would be to insulate the beams in the sunroom to prevent them from bleeding heat gained from the conditioned interior.

But the best solution — if the design of the structure permits — would be to physically decouple the outer and inner beams from one another where they pass through the wall, and separate the cut ends with pieces of $\frac{3}{4}$ -inch rigid foam. This approach would have to be designed by a qualified engineer.

However, before you do anything, you should consider how the thermal bridge fits into the bigger energy picture. Most homes have at least a few energy issues, and it's best to start by tackling those that offer the largest return for the smallest investment. Conduction through the beams you've described here, for example, probably accounts for less heat loss than a 1- or 2-square-inch air leak in the building envelope. Simply air-sealing the beam penetrations through the outside wall might save more energy than insulating the beams themselves or engineering an internal thermal break — and at a tiny fraction of the cost.

Q. Aftermarket Fire Protection for Wood Roofing

Are there commercially available coatings that can be sprayed or brushed onto a cedar shake or shingle roof to give it a Class B fire rating?

A. *Robert White, a wood scientist at the USDA Forest Products Laboratory in Madison, Wis., responds:* While I can't conclusively say that no such coatings exist, I'm not aware of any that can show the required documentation. Where a wood roof is to be used in a fire-prone area, the recommended solution is to choose shakes or shingles that have been pressure-impregnated with a flame-retardant treatment (FRT) rated by the ICC-ES. Depending on their performance in the ASTM E 108 (or UL 790) test — which includes a flame-spread test and a burning-brand test — FRT shakes or shingles may receive a B or C fire rating. Although a B rating is the highest available for pressure-impregnated FRT shingles alone, a Class A-rated wood roof system can be achieved by using Class B wood shingles with a specified roof deck and underlayment, such as approved gypsum/fiberglass panels.

Don't be confused by ASTM E 84, a second test protocol that



Three Things I've Learned: Tips from Seasoned Pros

measures the flame-spread index of materials for *nonroof* applications, and that also provides an A, B, or C rating. While untreated wood products may be rated Class B or C under E 84, wood roofing materials need flame-retardant treatment to qualify for even a C rating under the E 108 protocol.

Durability is also a major concern, so the roofing test protocol includes weathering requirements to ensure that the flame-retardant treatment won't lose its effectiveness when exposed to rain and sunlight.

Q. Hardwood Flooring Over Vinyl

I'm planning to apply a prefinished hardwood floor over existing sheet-vinyl flooring. What do I need to know to do the job right?

A. *Daniel Boone, a wood-flooring contractor and instructor in Jacksonville, Fla., responds:* Start by evaluating the existing floor assembly. The new hardwood flooring must be installed on a wood subfloor of approved thickness that is at or above grade, flat, and well-fastened to appropriately spaced joists. You can check the joist spacing from the basement or crawlspace, but to

confirm the subfloor material you'll have to remove a small section of vinyl. Make sure the vinyl is well-adhered, and plan to remove any existing trim or cove base.

Don't install nail-down flooring over particleboard underlayment — particleboard doesn't hold nails adequately and will literally dissolve if it ever gets wet, wrecking the whole installation. Use a pin-type moisture meter to check the moisture content of the subfloor before you start. Vinyl is a moisture retarder but not a moisture barrier; if there are high levels of moisture in the subfloor, it will eventually affect the finish floor as well.

Finally, follow the manufacturer's installation instructions or the NWFA (National Wood Flooring Association) guidelines and plan to use a fastener length that provides a minimum penetration of $\frac{5}{8}$ inch into the wood subfloor.

If it's not possible to meet the above conditions but a nail-down floor is the only option, you'll have to remove the existing vinyl and upgrade the subflooring and joist system as needed. Another alternative is to go with a glue-down installation, which some manufacturers approve for their solid flooring products. If you go this route, you must closely follow their specific instructions for installation over vinyl.

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On the Job

Cornice Returns, Production Style

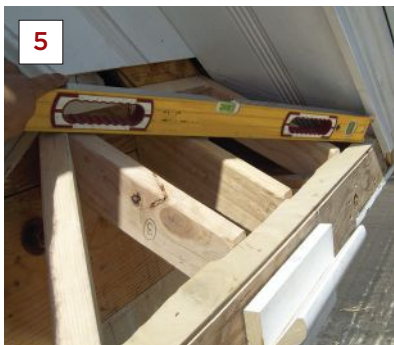
by Matt St. Martin

One of the most enjoyable phases of this three-story addition (1) was matching the cornice returns on the 130-year-old Denver home. The masons who laid up the brick veneer left us with pairs of protruding anchor bolts (2). The process started with full-scale layout scribed right in place, using mockups made from the trim materials (3). Solid blocks bolted into place provided attachment for the built-out boxes (4), which we beveled to match the 8/12 pitch and shimmed as needed, using a straightedge to make sure the surfaces were in plane (5).

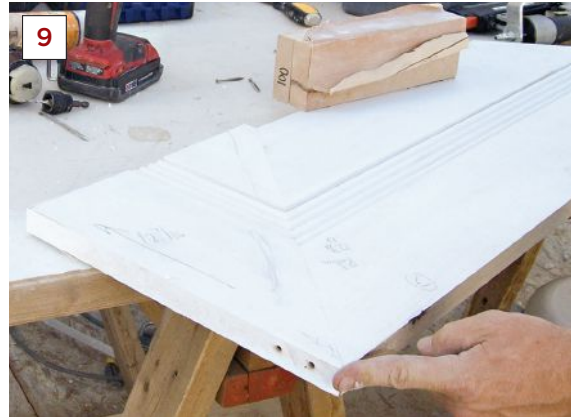
We capped the returns with sheathing (6), then covered the OSB caps with peel-and-stick membrane (7). (We would install the reglet flashings later.)



continued on next page



On the Job | Cornice Returns, Production Style



Next, we preassembled as many of the trim parts as possible on the ground, including the fascia (8) — shown glued and clamped with Collins miter clamps — and the fluted soffits (9), which we mitered, glued, and screwed together at the outside corners. Preassembly reduced trips up and down the ladder and cut down installation time (10, 11). We left the finished cornices (12) ready for the painters (13).

Matt St. Martin is a lead carpenter for Moonstone Construction in Denver.

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A Simple and Effective Contract for Subs

by Dennis Dixon

The written agreement between the contractor and subcontractor sets the ground rules for everything that will happen on the job, so it should be simple, concise, and organized. Unfortunately, a lot of the contracts I've seen don't measure up, including the one my company originally used. It was a five-pager with lots of legal boilerplate that, despite its length, either lacked the specifics needed to minimize conflicts or buried them where they were unlikely to be read. The result? We seemed to have misunderstandings with subs on two out of five jobs.

We eventually created a contract written in simple language that fits on two sides of a single sheet of paper. Though short, it includes the details needed to eliminate most job-site problems, and we've been using it for 15 years with great success. In fact, our subs say it's one of the reasons they like working with us. And when owners

or architects see the contract, it reinforces their perception of us as a professional, well-managed operation.

In the contract, I succinctly lay out what I expect subs to know and do, and I also identify nonstandard plan items — such as rounded drywall corners — that could be easily overlooked. (Including these items also reminds me to review them with the sub.) Because my subs know they will be responsible if their employees don't follow the contract, everyone who works for me quickly learns to bring a copy to each job.

My contract is easy to customize. It has 16 short sections, which I've broken out into three broad areas: project (description and specs), processes (from how to get paid to how to handle materials), and people (how everyone is expected to behave).

Project Location and Scope

The where and what of the project are covered in the first two — and probably most important — contract sections.

Address. I include as much information here as possible, along with the version of the plans the contract refers to: Johnson Job, Lot 31, Rolling Meadows Development, 456 Elk Drive, plans dated May 17. This helps subcontractors get to the correct site, with the most current version of the contract.

Subcontractor scope of work. My old contract had extremely detailed scopes, but my subs convinced me that was unnecessary. ("It's a commercial job. We already know that it needs metal boxes and galvanized conduit.") Now my scopes look like the following:

Drywall — hang, tape, texture, and finish (L&M).

Electrical — service connection, rough-in, trim, and fixtures.

Hvac — supply all hvac rough-in and equipment, trim, and test.

Most of the details in this section highlight deviations from the plans. If the electrical panel location has moved but the plans haven't been updated, the contract might note, "Electrical panel is in closet five in the plans, but that closet has been eliminated. The panel is now in closet seven."

Specialty details: Type X 5/8" double layer @ common wall; garage to house. Single 5/8" @ garage ceiling.

Note: Ignatio inspection

Insurance Workers comp License #:

Job-site work on Sundays

Job-site professional members, on site, no vehicle

DIXON VENTURES INC. Contractor & Subcontractor Agreement

Date: March 1, 2012

Project: Corley residence by Parks Architects, Karyn Parks, 12 pages, stamped 3-5-2012. Civil Engr: Mogollon (Rob Fitz).

Project address: Corley residence, Lot 825, Forest Highlands subdivision, 3125 Windy Pine Way, Flagstaff, Ariz. 86001

Contractor: Dixon Ventures Inc., Supt. Herb Wolf 928-699-1444

Subcontractor: Ignacio Drywall Inc.

Date sub to begin: March 14, 2012

Sub to complete work: April 6, 2012

Contract amount: \$7,920.45 (fixed price)

Work: Hang, tape, texture drywall with "Santa Fe" texture. Use 3/4" galvanized round corner bead. All cleanup by subcontractor, broom clean. Use of job-site dumpster permissible. ALL MATERIALS, LABOR, EQPT, NAILS, etc., supplied by Ignacio.

- Windows wrap sides and cap. Wood sill by others.

- Georgia Pacific DensShield (yellow) @ ALL wet areas.

- Add'l blocking needed is by Ignacio.

- Heaters and fans by Ignacio.

- ABSOLUTELY no use of house furnace during drywall work.

Payments:

33% @ drywall delivery.

33% @ drywall hanging complete and passes nailing inspection.

34% @ completion, approval by DixVen and cleanup 100%.

Business | A Simple and Effective Contract for Subs

The scope section also includes two subsections:

Atypical conditions. This is where I call out unusual items and circumstances, such as “3½-inch casings” or “flooring at kitchen finished floor is built up 1½ inches, so adjust your cabinetry and appliance

rough-ins and installs accordingly.”

Building codes. Here, I require subs to know the codes and regulations of their trade. This seems like a no-brainer, but I build in different jurisdictions — one that uses the 2006 International Building Code, and another that’s still on the 2003 version

— and I want subs to understand that they must know which code is in force where.

This section also requires each trade to know code requirements for other trades where applicable. For instance, electricians should know that code requires 5/8-inch drywall in the garage and should set electrical boxes accordingly — without me telling them.

Work Processes

After project location and scope, the next-most important sections relate to payment schedules and the paperwork I need before writing a check.

Payment schedule. I keep this to-the-point and specific to every trade. For example, for drywall I might say: “All hung and passed nailing inspection, 35 percent of the draw; taped, 25 percent; balance when sanded, textured, and cleaned, and scrap removed.” Or for hvac: “75 percent of payment can be made after the furnaces and ductwork are set and system is operable for construction basis; balance on system trim, test, balance, completion.”

Invoicing, lien waivers, and other paperwork. These requirements are the same for everyone. Up-to-date liability insurance and workers’ comp certificates, license, and bond details must be on file at my office before the first draw is paid. I’m not going to hound anyone for this stuff. No paperwork means no pay.

When I send the check for the first draw, I include with it a lien waiver form and a prestamped, preaddressed envelope. The next draw won’t be paid until I get the signed form back. (In Arizona, where I live, you can’t lien a property unless you have a contract with the property owner, but I insist on the waiver anyway.)

Items needed before final payment. Items like keys, alarm codes, garage-door openers, and product documentation are easy to forget. That’s why I need them in hand before writing the final check.

Work hours. These are usually 7 a.m. to 6 p.m., Monday to Friday.

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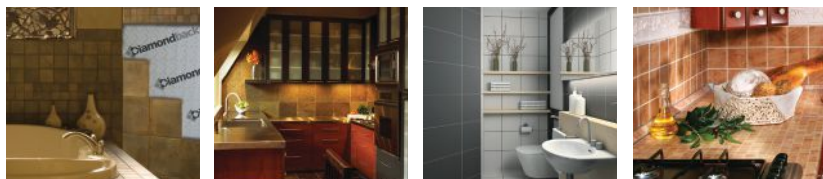




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Business | A Simple and Effective Contract for Subs

Change-order procedures. All changes must be authorized by my project manager or me.

Materials storage. Subs have to keep their stuff out of other people's way. If the roof trusses are delivered three weeks early, it's up to the framing sub to get them out of the driveway.

Warranty. The contract notes any non-standard warranty issues and requires the sub to tell me about conditions that will void a warranty — such as when the owners want to put a moving van on the driveway 10 days after the concrete has been placed, even though the warranty requires a 30-day wait.

Contractor responsibility. The contract also includes a section that puts responsibilities on my company. We agree to reconfirm scheduled work with all subs at least three days in advance and to notify them of any changes, delays, or prob-

lems. This reminds subs that we're on the same team and that I'll watch out for their interests.

Setting Expectations

The people-related sections define how we expect everyone to behave. They're not as critical as scopes and payments, but they set standards for professionalism and make it clear to subs that I expect them to live up to those standards.

Self-supervision. All subs have to manage their own work. If a plumber shows up and asks my project manager or me what to do, we tell him to call his office.

Visitors. No pets, family members, or visitors are allowed on site without our permission. Common sense is in order here: If the painter's wife comes by to tell him something, that's fine; if he's working with his kids sitting in the car, that's not.

Self-administration. Subs are respon-


sible for scheduling their own inspections and deliveries and protecting their own materials from the elements.

Personnel. We make it clear that subs have to provide qualified people. We're not babysitters.

Professionalism. The contract requires professional and courteous behavior, common sense, and consideration of project neighbors. If someone doesn't understand what those terms mean, he's probably not a good fit for us.

Feedback. This part of the contract welcomes suggestions from subs. It reminds them that we're reasonable, that we will listen to their ideas, and that we understand that the contract is as much in their interest as ours.

Dennis Dixon is a licensed general contractor in Flagstaff, Ariz., and a regular speaker at JLC Live.



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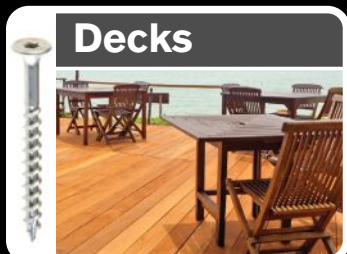
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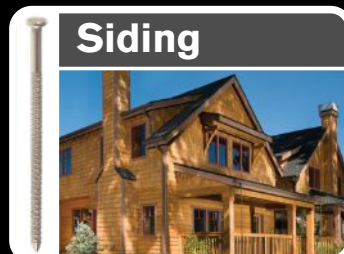
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Pouring a Structural Slab

Commercial-grade steel deck pans worked well for placing the slab on this steep-site garage addition



by Mike Rockwell

As a project manager and partner in a contracting business, I always enjoy a challenge. So when a client called us about adding a garage to his lakeside log cabin, I figured it would be a fun project, since we would be integrating a stick-built addition with the log home. But when we went to the site for our first meeting, the steeply sloping driveway was a clue that dealing with logs would be the least of our concerns.

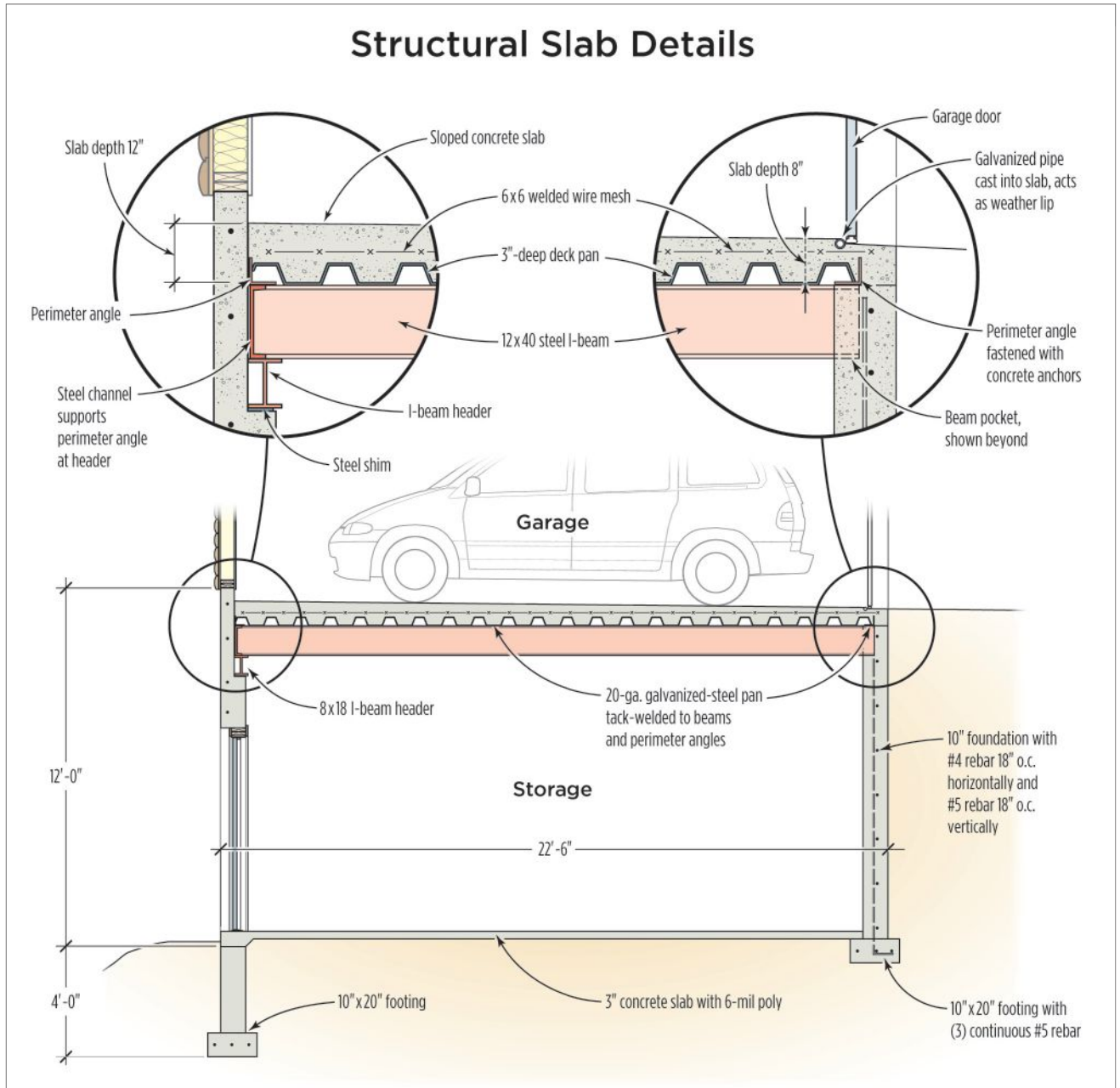
The customer wanted a two-car garage with living space above, something we'd done many times before. Though the entrance to the garage would be level, the severe slope meant that the back of the garage floor would sit a whopping 12 feet above grade! Pouring the foundation and filling it to the slab was one solution, but the customer wanted to use the space under the garage floor for storage. In other words, we would need to build a ceiling that could support the weight of two vehicles.



Design Strategies

This ceiling — the garage floor — also had to provide fire protection. After researching the issue, we came up with three possible strategies. The first was to build a heavy-duty wood frame with a lightweight

Pouring a Structural Slab



concrete layer on top for fire protection. Engineering this floor would not be a problem, but we were concerned about meltwater from those crusty chunks of snow that fall out of a vehicle's wheel wells in the winter, and about the flex, shrinkage, and resultant cracks you typically get with a wood frame. Our second idea was to use precast concrete floor panels, but — again — the possibility of leakage or seepage along the seams between the panels was a red flag. Plus it might be tough to get a large enough crane on site to set the heavy panels.

The third approach was to pour a concrete slab on top of metal deck pans supported from below by steel I-beams. Luckily both our foundation contractor and our engineer had experience with this type of construction, and they convinced us it was the best way to go. The engineer and I worked together to come up with a design that called for 10-inch-thick reinforced foundation walls, formed with beam pockets and a perimeter shelf to support the steel pans. Two W12x40 I-beams would span front-to-back below the deck pans to support the reinforced slab (see illustration, above).



Figure 1. The steep slope presented a challenge at every stage of construction, starting with the excavation and the removal of several large boulders (A). The foundation forms tower 12 feet above grade at the back of the garage (B). Restricted access made this an ideal job for a pump truck (C). Polystyrene insulation panels formed the shelf for the deck pans and the pockets for the steel support beams (D, E).

Tall Foundation Wall

We prepped the site by removing a dozen or more trees and staking in hay bales and a silt fence before bringing in the excavator. Cape Cod is known for its deep sandy soil, which usually makes digging as easy as building a sand castle. But this particular lot happened to be one of those pockets of glacial till. As the excavator hollowed out the grade for the garage foundation, he encountered scores of glacial erratics — giant boulders deposited during the ice age (see Figure 1). The excavated soil was piled at one end

of the driveway, and most of the boulders ended up being reused on site for retaining walls.

Footings for the foundation had to sit 4 feet below grade to meet local frost requirements, meaning the back wall of the foundation was a total of 16 feet high. To prevent the exposed 12-foot section from looking like a bunker, the homeowner requested an 8-foot-wide access door into the storage area, along with a regular entry door next to it. To form the entry door opening, as well as a couple of window knockouts along the sides, our foundation contractor,

Pouring a Structural Slab



Figure 2. I-beams provide midspan support for the garage floor. A header beam spans the door opening at the rear of the building (A) and also supports one of the I-beams (B). The second beam sits in the formed foundation pockets (C). Sections of steel channel shimmed to the correct elevation on top of the header support the perimeter steel angle (D).



Bruce Kelly, built 2-by bucks; the reinforced concrete wall section above the openings would be strong enough without any additional headers. However, the 8-foot-wide access door needed a steel I-beam header to span the opening and also to support the main I-beam that landed on top (Figure 2).

Forming Beam Pockets

After determining the elevation of the header beam, Bruce attached a double thickness of 2-inch-thick rigid foam to the inside of the concrete forms to create a 4-inch shelf for the header beam. He also used foam board to form the beam pockets and the perimeter shelf along the top of the walls (which would support the edges of the steel deck pans). After the rebar was placed, we were ready for concrete.

Thanks to all the prep work, the pour itself was uneventful. We had the mix pumped in for convenience and to keep the trucks safely away from the hole. Once the forms were stripped, the

blocks of foam came out easily, with only a little minor cleanup needed in the corners of the shelves and beam pockets where the concrete had oozed in. Before starting on the garage floor, we also had the storage floor slab placed, so that we'd have a solid, even surface to work from.

Setting the Steel Beams

With the forms gone, the next step was setting the steel beams. I'd had an assortment of steel shims of various thicknesses



Figure 3. A worker bolts the steel angle to the perimeter shelf (A), then the crew sets the steel pans, which are strong enough to walk on but light enough to carry easily (B). A welder then spot-welds the pans to the perimeter angle (C) and the I-beams (D).

shipped along with the steel beams, so that we could make sure the tops of the beams were even with the deck-pan shelf. I got the shims in place before the crane arrived, and we got all the heavy support steel in place in about an hour — without even breaking a sweat.

Next came the steel angle that went around the perimeter shelf (**Figure 3**). Each length came with holes drilled every 2 feet, and two of us easily set them in place and anchored them with 6-inch- $\frac{1}{2}$ -inch Simpson Titen anchor screws (strongtie.com). We also

placed lengths of steel channel on top of the header beam on both sides of the I-beam, to support the angle in that area.

Positioning the Deck Pans

We cut the 20-gauge galvanized pans to length using a recip saw fitted with a metal-cutting blade. The sections were fairly light and we had no problem placing them by hand. Each length has a ridge along one side and a channel along the other so that the adjoining pans align and interlock.

After we put the first section in, the welder went to work. First he cut holes around the heads of the anchor screws so the decking would lie flat on top of the perimeter steel angle, then he spot-welded the edge of the decking to the angle. Finally, he tacked the pans to the I-beams below.

When I walked on the decking before it was welded, I was concerned about the amount of flex. But by the time the welder had finished, the give had all but disappeared.

Pouring a Structural Slab



Figure 4. With steel reinforcing mesh on top of the pans (A) and temporary support walls below (B), the slab is ready to place. Chalk lines guide the screeding (C), leaving the slab slightly sloped for drainage. A power trowel adds the final finish (D).

Bring on the Concrete

Before the concrete arrived, I framed some “just-in-case” walls below the pans (**Figure 4**). My engineer had assured me they weren’t necessary, but I figured they were cheap insurance, and anyway we would use the studs later for framing the garage. Up top, we prepared for the pour by placing 2-by dams across the garage door openings and snapping lines for the slab elevation, giving it almost a 4-inch slope from front to back. We also laid out 6x6 wire mesh on top of the pans, and for good measure I spray-foamed gaps at the ends of the pans to minimize seepage during the pour.

Slab placement was pretty standard. The concrete contractor and crew poured one side at a time, screeding the slope down one side, then the other. The first section was bull-floated before the second batch of concrete arrived, then the process was repeated on the other side. When the slab had set up sufficiently, the surface was finished in the usual way, ending with a power trowel. The concrete mix used was 4,500 psi, but the slumps of the two

batches were different, which just meant that the second, lower slump batch took a little longer to set up.

A Weather Edge at the Threshold

Garage thresholds are a tricky spot. Without a raised weather lip, wind-driven rain and debris will blow in. But a weather lip positioned improperly can interfere with the garage door, which can be just as bad. Many concrete contractors drop the slab $\frac{3}{4}$ inch or so just inside the door and leave a lip where the concrete steps down. But that exposed edge can be fragile and chip off as things are dragged across it.

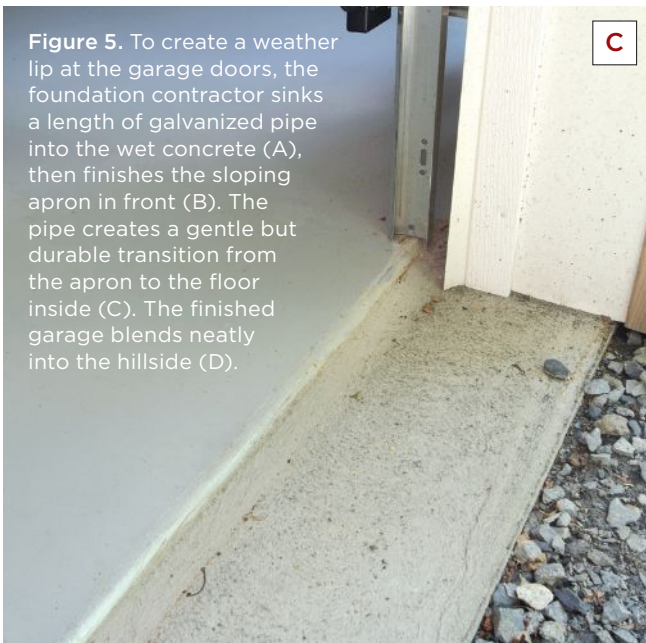


Figure 5. To create a weather lip at the garage doors, the foundation contractor sinks a length of galvanized pipe into the wet concrete (A), then finishes the sloping apron in front (B). The pipe creates a gentle but durable transition from the apron to the floor inside (C). The finished garage blends neatly into the hillside (D).

Instead, we used a detail that Joel Bess, our concrete contractor, has used successfully. He sank a length of 1½-inch-diameter galvanized pipe into the wet concrete, spacing it inside the foundation with 2x4 blocks attached to the stem walls. He tapped the pipe down until the surface of the slab was even with the top of the pipe, then removed the concrete in front of the pipe about halfway down its diameter and sloped it out to the edge of the threshold (**Figure 5**). After the dropped area was roughed out, he removed the blocks and filled in the voids, then floated the surface smooth and finished the outer edge with an edging trowel. The result is a weather lip with a durable rounded edge that won't

chip away over time and that's easy for car tires and lawn-mower wheels to roll over.

After the concrete cured, building the rest of the garage was mostly straightforward, though working with log veneer siding was an experience of its own. We also furred out the back wall of the foundation (which faces the pond), so that we could side it to conceal the tall expanse of raw concrete.

Final Cost

In the end, the addition cost approximately \$55,000 more than if we'd simply backfilled the foundation with compacted stone and poured the slab on top. But the owner ended up with a roomy garage plus a big storage area below. And at 200 to 250 pounds per-square-foot design load, the slab is strong enough for just about any vehicle that will fit through the doors.

Mike Rockwell is part owner and production manager of The House Company in Barnstable, Mass.

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Ductless Heat Pumps

by Jerry Sutherland



These easily installed units offer flexible sizing and high efficiency at moderate cost

I'm an hvac system designer in Vancouver, Wash., just across the Columbia River from Portland, Ore. We install a wide variety of heating and air-conditioning systems, but in recent years our best-selling products have been super-efficient small-to-medium-sized ductless heat pumps (DHP), most of which are retrofitted into existing homes.

That trend has been helped along by now-expired federal and state tax credits and an ongoing rebate program sponsored by the Northwest Energy Efficiency Alliance, or NEEA. The NW Ductless Heat Pump Project, as it's called, helps eligible homeowners cover the cost of converting from existing electric resistance heat — which the regional utilities call “zonal heat” — to more energy-efficient heat pumps. Even before the program took effect,

though, we'd already been putting in quite a few ductless systems; in fact, we've installed more than 600 DHPs in the past few years. They go in quickly and easily, and have proven to be extremely reliable. We almost never have any quality issues with the equipment, and customer satisfaction has been very high.

Heat-Pump Basics

As most people know by now, heat pumps are refrigeration-cycle devices that use electricity to move and concentrate heat energy. During cold weather, the system collects diffuse heat energy from the outdoors and releases it indoors; and during the cooling season, it does the opposite. Although electricity is required to run a compressor, the energy needed to deliver a given quantity of heat with

Ductless Heat Pumps

a heat pump is typically a fraction of what it would take to provide the same amount of heat with resistance base-board heaters or wall-hung units.

Air-source vs. ground-source systems. The NW Ductless Heat Pump Project rebates apply only to air-source heat pumps, which draw heat energy from the ambient outdoor air. In the past, our company has installed some ground-source systems (also known as geothermal systems), which extract heat from soil or groundwater by circulating fluid through a closed loop of buried or submerged tubing. Ground-source systems are at their best under extreme environmental conditions, so they can be a good choice in regions with long, blazing-hot summers or winters that feature long periods of subzero cold.

But in our area, temperatures are quite moderate throughout the year. The design temperature for heating-load calculations, for example, varies from 18°F to 22°F, depending on elevation, while cooling-load design temperatures are in the 85°F to 88°F range. Air-source heat pumps operate very efficiently here, and offer much more bang for the buck than ground-source systems, which must be individually engineered and often cost

tens of thousands of dollars to install. As a result, our company now offers air-source systems exclusively.

Going ductless. The output from any heat-pump system — whether ground- or air-source — can be distributed by way of a conventional duct system served by a central air handler. But the ductless systems I'll be talking about in this article consist of an outdoor unit — made up of a coil, a fan, and an inverter-driven variable-speed compressor — connected by refrigerant lines to one or more indoor fan-coil units, each of which is equipped with a filter, a coil, and a multispeed blower to distribute the conditioned air (see Figure 1).

These kinds of systems are often called mini-splits, to distinguish them from through-the-wall "motel units" that combine the compressor and fan coils in a single package, as in a conventional room air conditioner. But to avoid confusing consumers, we follow NEEA's lead and refer to them as ductless heat pumps.

Measuring efficiency. One standard measure of efficiency for heat pumps while in heating mode is their coefficient of performance, or COP. A heat pump that is operating with a COP of 2, for example, is delivering twice as much heat as a resistance heater that's drawing the same wattage (Figure 2).

Many consumers and contractors will be more familiar with heating seasonal performance factor (HSPF) and seasonal energy-efficiency ratio (SEER) ratings, which in effect average the instantaneous COP figure over an entire heating or cooling system. Some of the ductless systems we install have SEER ratings of more than 20, and HSPF ratings of 12 or more — far exceeding the minimum federal SEER and HSPF standards of 13 and 7.7. Very few ducted heat-pump systems can come anywhere near this level of efficiency.

Sizing Strategies

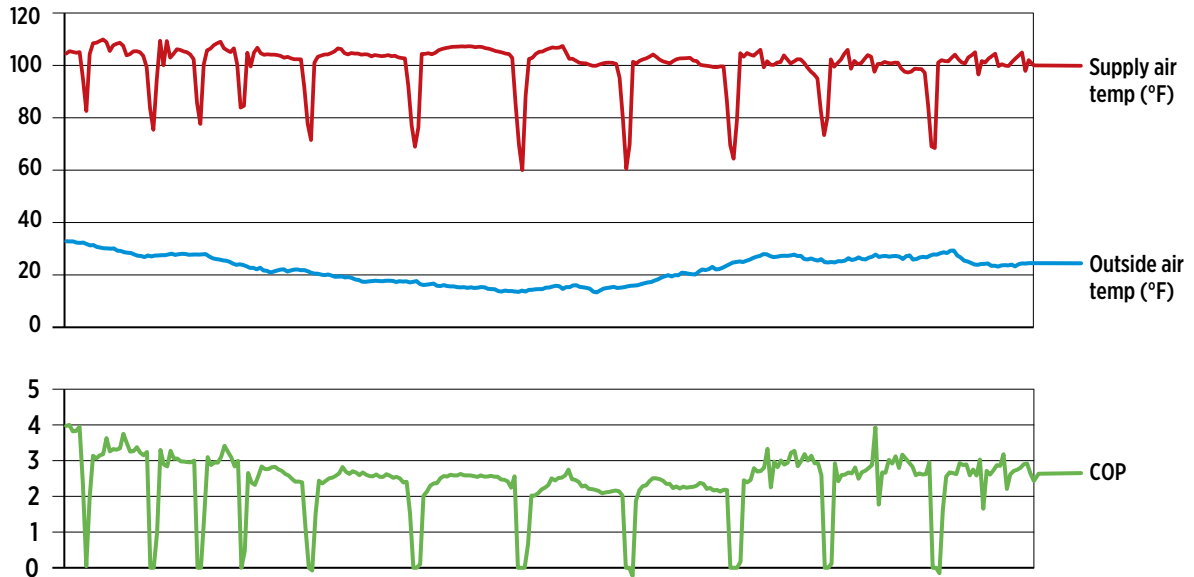
In some respects, the ideal ductless heat-pump configuration is a zoned multihead system. By putting an indoor fan-coil unit in each room or area to be heated, you get the same sort of control over each zone that you would with conventional zoned electric resistance heat. Each indoor unit comes equipped with its own remote control, allowing the residents to tailor the temperature of the main living space and bedrooms to suit their individual preference (Figure 3, page 42).

Displace, don't replace. That approach is standard practice in much of Europe and Asia. In the U.S., however, such systems are less familiar, and many customers balk at the cost and the thought of having to look at a fan coil in



Figure 1. Ductless heat pumps deliver cooled or heated air with one or more indoor fan-coil units. For this home's single-zone system, the surface-mounted indoor unit has been placed in a central area of the living space to distribute the conditioned air as widely as possible.

DHP (#13183) Performance, Logged for 24 Hours



DHP (#13170) Performance, Logged for 180 Hours

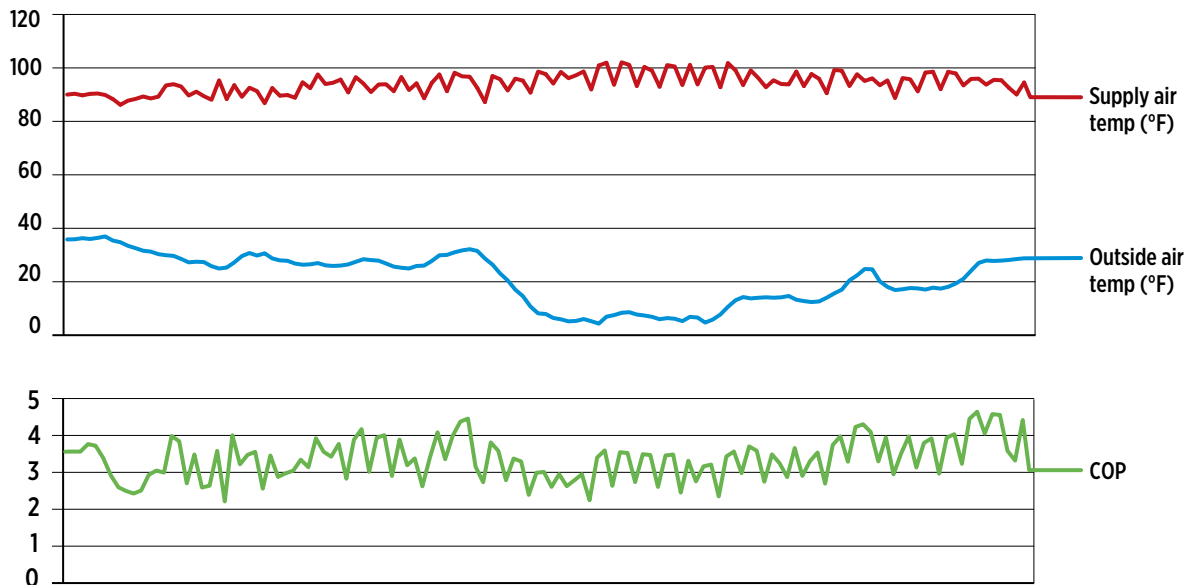


Figure 2. The graphs above show some of the data collected from two of the many ductless heat pumps monitored in operation by Ecotope, a Seattle-based consulting firm that specializes in renewable resources and energy efficiency. The dips in supply air temperature and COP visible in the top graph show what happens when this unit, monitored for one day, kicks into a periodic defrost cycle to clear the outdoor condenser coil of accumulated ice. The bottom graph shows the operation of a different unit — specifically designed for cold-weather operation — during a week in which outdoor temperatures dipped below 10°F; despite the cold the DHP maintained an average 3.4 COP.

Ductless Heat Pumps



Figure 3. Unlike most hvac equipment, which cycles on and off as a thermostat calls for heating or cooling, inverter-driven ductless heat pumps ordinarily run continuously, adjusting their output as needed to maintain a constant indoor temperature. A remote supplied with each indoor unit controls temperature, blower speed, and the position of the vent louvers.



Figure 4. Although indoor units are most often mounted high on a wall, some models are designed to be concealed in a soffit (above) or mounted flush in a dropped ceiling (right). Floor-mounted low-wall units (far right) are also available.



every room. Although we do install some multizone systems, single-zone systems — in which one fan-coil indoor unit is placed in an area of the main living space where it can distribute conditioned air across a wide area — are by far our biggest seller.

In this application, the centrally located indoor unit is responsible for the baseline heating load, and the existing zonal electric heaters provide additional heat to outlying rooms as needed. Energy-use data collected from homes in the NEEA program show that the DHP typically provides all the heat needed during the swing seasons of the year, with the resistance heat coming into play only during the coldest months. This is known as the “displace, not replace” strategy, since the intent is to shift as much of the heating load to the heat pump as possible, without removing the resistance units entirely. Customers who really hate the appearance of their wall or baseboard heaters may be able to remove them from rooms served by a fan coil large enough to handle the worst-case heating load, but I always recommend that they hold off on doing so until they’ve lived with the DHP through at least one severe winter.

Cost and capacity. Today’s homeowners are very cost-conscious. As a result, a lot of contractors will try to keep the upfront cost to a minimum by specifying a DHP system just large enough to heat and cool the main living area where the indoor unit will be installed.

We too will do that, if the room layout makes it impractical to move heated or cooled air to other parts of the house, or if that’s what the customer wants. But if we can use the blower on the indoor unit to provide significant airflow to outlying areas that would otherwise be heated by the resistance heaters, we usually recommend going with a larger unit. Most of the systems we install are rated at 15,000 to 24,000 Btu. Increasing the size of the DHP does carry a higher cost, but a lot of extra capacity is available for a relatively small price bump. In our area, for example, the installed cost of a 12,000-Btu DHP — including state sales tax — is about \$4,000. Going with a 24,000-Btu unit would

increase that figure by only about a thousand dollars.

Of course, the by-the-book approach to sizing conventional hvac equipment (the “book” in this case being the ACCA’s Manual J) is to perform a heating- or cooling-load calculation for the conditioned space, then choose a unit just large enough to handle the resulting design figure. But with a DHP powered by an inverter-driven compressor — the only kind we sell — there’s no need to closely match output and load, because it’s designed to operate continuously over a wide range of speeds. Rather than shortening its operating cycle in response to reduced demand for heating or cooling, the unit simply increases or decreases output as needed, like cruise control in a car.

And remarkably, as a DHP slows down, its overall efficiency actually improves. An oversized unit that’s loafing along, in other words, will use less energy per Btu of output than a smaller one running at near capacity.

In short, when it comes to sizing a DHP, bigger is usually better. A larger model not only operates more efficiently, but the added heat it provides reduces the need for the costly zonal resistance heat that would otherwise pick up the slack. The inherent flexibility in a DHP system is also useful if the homeowner later adds to the heating load by adding on, or subtracts from it by improving the building envelope or beefing up the insulation.

Planning the Installation

There’s a variety of great DHP products on the market today, and we’ve installed quite a few brands over the years. But we rely mostly on Mitsubishi, Daikin, and Fujitsu, all of which offer multiple sizes and models with different features. In deciding which DHP to use for a given installation, we base our choice on the specific combination of features needed, not the nameplate.

Planning the layout. In zoned systems with a fan coil in every room, placement of the units can be fairly flexible. But in a single-zone system, it’s critical to put the indoor unit where it will best distribute conditioned air to the desired rooms. Ideally, it should go fairly high on a wall so furniture and other obstructions don’t interfere with circulation of the conditioned air, and in as central a location as possible. Recessed-ceiling and low-wall units are also available for applications where a high wall location isn’t possible, or for customers who just prefer their appearance (Figure 4).

All indoor fan coils have adjustable louvers to direct the flow of conditioned air as needed. Some models allow the user to choose an oscillating setting that will sweep the airflow back and forth or set the louvers in one position



Figure 5. After the mounting bracket of a wall-mounted indoor unit is screwed to the studs (top), the unit itself is hung on the bracket, with the stubs for refrigerant lines, a condensate drain, and an electric line passing through a hole in the exterior wall (center). The 2⁹/₁₆-inch hole is later filled with canned closed-cell foam and waterproofed with caulk (above).

Ductless Heat Pumps



Figure 6. Concrete riser blocks — which elevate the outdoor unit to provide drainage — are fastened to the pad with construction adhesive (top). Then the outdoor unit itself is put in position (center) and fastened to the risers with Tapcon screws (above).

(so they blow air in the direction of a hallway, for example, to help heat or cool outlying areas of the house). This feature can usually be operated with a remote.

Some DHPs from Mitsubishi include a feature the company calls “i-see,” which uses a roaming infrared sensor to locate the coldest or hottest part of the room and then adjust the louvers to blow conditioned air in that direction. That sounds good, and we find that it can work well in a system with a fan coil in every room. But we recommend against using this feature in single-zone systems, because the sensor tends to direct the airflow continuously toward a window or other localized cold spot, defeating the goal of moving as much conditioned air as possible to other rooms in the house.

Installing the Units

It ordinarily takes two technicians half a day to complete a single-zone installation. After confirming the system design with the homeowner, the installers unpack and install the indoor fan coil while the electrician roughs in the power supply for the outdoor unit. The indoor unit is secured to a mounting bracket that’s screwed to the wall studs; an opening in the sheet metal provides a template for the hole that allows the line set to pass through the wall. After drilling the required 2⁹/₁₆-inch hole, the installers unfold the short lengths of wiring, refrigerant tubing, and condensate line that come attached to the unit, push them through the wall, and secure the unit to the wall bracket. The hole is later filled with closed-cell spray foam and weatherproofed on the outside with caulk (**Figure 5, previous page**).

For the sake of appearance, we try not to put the outdoor unit on the front of the house. If the indoor unit is mounted on a back or side wall, it’s often possible to locate the outdoor unit directly below the wall penetration, which keeps the line set as short as possible. The maximum allowable length varies from 33 to 100 feet, depending on model and manufacturer, so the site layout often has some bearing on the product we’ll specify for a particular installation.

In most cases, we place the outdoor unit on a lightweight 16-by-36-inch mounting pad that looks like concrete but is actually made from polyurethane foam wrapped in fiberglass (diversatech.com). To make sure defrost water won’t refreeze in the drain pan and back up into the unit — which could damage the fan — we provide extra drainage space by attaching two concrete riser blocks to the pad with construction adhesive. Then we place the outdoor unit on the blocks and

Understanding Ductless Heat-Pump Sizing

When the flexible “displace, don’t replace” strategy outlined in this article is followed, it’s easy to select a right-sized ductless heat pump. But in applications where the unit will serve as the sole heating source, the selection process gets a little trickier.

As an example, look at the partial spec sheet for a single-zone heat pump shown below. Note that performance figures are listed for four separate categories: cooling; heating at 47°F; heating at 17°F; and heating at 5°F. In every case, says Mitsubishi engineer Joe Cefaly, the “rated capacity” figure is relatively unimportant; it simply represents the manufacturer’s best guess at where the efficiency “sweet spot” lies within each unit’s range of operation.

More important is the “capacity range,” which gives the high and low output figures at which the unit will operate continuously. When operating in cooling mode, for example, the highlighted model can provide from 2,800 to 12,000 Btu of cooling, or anywhere from a small fraction of a ton up to about 1 ton. If less cooling is required, the unit will begin to cycle on and off, like a conventional single-speed air conditioner, rather than running continuously.

When operating in heating mode at an outdoor temperature of 47°F, the unit’s range is even wider. At that relatively warm temperature, the heat pump can deliver a maximum of 21,000 Btu or throttle back to 3,000 Btu.

But as the outdoor temperature falls, the heat pump’s ability to extract usable heat falls with it, and a second figure — the “maximum capacity” listing — becomes critical. At 17°F, the unit can no longer provide the 21,000 Btu it delivered at 47°F; instead, its new maximum is 13,600, a decline of 30 percent.

At an ambient temperature of 5°F, the maximum capacity falls still further, to 12,500 Btu. (The product we’re considering here — one of Mitsubishi’s “Hyper Heat” models — is designed to operate at unusually low temperatures; many DHPs aren’t configured to heat effectively much below 20°F or so.)

In other words, the colder it gets outside — and the

more heat is needed to keep the indoor temperature at a comfortable level — the less heat a DHP can actually deliver. If its output declines to the point where it can no longer heat the space on its own, some additional heat will be required.

In an energy-efficient new home, the best choice may be to install low-cost electric strip heating as a backup. Although operating costs will be high when the resistance heat is running, it will be needed for such a limited amount of time — perhaps only a few hours each

Single Zone | MSZ Heat Pump

Model Name	Indoor Unit		MSZ-FE09NA-8	MSZ-FE12NA-8	MSZ-FE18NA-8
	Outdoor Unit		MUZ-FE09NA-1	MUZ-FE12NA1	MUZ-FE18NA1
Cooling *1	Rated Capacity	Btu/h	9,000	12,000	18,000
	Capacity Range	Btu/h	2,800-9,000	2,800-12,000	8,200-18,000
	Total Input	W	580 (160-650)	930 (160-960)	1,270 (160-1,250)
	Energy Efficiency	SEER	26	23	21
	Moisture Removal	Pints/h	2.1	2.9	3.8
	Sensible Heat Factor		0.76	0.73	0.70
Heating at 47° F *2	Rated Capacity	Btu/h	10,900	13,600	21,000
	Capacity Range	Btu/h	3,000-18,000	3,000-21,000	7,500-21,000
	Total Input	W	710 (150-2,250)	950 (150-2,250)	1,540 (150-2,250)
Heating at 17° F *3	HSPF (IV)	Btu/h/W	10	10.5	11
	Rated Capacity	Btu/h	6,700	7,900	13,600
	Rated Total Input	W	650	750	1,250
Heating at 5° F	Maximum Capacity	Btu/h	12,500	13,600	21,000
	Maximum Capacity	Btu/h	10,900	12,500	18,000
Power Supply	Phase, Cycle, Voltage				Phase, 60 Hz
	Indoor - Outdoor S1 - S2				AC 208-230V

When sizing a ductless heat pump in a mixed or heating climate, it’s important to match the “maximum capacity” spec at the design temperature to the expected load.

year — that the total expense will be low. (Be sure to check your local code; some jurisdictions may prohibit the use of backup resistance heat.)

A woodstove is another possible source of low-cost backup heat. And while it doesn’t make economic sense to install a new furnace or boiler to back up a heat pump, an existing heating system can sometimes provide backup in a retrofit situation. “A lot of people will install a heat pump to lower their energy costs and add air conditioning,” says Cefaly. “If they have functional heating equipment that’s not at the end of its service life, they can hang onto it and use it on the rare occasion where they need to.” — *Jon Vara*



Figure 7. If no suitable position for a ground mount is available, the unit can be wall-mounted on a manufactured bracket.



Figure 8. Refrigerant lines and wiring on the exterior wall are protected with a vinyl or sheet-metal cover. Condensate drain tubes are visible at lower right.

secure its mounting feet to the blocks with Tapcon screws (Figure 6, page 44).

If there's no suitable flat ground available, we install the outdoor unit on a manufactured wall-hung mounting bracket that keeps it well off the ground and a suitable distance from the wall (Figure 7). We've learned from experience not to put brackets over an outdoor deck, though, because it really bothers customers to see its surface wetted by defrost water, even though the entire deck may be soaked with rain for much of the year. We also avoid putting an outdoor unit directly on a deck, both because of the drainage issue and because we're concerned that vibration of the deck structure could lead to cracking of welds or other unforeseen long-term problems.

Refrozen defrost water is a potential hazard, too, if an outdoor unit is mounted above a sidewalk or hard-surfaced patio (or — again — a deck). The only time we'll place it in that type of location is if there's no better option available, there's no regular foot traffic in the area, and the customers sign off on the contract saying that they've approved it.

Line Set and Cover

Once both units are in place, they're connected with copper refrigerant line. If an exposed horizontal run is necessary, we ordinarily route it low along the wall, where it will be relatively inconspicuous. The paired refrigerant lines — which come wrapped along their length with insulation — are secured to the siding with two-hole pipe straps. Once the line set is secure, the electrician runs the cable from the outdoor unit to the indoor fan coil, zip-tying it to the line set. This is required under our state code — elsewhere it may be possible to use line sets that come with the required cable bundled with the refrigerant lines.

After the refrigerant lines have been pressurized with nitrogen and tested for leaks, we install a protective cover over the line set, which helps prevent physical damage and deterioration from the UV in sunlight. Depending on the situation and the customer's preference, we'll use either manufactured vinyl "line hide" covers or 26-gauge aluminum covers that we make up as needed in our own sheet-metal shop (Figure 8). These are reversible and pre-painted white on one side and brown on the other, allowing us to use whichever side looks best with the siding. The owner can then paint over it for a more exact match later, if desired.

Jerry Sutherland is an estimator and hvac system designer with MetFab Heating in Vancouver, Wash.



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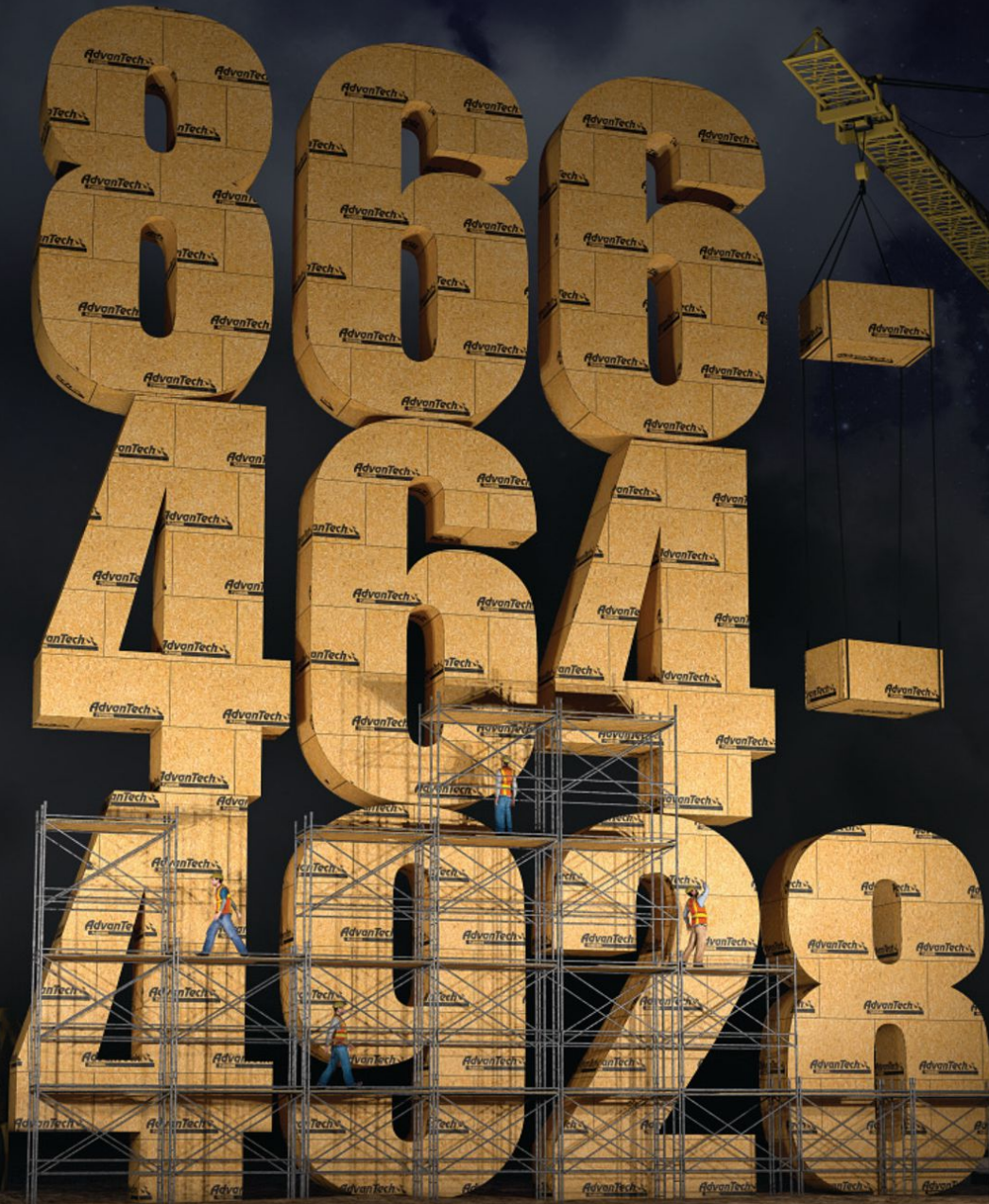
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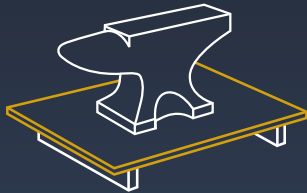


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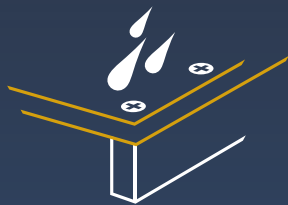
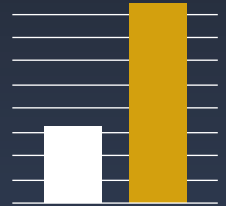
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ENGINEERED
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Restoring a Round Porch

by Ben Kelley

Rot-resistant materials and better details extend the life of this unique coastal porch



Recently we renovated a semicircular screened porch, one of the key features on a classic 1930s Martha's Vineyard home. Like a lot of coastal porches, this one had rot issues, particularly at the base of the sculpted fir posts. The posts had been repaired more than once, but the underlying problem had never been corrected. Our plan was to retain as much of the original woodworking as possible, replace what we had to, and incorporate details that would prevent future rot.

Column Repair

Before pulling the supports, we documented the existing ceiling height, the distances between the posts, and the size of the openings for the screen panels. This would make it easier to replace everything in its original location and

Restoring a Round Porch



Figure 1. The 2x10 fir laminations of the partial replacement posts are offset to create a slot for joining to the original post sections (far left). After scribing the original column patterns (left) and cutting them out on a band saw, the author created a matching tongue profile with a router (below).



replicate the appearance of the original porch. The posts were held in place with 20d nails driven down through the top plate, a surprisingly strong connection that was difficult to disassemble. (After seeing how durable this connection proved to be, we used a similar detail when we re-installed the posts, replacing the 20d nails with 6-inch TimberLok structural screws, four per post.)

Epoxy to the Rescue

Back in the shop, we inspected each post carefully for rot — at least the portions that didn't disintegrate on removal. Because the bottoms had been resting directly on the sill plates or decking, most of the damage was within a couple of feet of the base. There was also some rot where horizontal sections of the scrolled profile had caught water. We cut off the rotted sections, but saved them to use as templates.

We assembled the replacement sections from four layers of 2x10 vertical-grain fir

laminated together with West System two-part epoxy (see Figure 1). We clamped the laminations together as the epoxy set, and also reinforced the assembly with torque screws and 1/2-inch-diameter through-bolts, countersinking the bolt holes and later filling them with fir plugs. To create a T&G profile that we could use to join the new and old column sections together, we offset the two outer laminations by 6 inches.

Using the removed column sections as templates, we scribed the appropriate profile onto each of the new blanks, then cut the profiles out on our band saw. We used a router with a 2-inch straight bit to give us a clean joint for the tongues on the old columns, then finished and fine-tuned the tenons with a chisel and belt-sanded the cuts smooth.

We joined the old and new column sections together with more epoxy, reinforcing the joints with 1/2-inch-diameter galvanized carriage bolts, which we drove through predrilled holes (Figure 2).

We also countersunk these holes, and later filled them with wood plugs. Some of the old 6-inch-by-9 1/2-inch columns were warped, so we trued and cleaned them up with our 16-inch beam saw. We patched blemishes and minor areas of rot with epoxy thickened with epoxy filler, then smoothed the cut edges with a belt sander. To clean up the scroll work, we used a drill-mounted paddle-style sanding wheel and a Fein detail sander. Then we primed the columns and brought them back to the site.



Figure 2. The new and old column sections were joined together with galvanized through-bolts and epoxy (above). Once the columns were reassembled, a worker straightened them with a large-capacity beam saw (right).



Deck Repair

Next, we stripped the remaining decking. The tops of the joists had been flashed with felt paper and many were in reasonable shape, but we ended up replacing the framing around the perimeter of the deck. Because the original framing sagged slightly toward the center, we wanted to pitch the new deck away from the house and provide positive drainage. The deck framing was freestanding, with the ledger beam at the house supported by the stem-wall foundation at the ends and by a pair of block piers midspan. It was a simple matter to raise the ledger by installing blocking on top of the piers, but unfortunately the doors limited the elevation change to about an inch. Still, one inch of pitch per 16 feet of deck is better than none at all.

After doubling the ledger with an additional PT 2x10, we reinforced the connection between the ledger and the pair of beams perpendicular to the ledger with

Simpson ZMax right-angle hangers. Each beam also had some rot damage out near the sill, but instead of replacing the beams, we cut off the rotted sections and replaced them with new PT framing. PVC Redi-footings (866/586-6082, redifooting.com) installed underneath the splice joints support the framing.

Finally, to make sure the radiused sill and rim joist would provide fair and smooth backing for new fascia trim, we set up a large trammel at the centerpoint of the deck (**Figure 3, next page**). Then we installed PT blocking on the flat around the perimeter of the deck, and used the trammel to scribe the radius on the blocking. After cutting the curved profile with a circular saw, we padded the framing below this cut to our new radius line.

Reinstalling the Posts

To prevent the column bases from contacting the framing, we reinstalled the columns on top of Simpson CPS6 standoff

bases, which we had fastened to the bottoms of the columns with stainless steel screws. We secured the columns to the sill with Simpson angles and 1/2-inch-diameter lag bolts, and secured them to the top plate with TimberLoks.

Afterward, we trimmed the rim joist with 3/4-inch-by-10-inch Azek. PVC is not my first choice of trim material, but for locations like this where the deck is close the ground and prone to rot, PVC makes a lot of sense, and it was easy to bend around the curved rim joist.

Decking

We sent the new vertical-grain fir decking to a local painting contractor, who primed and applied the first coat of Pettit marine paint to all four sides. Even on Martha's Vineyard, marine paint isn't typically used on decks, but our client had previous experience with it and this particular brand had the color she was looking for. After the decking was installed,

Restoring a Round Porch



Figure 3. The author replaced the rotted joists with treated framing, then used a trammel arm (left) to scribe the deck's radius onto blocking installed on the flat around the perimeter of the deck (right).



Figure 4. To cut the new decking to length after installation, the author made a plywood extension fitted with a curved fence for his Porter-Cable 4½-inch trim saw (left). One person manned the saw while another crew member removed the offcuts (above).

the painting contractor touched up the deck, primed again, and then applied the finish coat.

We installed the decking using the Camo hidden fastener system (800/968-6245, camofasteners.com). One advantage of this system is that it self-spaces the decking to $\frac{3}{16}$ inch, which allowed us to eliminate the new foundation vents called for in the original plans (the existing decking had been butted tightly together, and any gaps had long since been sealed up with paint). Another advantage is that the fasteners mostly eliminate predrilling, though we had a few problems with end-grain splitting at the butt joints. We solved this issue by driving stainless steel screws through the face of the boards at butt joints.

To cleanly cut the decking around the perimeter of the porch, we fashioned a simple jig for our circular saw consisting of a plywood table and a curved fence that matched the radius of the porch (**Figure 4**). With the saw clamped to the table, the jig was a little heavy but made it easy to safely and smoothly cut the radiused profile in the decking.

Costs

It took about 14½ hours to remove each post and repair it, or 115 hours for eight posts. This included laminating and milling the new extensions, reassembling the posts, and prepping them for paint.

Additional demo and structural work added almost 40 hours to the job. Repairing the deck framing took us almost 60 hours, while installing the decking on the 32-foot-diameter deck with the Camo system took about 66 hours. That included priming the end cuts and custom cutting the decking around the posts.

Ben Kelley owns Building Shelter, a building and remodeling company in Vineyard Haven, Mass.

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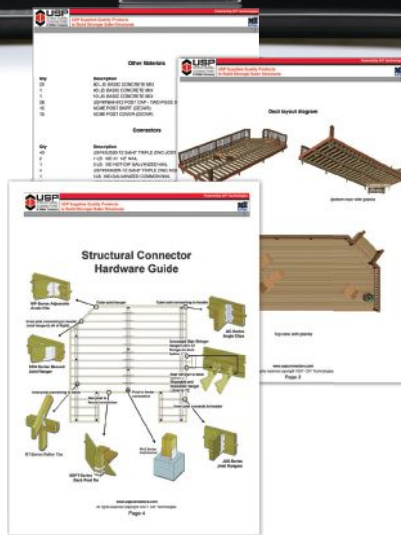
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Kitchen & Bath Show Roundup

Problem-solving products from KBIS 2012

by Bruce Greenlaw

When times get tough, think kitchens and baths. That's what many builders and remodelers are doing, and that's why *JLC* decided to visit the latest Kitchen & Bath Industry Show, held this April in Chicago. The annual event — which is owned by the National Kitchen & Bath Association — drew 32,000 attendees and featured 550 exhibitors, from solo entrepreneurs displaying single prototypes to mega manufacturers showcasing soft-close cabinets, vitamin-saving ovens, automatic bath fans, chic surfaces, and much more. The biggest surprise? The show offered a wealth of practical solutions for builders and remodelers, including hardware and fixtures that are easier to install than their predecessors, quick cabinet upgrades, and toilets for tight spaces. On the following pages are some of our favorite products, with some fancier items thrown in for good measure.



FLEXIBLE CABLE DRAINS

Kohler's new *PureFlo* universal cable drains have a flexible neck that should make them easy to install regardless of the bath-wall slope. They come with a 30- or 45-inch cable to accommodate bathtubs 14 to 26 inches deep, and accept seven different trim kits offering either rotary-turn or push-button actuation and a variety of styles and finishes. For a change of pace, homeowners can easily change the appearance or the actuation method from the surface of the tub. The drains cost \$70 to \$210, and the trim kits \$55 to \$165.

Kohler, 800/456-4537, us.kohler.com.



SPACE SAVER

If you need to fit a toilet into a tight space, consider a wall-hung model. Its tank and carrier frame fit inside the wall, saving about 9 inches of floor space (compared to a standard floor-mounted toilet). Geberit's concealed tanks and carrier frames have standard plumbing connections, fit into 2x4 or 2x6 walls, work with wall-hung toilets made by a variety of manufacturers, and allow you to set the seat at 15 to 19 inches high. Actuator flush plates provide push-button flushing and tool-free access to all working parts. The tank-and-carrier units cost \$500 to \$630, and the actuator flush panels \$80 to \$540. Wall-hung toilets typically cost \$300 to \$800 (though some cost over \$3,000).

Geberit, 800/566-2100, geberit.us.

LINEAR DRAINS

Linear drains allow shower floors to slope in one direction, so you can install large-format tiles and — if desired — eliminate the curb for a contemporary, barrier-free design. Noble's *FreeStyle* linear drains are made of PVC or ABS and include a choice of four brushed stainless-steel strainers. They're 2 to 6 feet long and clamp to your waterproof membrane to prevent leaks. The standard kit is designed for thin-bed installations, but Nobel says it's about to introduce an adapter for mortar beds. The PVC version costs \$460 to \$880, the ABS version about 10 percent more. The mortar-bed adapter will cost about \$65.

Noble Co., 800/878-5788, noblecompany.com.



VERSATILE HINGES

The *Tiomos* hinge collection can handle almost any application in frameless and face-frame cabinets with full-overlay, overlay, half-overlay, or inset doors, regardless of the size or weight of the doors. The hinges come in a self-close version or with a soft-close mechanism that's concealed in the hinge arm and adjusts for three levels of closing action. They're supposed to be easier to adjust than most hinges, which should help to minimize gaps. Prices start at \$4 apiece.

Grass America, 800/334-3512, grassusa.com.



ONE GALLON PER FLUSH

According to Toto, its new two-piece ADA-compliant *1G* toilet is the first gravity-fed model to use just one gallon of water per flush. This is possible, the company says, because of the toilet's dual-nozzle Double Cyclone flushing system. The toilet costs about \$600.

Toto USA, 888/295-8134, totousa.com.

LABOR-SAVING GROUT SEAL

Instead of water, mix DuPont's *StoneTech Professional Stain Protecting Grout Additive* with your sanded or unsanded cement-based grout to eliminate the extra step of sealing the grout after it cures. The additive won't affect the grout color, the company says. A 27-ounce bottle costs about \$25, a 67-ounce bottle about \$50.

DuPont StoneTech Professional, 877/786-6383, stonetechpro.com.



FLOWS UPHILL

Putting a bathroom in a basement? One option is to install a macerating toilet. Liberty Pump's new ADA-compliant *Ascent II* model uses replaceable utility-knife blades to liquefy waste, mixes in flushing water, and then pumps the fine slurry up to 25 feet vertically and 150 feet horizontally to a sewer or a septic tank. The macerator can simultaneously accept wastewater from several other fixtures (such as a sink, shower, and bathtub). An alarm announces trouble, and an access panel makes it possible to service the macerator without removing it from the toilet. Prices are \$1,130 for a round-front toilet and \$1,180 for an elongated toilet.

Liberty Pumps, 800/543-2550, libertypumps.com.





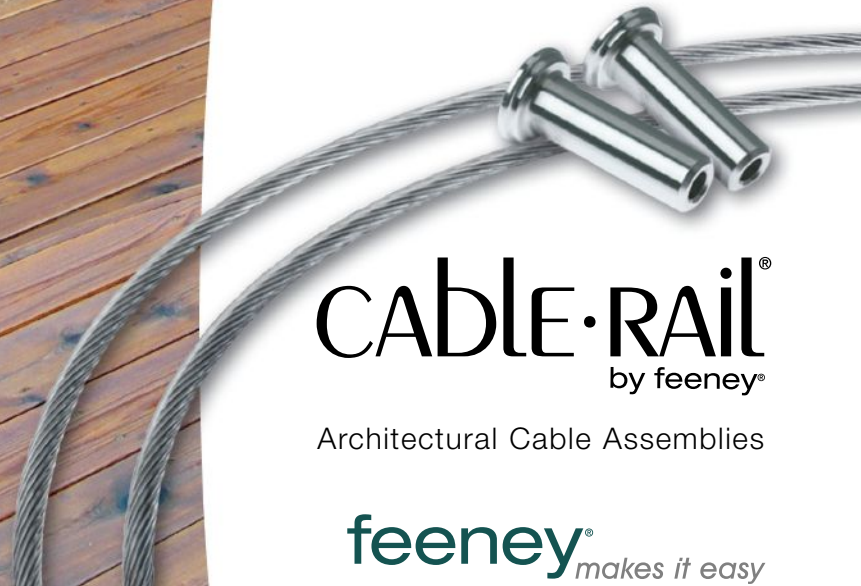
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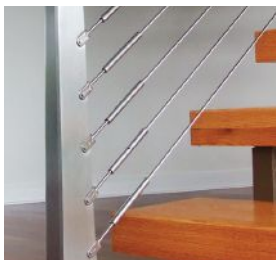
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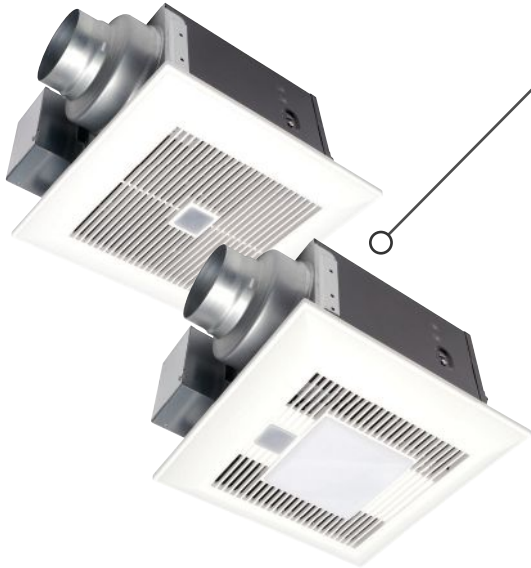
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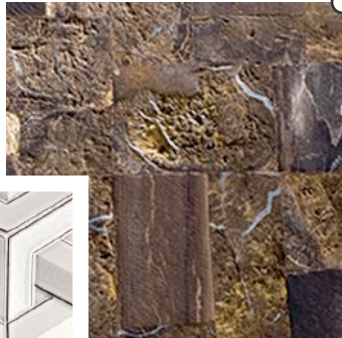
SENSITIVE BATH FANS



Panasonic's 80-cfm and 110-cfm *WhisperSense* and *WhisperSense-Lite* bath fans are the only ones on the market that respond to both motion and humidity, says the maker. The motion sensor activates the fan when anyone enters the bathroom, and turns it off after the person exits — unless someone takes a shower or bath, in which case the humidity sensor takes over and keeps the fan on until the humidity drops to the desired level. (A built-in delay timer can be used to keep the fan running for up to an hour extra.) The fan connects to 4-inch or 6-inch ducts with no additional adapters required. *WhisperSense-Lite* models add a 32-watt CFL and a night light. Prices range from \$330 to \$475.

Panasonic Eco Solutions, 866/292-7292, panasonic.com/ventfans.

WILD TILE



Ann Sacks launched eight new sustainable tile collections at the show, with prices per square foot ranging from \$10 and up for a porcelain tile that resembles wood-plank flooring to \$350 and up for tiles made of stingray skin. The Ogassian and Petrified Wood samples shown here cost \$100 and \$225 per square foot, respectively.

Ann Sacks, 800/278-8453, annsacks.com.

Ogassian



Petrified Wood

ACCESSIBLE CABINETS

Wellborn makes its kitchen and bath cabinets — including doors, drawers, and face frames — in Alabama and even has its own sawmill. Its *Active Living Collection* is designed to improve accessibility for people of all ages and abilities. This “universal design” option is now available for good, better, and best cabinetry with no upcharge.

Wellborn Cabinet, 800/762-4475, wellborn.com.





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SMART PULLOUT

According to Hafele, 80 percent of all base cabinets have a drawer over the door, yet 80 percent of the accessories made for these cabinets require a full-height door. Hafele's new *SmartCab* pullout fits into 15-inch or 18-inch base cabinets that have a drawer above the door, and it can be customized using interchangeable "Apps" like trays, a knife block, and a roll manager. The pullout mounts to the base cabinet with four screws and includes soft-close runners. It can be installed behind a hinged door, or the door can be attached to the front of the pullout. The pullout sells for \$290, and the Apps sell for \$20 to \$130.

Hafele America, 800/423-3531, hafele.com/us.

TOP-DRAWER RUNNERS

Blum's improved *Tandem plus Blumotion* soft-close full-extension undermount drawer runners — due to roll off production lines in North Carolina by the end of summer — will allow "four-dimensional" adjustment using simple built-in levers and dials. In other words, they'll allow you to adjust drawers from side to side and tweak their height, tilt, and depth (which should be especially useful for aligning inset drawer fronts). The runners are designed to meet or exceed ANSI/BHMA test specs with a 100-pound static load for good stability and minimal sag. They'll cost \$15 to \$40 per pair.

Blum, 800/438-6788, blum.com.



CONVINCING LAMINATES

Laminate countertops are still the economical choice, but — thanks to advanced printing techniques, tactile surfaces, improved durability, and new edges with less-conspicuous seams — today's top-of-the-line laminates seem like a whole new category. Formica just added five new patterns plus IdealEdge bullnose and ogee edges (which eliminate brown seams and work with curved, clipped, or 90-degree corners) to its *180fx* line of "exotic stone and granite" laminates. With the new edges, these countertops cost about \$25 to \$28 per square foot installed versus about \$12 per square foot for the company's standard laminates.

The *Wilsonart HD* brand of decorative laminates now includes more than 50 realistic surfaces, including 14 new ones inspired by Mediterranean and South African natural stone. The maker just unveiled two new edges — the Cascade and the Crescent — for a thick, seamless appearance. Integrated sinks are also available. The countertops and new edges cost about \$31 per square foot installed, and an integrated sink adds about \$400.

Formica Corp., 800/367-6422, formica.com.

Wilsonart International, 800/433-3222, wilsonarthd.com.



Formica



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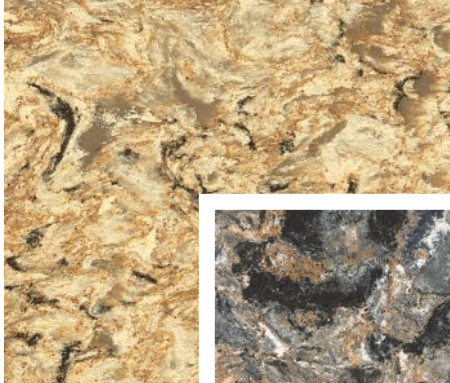
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*Warranty applies to all Honda GX Series Engines and GX Series-powered Honda Power Equipment, 100cc or larger, purchased or put into rental service since January 1, 2009. Exceptions apply. See full warranty details at honda.com. Does not apply to EU1000 models. Please read the owner's manual before operating your Honda Power Equipment and never use in a closed or partly enclosed area where you could be exposed to carbon monoxide. Connection of a generator to house power requires a transfer device to avoid possible injury to power company personnel. Consult a qualified electrician. ©2011 American Honda Motor Co., Inc.

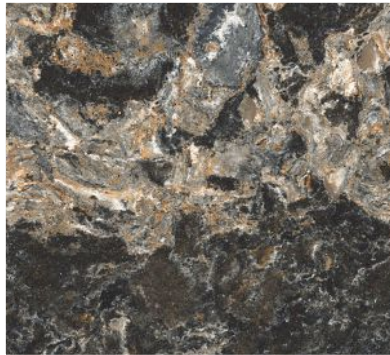
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QUARTZ SURFACES

In the world of countertops, quartz and granite are upscale rivals. Granite countertops are solid stone and require periodic sealing, while quartz countertops typically contain 93 percent pure quartz crystals blended with advanced polymers and require no sealing. Cambria claims that it offers the largest selection of quartz countertops in the world — more than 100 options. It makes all of its slabs in Minnesota. The countertops cost \$65 to \$100 per square foot.

Cambria USA, 866/226-2742, cambriausa.com.



WOOD COUNTERTOPS

Grothouse Lumber says its custom edge-grain, flat-grain, and butcher-block countertops and bar tops are made from more than 60 responsibly harvested wood species. The company offers 30 standard edge profiles, 40 stock stains, custom stain matching, and its own Durata permanent finish for non-chopping applications. It also makes custom wood sinks. Standard lead time is two to three weeks, and prices range from \$80 to \$400 per square foot. The 2¹/₄-inch-thick edge-grain Peruvian walnut countertop shown features a Durata Matte finish and costs \$160 per square foot.

Grothouse Lumber, 877/268-5412, glumber.com.



COMPATIBLE COPPER SINK

A contemporary take on the traditional farmhouse sink, the new *Paragon* undermount apron-front sink by Native Trails is made of 16-gauge hand-hammered recycled copper. Its apron drops just 6¹/₂ inches to allow easy installation in standard cabinetry. It costs about \$3,000 with an “antique” finish or \$4,300 with a brushed-nickel finish.

Native Trails, 800/786-0862, nativetrails.net.

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CLEAN ASSEMBLY



The typical way to plumb a kitchen sink is to insert a strainer body or garbage-disposer sink flange ringed with plumber's putty into the drain hole, then secure it from beneath with a lock washer or screws.



Lenova's *PermaClean* stainless-steel sinks eliminate the strainer bodies and sink flanges and their unsanitary exposed seams. The drain hole flares underneath, creating a lip that accepts a special EPDM gasket so you can secure drain fittings or disposers by simply snapping on the C-clamp included with the sink. Other features include removable splash guards and strainer baskets that double as disposer plugs. The sinks cost \$275 to \$1,030, which includes the drain set.

Lenova Sinks, 877/733-1098, lenovasinks.com.

EVERYTHING PLUS THE KITCHEN SINK



Available in lengths of 4, 5¹/₂, and 7 feet, the trough-style stainless-steel *Galley* sink holds interchangeable cutting boards, colanders, bowls, and other accessories that slide above and below each other to create a versatile indoor or outdoor work station. You can also insert a galley divider and fill part of the sink with ice and drinks. The sink costs \$3,900 to \$7,000, with various accessories included. Additional accessories cost \$45 and up.

The Galley, 918/794-2700, thegalleyssink.com.

CHOICE DISPOSERS



InSinkErator's *Evolution* series offers quiet and efficient "food waste disposers" for a broad range of applications — the Compact, for instance, fits in tight spaces, and the Septic Assist injects a solution into the waste that supposedly helps keep septic systems healthy. All of the disposers feature twist-on/twist-off sink mounts. They cost \$375 to \$645.

Emerson Electric Co., 800/558-5712, insinkerator.com.

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Delta



EASY FAUCETS

Pull-down and pull-out faucets are becoming the new standard for kitchens because their built-in multifunctional heads eliminate the need for a separate side-spray and make it easy to fill large pots. Delta's *Allora* pull-down faucet features the new EZ Anchor mounting assembly, which allows you to install the faucet from up top using the included EZ Bar and a screwdriver. (You still have to connect the lines underneath, but at least you don't have to lie on your back inside the cabinet.) The faucet comes with a chrome or stainless finish and costs \$410 or \$550.



Moen



Moen's new *Arbor* pull-down faucet with MotionSense has the usual handle but can also be operated by waving a hand over the spout or placing something underneath. The motion sensors are powered by six AA batteries that typically last about a year, or an optional AC adapter can be plugged into a GFCI outlet. The control box mounts under the sink. The faucet comes in three finishes — chrome, oil-rubbed bronze, and stainless — and costs \$625 to \$690.

Delta Faucet Co., 800/345-3358, deltafaucet.com.

Moen, 800/289-6636, moen.com.



SEGMENTED COOKTOP

Induction cooktops use electromagnetic energy to heat magnetic cookware directly while staying relatively cool to the touch. They change cooking temperatures instantly, boil water in a snap, and are easy to clean, but you have to learn how to cook by numbers to control the heat levels — which is why some people find it easier to cook some recipes with gas. Bertazzoni's new *Design Series* of segmented cooktops includes the versatile model PM36 1 IG X, which offers gas on the left, induction on the right, and an electric griddle in between. It fits the standard cutout for a 36-inch cooktop. Winner of the KBIS "Best of Show" award, the cooktop costs \$2,700. Other burner combinations are also available.

Bertazzoni, 866/905-0010, us.bertazzoni.com.



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FULL STEAM AHEAD

According to Wolf Appliance, steam ovens cook up to 25 percent faster than standard ovens and help food retain up to 22 percent more vitamin content while preserving color, taste, moisture, and texture. The company's new stainless-steel *Convection Steam Oven* allegedly cooks everything from pastries to asparagus to rack of lamb, rejuvenates leftovers, works great for defrosting, and virtually eliminates the need for butter and oil. Other advanced features include a gourmet mode that automatically sets the time and temperature based on the amount and type of food being cooked. The oven costs \$3,500.

Wolf Appliance, 800/222-7820, subzero-wolf.com.



QUICK MASONRY FOR OUTDOOR KITCHENS

Eldorado Stone says it offers a faster and easier way to build masonry outdoor kitchens. *Eldorado Outdoor* is a collection of modular units that assemble quickly into the kitchen's basic shape and accept Eldorado or other manufactured stone or brick. The units are made of lightweight glass-fiber reinforced concrete that can be cut out on site to accommodate appliances and fixtures. The collection also includes sitting walls, fireplaces, and a fire pit. You can design your own configuration using the company's website. The modular components for the project shown cost about \$5,400.

Eldorado Stone, 800/925-1491, outdoor.eldoradostone.com.



OPENING GLASS WALL

NanaWall makes opening glass walls that meet fenestration-industry standards for air infiltration, water penetration, structural performance, and forced entry. The *NanaWall Kitchen Transition* promoted at the show is a custom window and door configuration that allows an indoor kitchen to double as an outdoor one, eliminating costly duplication and extra maintenance. The wall shown would cost about \$19,000, or \$1,000 per lineal foot.

NanaWall Systems, 800/873-5673, nanawall.com.



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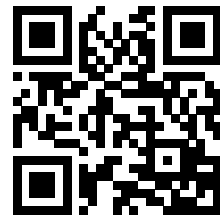
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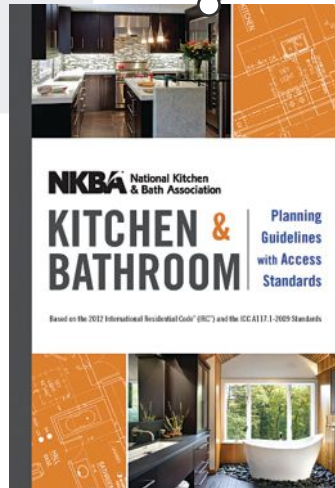
FUTURISTIC DIMMERS



Lutron's new C.L dimmers can dim incandescent and halogen bulbs as well as dimmable CFL and LED bulbs. They can even dim a mixed load of light sources on the same circuit. Lutron says they're free of common CFL and LED dimming problems like "drop-out" (bulbs turning off before the slider reaches the bottom). Several models are available, with prices from \$15 to \$40.

Lutron Electronics Co., 888/588-7661, lutron.com.

HANDY REFERENCE



The biggest KBIS booth belonged to the National Kitchen & Bath Association, which offers industry professionals all sorts of information, including the 84-page *Kitchen & Bathroom Planning Guidelines With Access Standards*. Based on the 2012 IRC and the latest ICC access standards, this illustrated spiral-bound booklet contains 31 guidelines for kitchens and 27 for bathrooms. It costs \$15 (\$12 for NKBA members). For \$5, you can buy an app for the iPad, iPhone, iPod Touch, or Android containing the same information, but searchable.

NKBA, 800/843-6522, nkba.org.

MODULAR LED TRIM

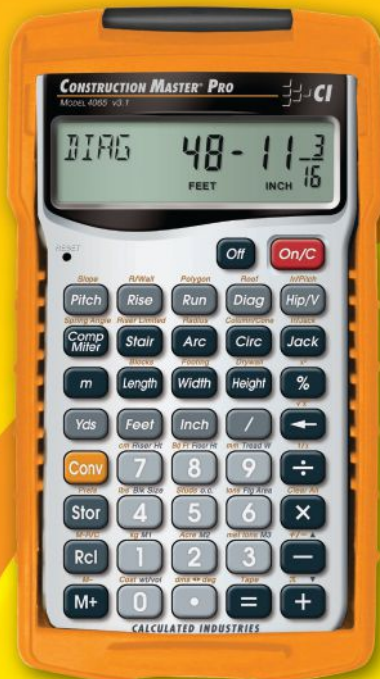


Keeler-brand *LIT* (Light Integrated Trim) combines low-voltage LED lighting strips with decorative trim and other elements to accent everything from cabinets and backsplashes to porch and deck railings. According to the manufacturer, you can easily create a continuous strip of any length with no soldering required. Various styles of decorative trim and optional covers (which can change the quality of the light) simply snap on. The product costs \$10 to \$40 per running foot.

Belwith Products, 800/235-9484, keelerproducts.com.



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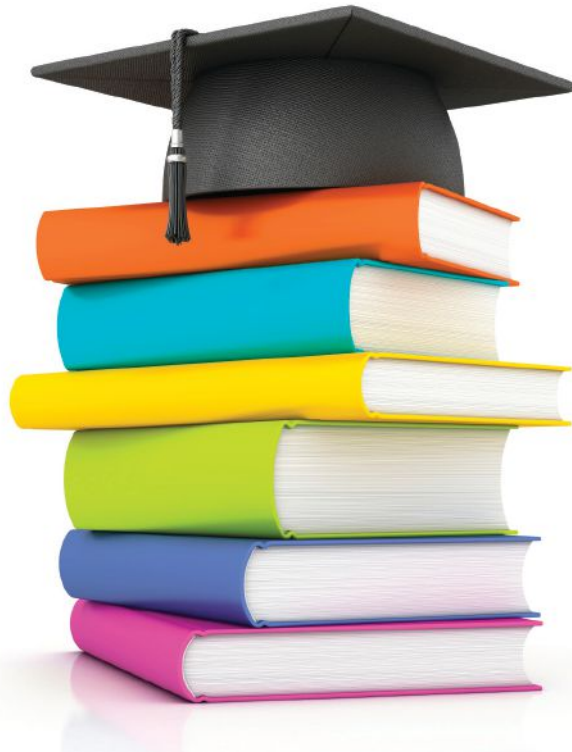
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Products | by Tom O'Brien

Flow-Through Ventilation. Marvin says its *Ultimate Venting Picture Window* offers an unobstructed view (no mullions or visible screens) while still allowing airflow. "Opening" the unit involves flipping a pair of handles to push the sash away from the frame enough to create a gap around the edges (a hidden screen keeps out bugs). The window comes in a range of custom sizes; the contractor's price for a 48-by-48-inch unit at one New England supplier I called was \$975.

Marvin Windows and Doors, 888/537-7828, marvin.com.



Fourplex Receptacles. Duplex receptacles from Current Werks feature two built-in USB ports alongside the 110v outlets. Available in standard and decorator styles and three colors (white, ivory, and light almond), the devices cost \$30. The company also sells a stand-alone four-port USB outlet for \$40.

Current Werks, 408/827-1180, currentwerks.com.



Durable Decking. Eastman Chemical Co. says it's developed a process that combines heat, pressure, and an "organic compound" (which it won't name) to make wood cells impervious to moisture and rot. Its *Perennial Wood* is supposedly 25 percent harder and three times more stable than raw wood. It's available as 5/4x6 bullnose deckboards for about \$3 per linear foot; other applications are pending.

Eastman Chemical Co., 800/530-7495, perennialwood.com.



Foot Wiper. When workers have to walk through occupied spaces, a *Dirt Grabber TakMat* keeps them from leaving a trail of debris in their wake. The 2-by-3-foot plastic mat has a sticky surface that pulls dirt off shoes and traps it. Each mat has 30 layers; when one gets dirty, you peel it off and throw it away. A box of two self-adhesive TakMats (60 sheets total) costs \$58. A reusable (nonadhesive) base costs \$44.

Protective Products International, 800/789-6633, protectiveproducts.com.

For more information about these products, go to <http://jlc.hotims.com>.

Products



Safety Rails. The *Horizontal Under-Eave Guardrail System* (HUGS) is intended to be an easy-on, easy-off rooftop railing for use with trusses or open-tailed rafters. A metal “Quick Bracket” slips over the tail of the truss, and the orange guardrail is fastened to the bracket. In many cases, both parts can be installed before the trusses leave the ground. Each guardrail costs \$138. Nail-on brackets, which remain in



place after the work is done, are \$5.50 apiece. Reusable screw-in brackets cost \$14.75.

Hugs One,
888/448-4723,
hugsafety.com.

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Products

Better Slider. The sash on Lincoln's redesigned *Glider Windows* slide on nylon pads instead of rollers for easier, quieter operation, says the company. Other improvements include coped joints rather than miters and an optional extruded aluminum cladding that's available in 17 stock colors and unlimited custom colors. Glazing options include an exterior coating called NEAT that supposedly resists dirt and streaks. A fully equipped 5'-4" x 5'-0" unit costs about \$1,160.



Lincoln Wood Products, 800/967-2461, lincolnwindows.com.

Traditional Profile. Replicating a historic molding profile no longer requires custom millwork or a scavenger hunt. The 66 varieties of casing, base, crown, chair-rail, and panel moldings in the *KB Classical Moulding Collection* are milled from domestically sourced yellow poplar, then primed and sanded before being shipped to the end-user. Casing prices range from \$1.50 to \$4.40 per foot; crowns cost between \$1.30 and \$3.85 per foot.



Kuiken Brothers Co., 201/652-1000, kuikenbrothers.com/classical.

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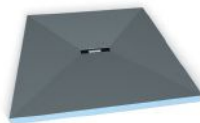
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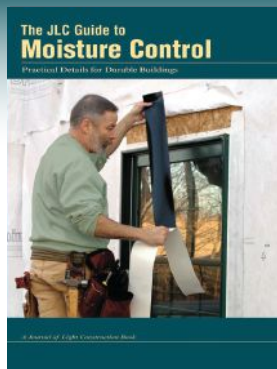
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Products



Exterior Trim. Royal Building Products has partnered with the designer of the Katrina Cottage to develop a series of affordable window- and door-surround trim packages. *Royal Envelop* by *Marianne Cusato* one-piece surrounds (with optional headers) are made from cellular PVC. The contractor's cost (including labor) to trim out a 2'-6" x 4'-6" window ranges from about \$80 to \$100.

Royal Building Products, 800/368-3117, royalbuildingproducts.com.



Ultra-Modern Bath. Don't let a nearly unpronounceable name dissuade you from considering the *Ilbagnoalessi One* bathroom collection. The washbasins, freestanding tub, and wall-hanging toilet and bidet all feature a curvy, minimalist design and come in classic white or gray. Prices range from \$1,850 for the bidet to \$8,750 for the tub.

Laufen Bathrooms North America, 866/696-2493, us.laufen.com.

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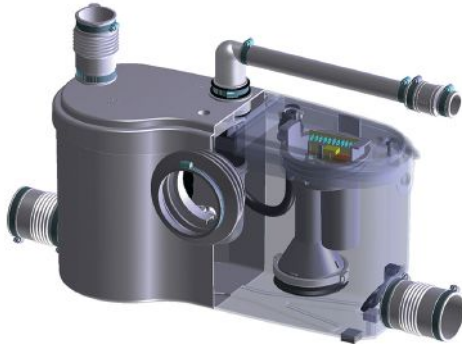
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Products

Fiberglass Door. Pella says its new *Architect Series* fiberglass entry doors look like wood but are easier to maintain and more energy-efficient. They can be stained on site or ordered prefinished from the factory. A wide variety of colors, architectural styles, and hardware options is available. The entry door shown (with sidelights) costs about \$5,000.

Pella Corp., 800/374-4758, pella.com.



Waste Management. The redesigned *Sanibest Pro* upflush grinder is 25 percent more powerful than before and features a top-mounted service panel so plumbers can get inside the unit without disconnecting it. The hardened-steel blade can shred accidentally flushed sanitary products without blocking the $\frac{3}{4}$ -inch discharge line, the maker says. The grinder costs \$1,000, and compatible toilets cost \$250 to \$275.

SFA Saniflo USA, 800/571-8191, saniflo.com.

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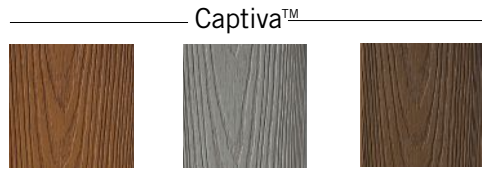
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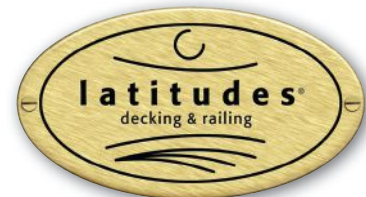
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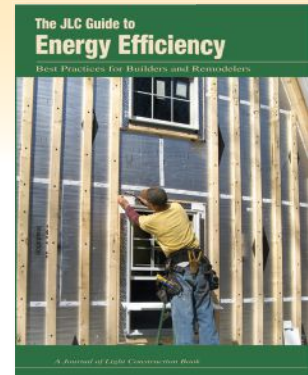


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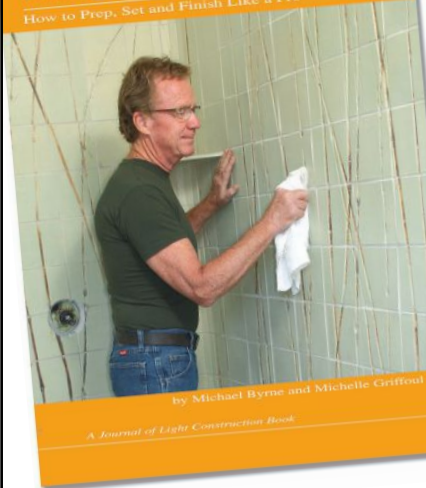
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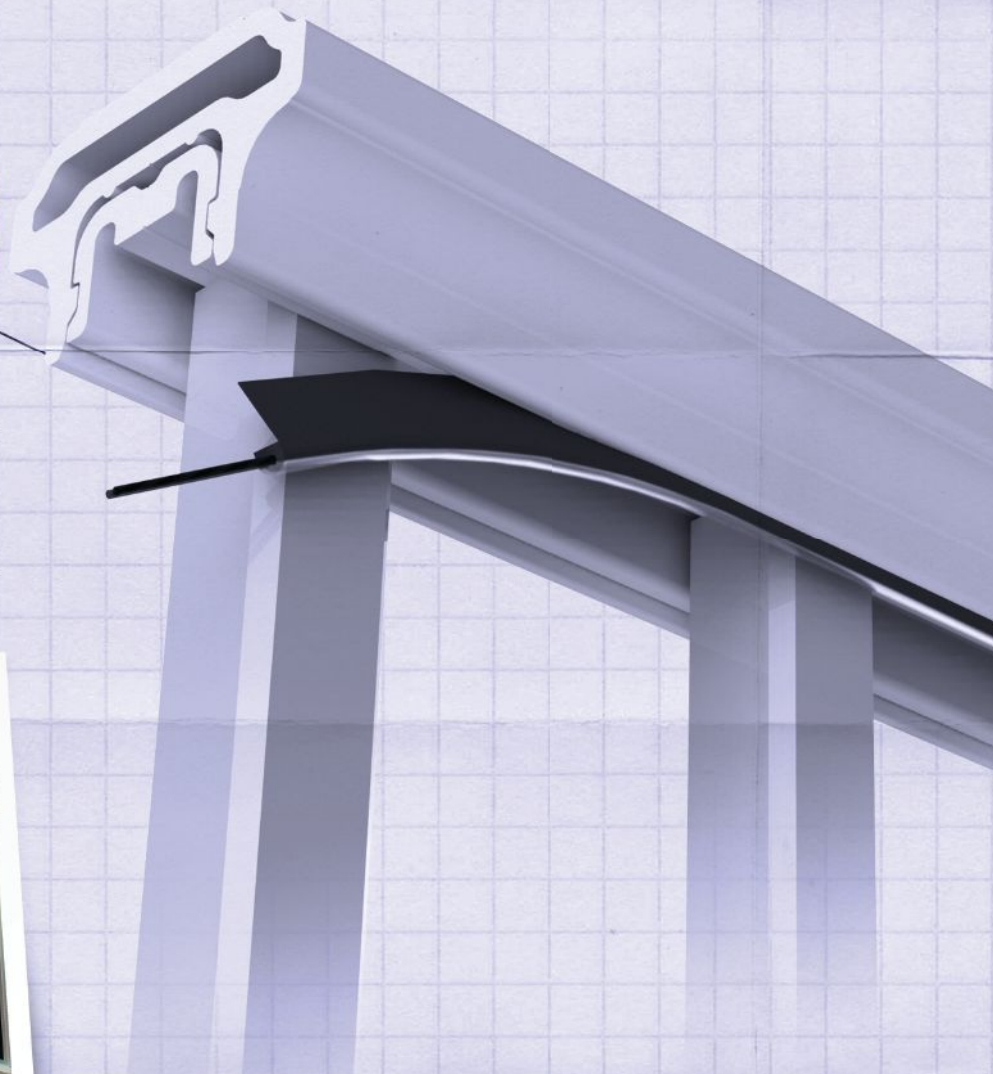
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Toolbits | by Tom O'Brien



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Gardner Bender, 800/822-9220, circuitalert.com.



Tough Lamp. The *Wobblelight* won't leave you in the dark if some knucklehead trips over the cord — because, like an inflatable punching toy, it's counterweighted to bounce back after it gets knocked down. Each of the four models has an impact-resistant lens cover and a shock-absorbing bulb-holder. An 85-watt fluorescent model with a light range of 10 to 25 feet costs \$135, and a 400-watt metal halide model that brightens 50 to 110 feet costs \$300.

ProBuilt Professional Lighting, 877/707-0800, probuiltilighting.com.

Dryness Detector. Instead of guessing whether the wood you're assembling (or painting) has the proper moisture content, why not find out for sure? Delmhorst's *BD-2100 Digital Moisture Meter* can gauge moisture levels in wood from 6 percent to 40 percent. It can also take moisture readings in other materials, such as gypsum, concrete, and EIFS.

The standard contact pins provide $\frac{5}{16}$ -inch penetration; various electrodes for deeper penetration are available as accessories. The BD-2100 is made in the U.S. and can be found online for \$340.

Delmhorst Instrument Co., 877/335-6467, delmhorst.com.



Do-It-All Bit. A step drill makes it easy to bore large-diameter holes — or holes of different sizes — in metal or plastic without drilling a starter hole or changing bits. Irwin says its *Unibit Cobalt Step Drill* is made from M35-grade high-speed steel and therefore cuts faster and stays sharp six times longer than competitive tools. The drill also features laser-etched hole sizes that allegedly won't wear off. It's sold in six English and four metric sizes and costs \$25 to \$70.

Irwin Tools, 800/866-5740, irwin.com.



For more information about these products, go to <http://jlc.hotims.com>.

Moving Juno

Over the past decade or so, Littleton, Mass., masonry contractor Mike DeBlasio has completed a number of challenging projects for Boston's Museum of Fine Arts. But late last year, the MFA handed DeBlasio and a hand-picked team of specialty subcontractors a truly monu-

mental challenge: helping museum conservators move a recently purchased 1,900-year-old marble figure of Juno from a private estate in Brookline, Mass., to the museum, a five-mile trip by road.

At 13 feet 8 inches, Juno (wife of the Roman god Jupiter) was the largest classical sculpture in the U.S. But the harsh New England climate had not been kind to her. Since being imported from Rome in 1904 by a wealthy Boston couple, her surface had been etched by acid rain and streaked with green moss. Worse, a century of freeze-thaw cycles had created or worsened some potentially disastrous cracks, including one that ran three-fourths the way through her body at waist level.

To stabilize her for the move, the team first used a 4-foot diamond saw blade, operated by Prime Drilling and Sawing Services of Worcester, Mass., was used to slice Juno's head from her body.



▲ A 4-foot diamond saw blade, operated by Prime Drilling and Sawing Services of Worcester, Mass., was used to slice Juno's head from her body.



MFA

▲ While the unrestored statue of Juno cut a majestic figure, 2,000 years of wear and tear had left their mark, adding considerably to the challenge of moving the 6-ton figure.

► Encased in a custom-made steel enclosure, the reinforced statue was plucked from the site by crane and placed in storage for a couple of months. Later, the same rigging and hauling contractor, Shaughnessy and Ahern of Boston, would ease the figure into the museum through a skylight.



MFA

Next, using a specially made coring bit, they bored a vertical 2-inch hole from the statue's neck into her torso to accept a stainless-steel tension rod. Then, to anchor the rod itself, DeBlasio used an extended $\frac{7}{8}$ -inch bit to drill a perfectly centered 18-inch hole in the base of that larger bore — the bottom of which lay nearly 9 feet deep in Juno's solid marble interior.

After that smaller hole was etched with dilute muriatic acid (introduced by way of a long tube), the tension rod was epoxied in place and carefully tightened to 125 foot-pounds against a steel plate on the figure's neck. DeBlasio recalls the last few turns of the wrench as the most nerve-racking moment of the entire project. "Believe me, I was sweating," he says. "It was a relief when nothing let go."

Once the fully tensioned rod was grouted in place, the reinforced goddess was enclosed in a welded steel cage and immobilized with plastic bags containing a lightweight high-slump concrete aggregated with perlite. Then, after a couple of months in storage, she was trucked to the museum, craned through a skylight opening (clearing it with 2 or 3 inches to spare on each side), and conveyed on rollers along a series of temporarily reinforced hallways to the institution's Behrakis Gallery, where she has been on display since mid-April. This summer, museum visitors will be able to watch as she's cleaned and restored by conservators. — *Jon Vara*

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