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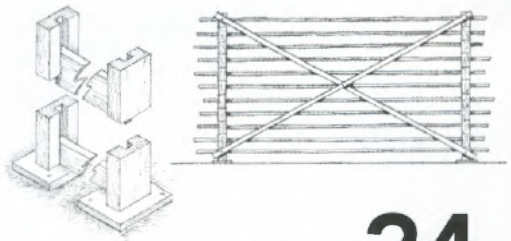
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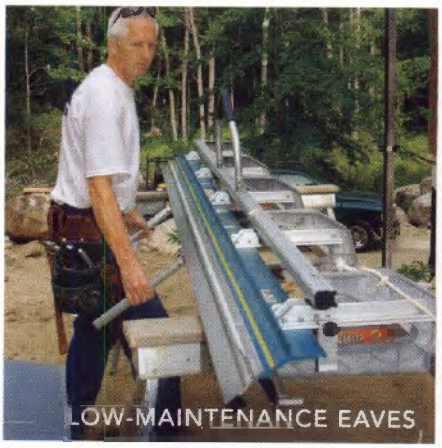
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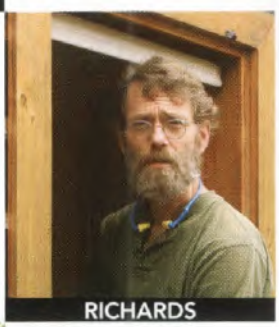
contributors

THE VOICES OF EXPERIENCE



MILICIA

JOE MILICIA ("Mastering Complex Crown," pp. 66-71) honed his finish-carpentry skills under the tutelage of longtime *FHB* contributor Jim Chestnut, then started his own residential-construction company, Hobart Builders, more than a decade ago. Joe lives in Fairfield, Conn., with his wife, Betsy, and their three daughters. When not at work, he can be found on the athletic fields, coaching his daughters' lacrosse teams.



RICHARDS

When not discovering new ways to do old things, remodeler **T.H. RICHARDS** ("Building a Divided-Lite Storm Sash," pp. 82-85) prefers to be telemark skiing in the woods with his son, Ryan, the youngest telemarker ever to ski the Johannson Peak Trail on Québec's Mont Tremblant.



CARROLL

JOHN CARROLL ("Hip-Roof Framing Made Easier," pp. 86-91) began his career in the late 1960s roofing houses during summer vacations. These days, he begins at the bottom, laying masonry foundations for the additions he builds. John lives in Durham, N.C. He's the author of two Taunton Press books, *Measuring, Marking & Layout* (1999) and *Working Alone* (1999), and he's writing a book about roof framing.

As a Boston-based contractor in the early 1990s, **ANDREW DEY** ("Reinventing the House," pp. 58-63) had a chance encounter with Benson Woodworking. Soon after, he joined their team as a project steward. In 1999, Andrew and his wife, Annette, moved into their new house, a timber-frame raised traditionally with the help of friends and family. Their slow but steady progress toward completion reflects Andrew's desire to have the details be just so and Annette's desire for the house to be just finished. Last year, they spent three months in Sri Lanka building homes for families displaced by the tsunami.

STEPHEN HAZLETT ("A Durable Roof-Valley Repair," pp. 53-57) prefers fixing and preserving old houses and neighborhoods to new construction. He expects to be finished restoring his own circa-1910 colonial in a mere 15 years. When not working, Stephen enjoys reading and woodworking. He, his wife, and their two sons live in Akron, Ohio.

Top photo: Betsy Milicia; center photo: Daniel S. Morrison; bottom photo: Elva Garza.

write an article

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Fine Homebuilding (ISSN: 1096-360X) is published bimonthly, with a special 7th issue in the spring and a special 8th issue in the fall, by The Taunton Press, Inc., Newtown, CT 06470-5506. Telephone (203) 426-8171. Periodicals postage paid at Newtown, CT 06470 and at additional mailing offices. GST paid registration #123210981.

Subscription Rates: U.S. and possessions and Canada, $37.95 for one year, $65.95 for two years, $93.95 for three years; outside the U.S. and possessions and Canada, $45.95 for one year, $81.95 for two years, $117.95 for three years (in U.S. dollars, please). Single copy, $7.99. Single copies outside the U.S. and possessions, $8.99.

Postmaster: Send address changes to *Fine Homebuilding*, The Taunton Press, Inc., 63 South Main Street, P.O. Box 5506, Newtown, CT 06470-5506.

Canada Post: Return undeliverable Canadian addresses to *Fine Homebuilding*, c/o Worldwide Mailers, Inc., 2835 Kew Drive, Windsor, ON N8T 3B7, or email to mnfa@taunton.com

Printed in the USA

HOW TO CONTACT US:

Fine Homebuilding
The Taunton Press, 63 S. Main St., P.O. Box 5506,
Newtown, CT 06470-5506 (203) 426-8171
finehomebuilding.com

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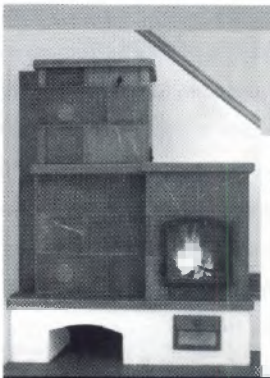
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letters

READER FEEDBACK

IN THE SPOTLIGHT

Flood insurance of a different kind

Recently, I got a phone call from my sister-in-law in Pennsylvania. She and her husband were nearly done building a new home on a hill, not a place I'd ever expect to see flooding despite the torrential rains that had been occurring there. But she called, nearly in tears, to ask advice about the 2 ft. of water that appeared in her basement overnight. Ruined were thousands of dollars worth of tools, books, furniture, and trim lumber that were stored in what should have been a dry basement. The site is well drained, the footing drains work, and the outside of the foundation was waterproofed professionally.

Groundwater came in through the foundation where the water line enters from the well. While the foundation had been mortared up around the pipe before backfill, this is a spot that's subject to leakage. I know because it happened at my own house, though my experience was more of a nuisance than a disaster.

What happens is this. Utility lines—water, power, gas—are backfilled with sand. If, as is typical in much of the Northeast, the footing drains are covered over with relatively impermeable native fill before the utility trench is dug, the utility trench drains slowly, if at all. In times of extraordinary rain, the sand collects water. Particularly if the water line comes from uphill, as does my in-laws' and mine, a tremendous amount of water pressure can build—enough to overcome most any attempt at plugging the foundation penetration.

The solution is simple, though easier to do during construction than afterward. Make sure that there is free-draining fill, such as crushed stone, between the bottom of the utility trench and the footing drains. I spent an unpleasant day with a shovel and a pickup load of gravel to fix this problem at my house. That was a year and a half ago, and despite some of the wettest months I've ever seen, my basement remains bone dry. I'm afraid that once my in-laws finish discarding the contents of their basement, they're in for much the same workout.

—ANDY ENGEL Roxbury, Conn.

Deck footings need inspections

In the article "A Solid Deck Begins with Concrete Piers" (*FHB* #180, pp. 44-49), the author correctly mentioned that local building codes govern footing depth, but he failed to have the inspector check his footings before pouring concrete. Decks are structures and require permits and inspections.

I'll offer two other suggestions. Digging a hole manually or via machine invariably disturbs the soil at the bottom of the hole. Many of the 6-ft. and larger digging bars have a flat, circular knob at the top that, when turned upside down, makes a great tamping tool to compact the soil. Also, rather than using a shovel to direct concrete from the mixer (or

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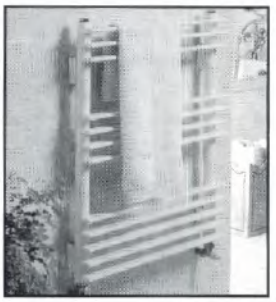
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wheelbarrow) into the tube, use a BigFoot (www.bigfootsystems.com). Inserted upside down into the tube, it makes an effective funnel.

—JIM FINLAY
Boston, Mass.

Cordless batteries can start fires

Maybe this is common knowledge, but I'll bet at least a few others are as oblivious as I was to the danger posed by a battery pack coming in contact with a jumble of fasteners.

I was dismantling a deck and had carried my tools and spare batteries in a plastic bucket.

> **"The screws made contact with the terminals of the batteries and acted like the element in a toaster."**

Whenever I had a handful of used screws, I tossed them into the bucket. After a while, I caught the scent of hot plastic. When I finally quit work to investigate, little flames were shooting up out of the heap of used screws. I'd not been aware of a pop or shower of sparks. The screws made contact with the terminals of one of the batteries and acted like the element in a toaster—a really good way to burn down the shop, the house, or a client's home. Of course, the battery pack was ruined and would neither hold nor accept a charge afterward.

—MARK KOONS
Wheatland, Wy.

Vapor barriers and rigid foam

In Rick Arnold's article "Save Energy With Rigid-Foam Insulation" (*FHB* #181, pp. 88-91), he wrote that "the foil-faced polyisocyanurate used here is a vapor barrier, so I eliminated the interior vapor barrier of the original design." This is dangerous advice and contradicts everything I have read in the magazine over many years. The purpose of a vapor barrier is to keep warm, humid air inside the house to prevent condensation in walls during the heating season. The purpose of an air barrier (and housewraps such as Tyvek) is to keep wind-driven water out of the walls while allowing moisture to escape. In this case, an effective vapor barrier on the outside, mated with no vapor barrier on the inside, is a recipe for disaster. Come wintertime, the structural sheathing on this house is going to be soaking wet as moisture from the interior condenses on the inside of that foil-faced insulation board. This is exactly the condition that has caused such a debacle with the application of EIFS (synthetic stucco) systems on houses that do not have proper air barriers.

Our solution has been to apply rigid insulation to the *inside* walls prior to framing interior partition walls. This system requires the use of sealed electrical boxes on exterior walls and allows some thermal bridging at rim joists, but winds up achieving 95% of the benefits while allowing the house to breathe.

—CHRISTIAN BANDLER
via email

Author Rick Arnold replies: The rule of thumb that a vapor barrier is applied to the inside of a wall assembly in a cold climate is a good one to follow. But with a thorough understanding of modern building science, you'll find there are many ways to design an effective wall system.

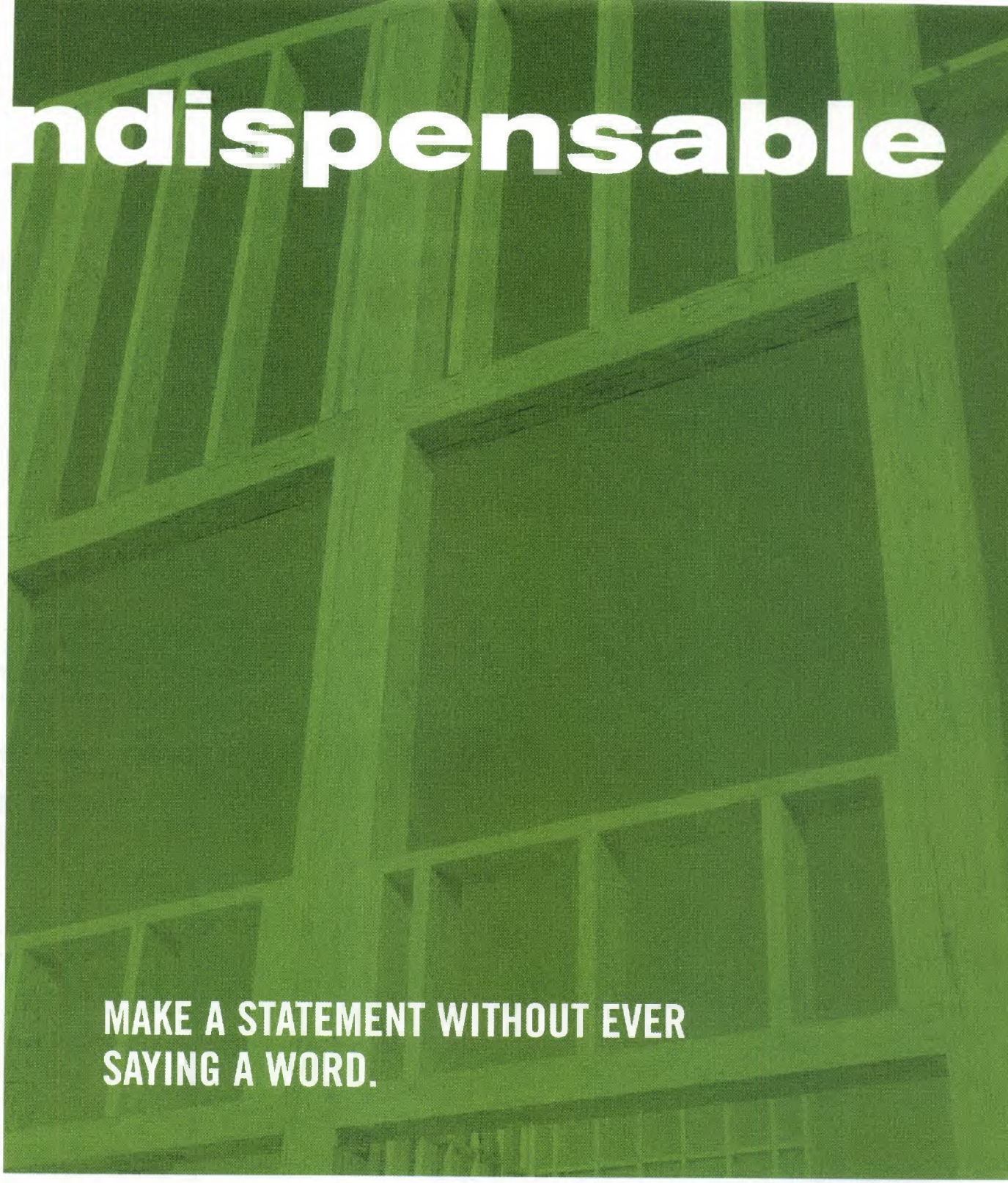
The insulation system I use controls the dew point within the wall assembly so that condensation won't occur, and it permits the wall to dry to the inside. The rigid foam applied to the exterior of the wall sheathing changes the typical temperature profile within the wall cavity. The structural wall sheathing is on the warm side of the foam insulation and is no longer a condensing surface. No condensation inside the wall, no problems. It's important with this wall design to omit an interior vapor barrier; otherwise, you could trap moisture inside the stud cavity. Without an interior vapor barrier, mois-

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ture vapor that migrates into the stud-cavity insulation can dry to the inside of the house. Combined with a mechanical ventilation system that controls indoor relative-humidity levels and an interior air barrier

> **"Come wintertime, the structural sheathing on this house is going to be soaking wet."**

such as sealed drywall, a foam-sheathed wall is a safe and effective system.

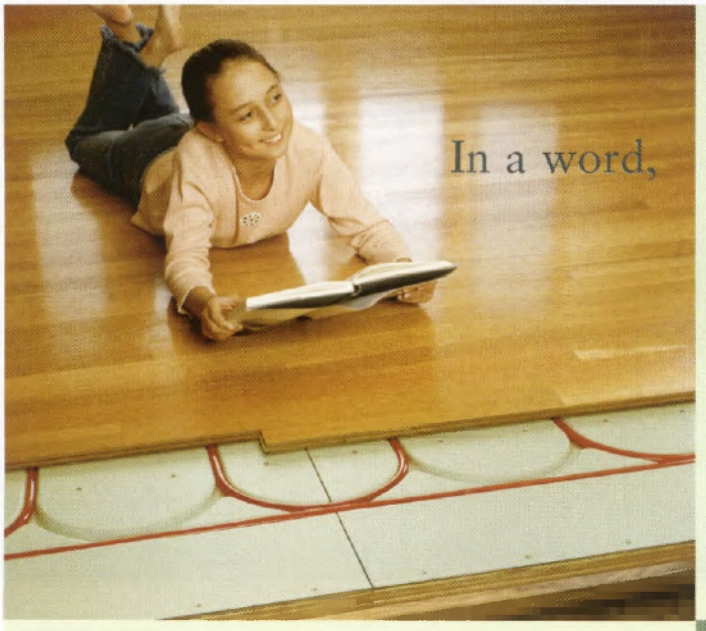
My foam-covered walls are not like an EIFS wall. Moisture problems with EIFS were due to exterior water intrusion from improper installations and ineffective flashing details, not condensation of interior moisture migrating from the interior. The old EIFS didn't include an effective secondary system to drain water leaking in through the exterior face.

Debating gable-wall details

Looking over the article "Framing Big Gable Walls" (*FHB* #181, pp. 70-75), I'm wondering what firestop method author Lynn Hayward uses. His framing seems to leave the wall cavities open into the rafter bay (and perhaps into the entire attic cavity, depending on the ceiling-framing details). According to the IRC 2003 and 2006, there needs to be a firestop to separate wall cavities and roof cavities.

In a couple of instances, the author notes that his framing details are lighter and use less wood. One place that I've found where I can save a lot of lumber and lighten up gable-end walls is to eliminate the structural headers. There's no load on them because the author inserts a full-length rafter at the top of the wall. The headers and the jack studs can be eliminated easily on all but the widest openings.

After years of using gable-framing details similar to the author's, I've become a fan of framing gable walls without inserting the rafter and using a 2x plate only along the very top. It's faster than notching studs, and you don't waste large rafter stock where it serves no purpose. Plus, the gable walls are easier to straighten (provided you choose a straight plate for



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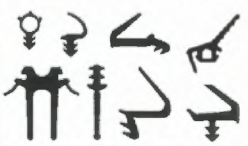
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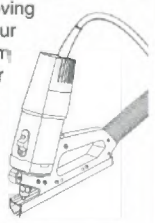
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WINDOW + DOOR WEATHERSEALS

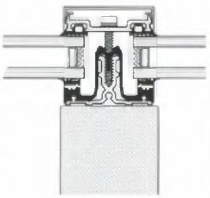
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your safety

Home building is inherently dangerous. From accidents with power tools to falls from ladders, scaffolds, and roofs, builders risk serious injury and even death. We try to promote safe work habits through our articles. But what is safe for one person under certain circumstances may not be safe for you under different circumstances. So don't try anything you learn about here (or elsewhere) unless you're certain that it is safe for you. Please be careful.

—KEVIN IRETON
editor

the top) than walls framed with a rafter along the top edge.

—MIKE GUERTIN
East Greenwich, R.I.

Author Lynn Hayward replies: I wait until the roof is on before I install blocking for firestops because I'll have more scraps to use later in the framing process. Another reason I wait on the blocking is that I'm eager to get my roof framed and watertight so that I don't lose days of work due to the rapid weather changes here on the Maine coast.

There is no question that you can eliminate jacks and headers because there is no real load on the gable end, but we often use wide interior- and exterior-trim stock (1x4s and 1x5s); one stud would not allow enough nailing space on the outer trim edge.

The trade-off for saving time and lumber by using a top plate rather than a rafter is giving up a continuous nailing surface for the rake ladder, subfascia, and trim; you can nail 16 in. on center only. You also would have to make a transition piece at the end of the gable to connect to the rafter tails. You're right that angle cutting is faster than notching, but I worry that it's not as strong because you're nailing into the end of the studs rather than the side of the stud notch.

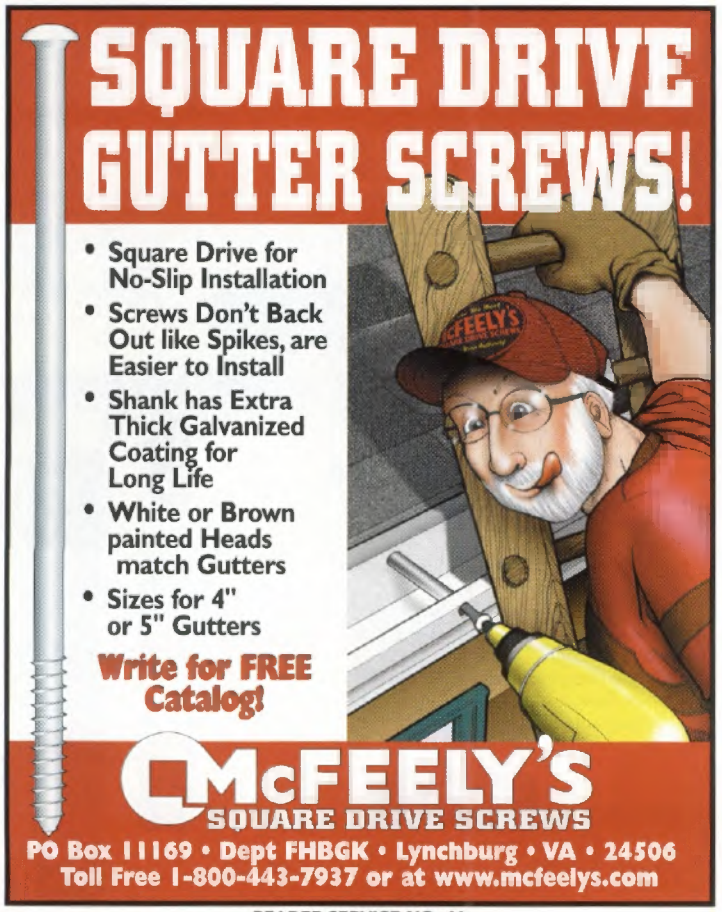
Not long ago, I drove by a home I built 34 years ago, and it looks as straight today as it did when I finished it. I like that.

Insul-Knife's real price

In the old days, *Fine Homebuilding* listed the manufacturer's suggested retail price when we featured a product in the magazine, but because retailers typically discount that price, it wasn't really an accurate indication of how much you could expect to pay.

Today, though, Web-based superstores like Amazon.com make it easy for us to list what we call a "street price," a real price that's available to anyone with a computer. But sometimes we still get it wrong. In our recent "Tools & Materials" review (*FHB* #181) of the Insul-Knife (www.cepcotool.com), we mistakenly quoted an Amazon.com sale price of $16, but the product normally sells for about $34.50. We apologize for any inconvenience.

—JUSTIN FINK
assistant editor



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Cross Section

BUILDING NEWS FROM AROUND THE COUNTRY



Speed and accuracy are vital. *Students in the carpentry division frame a metal-stud wall at the SkillsUSA national competition. At the event, students vie for national titles in 46 skilled-trade categories.*

JUST THE FACTS

SkillsUSA

- Founded in 1965 as the Vocational Industrial Clubs of America; officially known as SkillsUSA since 2004
- National headquarters: Leesburg, Va.; Web site: www.skillsusa.org
- Average 284,000 members per year
- Programs in 14,700 classrooms in 50 states
- National championship occupies a space of 685,782 sq. ft. (more than 11 football fields)
- Organization has served more than 8.8 million members since 1965

Tomorrow's builders compete for gold

On June 22, 2006, Denver Gravely sunk the final nail into a square and sturdy 2x4 stud wall. The 18-year-old from Arona, Pa., wasn't wrapping up the day with a local construction crew. He was competing under the fluorescent lights of Bartle Hall in Kansas City, Mo., at the SkillsUSA championships.

For Gravely and more than 4,700 other students from around the country, the competition is the culmination of a series of local and state events where contestants display their skills in 84 occupational and leadership fields. In the skilled-trade contests, comprised of 46 categories that range from carpentry and masonry to HVAC and residential wiring, students are judged on their workmanship, accuracy, proper use of tools, safety, ability to read blueprints, and adherence to codes.

Each trade category includes events designed to test skills necessary to be a successful entry-level employee in the student's respective field, a format that creates a reality-based learning experience. Gravely and his carpentry competitors were required to frame walls using wood and metal studs, to cut and install common and hip rafters, to hang and tape drywall, and to install interior trim. The masonry category called for contestants to build a composite brick and block wall and to complete a written exam.

Originally founded in 1965 as the Vocational Industrial Clubs of America, SkillsUSA has become a prominent force in advancing the development of students enrolled in specialty secondary, post-secondary, college, and technical-education programs. SkillsUSA organizes

Photo: Courtesy of SkillsUSA

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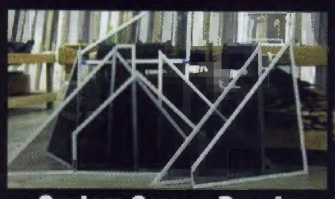
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international competitions and leadership conferences sponsored by partners that include Bosch, Irwin, and The National Center for Construction and Research. At the 2006 national competition alone, these organizations provided millions of dollars worth of services, equipment, and materials.

With a presence in roughly 14,700 classrooms and a yearly membership averaging more than 284,000 people, SkillsUSA is succeeding in its mission to promote a qualified, successful workforce for the future. For more information on SkillsUSA programs, events, and local chapters, visit www.skillsusa.org.

—Rob Yagid is an assistant editor at Fine Homebuilding.

Making sense of water-efficient products

The Environmental Protection Agency (EPA) has launched a new labeling program designed to help consumers identify water-efficient products. WaterSense, a voluntary EPA program, aims to help consumers save money on utility bills and reduce water consumption. The program launched in June 2006, and WaterSense labels are expected to start appearing on products as early as January 2007.

Residential-plumbing fixtures, such as showerheads, faucets, and toilets; and commercial- and residential-irrigation systems will be the first products to carry the label. In addition, irrigation professionals will be offered WaterSense certification programs.

To carry the WaterSense label, products are expected to be about 20% more water efficient than those now on the market. Toilets will use less than 1.3 gal. of water per flush as opposed to the 1.6-gal.-per-flush standard set in 1994 by the National Energy Policy Act. Most residential fixtures have a flow rate around 2.2 gal. per minute, which means a WaterSense faucet would run at about 1.76 gal. per minute.

U.S. EPA WaterSense

WaterSense is a lot like the EPA's Energy Star program. Both programs seek to conserve resources and save money. Unlike Energy Star, however, WaterSense uses third-party testing to ensure customer protection. WaterSense also will partner with Energy Star to certify home appliances.

For more information, log on to the EPA's WaterSense Web site at www.epa.gov/watersense to see a list of approved products.

—Ashley Pedersen is an intern at Fine Homebuilding.



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Architect
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In just about any book or magazine dedicated to modern architecture, it's easy to see the influence of Philip Johnson. Before enrolling in Harvard University's School of Architecture, Johnson was director of the architecture department at the Museum of Modern Art in New York. There, he discovered the work of European architects Ludwig Mies van der Rohe and Le Corbusier. Inspired by their postwar, modern, or (to use his own term) International Style, Johnson designed the Glass House for his master's thesis project.

Revered for style rather than functionality, the Glass House was built on a 45-acre site in Connecticut and became Johnson's home for close to 50 years. Clad in steel-framed glass panels and void of conventional partition walls, the house epitomizes the importance of connecting a home to its surroundings. Cabinets help to divide the house into kitchen, bedroom, and sitting room. A cylindrical brick chimney offers privacy for the bathroom.

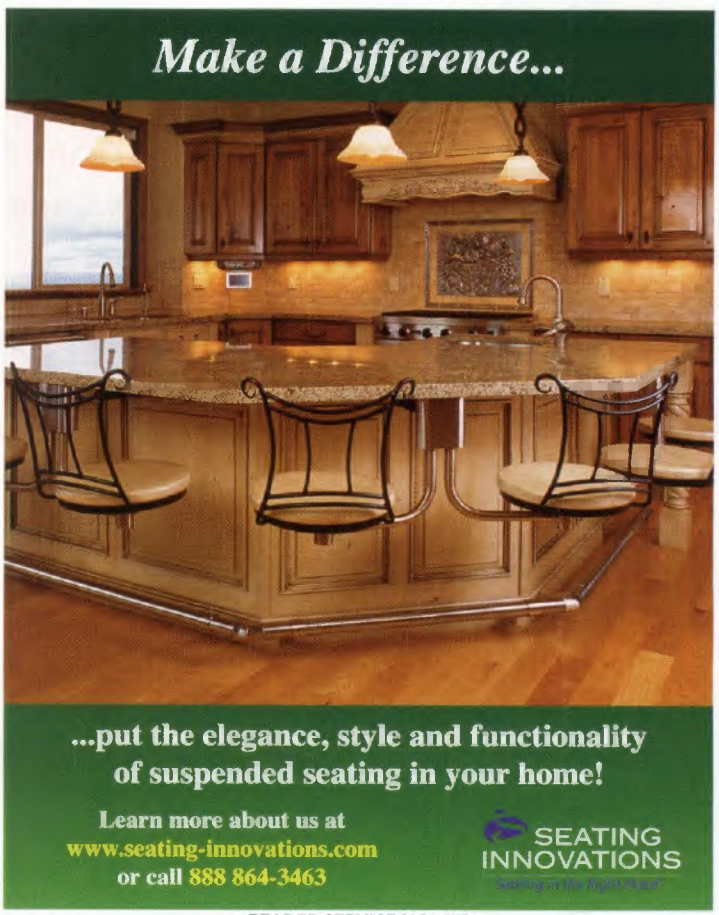
Johnson died in 2005 at age 98, leaving the Glass House to the National Trust for Historic Preservation. The trust plans to begin offering tours of the house and on-site art galleries in the spring of 2007.

—Brian Pontolilo is an associate editor at Fine Homebuilding.

Photo: Courtesy of the National Trust for Historic Preservation



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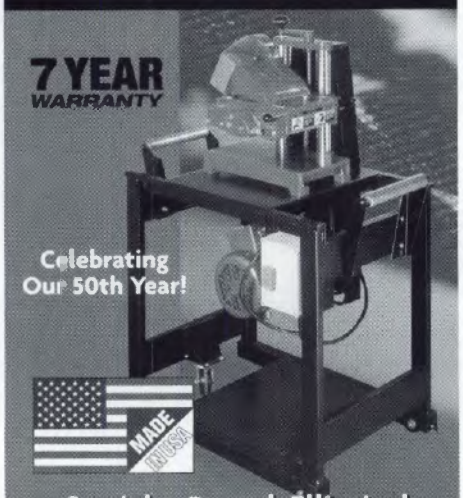
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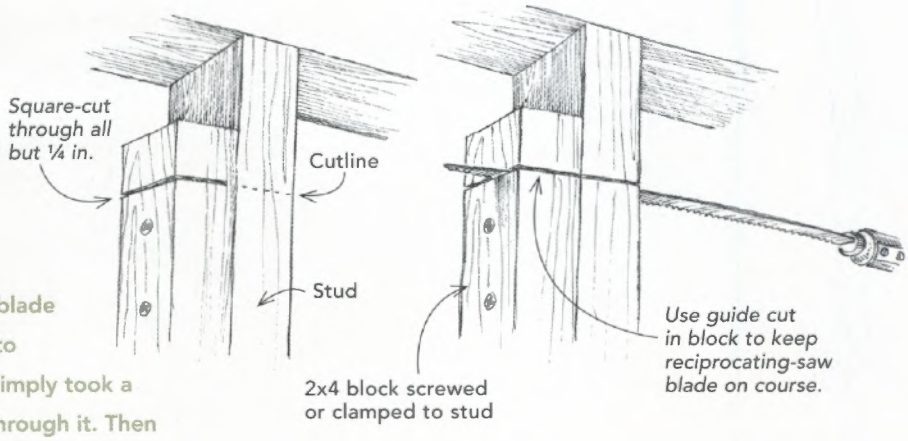
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—DON MATHIS Macomb, Ill.

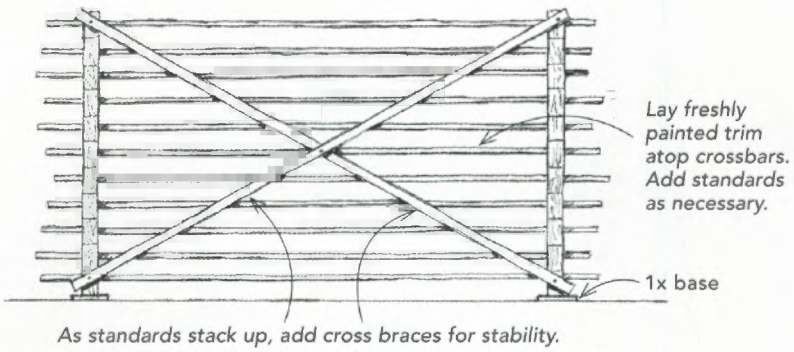


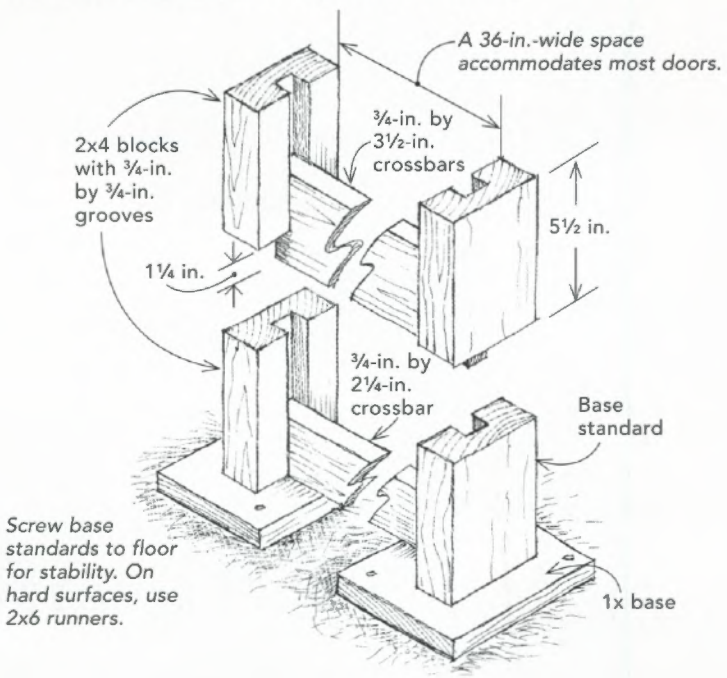
Knockdown drying rack

The drawing at right shows my solution to the problem of stacking freshly painted trim without taking up all the floor space in my shop. It's a drying rack composed of individual standards that can be stacked atop one another to provide varying amounts of rack space. With the components illustrated here, you end up with a 2-in. space between the crossbars of each standard.

I've stacked as much as 750 lin. ft. of base and casing on this setup by going 15 standards high (be sure to add cross bracing as the stacks get taller). Just start at the bottom, fill with trim, and then add another pair of standards—no messing with sliding wet trim in and out. By cantilevering the work beyond the standards, one set can accommodate 16-ft. material with no problem.

—HARRY BISHOP Middletown, Mo.





■ submit a tip

"Tips & Techniques" is a forum for readers to exchange information about methods, tools, and jigs they've devised. We'll pay for any we publish. Send details to Tips, *Fine Homebuilding*, P. O. Box 5506, Newtown, CT 06470-5506, or email them to us at FH@Taunton.com.



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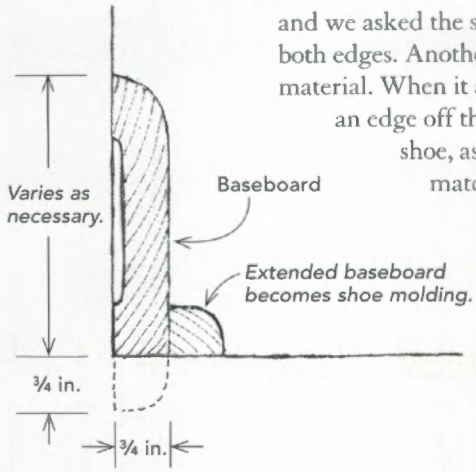
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Combo baseboard/shoe molding

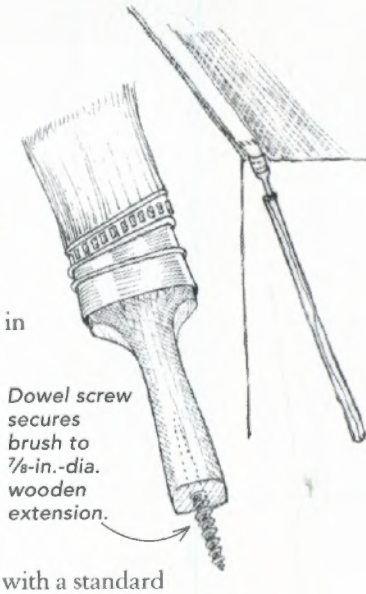
On a recent job, we tried a new approach to installing custom-milled baseboard over a concrete slab. We had the base milled 1 in. wider than usual, and we asked the supplier to mill a casing profile on both edges. Another shop stained and varnished the material. When it arrived on our job site, we ripped an edge off the base and installed it as base shoe, as shown in the drawing at left. It matched perfectly in color and grain.

—STEVE CHRISTENSON
Readstown, Wis.



Paintbrush handle extension

If I had lower ceilings, I wouldn't need a long-handled paintbrush to cut in a line along the top of the wall or where the ceiling meets the crown molding. But I've got nice high ceilings that require me to stand on a ladder or a low scaffold to reach these targets with a standard paintbrush. On the other hand, I can skip the ladder and scaffold altogether and use my customized paintbrush. As shown in the drawing above, I lopped off its wooden handle at the thickest part and inserted a dowel screw into a 5/16-in.-dia. pilot hole. Dowel screws have threads at both ends, which leaves a threaded shank to insert into a pilot hole drilled in a 7/8-in.-dia. dowel. I've found that a 3-ft. to 6-ft. dowel is most convenient, depending on the height of the ceilings.



—JAMES BROOKS Boston, Mass.

Crack-free, color-matched grout for a tile backsplash

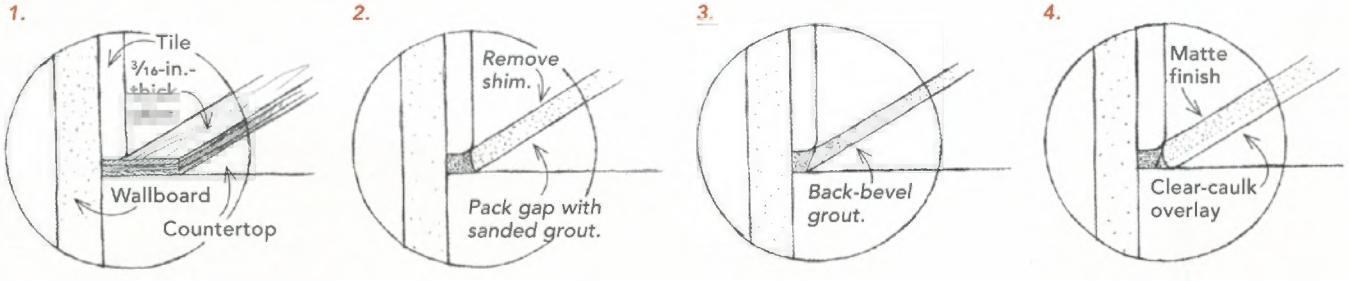
My experience as a kitchen designer has taught me that tile installers rarely use color-matched caulk to fill the space between the first row of tiles in a kitchen backsplash and the countertop—and perhaps for good reason. Color-matched caulk almost never matches the appearance of the grout perfectly. And if that joint is filled with grout instead of caulk, it will discolor, crack, and eventually start to fall out. To reduce the visibility of the problem, some installers minimize the grout line. However, an undersize grout joint is weak and breaks down more quickly. Over the years, I've learned to use the detail that's shown in the drawings below to solve this problem.

As shown in drawing 1, I begin working on a tile backsplash by supporting the first row of tile on strips of nominal 5/16-in.-thick plywood, the kind typically used for flooring underlayment. This creates a space wide enough for the grout to have some strength, and the gap is wide enough to be proportional to the wider grout lines typically used for the tumbled-marble and slate tiles my clients prefer.

Once the tiles are adhered to the wall, I remove the shims and pack the gap with sanded grout (drawing 2). After 30 minutes or so, the grout has firmed up enough to back-bevel it at about 50° to 60° (drawing 3). I use a putty knife or a taping knife for this step. When the grout has dried overnight to its final color, I caulk the joint with a clear, matte-finish siliconized latex caulk (drawing 4). I've found that DAP Dynaflex 230 is the best. I have used other brands, but they either turn yellow or become sticky over time.

The cured clear caulk lets the color and texture of the underlying grout remain visible in a beautiful way. The matte finish almost makes the caulk disappear. I installed backsplashes more than 15 years ago that look as good today as they did when they were completed.

—KERRY L. KLAGES Ann Arbor, Mich.



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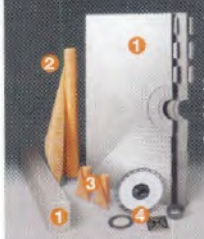
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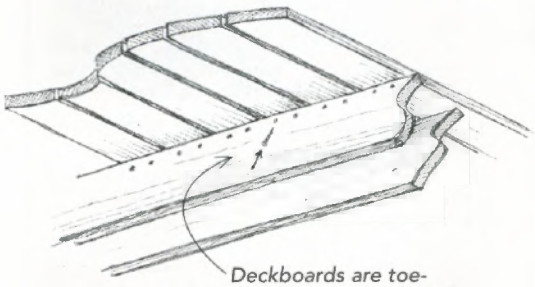


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A low-cost alternative to hidden deck fasteners

After reading your story on deck fasteners and fastening systems (*FHB* #178, pp. 78-82), I had to chuckle. When I built my own deck, I wanted to conceal the fasteners for aesthetic reasons as well as for function (not catching something on a protruding fastener) and durability (not creating an entry point for moisture to penetrate the decking).



Deckboards are toe-screwed through joists from below.

I looked at all the edge-mount and bottom-mount systems, and was turned off by their tediousness and taken aback by their price. Instead of investing in one of these proprietary systems, I used GRK R4 Multi Purpose Screws (www.grkfasteners.com) to affix each deck board to its joist from below. As shown in the drawing at left, I used two 8x2½-in. screws per board at each joist. Working from below, I started the screws about 1½ in. from the top edge of the joist and angled them at about 30°. That put about ¾ in. of each screw into the 5/4 deck boards. The sharp "zip-tip" points of the screws eliminated the need to drill pilot holes.

It has been a couple of years since I installed the decking, and it looks great. The decking is solid as a rock without a single squeak, and I saved about $1,500 on mounting gizmos.

—STEVE CARLE Edina, Minn.

Improvised mason's level

I had some concrete-block work to do recently. I didn't want to buy a mason's level for just one job, so I built my own. I took a 4-ft. length of straight 2x4 and routed a 1-in.-deep cavity into one side of it for a friction fit of my 2-ft. level. Made of aluminum, the level is 1 in. thick and 2 in. tall, so it's flush with the face of the 2x4 and is visible from only one side. I can work with that. I now have a mason's level that works great (and won't take up space when I'm through with it).

—J. KAYE Phenix, Va.

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TIP FROM THE ARCHIVES

Mud-bucket storage trays

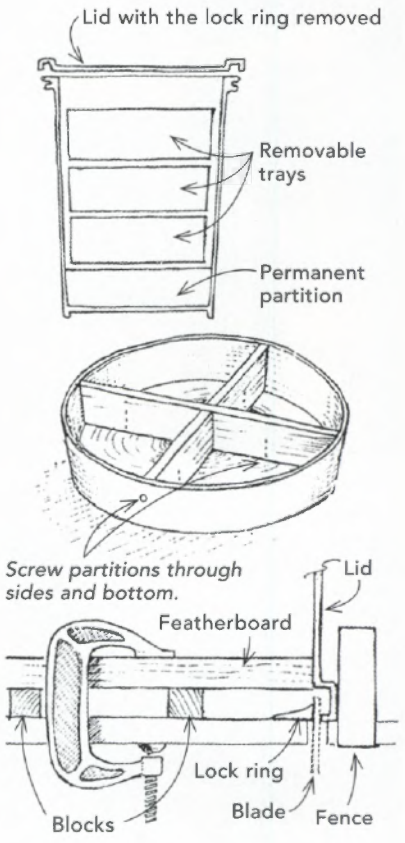
You can pack a lot of nails, screws, nuts, bolts, and other assorted small parts into a 5-gal. joint-compound bucket. The problem, of course, is how to keep the parts separated from one another and easily accessible. Stacking trays are a good solution to this dilemma. The drawing shows how I made a set of them.

First, I use a tablesaw to cut the top lips off three buckets. I want the bottoms of the buckets for the trays, but when the top lips are still on the buckets, it's tough to get a clean edge while cutting the trays. My second cut removes the bottom of the bucket. Then I adjust the height of the tray to accommodate whatever it is that I plan to store in it.

The partitions are made of 1x material, and they intersect each other in the middle by way of half-lap joints. As shown in the drawing, I use screws driven through the sides and the bottom of the tray to secure the wooden partitions to the trays. At the bottom of the bucket, I installed permanent partitions that are 3 in. deep to keep the lowest tray from getting jammed in the bottom of the bucket.

I capped my storage bucket with a lid that's easy to operate. The lids on joint-compound buckets have lock rings around their edges. The lock rings help to keep the joint compound from drying out, but they're a pain to pry open. So I removed the lock ring by running the lid over the blade on my tablesaw. As you can see in the drawing, I used a featherboard atop a couple of blocks to keep the lid tight to the fence during the cut.

—THOMAS E. HUNT Wilbur by the Sea, Fla.



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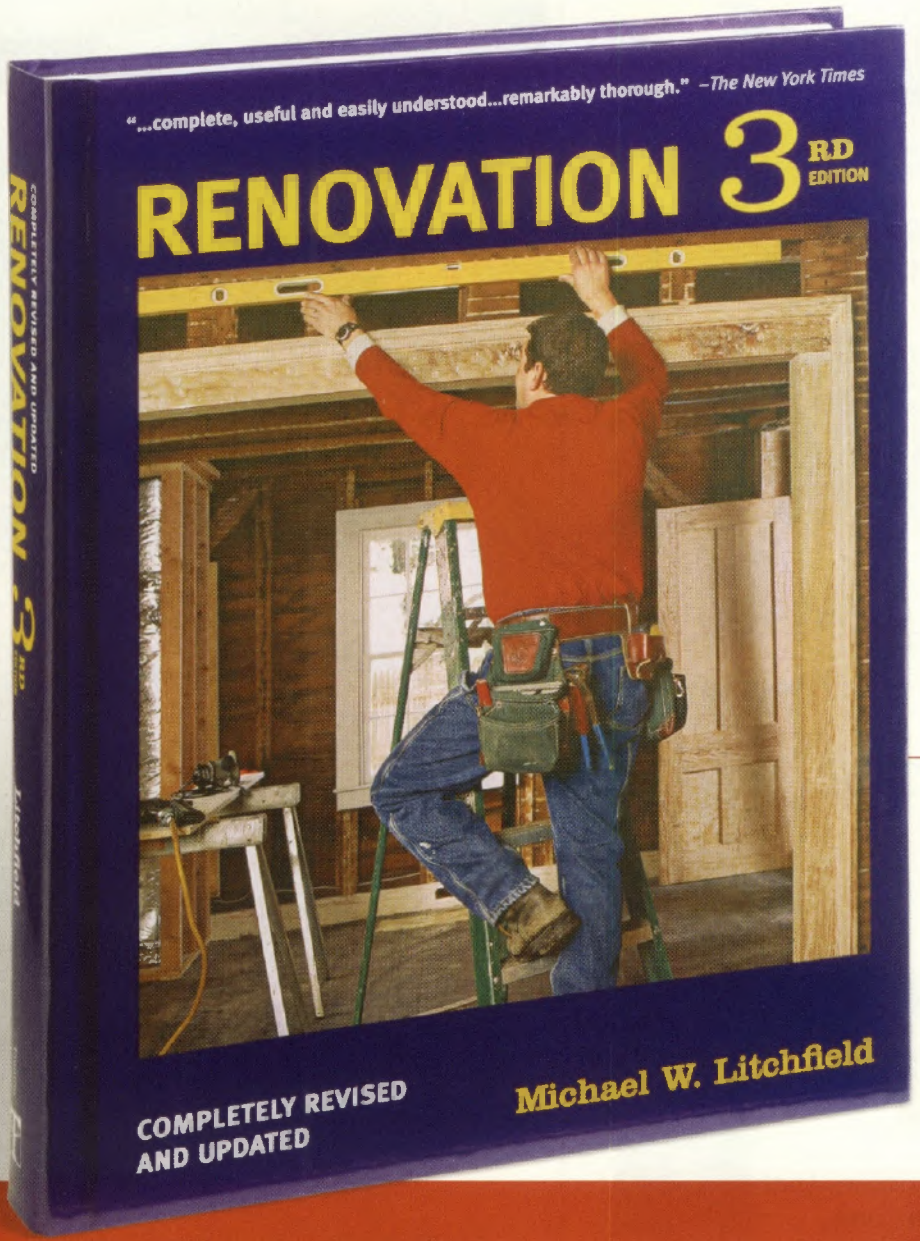
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As a dyed-in-the-wool tool fogy, I'm always leery of new technology, which most often is heavy on gimmicks and short on real improvements. When I got my hands on Bosch's new I-Driver (PS10) and Pocket Driver (PS20), I was skeptical.

At first glance, the tools looked like those handyman specials that drive three short screws into cottage cheese before giving up the ghost. In this case, however, nothing could be farther from the truth. These tools have all the solid engineering and power we've come to expect from Bosch, but in a lightweight, compact package. The secret is lithium-ion (Li-ion) battery technology (*FHB* #180, pp. 55-59).

One of the big advantages of Li-ion technology is reduced weight; the PS20 driver tips the scales at a mere 1.8 lb. According to my kitchen scale, the yellow 14.4v drill/driver that I've used happily for years comes in at more than four times the weight of the Pocket Driver. Combine light weight with the fact that the driver can slip almost unnoticed into the large pocket of my nail bag, and I don't end up with a noticeable starboard list as I walk. And the handle of the Pocket Driver is only slightly larger than my old driver, so it's comfortable, even for my stubby digits.

I put the drivers to work right away, easily driving 2½-in.-long bugle-headed screws into both pine and oak. The torque of the Pocket Driver, which maxes out at 400 rpm, is fine for the driving I did, although it does sacrifice a little speed. The variable-speed trigger engages at a very slow speed, making it easy to start screws one-handed. The reverse switch is accessed easily with the thumb and forefinger. My experience with drill clutches in the past has been frustrating because of their inconsistency. The clutch on the Pocket Driver, however, lets me sink screws into pine almost perfectly without overdriving them.

The I-Driver features a head that adjusts in five stops from 0° (parallel to the handle) to 90° (perpendicular to the handle), making it great for driving screws in tight spaces. The tool weighs about 12 oz. more than the Pocket Driver, and the handle has a slightly larger circumference, with a three-finger trigger mounted in line with the handle. The reverse switch is also a little harder to access.

Some features of the I-Driver took a bit of getting used to. The barrel grip didn't feel as comfortable as the Pocket Driver's pistol grip, and the slow-start feature bothered me at first. When I had to drive a screw one-handed with my left hand, though, the slow start made that job easy.

The electronic clutch is also different. Instead of slipping when the torque becomes too great, the tool just stops. Often, a screw can't be backed out at the same setting, giving the impression that the battery is dead. Increasing the torque setting solves the problem, but at the expense of convenience. The Bosch folks said that the electronic clutch is necessary to maintain the tool's compact configuration.

Both tools come with two batteries and a 30-minute charger in a Cordura cloth case. For this old tool fogy, these drivers are an exciting foray into a technology that lives up to its hype.



I-Driver (PS10)

Pocket Driver (PS20)

Roe A. Osborn, a former editor at Fine Homebuilding, *is a freelance photojournalist in Harwich, Mass.*

Photos: Krysta S. Doerfler, except where noted



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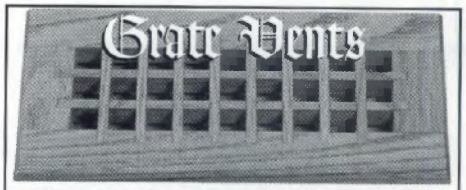
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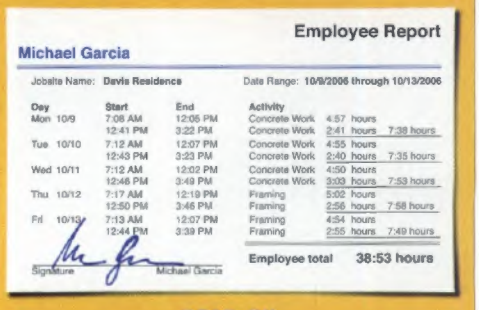
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As editor of the "Tools & Materials" department, I've gotten mail that has included everything from 3-D pop-up brochures to a product announcement shipped in a plastic water jug. The goal is simple: Stand out from the crowd. But I recently received a package from Mountain Lumber Co. that didn't need bold lettering or a fancy sales pitch. This box contained only two small pieces of flooring: reclaimed wood on one side, plywood on the other. It got my attention.

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Justin Fink is an assistant editor at Fine Homebuilding.



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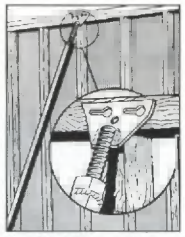
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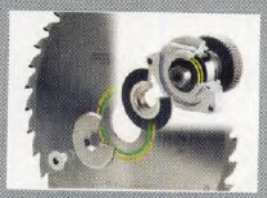
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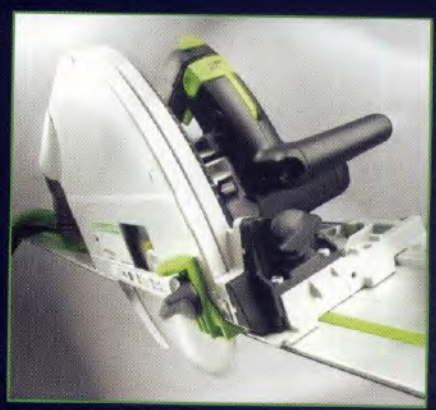
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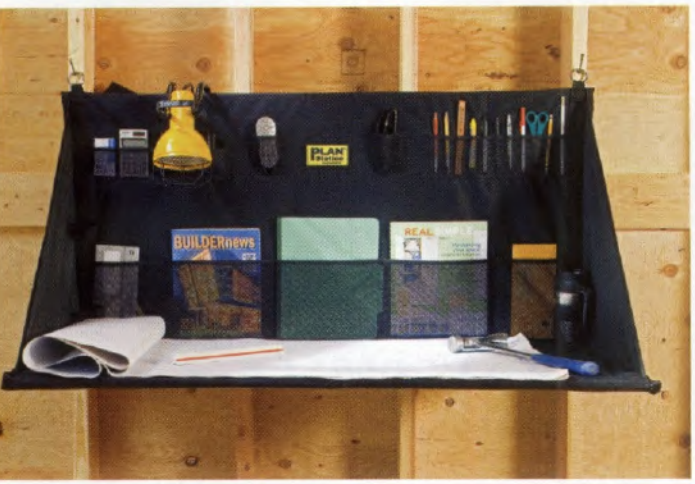
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PLAN STATION

- Manufactured by Plan Station of Jackson Hole Inc.
- 800-496-7617; www.planstation.biz
- Cost: $70



For carpenters, the time when blueprints are most vulnerable is also the time when they are most necessary, in the weeks before a house is dried in. The Plan Station solves this problem by keeping plans off the ground or the floor, where they are most likely to get wet and dirty.

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The entire assembly can be folded up tightly with the included hook-and-loop fasteners—with blueprints still inside, by the way. Speedy setup and breakdown pay off at the end of the day and at the arrival of a sudden rainstorm.

The only drawbacks are the size and the material. The Plan Station does not fit easily in my passenger seat, and I wouldn't want to leave it in the back of an uncovered truck. I also wonder how well the nylon will hold up to job-site abuse. Otherwise, at around $70, it's handy for anyone who does a lot of framing.

Jesse James is a builder in Asheville, N.C.

Photos this page: Courtesy of Plan Station

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Photo left: Courtesy of Highland Craftsmen

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- 828-765-9010; www.highlandcraftsmen.com
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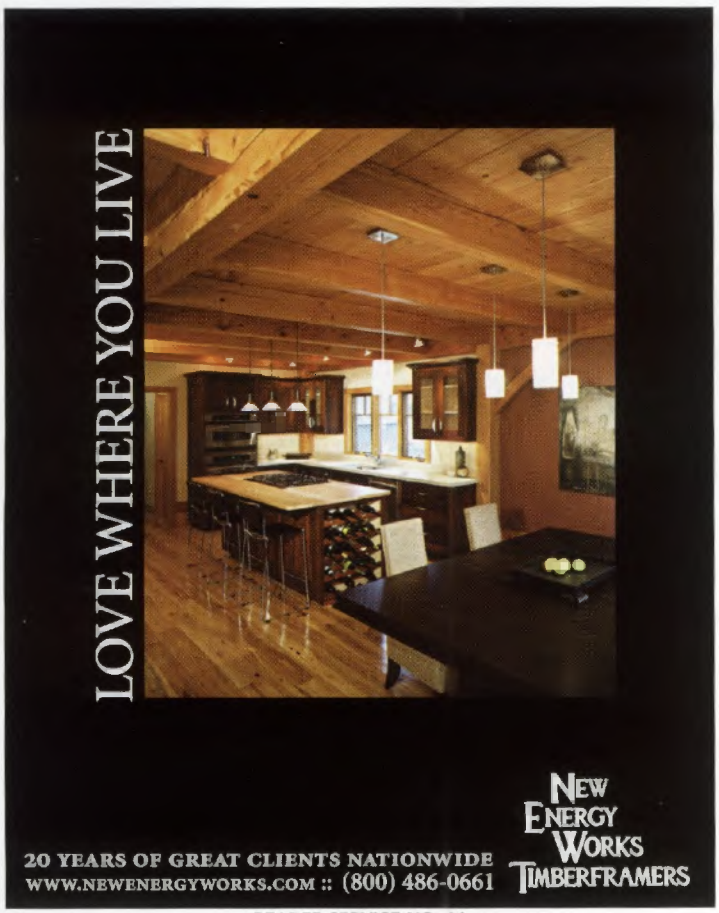
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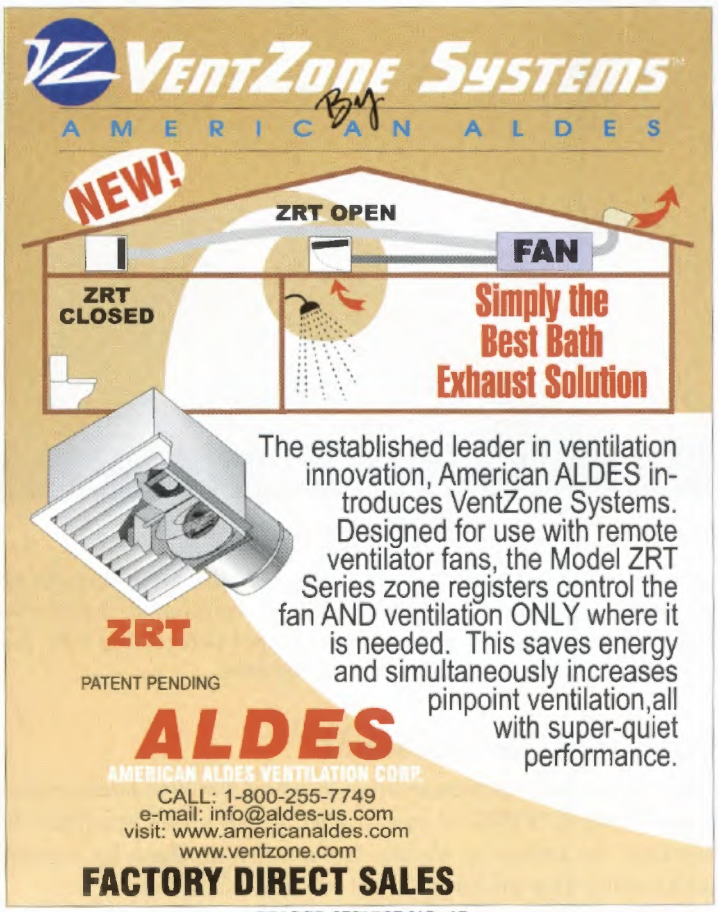
The manufacturer provides clear guidance on the bark-siding installation process. Bark requires no maintenance, although use of a wood preservative can slow the bleaching process in areas exposed to strong sunlight or significant moisture. According to Highland Craftsmen, properly installed bark siding can last 75 years.

If you get hooked on the siding, you don't have to leave that tree sensation outdoors. Highland Craftsmen complements its bark-house style with highly individualized trim and furniture that's created from twigs, poles, and logs.

Andy Beasley works on his house in Colorado.



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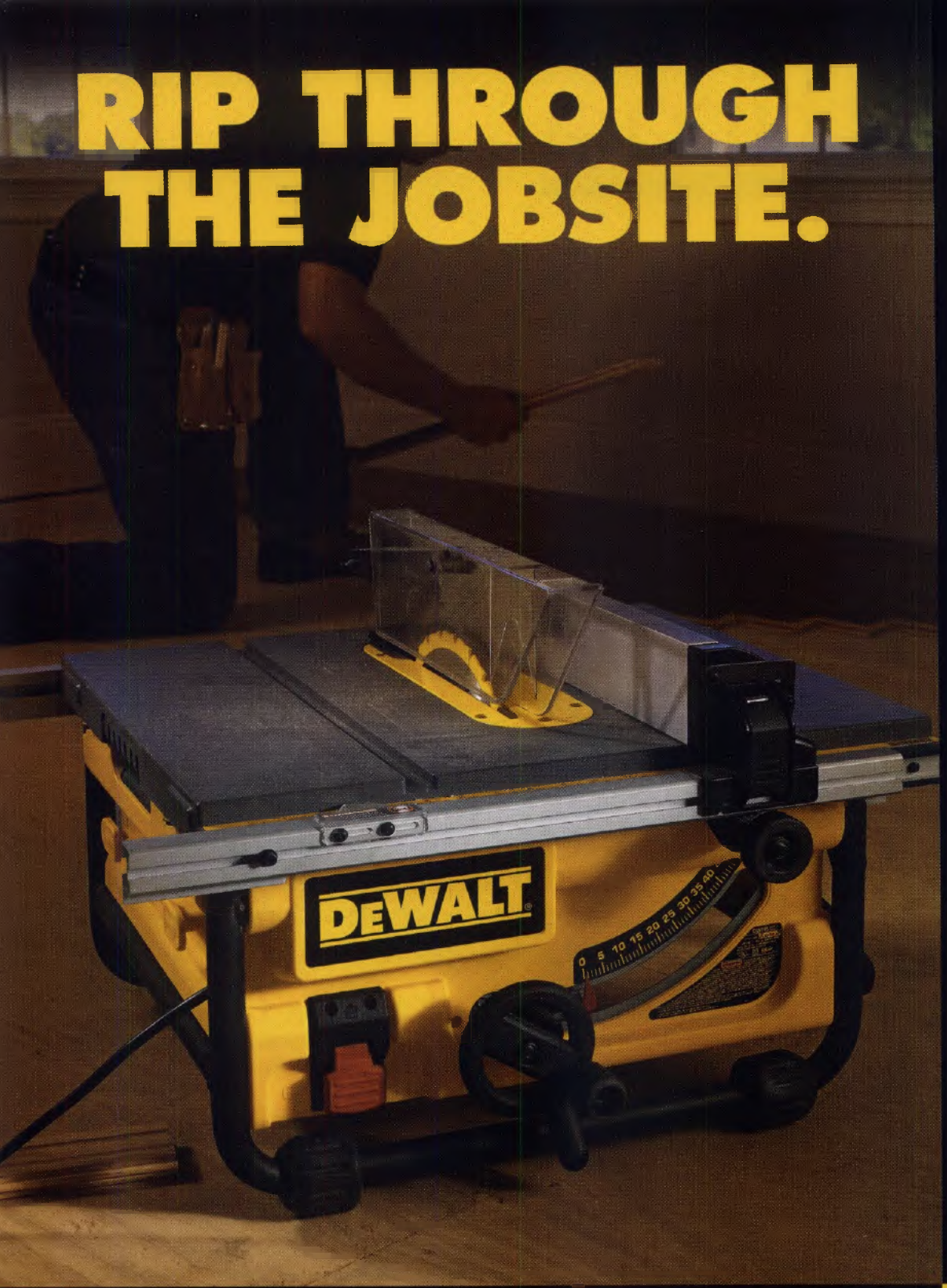


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If you haven't visited "Breaktime," our online discussion group, then you're missing out on a fascinating exchange of ideas, advice, and commentary. You'll find "Breaktime" on our Web site at www.finehomebuilding.com. Listed below are some recent highlights.



www.finehomebuilding.com

Painting round porch-rail balusters

CREATED BY MUTTFACE: I just had a new porch installed, and now I have to paint more than 100 round balusters. I'm planning to do the job right: a coat of high-quality primer, followed by two coats of white paint. I figure I'm looking at a pretty good workout, but are there ways to make the job easier?

Posted by DougU: If you're going to do the job by hand (with a brush), I'd get a second person to help out. Both of you can work on the same baluster at the same time, one on each side. This way, you won't have to go around the railing to see if you have drips and runs.

Posted by Slykarma: If the balusters aren't installed yet, dipping is the easiest way to coat them. Buy a piece of 4-in.-dia. sewer pipe a couple of inches longer than the balusters and an end cap to fit over one opening. Brace the pipe upright, and fill it with paint or stain. Wearing gloves, submerge each baluster fully in the paint-filled pipe, pull it back out, and brush off the excess. I've also seen painters screw cup hooks into the baluster ends so that the pieces could be hung up to dry.

If the balusters are installed already, then using a foam stain glove is the way to go. Spread lots of drop cloths around; then dip your gloved hand in paint and rub it all over the baluster. Once again, a brush will be needed to prevent runs.

Is green building just about making green?

CREATED BY GREENGIANT: The current state of information about green building materials and practices seems to be all over the board. There's lots of information on the Web and in magazines and books. I'm starting to wonder, though, if there is a truthful source for information about green building, or if this is just the latest buzzword that manufacturers are using to make a buck.

Posted by Ricks503: If a company labels something as organic, it is required by the government to have met certain standards. "Green," on the other hand, has no legal definition or requirements—at least not yet. So "green" can mean almost anything: biofuel, recycled plastic made into building products, wind, solar, or geothermal power.

Posted by Experienced: LEED (Leadership in Energy and Environmental Design) is being set up to address these issues and more. Another good reference is Environmental Building News (www.buildinggreen.com).

Posted by BrianP: I recently attended the Green Building Conference sponsored by the National Association of Home Builders. I went in with the same confusion many of you are expressing, but I came out with the notion that "green" is a terrible word to describe what I learned about. For some, it conjures up images of hippies in mud huts; for others, it means spending more money.

> "The truth is that few people understand that green building is really just about making better homes."

The truth is that few people understand that green building is really just about making better homes. In fact, many of you probably already are building green without even realizing it.

What's the best way to coil an extension cord?

CREATED BY SCOTTBIRNIE: Even though I take my time coiling extension cords around my arm, I still end up fighting with knots when I unravel them later. What is the best technique for coiling and storing extension cords?

Posted by GeorgeAbramshe: I always use what's called a "fireman's loop." Basically, I make large, even loops in the cord by extending both arms out to their widest spread. Once I've got the entire cord in big loops,

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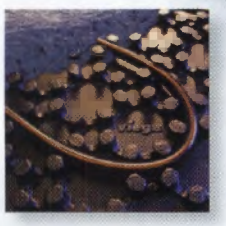
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I just plug the two ends of the cord together into one last smaller loop, which I then use to hang the coil in my truck or on a hook.

Posted by RonBudgell: Coiling extension cords around the arm doesn't work. They have to be laid down freely without too much persuasion, or they will kink. Try laying the cord down on the floor in figure eights, with each half of the eight tied separately; then fold the whole thing together.

> "Coiling extension cords around the arm doesn't work. They have to be laid down freely without too much persuasion, or they will kink."

Posted by Mongo: I use the "daisy chain" method. It's tough to explain, but essentially, I start with a loop about 12 in. in dia.; then I reach through the loop, grab the cord, and pull it through the loop so that it makes another loop. Then I reach through that loop, grab the cord, pull it through the second loop so that it makes a third loop, and so on until I get to the end. I never get tangles, and the cord unravels like sweater yarn coming unknit.

Posted by TomDunlap: I use a technique made popular by rock climbers. Put one end of the rope in the bottom of a drywall bucket, and then pile the cord in, hand over hand. Don't try to be careful or to stack the cord neatly; it will come out snag-free on its own.

Boring a hole in the center of a 4-ft. post

CREATED BY SALESI: I have a customer who wants to mount a low-voltage light on top of a 6-in. by 6-in. by 48-in. wooden post. He wants the wiring to run up through the center of the post, which will require a ½-in.-dia. hole. How do I bore a 4-ft.-deep hole?

Posted by Try50772: Cut the post down the middle with a bandsaw or on a tablesaw equipped with a thin-kerf blade. Then rout or dado a groove into the post to fit the wire, and reassemble the two halves with your favorite outdoor glue. You will lose only the thickness of the saw kerf, which likely won't be noticeable.

Posted by TedW: You can buy really long spade-drill bits at an electrical-supply store. You probably still will



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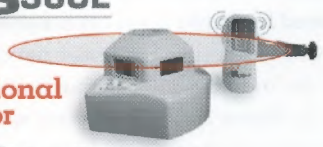
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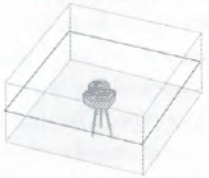
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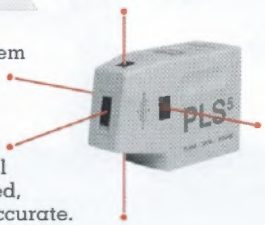
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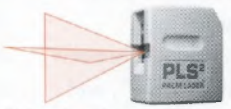


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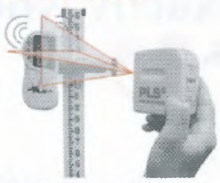
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need additional extensions to get you to the 48 in. you need for the job. Of course, the customer probably should be billed for them because you'll likely never need them again.

Posted by Saulgood: Choose the side of the post that will be least visible, and run the whole piece over a tablesaw with the blade set at a 45° angle. Make two passes with the post so that when you're finished, you have a long V-shaped groove that has been removed down the length. This groove can be big or small, depending on how deep in the post that you need to run the wiring.

> **"The pipe would have cut off my finger had it not hit exactly where the ring was."**

Now set the tablesaw blade back to 90°, and cut a properly sized groove down the middle of the V-shaped groove to allow room for wiring. With the wire in place, you can cut a triangular strip of wood to fill the gap and trim it flush with the finished surface.

Wedding-ring safety

CREATED BY PENOBSCOTMAN: What do you think about the safety of wedding rings? I've heard that they can be a source of accidents around machinery.

Posted by DieselPig: I don't wear a wedding ring at work. It's not that I want to deceive my spouse; it's just that I like having 10 fingers almost as much as I like having my wife by my side.

Posted by Draftguy: I always take off my ring when working, especially if working high off the ground with a chance to fall and snag my finger.

Posted by Mark: I don't necessarily recommend you follow my example, but I have never taken off my ring since the moment my wife put it on my finger at the church. About a month after we were married, I was unloading some windows from my pickup, and I didn't see the plumber's truck backing toward me. I grabbed a window, turned around, and smacked my hand into the sharp end of a protruding copper pipe. The pipe would have cut off my finger had it not hit exactly where the ring was. I had to get out the hammer and pound the ring back to round again, but I always have looked on that incident as good enough reason to keep the ring on.

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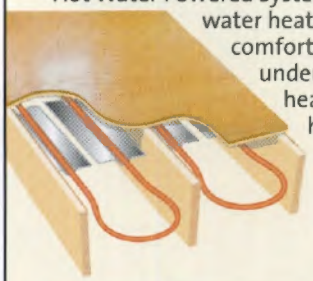
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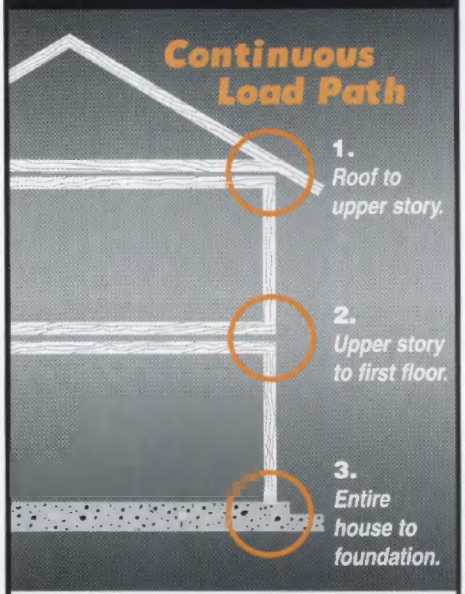
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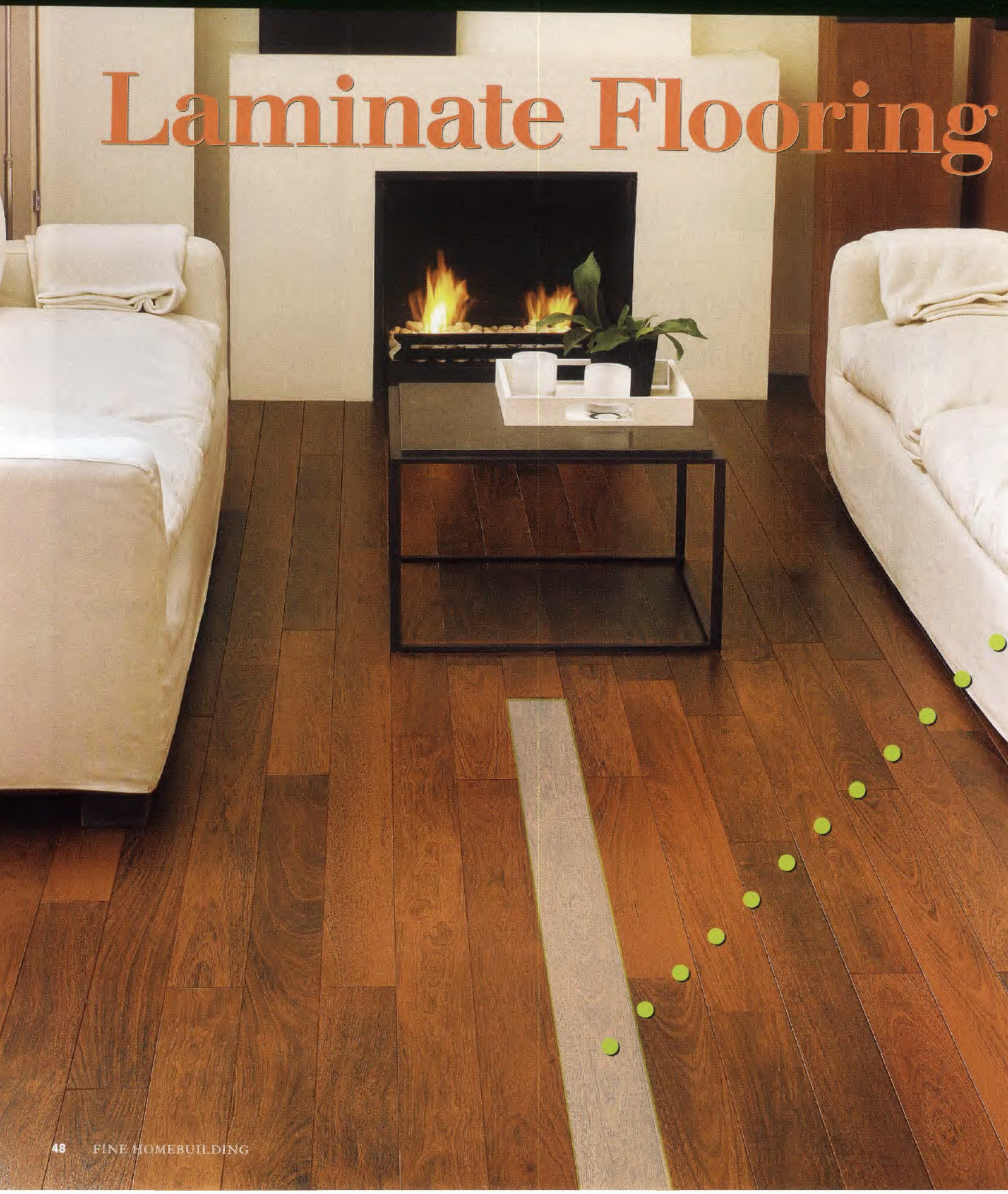
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READER SERVICE NO. 85

Laminate Flooring



Is Here to Stay



Like it or not, laminate flooring is growing in popularity, dropping in price, and looking better every day

BY JUSTIN FINK

While it may never be your first choice for the main entry of a house, laminate flooring has even the most devout natural-flooring fans appreciating its variety and affordability. According to Texas builder Mark McSwain, "Everyone seems to agree that it's not as good as the real thing, but at an average price of $1.24 per sq. ft., it is what folks will pay for."

According to the North American Laminate Flooring Association (www.nalfa.com), laminates have experienced the largest continuous growth in the entire flooring industry. Manufacturers are converting skeptics by improving laminate technology with innovations like glueless mechanical joints, tapered and beveled edges, and realistically textured surfaces.

The ever-widening choice of styles is also a positive factor. Interested in wormy chestnut, hand-scraped pine, limestone, Mexican pavers, or ceramic tile? You can be sure it's available in laminate.

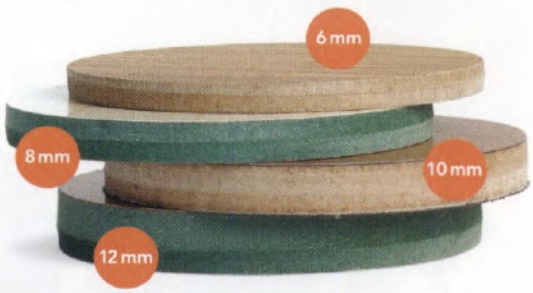
Photos can't compete with samples

The Web has created a large online flooring market, but resist the temptation to choose a laminate sight unseen. The feel of a laminate floor is absolutely as important as its appearance. At the very least, ask manufacturers, distributors, and online retailers for samples of each product you are interested in comparing. They are usually happy to provide samples, and you will be surprised by how different each floor looks in person.

Even better, visit a flooring retailer that has sample installations. There is simply no better way to see how realistic the surface appears, to evaluate how each brand holds up to foot traffic, and to hear how different floors sound under a pair of high heels.

Is thicker better?

Laminate flooring typically ranges from 6 mm to 12 mm thick (roughly ¼ in. to ⅓ in.). According to Andre Tesolin of Torlys Flooring, a manufacturer of laminate and other types of flooring, if a laminate is thinner than 8 mm, the planks may not be stable enough to resist the cupping effects of high moisture. And although the perception is that thicker is better, Tesolin warns that many of the thicker laminates are of a lower quality



Laminate flooring ranges in thickness from 6 mm to 12 mm. *The difference is typically a matter of the core size only; the wear layer and the photographic image do not vary.*

LAMINATE LAYERS

1. **Wear layer:** Typically made from a clear layer of melamine that is impregnated with a hard-wearing aluminum oxide, this film is the reason why laminate floors are so durable.
2. **Photo layer:** Not to be confused with the real layer of solid wood found on engineered flooring, the photographic image on laminates can mimic anything from marble tile to exotic hardwood.
3. **Core:** Also known as a carrier board, this high-density fiberboard core is the backbone of each plank.
4. **Backing:** Sometimes called a balancing layer, this portion of the laminate typically is made from melamine and adds extra resistance to subfloor moisture to make the flooring more stable.

Photo facing page: Courtesy of Quick-Step. Drawing this page: Don Foley.

No need for glue and clamps

Most modern planks connect with different versions of a dry-fitting mechanical joint to create a tight, water-resistant, nearly invisible joint.



and also may be susceptible to excessive swelling in moist environments.

Steve Simonson, chief executive officer of iFloor.com, notes that when thicker high-quality planks or tiles are combined with a good underlayment, they are less likely to sound hollow underfoot—a common complaint with laminates in general.

The only way to know for sure whether thicker is better is by checking the product's *swell rate*, which measures how much the laminate core expands when submerged in water for 24 hours. Tesolin notes that better-quality brands make this information available in print because it is a key differentiator. The maximum allowable standard for moisture swell is 18%; many laminates fail this test, or come dangerously close to failing. Once the core gets wet and swells, the entire piece needs to be replaced. Better products have swell ratings of 12% or less, but if you don't see the number on the box, there's a good chance that the product has poor resistance to high humidity and moisture absorption.

It's a floating floor

A laminate floor is not attached to the subfloor in any way. Instead, the planks or tiles are joined to each other and are installed over a smooth, level underlayment with a ⅜-in. gap around the floor's outside edges.

Until a few years ago, every brand of laminate flooring on the market required glue to join planks together. Glue-together planks still are being sold by a few manufacturers, but the vast majority of laminates sold today rely instead on a glueless mechanical joint.

The benefits are clear: Glueless floors assemble without clamps, adhesives, or resulting edge-swell problems. Instead, planks use locking tongue-and-groove connections that are faster and easier to install, yet allow the floor to be disassembled if necessary.

Natural character means a more realistic appearance

Each laminate tile or plank begins its life as part of a larger sheet, much like an oversize piece of veneered plywood. The veneer on laminate, though, is actually a huge photographic image coated with a clear, durable wear layer. The grain pattern and coloration vary across the face of the large uncut laminate sheet, but the overall image doesn't vary between sheets. The identical sheets then are cut into eight or nine planks so that there is a distinction in the pattern from one plank to the next.

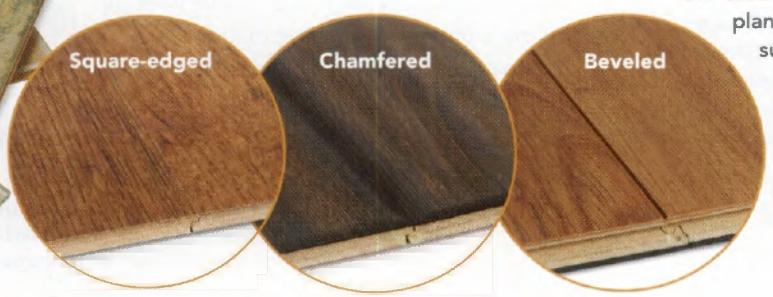
Why should you care? Because this repetition is part of the reason that laminate flooring often is designed with subtle grain and uniform colors. Many buyers believe that having less distinction between planks means less chance of noticing a repeat. The trouble is that these bland patterns often end up looking like poor substitutes for the real thing.

For the look of a true hardwood floor, forget about bland, and choose a style that includes natural-looking imperfections. Knots, checking, or even faux sawblade marks help to break up the repetition and make a laminate floor look more true to life. Some of the Mannington and Quick-Step products do an excellent job with these details.

According to Tesolin, the best laminates have about 10 plank variations, but some of the cheap varieties have as few as four. With such a high rate of repetition, you are more likely to join two planks with the same photo end to end or side by side. To help curb the chances of a repeat, Quick-Step's Elegance line and Lumber Liquidators's Nirvana V3 line both offer three different plank lengths within each package. By varying the orientation of the planks and by keeping the lengths random, you have more design options and much less chance of an obvious repetition.

Planks or tiles Laminates made to look like wood are manufactured in both random and uniform lengths, and either single boards (1) or combinations of two or three boards called strips (2). If you choose a laminate floor that looks like stone or tile (3), each piece usually is installed individually just like a real stone or tile floor. Manufacturers sometimes offer combination tiles as well.





In the groove Square-edged planks join together to create a surface with a smooth finish, but they sometimes end up looking like one continuous sheet of vinyl. If you want more delineation between planks, consider chamfered or beveled joints.



Natural or knot (1) Avoid generic grain patterns imprinted on the wear layer that don't match the grain of the photo layer below. (2) Better products use "embossed in register" technology to match the wear layer with the grain texture shown in the underlying photo. (3) To avoid a cookie-cutter look, some manufacturers take realism to the next level by showing imperfections like knots and sawblade marks. (4) The premium products go as far as imprinting gouges, grooves, and dents into the surface of the planks to re-create the look of distressed or hand-scraped wood. (5) For those who don't want to imitate nature, some manufacturers make laminates in solid colors and simple patterns.

There are also manufacturers—ABET is one example—that make laminates in solid colors or simple patterns. Because these floors aren't trying to imitate nature, repetitive patterns and imperfect impersonations are not concerns.

Technology creates the illusion of imperfections

Laminate-flooring manufacturers are using new technologies to make their flooring look more realistic. These features will raise the price to $3.50 per sq. ft. or higher, but paying extra can give you a floor that truly fools the eye.

Depending on the brand you choose and the amount of money you are willing to spend, the grain and surface texture you end up with can look more or less convincing. To see the difference between surface textures, hold the plank at an angle under a light source and look along its surface (photos above).

One popular method of breaking up the eerily smooth surface of a traditional laminate floor is either to taper or to bevel the edges of each plank slightly. Planks that join tightly to one another are great for keeping water from soaking through a floor, but that doesn't mean your kitchen floor has to look like a giant sheet of laminate with no delineation between pieces. Tapered or beveled edges offer the same water resistance, and they help to break up the monotony of a large laminate floor.

Another way manufacturers are making fake wood look real is by adding depth to the surface of the plank itself. Several brands now offer laminates that look like old reclaimed hardwood, with gouges and grooves pressed into the planks for the effect

Be wary of warranties

by Steve Simonson

A 15-year warranty covering wear, fade, stain, and moisture sounds good, right? That's reassuring, but only until you read the fine print. Truth is, it would be tough to get a laminate to stain or fade. And when it comes to wear-through, the warranty covers the product only if the photo layer is completely worn through in a sufficiently sized area. Small scratches, gouges, or chips typically are not covered. If the product carries a moisture warranty, it typically does not protect against edge-swelling, or water damage caused by moisture emissions from concrete.

You can, however, get peace of mind by trusting whom you buy from. Ultimately, the source for your product may be as important as the manufacturer who put the warranty on the box.

—Steve Simonson is CEO of iFloor.com.

Common laminate moldings

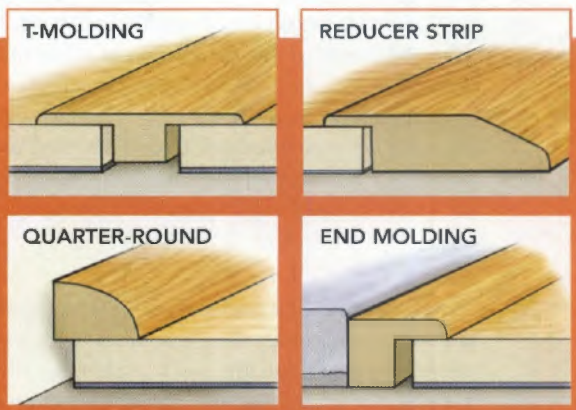
Laminate flooring needs room to expand with changes in humidity and temperature, so color-matched trim is necessary to cover the transition gaps and expansion gaps around the perimeter of the floor.

T-MOLDING
Typically found in a doorway between rooms, this molding attaches to the subfloor and is used to transition between two floors of the same height.

REDUCER STRIP
This molding is used to transition from raised flooring like hardwood, tile, or laminate down to slightly lower surfaces like vinyl or painted concrete.

QUARTER-ROUND
Either fastened to the wall or the subfloor, this molding most commonly is used to hide the gap around the outside edge of a room.

END MOLDING
This molding is used to terminate the laminate where it meets large thresholds. It also can be used in lieu of quarter-round when butting up to carpets or cabinet kick plates.



Drawings this page: Chuck Lockhart

Choosing an underlayment





The underlayment beneath a laminate floor allows the planks or tiles to float, expanding and contracting independently of the subfloor. Underlayments also compensate for slight imperfections in the subfloor, help to reduce the transmission of sound through the floor, and to a lesser extent, soften the feel of the floor underfoot.

Some laminates are available with an underlayment already attached to the bottom of each plank or tile to make installation easier (photo above). But most underlayments still are sold separately in sheets and rolls so that buyers can choose the best product for their budget and their type of installation.

FOAM

Typically about ⅛ in. thick, foam is the most commonly available underlayment and is considered to be the entry-level choice. Foam does a decent job of disguising imperfections in the subfloor, but its sound-reduction qualities aren't great; it's not the best choice for upper-level floors. Prices and sizes vary, but foam typically comes in 50-sq.-ft. to 100-sq.-ft. rolls that cost anywhere from 12¢ to 20¢ per sq. ft.



VAPOR BARRIER

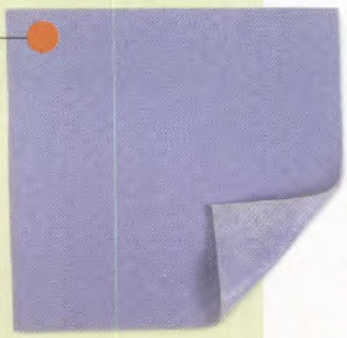
A vapor barrier is required any time laminate is installed in a below-grade-level application like a basement or is installed in any situation where moisture is likely to seep up from below, like the subfloor above a crawlspace. The easiest solution is to choose an underlayment with a built-in vapor barrier (shown here), commonly referred to as a 2-in-1 underlayment. Most manufacturers also allow the use of a separate 6-mil-thick plastic sheeting as a vapor barrier. Prices for 2-in-1 underlayments range from 4¢ to 35¢ per sq. ft.



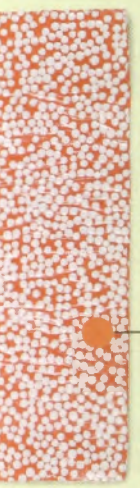
CORK

This underlayment is widely considered to be the best choice because of its breathability, sound reduction, natural composition, and reasonable cost. It is typically available in thicknesses from 2.5 mm to 12 mm, and the rule of thumb is the thicker the cork, the better the sound reduction. Because cork is breathable, it may require a separate moisture barrier. Prices range from 60¢ to $2.44 per sq. ft.

SOUND REDUCTION



Underlayments in this category typically are made from a higher-quality foam, rubber, or fibrous material. Note: These underlayments typically don't change the hollow or "clicking" sound of walking across a laminate floor; they are designed to reduce the transmission of sound to rooms below. The STC (sound transmission classification) and IIC (impact isolation class) ratings are the best way to determine the quality of these products. Consider ratings between 55 and 60 as a good choice, but the higher the number, the better. Prices range from 70¢ to $1.10 per sq. ft.



3-IN-1 COMBO

Combine a traditional pad with both a vapor barrier and a sound barrier, and you get a 3-in-1 combo underlayment. Materials and methods of construction vary widely, but again, STC and IIC ratings are the best measures of quality for this category of underlayment. Prices start at about 45¢ per sq. ft.

of a hand-scraped finish. This technique does a nice job of approximating the real thing.

Durability isn't predictable, but it is testable

The frustrating thing about side-by-side comparisons of laminate flooring is that much of the quality is a function of invisible details. For instance, it's impossible to look at a melamine wear layer and judge whether it will show scratches in a few years or whether a small puddle of water is more likely to seep into the crack between the planks of one brand or another.

For this reason, iFloor.com paid a laboratory to conduct blind-testing for side-by-side comparisons of features like wear resistance, moisture resistance, and more. Pergo, Quick-Step, True Groove, Westhollow, and Wilsonart were among the highest-scoring brands. The results for more than 70 varieties of laminate are available free of charge at www.ifloor.com/articles.

Laminate flooring always will be a cost-driven market

Mannington recently released a laminate plank that replaces the usual high-density fiberboard core with hollow chambers of extruded plastic. Called iCore, the product is designed for high-traffic commercial applications and is impervious to water. This plank definitely stands out from the crowd and raises the question of whether this is the next wave of laminate flooring.

According to Betsy Amoroso of Mannington, the iCore line probably does not indicate the future of residential laminate flooring, simply because its high price of about $6.20 per sq. ft. outweighs the number-one benefit of laminate flooring: low cost.

"Laminates are still very much a cost-driven product," said Amoroso, "and though the technology may improve over time, these products are likely to remain an economical flooring alternative." □

Justin Fink is an assistant editor at *Fine Homebuilding*. Photos by Krysta S. Doerfler, except where noted.

ONLINE CONNECTION

For a list of laminate manufacturers and links to online retailers, visit www.finehomebuilding.com.

A Durable Roof-Valley Repair

Peel-and-stick membrane and metal flashing are the best practice for new or old valleys

BY STEPHEN HAZLETT

When I started my roofing business almost 20 years ago, I quickly found myself specializing in roof repair, mostly reflashing valleys and chimneys on older roofs. Years later, those projects are still my favorites. Repair work has provided me with an excellent opportunity to learn from other peoples' roofing mistakes.

Old roofs usually aren't worth fixing

The quality and efficiency of a valley repair are determined largely by how well you can unzip the old valley. Thirty-year dimensional shingles in pretty good shape are a perfect candidate for valley repairs. Old wafer-thin 20-year shingles usually are not worth repairing because they're too delicate. It's better to replace the entire roof than to fool around with patches. Ironically, 50-year shingles are nearly as unsuited to repairs, but for a different reason. The seal-down strip is too good, which makes it almost impossible to separate the shingles without causing extensive damage. Here's one tip: You may be able to cut the seal-down strips on 50-year shingles using a long, thin knife, such as an old bread knife. Warm the blade with a heat gun, and use the back of the blade (not the serrated cutting edge) to slice through the sticky tar.

During warmer months, I usually start a valley repair around 7 a.m., when the shingles are cool and easy to separate. I try to unzip the valley quickly because by 9 a.m., the shingles are often too hot to separate cleanly. During cooler months, I start later (from 8:30 a.m. to 9 a.m.) to give the shingles a chance to warm enough to be pliable.

Roofing tools work better than carpentry tools

A few basic tools are necessary for a valley-flashing replacement project. First, you need a utility knife with a hook blade rather than one with a straight blade. The hook blade allows you to cut an underlying shingle from the top without damage to the membrane below. A standard utility-knife blade, on the other hand, forces you to cut from below the shingle with the blade tip protruding above the

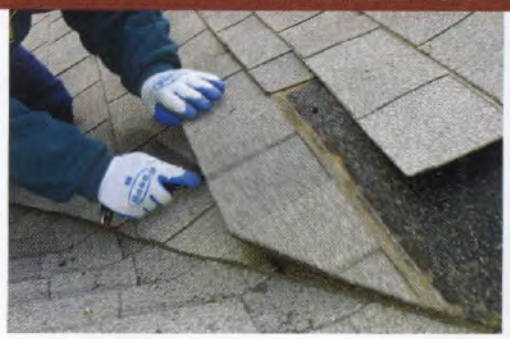
WHY DID THIS VALLEY LEAK?

In the process of unzipping this valley, one of the causes of the leak was revealed clearly. When the original valley was trimmed, the underlying shingle was cut accidentally. This damage probably was caused by trimming the valley with a roofing hatchet rather than a hook blade in a utility knife. The valley also had no flashing, no peel-and-stick membrane, and no underlayment of any kind under the shingles. It was a leak waiting to happen from day one.

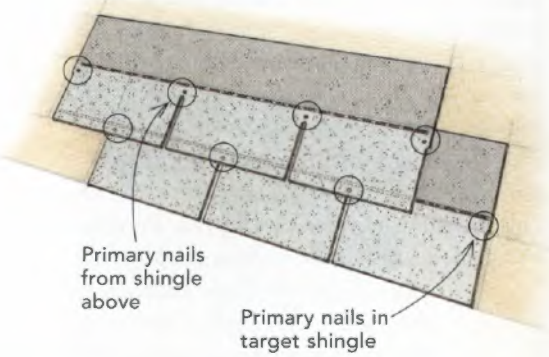




YOUR BEST DEFENSE IS A GOOD BEGINNING



Remove shingles from the top down. *If reusing the shingles you remove, take care not to rip the shingles, and keep them in order. Four primary nails are driven into each shingle just below the tar line, but the primary nails from the shingles above it also penetrate the target shingle. When removing shingles, pull all eight nails to avoid damage.*





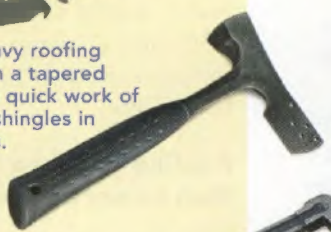
A clean valley is a happy valley. *Sweep all nails and other debris out of the valley. Loose debris could puncture the peel-and-stick membrane or interfere with its adhesion.*

SPECIALIZED TOOLS MAKE THE JOB EASIER

A hook blade in a utility knife won't damage the underlying surface.



A short, heavy roofing hatchet with a tapered head makes quick work of separating shingles in tight spaces.



A roofer's pry bar is the right length and angle for popping shingle nails (photo above).



A metal seamer makes straight, clean bends in metal flashing.









Backup layer. *Granulated peel-and-stick membrane provides a safe walking surface and a watertight seal. I sink a button-cap nail in the upper corner of the peel-and-stick membrane, then pull off the backing. After the backing is removed, slip the membrane under the shingle ends.*

Drawings: Vince Babak. Product photos: Krysta S. Doerfler.

shingle being cut. This slow technique is a pain in the neck.

The second item is a roofing hatchet. I prefer an Estwing hatchet (www.estwing.com) for its all-steel construction and its flat, blunt blade, which tapers to a wedge-shaped head. These features make the hatchet ideal for separating shingles from each other. With heavy weight and a short handle, this tool has enough punch even in tight spaces. Typical carpentry hammers are too light and have a long handle that interferes with the short strokes needed for remodel roofing. They also lack a tapered hatchet blade.

The third tool is a roofer's pry bar. It must have just the right length and just the right angle in the shank to reach under a shingle and pop out roofing nails. I now use an Estwing Roofers' Bar, which is almost perfect (it has a little too much spring for me). Ordinary carpenters' flat bars don't have the right weight, angle, and length for the job.

Although not pictured, another indispensable item is a 2-ft. by 3-ft. piece of foam rubber about 4 in. thick. This pad provides a nonskid surface to kneel, sit, and place tools and materials on. It saves a lot of wear and tear on roof shingles as well as on my knees.

Unzip valleys from the top down

Begin removing shingles from the top, and work your way down the valley. If the roof you are repairing is a second-layer roof, be careful to remove only the top layer of shingles from the valley.

Roofs have two types of valleys: cut and woven (sidebar p. 57). If you have been cursed with a woven valley, you'll have to dismantle both sides of the valley at the same time. To unzip a cut valley, work one side at a time, starting with the overlying side. Break the seal on the course above the first shingle you want to remove using a roofing hatchet or a pry bar. Next, break the seal under the target shingle. Slide the pry bar under the shingle, and tap it under the head of each roofing nail. Pop out each nail using the pry bar as a lever. Finally, because two sets of nails penetrate each shingle (drawing facing page), remove the nails holding the shingle above the target shingle.

At this point, I'm able to move fairly quickly, breaking the seal and pulling out the nails on each shingle, working my way down the roof. After removing the shingles from one side of the valley, I throw down the stack of shingles onto a ground tarp, and I repeat the

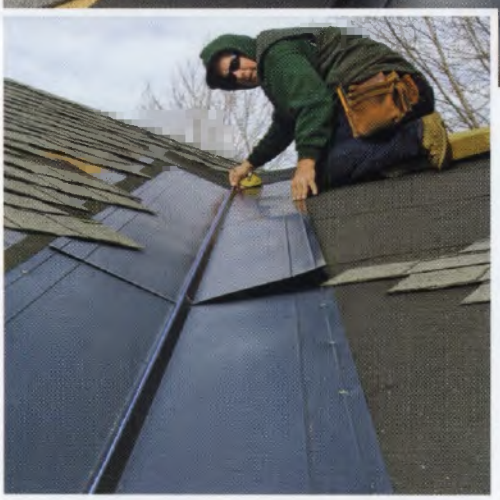
FIT THE FLASHING TO THE VALLEY





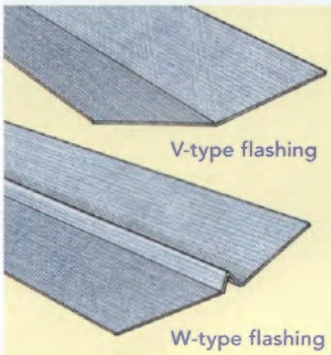
Fold the metal over the drip edge. *Lay the first length of metal flashing in place, and cut it about an inch beyond the roof's edge. Then use a metal seamer to bend the flashing over the drip edge. This prevents water from freezing its way up the roof in winter. Also, bend flaps over the raised ridge to keep out insects.*





Keep nails at the edge. *I nail within the outer inch of the valley flashing about every 10 in. When reinstalling the shingles, I don't let any shingle nails penetrate the metal.*

Use a string to keep the valley straight. *I stretch a string from the bottom to the top of the valley and align the first piece of flashing to it. As I add successive pieces of flashing, I restretch the string to keep the alignment perfect.*



WHY USE W-TYPE VALLEY FLASHING?

W-type valley flashing performs better and is easier to work with than V-type valley flashing. The extra rib in the center stops water rushing down one roof slope from pushing its way under the shingles on the opposing slope. The rib stiffens the metal so that it's less likely to bend while being carried. Also, the rib absorbs most of the expansion of the metal on sunny days, so W-flashing is less likely to buckle.

FOR ROOF REPAIRS, EXISTING SHINGLES SET THE LAYOUT



Keep nails out of the valley. *Lay shingles over the valley flashing to be cut later. The existing shingles provide a layout guide.*





Make a tapered line down the valley. *Because the bottom of the valley handles more water than the top, you should taper the shingle cut. It also looks better. I use my utility knife as a guide: the thin side for the valley top and the wide side for the valley bottom.*





Cutting shingles is a two-step process. *Cut down the valley first, then work your way back up to trim off the underlying shingle corners (see drawing, facing page). By cutting the leading edge of shingles in a valley, you can discourage water from working its way into the interior of the roof.*

process on the second side of the valley. Last, I sweep the exposed roof decking clean, and I inspect for damage and missed nails.

The start of a durable valley: peel-and-stick membrane

I begin the new valley installation by putting down a layer of peel-and-stick underlayment membrane. I prefer an underlayment with granulated coating because it's safer to walk on, but for longer life, smooth membranes are less abrasive to the underside of the valley flashing. The backing on this material can be slippery, so when using long pieces, I put a button-cap nail along the top edge to stop the entire piece from sliding off the roof. With the underlayment positioned, remove the split-sheet backing one side at a time. I carefully lift adjacent shingles, then slip the underlayment up under them if necessary.

When installing peel-and-stick membrane, you must work fast because as the temperature grows warmer, the sticky side becomes stickier. Before installing the membrane, keep it in the shade or in the garage and as cool as possible. If working during warm

weather or if working alone, it's easiest to install overlapping short pieces (about 8 ft. long) of underlayment. Work from the bottom up to cover the entire valley.

Valley flashing has a track record

I follow the membrane with W-type valley flashing (sidebar p. 55). In almost 20 years of roofing, I never have been called to repair a W-valley. I can get painted-aluminum W-type valley flashing in black or brown from my supplier. Copper is also available.

The top and sides of the metal tuck under the shingles, but the bottom needs to be bent to fold over the roofline. Because the valley featured here was formed by the junction of two unequally pitched roofs, the angle cuts at the bottom were weird; rather than cutting by eye, I used a framing square to trace the cuts. After trimming with tin snips, I bent the bottom with an ordinary hand seamer to form a neat return, which hooks onto the drip edge. A few small bends on the center notch that fold back on themselves close the gap that would be sure to attract ice dams, wasps, leaf debris, and other undesirables.

When I'm replacing a valley less than 10 ft. long, one piece of flashing can run the entire valley, and I can place it accurately by eye. If I need several pieces of flashing to run the length of a valley, I use a chalkline to align the flashing. I align these sections as I work up the valley with the string stretched the length of the valley. Getting the metal as straight as possible is important because any irregularity will be magnified when the valley is shingled. I nail the flashing about 1 in. from the edge, every 10 in. or so.

When installing shingles, cutting corners is a good thing

With the valley flashing installed, the project is nearing completion quickly. The existing courses of shingles act as layout guides for reinstalling the valley shingles one side at a time. Lay the shingle ends over the valley flashing, but keep nails in the outer inch of the flashing.

After completing one side of the valley, I snap a chalkline and trim that side with a hook blade. Using the fat and skinny profiles of my utility knife as a gauge, I mark a slightly narrower reveal at the top of the valley and expand to a wider reveal at the bottom. Long valleys or those draining a large area should have a larger reveal so that during heavy runoff, water won't work its way under the shingle edges.

After both sides of the valley are reshingled and trimmed, be absolutely certain to clip the top corners of the shingles with a slight back cut. Clipping these shingles prevents leaks caused by a shingle tip diverting water out of the valley stream and back under the shingles. Old shingles with broken seal-down strips can be resealed with roofing caulk (I like Geocel; www.geocelusa.com). I don't run a bead of tar up the valley along the edges of the shingles because the tar could prevent water from draining out if it got in via windblown rain or through undiscovered imperfections. □

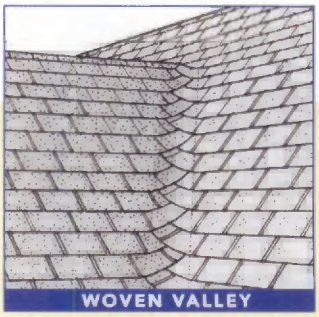
Stephen Hazlett runs Hazlett Roofing & Renovation in Akron, Ohio. Photos by Daniel S. Morrison, except where noted.

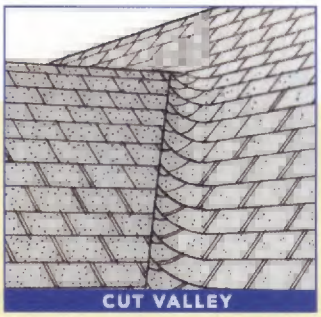




You can't start in the valley if you have to match existing shingles. *But because I stripped the small roof on the right side of this valley, it was like working on a new roof. Run the shingles through the valley and cut them later after snapping a chalkline. Keep nails out of the valley, although it's OK to nail in the outer inch of the flashing.*







CUT VALLEYS ARE EASIER TO UNZIP THAN WOVEN VALLEYS

There are two types of closed valleys. In woven valleys, shingles are interlaced from adjoining sides; in cut valleys, they are laid one side over the other. Both options work, but an open valley with metal flashing is the most durable choice.

Reinventing the House



Open building is a revolutionary approach to design and construction that promotes quality, efficiency, and homes that will adapt easily to their owners' needs

BY ANDREW DEY

If you ask most builders whether the homes they build are above average in quality, they are likely to answer, "Of course." But the reality is that most homes today are built through a process that is inefficient and unpredictable. In an environment where building high-quality homes is difficult and expensive, low-quality homes tend to be the norm.

In the 2006 issue of *Fine Homebuilding*'s *Houses*, timber-framing pioneer Tedd Benson provided a sobering assessment of the "dismal standard" of many homes being built today. The problems Benson identified include increasing shortages of skilled labor; poor coordination between subcontractors; inefficiencies and quality concerns due to job-site conditions; lack of organization between and within the various systems in a home; and poor quality control. These issues all contribute to unpredictability in schedule, cost, and quality: the elements of any project about which the builder, the client, and the designer care most.

With predictions of a housing-market slowdown clouding the horizon and the National Association of Home Builders (NAHB) reporting builder confidence to be at a 14-year low, the existing problems within the industry are likely to be magnified in coming years. We need innovative methods for designing and building homes to serve homeowners better and to ensure the long-term health of the industry.

During the past several decades, many architects, building theorists, and researchers have contributed to the principles of a strategy called *open building* (sidebar, p. 60). While companies in Europe and Japan have been creating construction systems based on these concepts, open building has been slow to take root in the United States. Our design/build company, Bensonwood, and its founder, Tedd Benson, are working to spread the word.

Keep everything separate and flexible

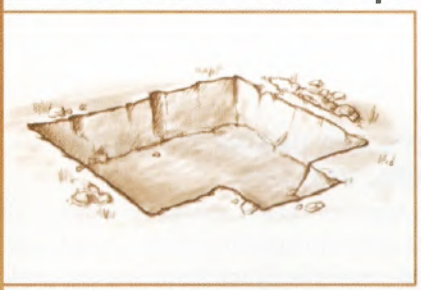
Open building views a house as a collection of layers or levels. These layers are characterized by their expected (or desired) life span and by their anticipated need for modification (drawings below).

In open building, these layers are kept as distinct as possible to optimize their performance and flexibility. This disentanglement between the layers of structure and skin works elegantly in a timber-frame wrapped with insulating wall and roof panels. The skin protects the structure, and the structure does not compromise the skin's insulation. In contrast, conventionally framed exterior walls tend to be highly entangled: Framing creates thermal breaks in the insulating skin; wires, electrical boxes,

Thinking in layers

Open building separates a house into layers based on their life spans. Each layer has a function and a theoretical life span that dictate its need for alteration or replacement. The more often a layer needs to be replaced, the more accessible it ought to be.

From timeless to temporary...



Site: Geological, timeless



Structure: Lasts 100 to 300 years



Skin: 40- to 100-year life span

Drawings, except where noted: Chuck Lockhart; top drawing: Courtesy of Bensonwood

The one-piece service layer reduces chaos



One of open building's main concepts is to build modular components off site in an environment where efficiency, cost, and climate can be controlled. A good example is the mechanical core wall, essentially a self-contained electrical, plumbing, and HVAC chase all in one. Assembled in the shop, the core is craned into place on site. Services already contained in adjacent components can be connected with a minimum of effort.

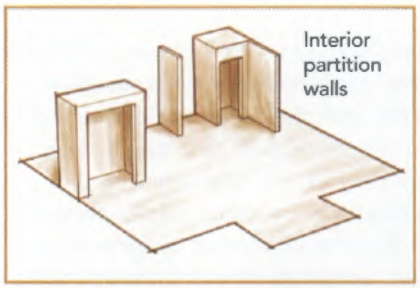
and various pipes run through both the insulation and the structure.

Regardless of the type of construction, open building argues that services such as electrical, plumbing, and HVAC systems should have dedicated zones (or chases) in which to run that are distinct from the skin and the structure. Such zones help to reduce the chaos typical of mechanical systems, and they allow for parallel, rather than sequential, installation of these systems.

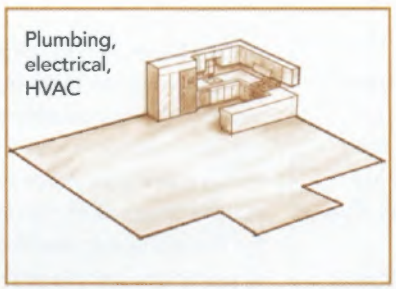
Disentangling layers and systems in a house allows one layer or system to be modified without affecting the others. This flexibility makes a house adaptable to the needs of its occupants, to the environment, and to new technologies. Adaptable houses tend to remain useful and relevant for generations.

In a house that is truly adaptable, the various layers not only are disentangled but also are accessible. Providing long-term access to the services layer is particularly important because modifications to electrical, plumbing, and HVAC systems generally are driven by advances in technology and changes in lifestyle. If a home's wiring is run in a chase that is accessible, then adding an outlet, a dataport, or speaker wiring can be relatively straightforward. Various systems currently on the market provide accessible wiring chases. Many of them were developed first for commercial construction, where forms of open building have long been practiced. Bensonwood's wire-chase system consists of a removable baseboard that installs over a bottom chase in the wall panels. In the second-floor system, access to the mechanical chase is through removable wood ceiling panels (photos p. 61).

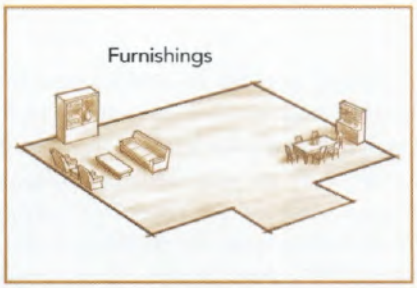
While we generally tout the long-term benefits of accessibility, the builders and homeowners with whom we work have appreciated this accessibility during construction. There was the electrician who had to add two wall sconces to a nearly completed home when the client decided there would not be enough light in the dining room. After popping the cover off the recently installed Bensonwood-style baseboard, the electrician was easily able to snake the necessary wires through the wall to the sconce locations. A homeowner experienced the benefits of our second-floor system when, just before she was to move into her new home, the tub drain began to leak through the kitchen ceiling. The fix involved popping out a ceiling panel, tightening the plug in the drain trap,



Space plan: Lasts 10 to 30 years



Services: Updated every 1 to 10 years



Stuff: Can change monthly

Top drawing, this page: Courtesy of Fachhochschule Rosenheim, Germany

and touching up the paint on the ceiling panel before reinstalling it. No messy drywall surgery, no waiting for three coats of joint compound to dry, and no dust.



It never rains on this job site. On the floor of Bensonwood's large workshop, a section of an attic floor is being assembled, complete with the home's HVAC unit. Lots of light, space, and cranes overhead make it easier to build a better product more efficiently.

Make design efficient with a universal system

As we have developed building components based on layers, disentanglement, and flexibility, we increasingly have seen the need for an organizing system that defines the relationships between the components of a home. For custom builders, each new project tends to be a journey into the unknown. Foundation plans often seem dimensioned without regard to standard form sizes. Floor-to-floor distances rarely are driven by the height of a comfortable stair riser. Walls and windows can be located in ways that complicate load paths or result in the inefficient use of materials. Tasks such as venting a kitchen sink, achieving the necessary pitch on a toilet drain, or running an HVAC duct from the first floor to the second can be frustrating and time-consuming.

A commonly shared organizing system does not exist in residential construction, although most carpenters could point to the beginnings of such a system. The dimensions of building materials (2x lumber, 4x8 sheet goods, etc.) are a good start, as are standards such as 8-ft.-tall foundation forms, 36-in.-high kitchen counters, and 3-ft.-wide exterior doors. Layout conventions, such as 16 in. on center, relate to standard material dimensions and provide some predictability to the assembly of parts. The guidelines of advanced framing (see Joseph Lstiburek's article in *FHB* #174, pp. 50-55) are part of the answer. However, these conventions fall short of a universal design system. At Bensonwood, our designs are organized by a virtual three-dimensional grid that's expressed in a computer-based catalog of standardized components.

This grid system underlies the floor plans of the houses we design. For example, by fixing the standard floor-to-floor heights in our homes as multiples of 7½-in. risers, we have significantly increased the chances of stairs being functional and to code. Our designers generally don't plan new kitchen layouts because the hundreds of kitchens in our electronic catalog fit the common quadrants that result from our grid system. The same is true of bathrooms, bedrooms, entry sequences, and even combinations of rooms. As we continue to increase the number of plan blocks in our electronic catalog, the possibilities for creating custom floor plans using standard components based on an organizing grid become limitless.

Rather than being constrained, our designers have found that such an organizing grid frees them to focus on larger design issues. A system based on predesigned and pre-engineered components—be they stairwells, floor-plan blocks, or dormers—allows for a tremendous variety of aesthetic expression. The same 8-ft.-wide gable dormer ends up in varying numbers and at different locations on many of the homes we build, but each of these homes is a unique design. The design system allows us to achieve a form of mass customization in which we provide high-quality work without the investment of time and money usually required for custom design.

The designs created for our virtual 3-D catalog also contain the information necessary to build the components in our shop. These virtual components reflect input not just from our design team, which is focused on the function and aesthetics of a component, but also from our engineers, who want the component to be structurally sound, and from our project managers, who review the com-

Our history of open building

by Tedd Benson

Somebody once pointed out, "To steal ideas from one person is plagiarism; to steal from many is research." But for that, my whole professional life would be on shaky ground. As it is, my company associates and I are avid researchers, constantly on the lookout for good ideas we can pluck from wherever they might be on the never-ending quest to do things better.

So it was in the early 1990s that I bumped into a marvelous little book by the Dutch architect John Habraken titled *Supports* (Urban Press, 1999). Originally written in 1961, it was a response to the European mass-housing experiments of the post-WWII period. He argued passionately that the process of making housing must preserve the "natural relationship" that humans need to have with the place where they live. He also believed that the building's shell can be constructed without specific concern for the occupant, but fixing the interior without consideration of particular people and their constantly changing requirements does a disservice to the very concept of home. This book was

wiring and plumbing where it's needed most


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3

ponent for cost-effectiveness and "buildability." As we have moved toward integrating wiring, plumbing, and HVAC elements into our components, we have sought input from the appropriate subtrades. When the relationships between these components are determined by an overarching system that embodies good design, sound engineering, and construction savvy, then we can be confident that these components will fit together well.

The site should be more for assembly and less for building

In our version of open building, we see a job site as the appropriate place to join together large prefinished components, rather than a place to turn raw materials into a house. Quality can be increased, waste minimized, and construction time on site dramatically reduced if more of the assembly and finishing are done off site (and under a roof). These realities have motivated our efforts to increase the level of finish on the assemblies that we deliver to the site and have inspired us to seek out like-minded subcontractors and suppliers.

When was the last time you milled door jambs, routed (or chiseled) them for hinges, and hung a door? Prehung doors have not always been the norm, nor cabinets that are delivered fully assembled to the site. Clearly, the trend in the building industry is away from low-margin commodities and toward value-added products. In many Bensonwood homes, the stairs are delivered assembled and finished. These stairs fit well in the spaces framed

In conventional building, installing or modifying electrical or plumbing services can be difficult and expensive. Think of the labor involved in running new wires in an old house or fixing a leaky pipe that's buried in a wall. Instead, Bensonwood developed a floor system (1, 2) that creates its own chases (3). Removable panels in the ceiling (4) allow electricians or plumbers easy access to wiring, plumbing, and HVAC.


4

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the birth of the open-building concept, which is ultimately about infusing the concept of building with the realities of life. In retrospect, it's amusing to see that I underlined most of the book.

Subsequently, I tracked down other books by John Habraken and also learned that he was then the head of the architectural department at the Massachusetts Institute of Technology (MIT) and living in Cambridge, Mass. I sought him out there and had the good fortune of getting to know John over a period of time. He gave a seminar to our company, and I later made several trips to Holland to learn more about how John and his colleagues were putting the ideas into practice.

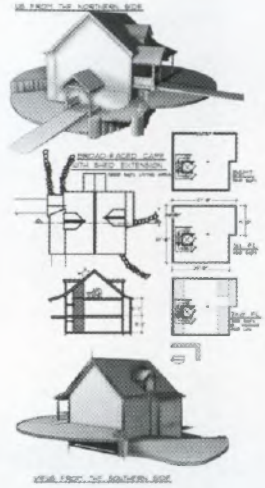
For our company, there was a natural acceptance of open-building ideas. We were determined to do everything necessary to ensure that our houses could last hundreds of years and, with that in mind, already thought of the building's shell and the interior layout as two different issues. We were searching for ways of

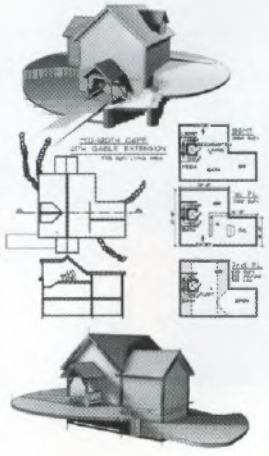
continued on p. 62

Design should be based on a system of standardized components

A design system that Bensonwood calls the 3-D grid incorporates compatible, interchangeable house parts that include everything from dormers and stairs to kitchen and bathroom floor plans. A computer catalog (right) and design software (below) allow the designer and the homeowner to try variations on a particular theme. Once chosen, the design is transmitted to the shop for production.







for them because the stairs and the stairwell framing are built from the same electronic model. The interior-trim kits that we supply to our homes also are highly finished. Whenever possible, we assemble interior-window casing in our millwork shop, securing joints with pocket screws and applying the final finish. An adjustable extension-jamb detail accommodates minor variations in wall thickness on site. The broad acceptance of such shop-assembled and -finished components will increase savings in time and money, and help to ensure quality.

The growth of shop-assembled components has not been restricted to products like doors and cabinets. Many builders take frequent advantage of prefabricated roof trusses and are experienced at working with a crane to install them. Methods for prefabricating foundations have advanced rapidly in the past decade. We see exciting possibilities opening to builders and manufacturers alike if the use of cranes becomes the norm on job sites.

On a recent collaboration with the Massachusetts Institute of Technology called Open Prototype (www.openprototype.com), we delivered wall panels with exterior and interior finishes installed, roof panels with an integral cold roof, and floor and wall systems with elements of the mechanical systems installed. A prefabricated mechanical core wall running vertically through the middle of the house contained the primary elements of the electrical, plumbing, and HVAC systems. We joined together the two sections of this core wall on site, then connected the pipes, ducts, and wires in the core wall to the branches that had been installed in the partition walls and floor systems.

New ways of building will include plug-and-play components

As the construction industry develops new ways of building, opportunities are multiplying for manufacturers to develop innovative products and for builders to use them. For instance, building large, prefinished, well-insulated wall and roof panels is relatively straightforward with the proper facilities and equipment. The trick is to join these panels together efficiently on site. These days, we're relying on gaskets of EPDM and other materials rather than on more rigid materials such as sprayed polyurethane foam to seal the joints between assemblies.

The technology also exists to connect on-site plastic pipe or electrical wires quickly, easily, and securely; you only have to lift the hood of a late-model car to see good examples. Many of these plug-and-play connections already are approved for use in homes. We anticipate that these products and materials increasingly will find their way into the residential-building market.

In the Open Prototype, we used standard neoprene no-hub connectors to join the rigid-PVC drainpipes in adjacent sections of the plumbing core wall. We also used PEX tubing for the water lines because it's flexible and easy to join. From a distributor in Germany, we obtained the plug-and-play electrical connectors we used to join wires in adjacent wall and floor assemblies. In a future prototype home, we hope to eliminate the need for wire nuts (can you imagine finding wire nuts under the hood of your new car?). Alternatives exist in the form of junction boxes, outlets, and switches that use plug-in connections. By providing dedicated spaces for the wires to be run and by locating the switches, outlets, and fixtures on a design grid, the lengths of the wires connecting the various electrical elements could be determined in advance, and the end fittings necessary for these wires and devices to plug and play could be preinstalled. Cable would not

Our history of open building *continued from p. 61*

making our buildings more adaptable, and therefore more durable. We didn't need convincing; we needed to find or develop methods that would work with our design and building systems.

Coincidentally, in the same time period, I also had the opportunity to communicate with Stewart Brand as he was completing his book, *How Buildings Learn* (Penguin, 1994). The essential point of the book is that houses appear to be insentient, but are more like living organisms, no matter what the intentions of the designer and the builder. After showing examples in many types and styles of buildings, Brand concluded that attempts to prevent adaptation and change are both futile and shortsighted. Life is not static; therefore, buildings that house life should be mutable.

In the book, Brand built on a theory developed by British architect Frank Duffy that there are actually distinct layers in buildings that live in time differently. To make buildings more flexible and durable, these layers should not be entangled with each other. Duffy described four layers, but Brand amended the four to six, and he called them the six Ss: site, structure, skin,

Drawings this page: Courtesy of Bensonwood

be wasted, and installing the rough wiring in a home could be as simple as plugging in an extension cord.

Craftsmanship vs. production

Any article that compares the state of home building unfavorably to the auto industry is bound to elicit strong reactions. Are we suggesting that the ideal future is one in which skilled carpenters are reduced to workers on an assembly line or are replaced by robots? Certainly not. Nor do we envision that in the future, success will be reserved only for builders with large prefabrication shops and all-terrain hydraulic cranes.

The balance between craft and production at our shop has been a recurrent theme. Most members of the Bensonwood team were drawn to the company because of its emphasis on quality. To many of us, timber-framing represents one pinnacle of quality home building.

In the early days, timber-framers in our shop argued about whether a saw or a chisel could more accurately cut the shoulder of a tenon. The debate shifted in the late 1980s when we began considering investing in an automated tenon-cutting machine. For the past eight years, we have kept a very large CNC machine busy cutting those tenons in one corner of our shop.

We embrace technology only after convincing ourselves that it will help us to maintain the quality of our products, improve working conditions for our associates, and reduce the costs for our clients. You don't have to cut hundreds of mortises with a drill and chisel before that "craft" begins to feel like drudgery. At its best, the technology used in our timber-frame shop frees our timber-framers to focus on those elements of the craft that require a wealth of experience, sharp thinking, and a practiced eye. For instance, a timber-framer designates and orients each timber before it goes into the milling machine. When it exits the four-sided planer at the end of the machine, the timber is checked by a framer because wood is not perfectly uniform and machines are not infallible. Our framers still chisel housings square, apply decorative embellishments to timbers, and do carvings. Because our CNC timber-milling machine does not cut compound joinery on timbers, our veteran timber-framers are teaching these skills to newer members of our team. And veteran framers have grown their skills in new directions because much of the joinery that used to be laid out on timbers is now done on a computer.

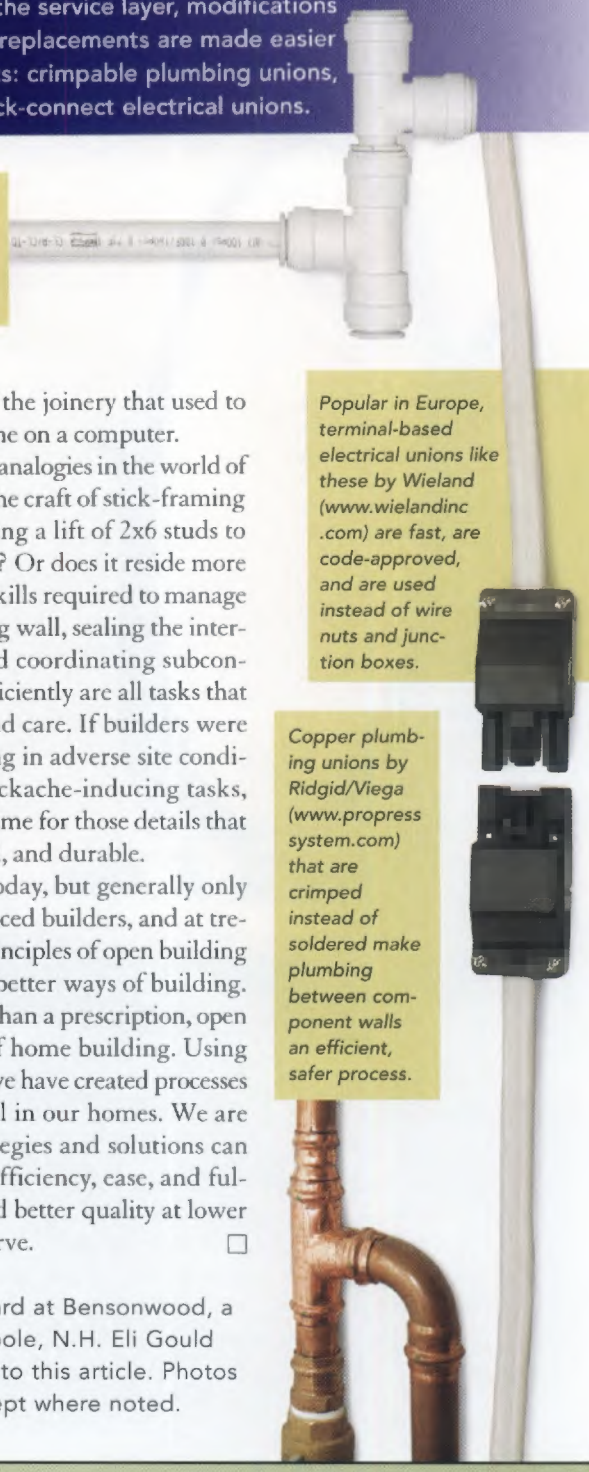
You don't have to look hard for analogies in the world of conventional home building. Is the craft of stick-framing a home found in tasks like cutting a lift of 2x6 studs to length and nailing off a subfloor? Or does it reside more squarely in the knowledge and skills required to manage complex processes? Lining a long wall, sealing the intersection of a wall and a roof, and coordinating subcontractors to use available space efficiently are all tasks that require considerable thought and care. If builders were able to spend less time struggling in adverse site conditions to complete repetitive, backache-inducing tasks, perhaps they would have more time for those details that make a project unique, beautiful, and durable.

Great homes are being built today, but generally only by the most skilled and experienced builders, and at tremendous cost and effort. The principles of open building hold the potential for new and better ways of building. Because it is more a perspective than a prescription, open building can inform all types of home building. Using the principles of open building, we have created processes and components that work well in our homes. We are optimistic that these same strategies and solutions can be developed to bring greater efficiency, ease, and fulfillment to all homebuilders, and better quality at lower cost for the homeowners they serve. □

Andrew Dey is company steward at Bensonwood, a design/build company in Walpole, N.H. Eli Gould and Tedd Benson contributed to this article. Photos courtesy of Bensonwood, except where noted.

Plug and play

In the service layer, modifications or replacements are made easier by plug-and-play components: crimpable plumbing unions, PEX plumbing lines, and quick-connect electrical unions.



Quick-connect manifolds, valves, and unions by Sea Tech (www.seatechinc.com) don't require specialized crimping tools or adhesives.

Popular in Europe, terminal-based electrical unions like these by Wieland (www.wielandinc.com) are fast, are code-approved, and are used instead of wire nuts and junction boxes.

Copper plumbing unions by Ridgid/Viega (www.propress system.com) that are crimped instead of soldered make plumbing between component walls an efficient, safer process.

services, space plan, and stuff. From our experience with timber-frame buildings, the idea of separating structure and skin from services and space plan sounded exactly right and provided us with a clear and memorable objective that could improve our homes.

Inspired and educated by Habraken and Brand, we have further developed their ideas, added our own, and continued our research. From our own experience, we know that quality, efficiency, and consistency can come out of a workshop setting in the form of parts and preconstructed elements. From the Europeans, we have seen that is possible to build standard homes with firmer structure and better energy efficiency. From the Japanese, we have seen that it is possible for every home, even by the tens of thousands, to be customized for the owners. From the auto and computer industries, we have seen the systems and technology that should be available in the average home. More than anything else, we can see that the world is changing, and home building should not drag behind. We should lead.

—Tedd Benson is the founder of Bensonwood, a design/build company in Walpole, N.H.

Photos this page: Krysta S. Doerfler



Yard-Sale Bureau Becomes a Bathroom Vanity

Ingenuity and a bit of planning transform an old dresser into a classy bathroom fixture

BY MIKE GUERTIN

One-of-a-kind bureaus are easy to find at yard sales, second-hand shops, and antique stores. They make unique bathroom or powder-room vanities and can cost hundreds of dollars less than commercially available cabinetry built to look like furniture. I've turned many bureaus into vanities, including two in my own house, with just simple modifications to the tops, backing panels, and drawers. Here are some tips for a successful conversion.

Ideally, you should select a bureau before installing the rough plumbing. This way, the drain and supply connections can be positioned to fit the bureau rather than requiring modifications later.

Choose a sink to suit both the size and the shape of the bureau top. Drop-in, undermount, and top-mount sinks are all suitable for bureau conversions.

Because of the space needed for the underside of the sink bowl and the plumbing, many faux-antique, store-bought vanities have fake drawer fronts that obviously aren't useful. You don't necessarily need to sacrifice the drawers on an antique bureau to the sink and plumbing; they can be modified to fit.

I make cardboard templates of the existing drawers and use a trial-and-error process to scribe the sides and the bottom panel precisely around the obstructions. Once the cardboard template fits, I cut the drawers to match and reinforce them with intermediate partitions. This way, I can retain 50% to 90% use of the drawers.

The veneers and glues used to make many old bureaus aren't intended for wet locations. To prevent the risk of delamination, I strip off old finishes and coat the top with exterior-grade marine urethane or two-part acrylic urethane. The vertical surfaces can be finished with regular urethane or varnish. □

Contributing editor Mike Guertin is a builder and remodeling contractor from East Greenwich, R.I. His Web site is www.mikeguertin.com. Photos by Roe A. Osborn, except where noted.





SIMPLE MODIFICATIONS CREATE A SEAMLESS TRANSFORMATION

Any sink will work, but a drop-in style (photo left) hides any imperfections in the cutout. I mark the opening on the bureau top, drill a starting hole in the waste area, and use a jigsaw to make the cutout. A reverse-toothed blade (teeth pointing down) helps to reduce tearout in the top surface.

Strengthen the top. *To support the weight of a filled sink bowl, you may need to install a ¾-in. plywood subtop with glue and screws.*

Install dividers. *New side panels stabilize the modified drawer.*

Modify the drawers. *Cutouts allow drawers to operate around obstructions like the sink bowl and the drainpipes.*

Strengthen the back. *Panels or slats may need to be reinforced to prevent parts from coming loose.*

Add height. *Bureaus are often shorter than the typical 30-in. to 36-in. height of a vanity, so I attach extensions. Blocks of wood and furniture feet work great, but in this case, a turned-wood doorstop fit the piece nicely.*

Minimize the intrusion. *Plan rough plumbing stub-outs to avoid drawers as much as possible.*

Drawings: Bob La Pointe. Top photo, this page: Mike Guertin.







Mastering Complex Crown

A five-, six-, or seven-piece cornice adds sumptuous detail to a room; careful preparation and a few tricks make the work easier

BY JOE MILICIA

For the past 14 years, I've spent my days building houses, mostly as a finish carpenter, and one of the most rewarding parts of my job is installing built-up crown, also called a cornice. To the untrained eye, a big crown is just another texture, but anyone who has built it knows that the process is more like building a cabinet than nailing up window casing and that most of the work remains hidden.

Because I run a crew (and sometimes an entire project), I spend less time with a hammer, but I still enjoy the work when I can get to it. Many of our projects are high-end houses in the New York City suburbs, so it's not unusual for us to devote a couple of months just to the interior trim. In addition to a typical package of tall baseboard, wainscot, and two-piece casings, we often use a built-up crown detail that includes soffit, fascia, and frieze boards along with crown and bed-molding profiles. A multilayered cornice in a room with high ceilings evokes a solidly traditional, even classical feel that many of my clients look for in a new house.

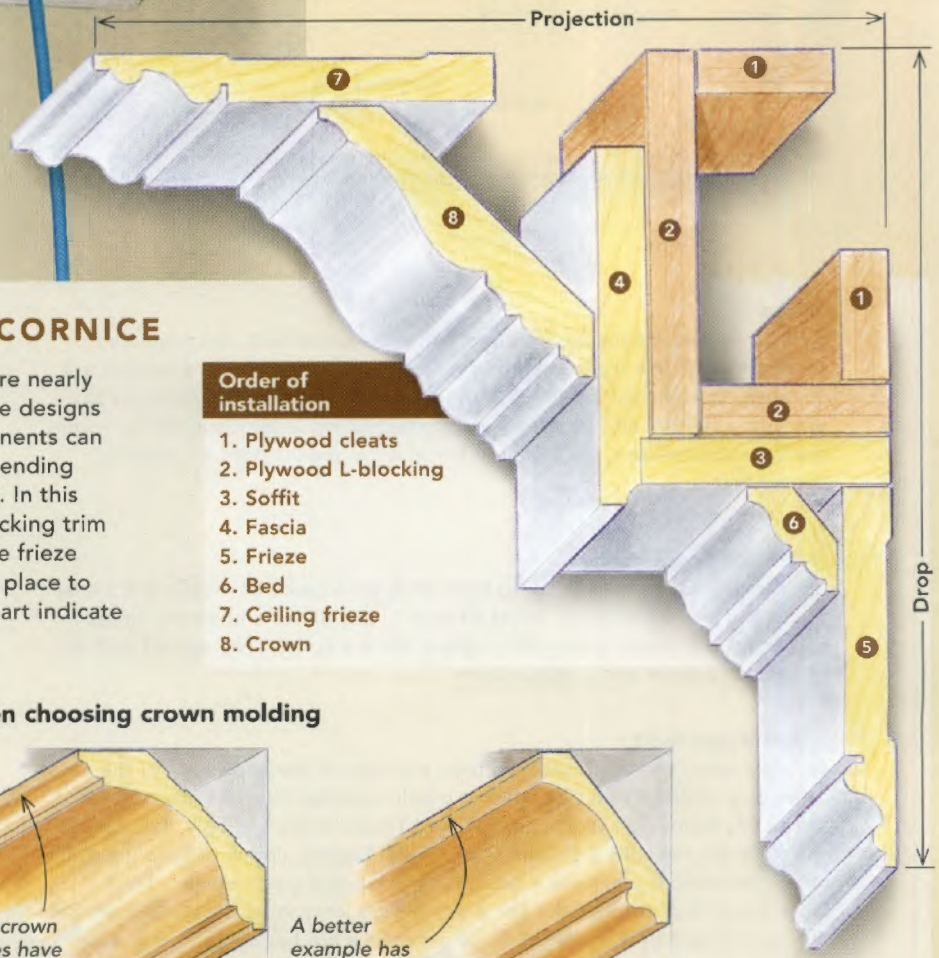
Mock-ups and design: an unbeatable combination

We start most of our jobs with drawings, but I still think a mock-up is the best way to settle on the final design. Mock-ups allow me to confirm with an architect or a homeowner exactly what they want and whether the proportions are correct. If the design works, we use that winning mock-up to confirm blocking dimensions and to settle on a materials list.

Drawings: Dan Thornton

ANATOMY OF A CORNICE

Although the combinations are nearly infinite, most complex cornice designs share common parts. Components can be added or subtracted, depending on the scale and size desired. In this particular design, I added backing trim on the ceiling that mirrors the frieze below and gives the crown a place to land. The numbers on each part indicate the order of installation.

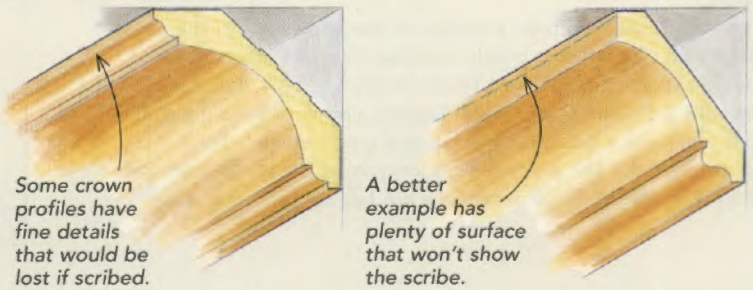


Order of installation

1. Plywood cleats
2. Plywood L-blocking
3. Soffit
4. Fascia
5. Frieze
6. Bed
7. Ceiling frieze
8. Crown

Keep scribes in mind when choosing crown molding

If a particular design calls for the crown to meet the ceiling, I pick a molding profile that has a meaty top edge. The extra material gives me something to scribe to an uneven ceiling.

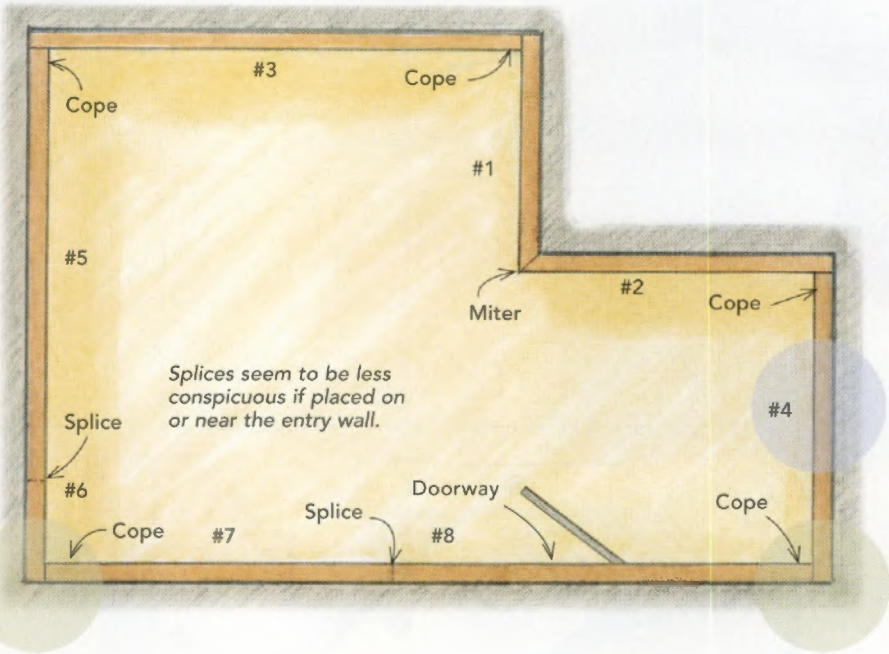


Some crown profiles have fine details that would be lost if scribed.

A better example has plenty of surface that won't show the scribe.

MAP OUT SPLICES AND COPES

There's no getting around it: You always end up with splices (also known as field joints) in long runs of molding. Scarf joints tend to move in service, so instead, we use butt joints. However, even the tightest butt joints will show at some point in the future, so I've learned to locate them in inconspicuous spots. (Trim pieces are numbered according to the order of their installation.)



Copes
By their nature, copes are invisible, but their placement still requires some thought. We try to cope the majority of pieces in one direction, for instance, straight cut on the right and cope on the left; this helps us to get into a rhythm and to speed up production on larger jobs. In the room configuration shown, we installed the shorter pieces with an outside corner first.

Avoid the double cope ...
It's always best to avoid coping both ends on a piece of molding; it's easy to cut the piece too short. After #1 and #2 are fit, #3 and #4 are single copes, #5 is a single cope with a splice, #6 is a splice only, and #7 and #8 have both a cope and a splice each.

... But if you can't
An alternative to the above would be to keep all the copes going the same way. Install #1 and #2 with an outside corner; then #3, #5, and #7 are all the same-side copes, and #6 and #8 are splice fits only. This layout would leave you with a double cope on #4. Double copes require careful measurements. If you have a double cope, always try to leave it for a long run so that you can cut the piece a little long, bow the middle of the crown, and spring it in a tight fit. Short pieces are harder to manipulate.

I make two types of mock-ups. The first is made of short pieces that I use to get all the parts and locations right. Once I've settled on a profile that I think will work, I build a larger version, usually about 12 in. to 18 in. long, that I can tack onto the wall. With two or three mock-ups on the same wall, my clients and I get a good sense of what's going to work in that room.

A good layout keeps you out of trouble

The layout method is as important as the pieces selected and assembled. Initially, going over the locations gets us in touch with any potential problems like bumps and dips in the drywall, as well as window and door heads that aren't exactly parallel with the ceiling. Catching these problems early saves a lot of aggravation later.

One of the ways I've found to offset bad drywall is to select crown profiles that allow me to make inconspicuous scribe cuts (sidebar p. 67). Working from the mock-up, we cut pieces of plywood to the measurements indicated for the projection and the drop, then go around the room and use gauge blocks to scribe reference marks. Chalklines connect the dots. To minimize mistakes, we use red chalk to show where the blocking goes and blue chalk to delineate the actual extent of the built-up crown.

Broad reveals are another consideration associated with profiles. When there's a broad distance between the edge of one molding and the profiled section of an adjacent molding, we have room to make field adjustments that are less conspicuous.

For example, if the ceilings and doors run out of level, we often like to show a reveal of 2 in. or more on the fascia above. The extra blank space allows us to make less perceptible adjustments that don't affect the detail. Another adjustment is to change the reveal of the head casing to mirror the out-of-level ceiling.

We seldom have been able to complete a room without splicing material, so another preparation is to map out the splices and copes (drawing left). We try to order the longest lengths of stock available, then place any splices on the least noticeable wall, such as above the doorway.

Blocking lays the foundation

If I've made an accurate mock-up, I'm usually able to fabricate a cutlist of blocking materials. I like to use plywood because it holds fas-

A STABLE FOUNDATION MEANS FEWER HEADACHES AND A BETTER JOB







Color-coded chalklines keep things straight. *Rather than follow the potential undulations of the drywall, the finished crown should have a straight, even reveal. Gauge blocks (left) help to establish reference points for the chalklines. Red chalk indicates the blocking; erasable blue is used for the finish.*





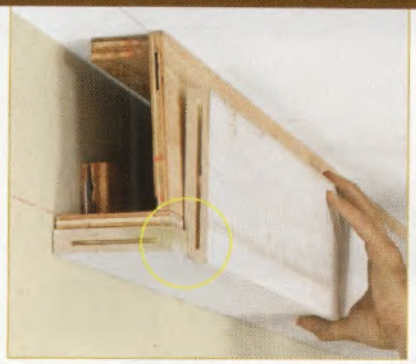


Make your world square. *Mitering or coping molding is much easier if the blocking is plumb and level, so we build a box on the wall to give that support. We glue and nail cleats to the drywall (photo above), then assemble a plywood L, scribing it to any imperfections (photo right). Sections are joined with biscuits and nailed to the cleats (photo bottom right).*

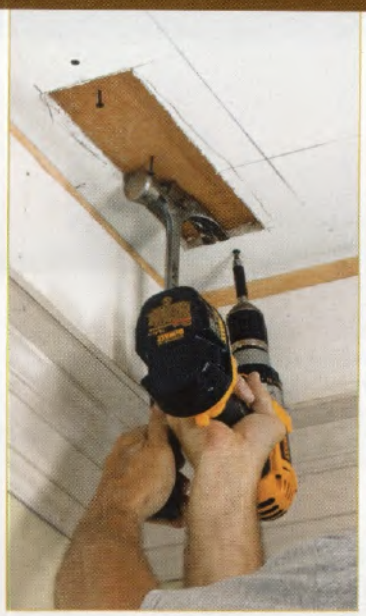








Interlocking soffit and fascia regulate the reveals. *Having parts that relate to each other helps to speed up production, so we often use fascia stock that's rabbeted. The soffit is ripped so that it stands ⅛ in. proud of the blocking and fits neatly into the fascia's rabbet.*





No blocking? No problem. *When we need nailing in the center of a joist bay, we carefully cut a rectangle in the drywall, insert a slightly larger piece of plywood, and secure it with screws (center). Positioned every 2 ft. to 3 ft., these nailers provide enough support for the ceiling soffit and crown (above).*



teners well and is dimensionally stable. Once I have all the parts, I go around the room in a sequential order: Snap all chalklines, install all cleats, then start the moldings.

After the red chalklines have been snapped, we put up the ceiling and wall cleats, which are ripped from ¾-in. birch or ½-in. AC plywood. To give the nails extra holding power, we usually use one of the newer urethane construction adhesives; they're really tenacious. Lately, we've been using PL brand (www.osiscalants.com). At some point, we also make up L-shaped sections of AC plywood. Nailed to cleats, the plywood box provides solid backing and molding-installation surfaces that are plumb, level, and straight. This makes for easier copes and miters.

Molding starts from the bottom

Once the blocking is up, we snap blue lines to mark the perimeter of the molding on the wall and ceiling. Flat stock goes on first, usually the soffit, followed by the fascia and the lower frieze. Butt joints that are biscuited and glued work best here.

The bed molding comes next. Any profiled moldings are coped on inside corners and mitered on the outside; field joints are easiest







Marking accurate miters in place. *Outside corners are never perfect, and rather than run back and forth to the saw, I hold one side of the miter in place and make a pencil line above and below where it intersects with the other half. After marking both halves, I transfer the marks to the molding, and using the laser guide on my saw (center), I cut the miters.*

SOMETIMES COPES NEED FINESSING







My lead carpenter, Don Carlson, has a trick for fine-tuning copes. He clamps the coped piece to a worksurface with an inverted scrap of the same molding as a pad (left). With the molding immobilized, he can touch up the cope with one of his fine rasps (center).

if butted. Yellow glue or urethane construction adhesive keeps the joints from moving later. The configuration shown is made from stock profiles available at any lumberyard. The ceiling frieze, a baseboardlike flat applied to the ceiling, forms the base for the final piece of the puzzle, a 3½-in. crown.

Unless the house's builders were farsighted and blocked across the run of joists, at some point we'll find that there's no nailing in the ceiling. By carefully cutting inside the blue chalkline, we can open up the ceiling and insert plywood blocking that attaches through the drywall.

Earlier, I mentioned problems associated with humps in the walls. Another trick that straightens a really wavy ceiling comes in handy when the cornice design includes a ceiling frieze. We nail the outer detail of the ceiling frieze first but let the back section float over the imperfections. As we nail the crown to the frieze, we pull the back of the frieze to meet the crown and get a nice straight run. □

Joe Milicia lives in Fairfield, Conn., where he runs Hobart Builders. Photos by Charles Bickford.

Low-Maintenance Eaves

BY RICK ARNOLD

Aluminum fascias and vinyl soffits installed properly never need painting, look great, and incorporate ventilation in the bargain

No matter what method you use, installing eaves involves staging, ladders, and a lot of up and down. After installing wood eaves, someone still has to go back to fill nail holes and then caulk, prime, and paint the entire assembly. This is all part of the construction process. But when it's time to get out the ladders, scrapers, and paint a few years later, it doesn't matter who you are: You're going to hate every single minute of being up there again.

Using aluminum fascias and vinyl soffits saves considerable installation time from start to finish, but best of all, it prevents all the future work necessary to maintain their wood counterparts. Are vinyl and aluminum eaves starting to sound better?

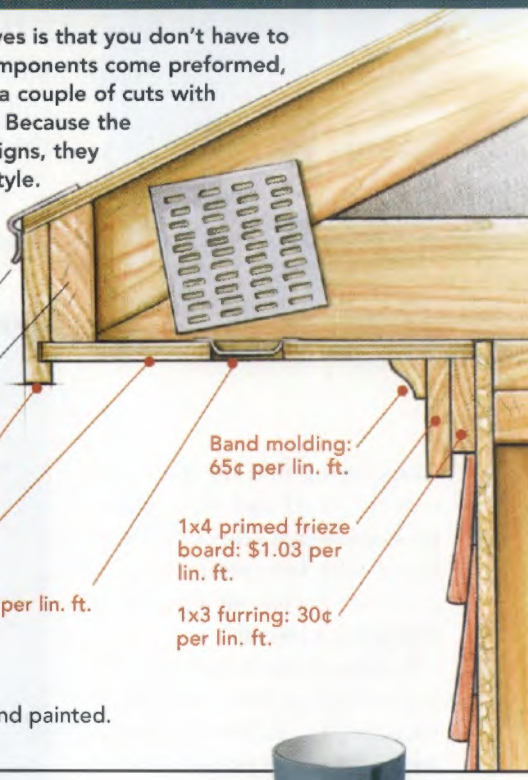


This house is ready for vinyl. *Although the eave approach in this article can be used for just about any siding application, I installed vinyl siding on this house. A vinyl termination strip (shown far left) slips into a rabbet in the vinyl lineal and secures the ripped edge of the last course of vinyl siding. Rigid-foam insulation installed over sheathing increases the wall's R-value. (For more information, see* FHB *#181, p. 88.)*

COMPARED TO WOOD, LOW-MAINTENANCE EAVES COST LESS

One nice thing about vinyl and aluminum eaves is that you don't have to work the materials as you do wood. Vinyl components come preformed, ready to install. And aluminum requires only a couple of cuts with a knife and an easy 90° bend (sidebar p. 75). Because the materials come in a variety of colors and designs, they can be adapted to almost any architectural style. Best of all, though, is that there's no need to scrape, caulk, prime, or paint. Ever.

Typical wood-eave detail



Total cost: $4.53 per lin. ft.

The eave still needs to be caulked, primed, and painted.

Low-maintenance-eave detail



Total cost: $3.96 per lin. ft.

You're done. Clean the eaves as needed.

Drawings: Bob La Pointe. Photos this page: Krysta S. Doerfler.



INSTALL THE EAVE PIECES FIRST, THEN WRAP THE RAKE

Straighten the subfascia with a stringline and shims before installing the vinyl soffit material and the aluminum fascia. Find the soffit depth from the wall sheathing to the outer edge of the subfascia, and subtract ½ in. to leave room for the F-channel and for thermal expansion. To find the aluminum-fascia width, measure down from the front lip of the drip edge, and add 2¼ in. so that the material can slip under the drip edge and wrap over the soffit. Cut soffit and fascia pieces on the ground. The remaining pieces can be cut on the staging with snips.

Considering that the material cost for vinyl and aluminum eaves is lower, it's easy to understand why low-maintenance eaves are becoming a popular alternative to wood.

Nonwood eaves and fascias are becoming more and more common here in New England, where a house's exterior takes a nasty beating. Homeowners are willing to sacrifice architectural authenticity for the freedom from periodic scraping and painting, especially in the eaves.

I've installed aluminum and vinyl trim on both new and old houses that were to be sided with wood shingles, fibercement siding, composite siding, and of course, vinyl siding. With few tools and few materials, I can install vented eaves that look similar to wood eaves in half the time.

There are all sorts of vinyl trim and accessories that, together with aluminum coil stock and your bending skills, can mimic just about any architectural detail. Although certain details can differ depending on the desired architectural look, my basic method for putting up the soffits, fascias, and rakes is the same no matter what the type of siding. □

Rick Arnold is a builder in North Kingstown, R.I. Photos by Brian Pontolilo, except where noted.



Install the F-channel flush with the bottom of the subfascia. *I hang the subfascia ¾ in. down from the truss tails to widen the fascia, so I nail strips of furring to the bottoms of the tails. I nail the F-channel just below the furring with 1¼-in. aluminum roofing nails 16 in. on center. Leave the nails 3/32 in. proud (the thickness of a dime) to allow for thermal expansion.*



Only the leading edge is nailed. *Once the first piece of soffit is installed, each consecutive piece snaps into the previous one. I nail the leading edge to the underside of the subfascia and to the furring strip above the F-channel with 1¼-in. roofing nails. Use a plywood blade installed backward to cut the soffit material.*



If you want a vinyl frieze board, use a starter strip. *After the corner piece is up, I install the starter strip just below the F-channel using the same nailing technique I used when installing the F-channel.*



The lineal mimics the frieze board. *I snap the lineal in place and nail it every 16 in., again leaving the nails proud. The lineal finishes the eave and provides a rabbetlike groove into which siding can terminate.*



Install the aluminum fascia with color-matched nails. *I bend ½ in. of the first piece around the end of the subfascia with a hammer (see the arrow on photo 6). Then I slip the aluminum fascia behind the drip edge. I nail the aluminum fascia about 2 ft. on center, alternating high and low, and pushing the lower edge against the soffit as I go. Overlap adjacent pieces by 1 in.*





Aluminum runs up the rake. *I bend a piece of aluminum to wrap around the soffit return and slip it behind the drip edge (photo left). An extra bend in the rake hooks the bottom of the subrake (sidebar right), so I nail the aluminum only at the top. Overlap the rake pieces by 1 in. to shed water.*

YOU NEED A BRAKE TO CUT AND BEND THE ALUMINUM STOCK

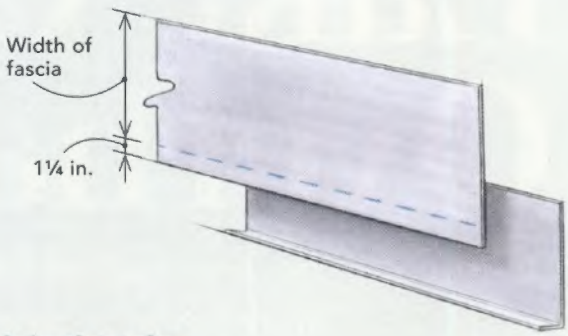
I own a 10-ft. brake, but you can rent one for about $60 a day. When ripping or bending a long piece, keep the length of the piece a few inches shorter than the brake; this keeps the ends of the piece clean. When ripping the coil stock, use the brake's clamp to hold the material and its guide as a straightedge. Score the stock a couple of times with a utility knife, and lift up on the lever to break the piece free. When working on rake pieces and eave pieces that won't be covered by gutters, I like to add a stiffening "hem" to the top of the fascia. The hem is simply a ¾-in. fold along the top edge.



Two steps complete the fascia

1. Rip the aluminum coil stock the width of the fascia plus 1¼ in. to cover the soffit.

2. Bend the stock slightly past 90° at the 1¼-in. mark for a tighter hold on the soffit.

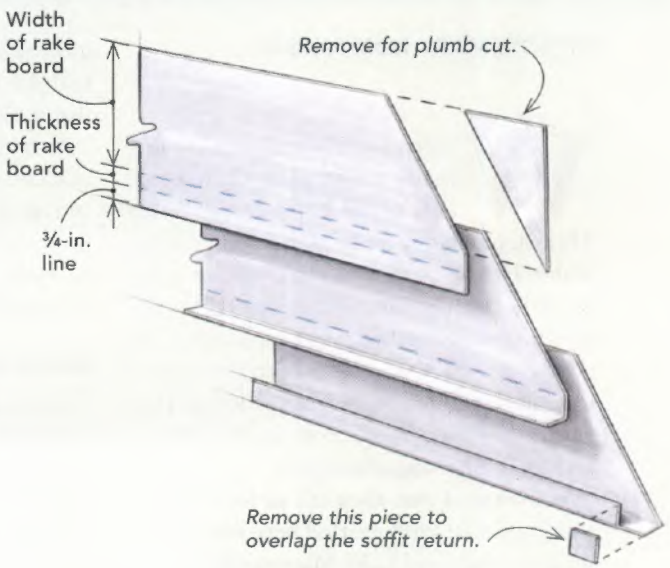


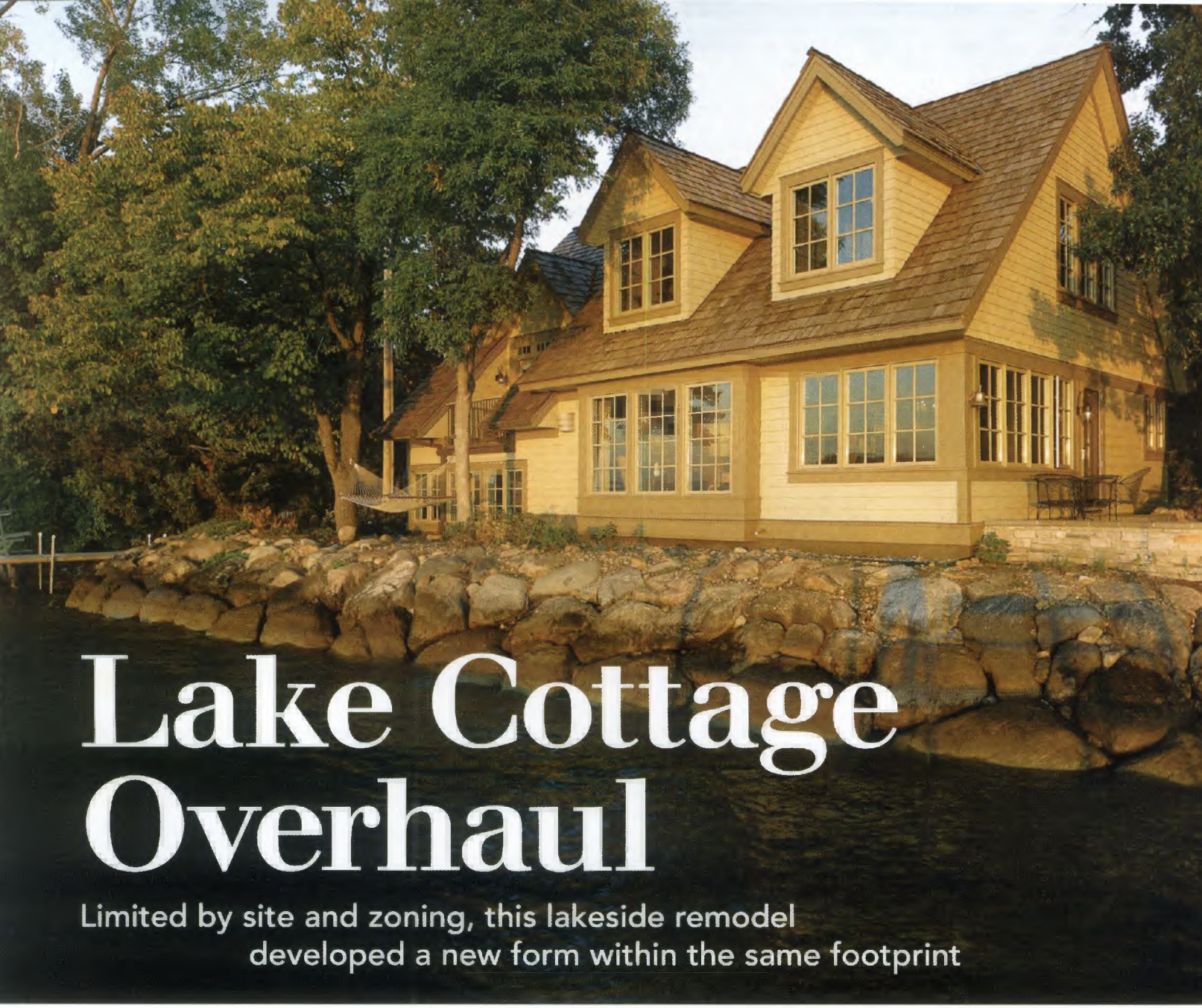
Three steps lock in the rake

1. Rip the aluminum coil stock the width of the rake board, plus the thickness of the rake board, plus ¾ in. Make a plumb cut in the bottom edge that will overlap the return piece.

2. Bend the stock slightly past 90° at the first ¾-in. line.

3. Bend the stock to 90° at the 1½-in. mark.





Lake Cottage Overhaul

Limited by site and zoning, this lakeside remodel developed a new form within the same footprint

BY ROSEMARY McMONIGAL

Warren and Donna came to me ready to simplify their lives and trade their large Lake Minnetonka home for a small cottage on the water. However, they weren't willing to let go of the fine detailing and beauty that years of antique-collecting had taught them to appreciate. They wanted to keep as many of their antiques as possible, but enjoying this Minnesota lake from a comfortable home was their most important goal.

As it turned out, they fell in love with a small piece of land nestled between public walking trails and Lake Minnetonka. A neglected house sat 8 ft. from the lake, but to build on the site, zoning regulations required that the house be kept in its existing footprint.

An overhaul was necessary to give Warren and Donna the quality materials, spaces, and cottage architecture that they envisioned. By preserving the exterior shape of the house, we retained the proximity to the lake, which is a stunning feature of this home.

Site problems had to be solved first

The site is just 0.22 acres, small by lake-lot standards. One long side borders the lake; the other borders a trail system. Our makeover plan for the site had two main objectives: maximizing lake views and access, and shielding the property from a busy public trail.

Our team worked with landscape designers to integrate the landscape and the architecture. Outdoor rooms, gardens, a waterfall, arbors, and stone walkways were created for continuity and circulation within the long, narrow lot. Modifications to existing retaining walls helped to fend off shoreline erosion. Native plants replaced invasive plants, and shrubs and small trees were planted to screen the trail. The preservation of mature trees maintained a canopy, which aids in summertime cooling and acts as a visual buffer.

A split-level Cape causes problems

Although from the exterior this house appears to have only two levels, it turns out to have four. The sloped lot hides the lower level,





WEDGED BETWEEN WALKING TRAILS AND THE WATERLINE, A SMALL SITE POSED BIG CHALLENGES

When downsizing to simplify their lives, the homeowners fell in love with a small piece of land nestled between walking trails and a lake. A neglected, outdated house occupied the site just 8 ft. from the water. The house couldn't be moved or enlarged because of zoning restrictions. An existing garage helped to create some privacy and to shield noise from the road, but the back of the house remained exposed to a heavily used public trail. Adding trees and bushes along the site's border buffered it from the trail, giving the house a more private feel and turning attention toward the spectacular lake view. Photo taken at A on site plan.

Drawings: Martha Garstang Hill



Raising the roof gains a closet. *By adding to the lower-level entry bump-out, we created a 5-ft.-deep walk-in closet off the master bedroom on the main level. The added section required a variance, but because it didn't alter the home's existing footprint or roof runoff, one was granted. Photo taken at B on floor plan.*

Photos taken at lettered positions.

0 4 8 12 ft.

North

SPECS

Bedrooms: 2

Bathrooms: 2½

Size: 2587 sq. ft.

Cost: N/A

Completed: 2004

Location: Greenwood, Minn.

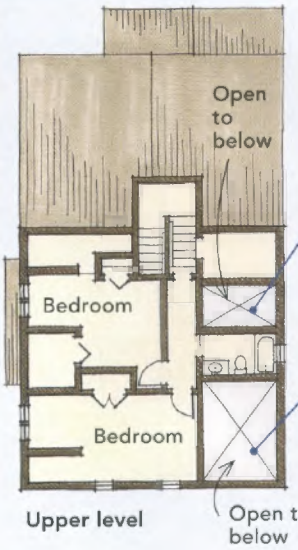
Architect: McMonigal Architects, LLC

Builder: Kyle Hunt & Partners

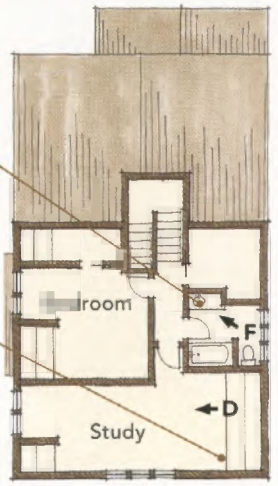
A NEW HOUSE EVOLVES INSIDE THE OLD ONE

The building permit for this project required that I keep the exterior footprint the same. So transforming the cramped, inefficient, and often dark interior spaces of the original house was especially challenging. The design strategy emerged as we identified problems and then developed solutions on each level of the house. The sum of these many alterations is literally a new house, created inside an older one.

BEFORE AFTER



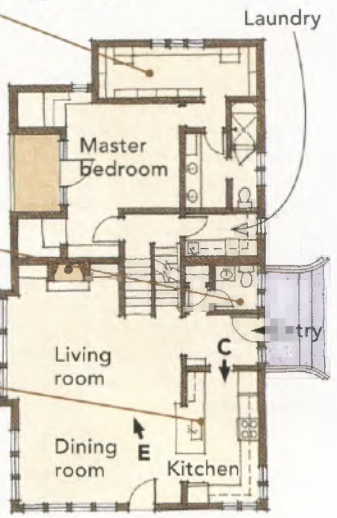
Upper level



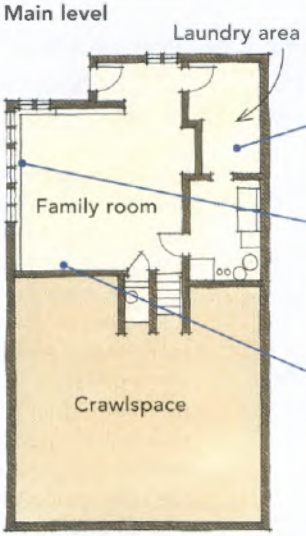
Upper level



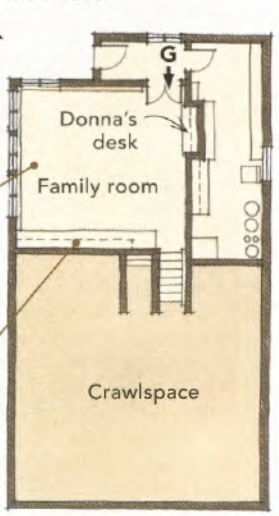
Main level



Main level



Lower level



Lower level

Problems

Poorly proportioned cathedral ceiling restricts size of bathroom dormer and limits storage.

Cathedral ceiling over kitchen creates a cramped bedroom.

Small closet and a tight bathroom leave no space for a laundry room.

Coat closet robs space from living room.

Kitchen island, pantry, and closets intrude on foyer, living room, and dining room.

Laundry area is too far from main living space.

Small windows create dark, uninviting space and don't exploit lake views.

No storage or place for electronic equipment.

Solutions

Close off cathedral ceiling and widen bathroom dormer.

Close off cathedral ceiling and convert bedroom to study.

Add cantilevered bump-out for large walk-in closet, open up bathroom, reconfigure fixtures, and create compact laundry room.

Move bathroom door to provide direct closet access from foyer.

Remove closets, reposition pantry, and move kitchen island closer to east wall.

Make space for laundry near master bedroom.

Widen windows facing lake and add window on north wall.

Add built-in entertainment center and bookshelves.





Closed ceiling, open rooms

The original kitchen (left) was dark and cramped despite its cathedral ceiling. Closing it up added space for the study upstairs (photo below, taken at D on floor plan). In the new kitchen (photo above, taken at C on floor plan), removing closets and reworking sink and appliance locations helped to improve the link to the living room and to lake views.

and the main level is actually split in two. In the owners' words: "This may be the only split-level Cape Cod in existence."

Given all the levels, we started to think about the house in three dimensions. We identified oddly proportioned rooms, and small rooms with disproportionately large vaulted ceilings. Even the basement needed help. It had a large family room with a low ceiling, long beams overhead, and doors interrupting each wall: in short, a claustrophobic space.

A major feature of the house—its proximity to the lake—did not take full advantage of the views. The interior lacked natural light, and many of the rooms were cut off visually from each other and from the view.

The house was less than it seemed

Even before hiring contractor Kyle Hunt & Partners, we brought consultants and subcontractors through the circa-1940s house to brainstorm cause-and-solution scenarios. Some of the problems they discovered included rotting wood, a bowed foundation wall, cupped and cracked roof shingles, moss on the siding, gypsum-board cracks, rodents, and outdated mechanical equipment.

After we marked key areas, a carpenter opened up some walls, ceilings, and floors. We found moisture in wall and roof cavities, and deteriorated framing. It didn't take long to decide that the house was going to be gutted back to the framing. Our structural engineer came on site to evaluate the framing. A soils engineer reviewed soils, bearing, and lakeside-erosion issues. A roofer discovered that a layer of wood shakes had been installed on top of older shakes without replacing the flashing, which had been a major cause for their failure. A waterproofing con-



"Before" photos: Courtesy of McMonigal Architects, LLC

On the lake in your living room

Most people add window seats, but with a large window just 8 ft. from the lake, I couldn't resist the opportunity to run the windows close to the floor. New built-ins, a granite surround, and trim details transform the fireplace wall. Photos taken at E on floor plan.

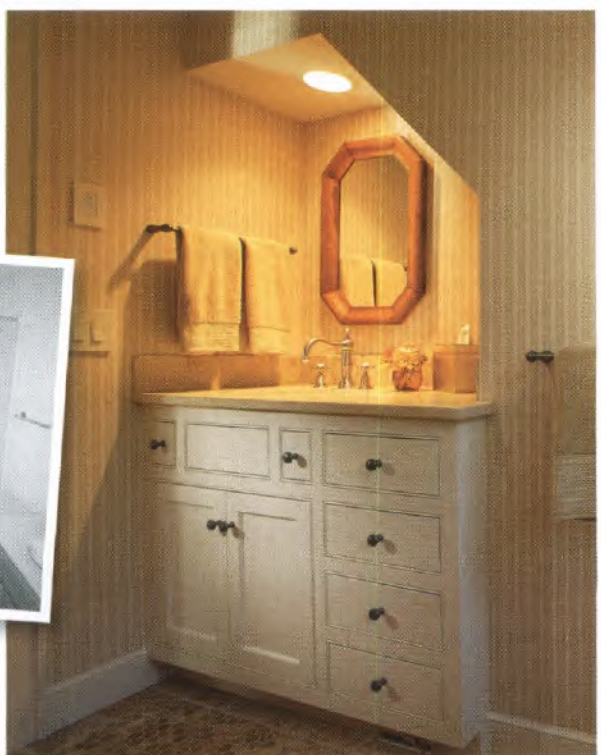




Vanity under the rafters

Tucking the vanity into a nook below a rafter made room for a larger tub and more floor space in an upstairs bath. Photos taken at F on floor plan.





tractor helped to evaluate the multiple types of foundations—concrete piers, block, and poured walls—and to propose solutions.

Finding retreat spaces in a smaller house

Downsizing sounds easy until the trade-offs begin to reveal themselves. We reviewed Warren and Donna's previous house carefully to compare the scale and the use of rooms to what we were proposing in this 2600-sq.-ft. house.

Moving to a smaller house meant that privacy would change and that more spaces would need to be multipurpose. We designed a study for Warren on the second floor and a desk area for Donna on the opposite end of the house (floor plans, p. 78). Outdoor retreat spaces like the roof deck off the master bedroom also would offer some solitude.



New life for a stodgy basement



Dark-stained beams and a small window made the original basement uninviting (inset photo). In the new space, cross beams were added to create a coffered ceiling. A band of windows brings in the view, and built-in cabinetry provides an entertainment center with ample storage space. Photos taken at G on floor plan.



Noise can be an issue in smaller homes, especially when private spaces are hard to come by. To limit sound transmission, we added sound insulation in walls and ceilings, and used solid-core doors.

The house sorely lacked storage, and its modest size meant that every inch of space had to be used. We widened dormers, exploited kneewall space with built-in shelving, added deep pull-out cabinetry, and closed up two cathedral ceilings to gain room upstairs.

We also found space for a walk-in closet in the master bedroom. To gain this closet, though, we needed to create a 5-ft.-deep cantilever above the lower level.

We moved the laundry out of the basement to the main level, the same level as the master bedroom. This move freed space for more mechanicals and storage in the basement, and put the laundry where clothes, bedding, and towels are used and stored.

Details unify the house

We used actual furniture pieces, artwork, and rugs early in the design for space planning. The details were designed to harmonize with the homeowners' furnishings and to fit the cottage style. Custom millwork profiles were proportioned carefully. We adapted interior and exterior bracket shapes from an early house that Warren and Donna had lived in.

Box beams in the main- and upper-level ceilings add character to the rooms and lower the scale of vaulted spaces. The basement family room changed from a walk-through room to a feature space with large windows, cabinetry, in-floor heat, and a coffered ceiling.

To increase daylight in all rooms and to create dramatic lake views, we added 17 new windows and enlarged 18 existing ones. Interior transom windows above a few doors bring light to the central staircase. Several bearing and nonbearing walls were moved or eliminated to gain openness for views and to increase usable space.

The drastic nature of this remodel meant that there was a lot of material to salvage. We contacted a local salvage expert, who was able to remove and reuse pretty much anything that was not deteriorated. □

Practicing in Minneapolis, architect Rosemary McMonigal credits team members Jennifer Hilla Schlag, Melissa Steinberg, Curtis Martinson, and Ashley Mitlyng for their work on this project. Photos by Phillip Mueller.

Building a Divided-Lite Storm Sash

Changing the setup of router bits made for cabinet doors is the key to quick construction of storm windows and glass-panel cabinet doors

BY T.H. RICHARDS



1-over-1



2-over-2



4-over-4



6-over-6

Storm sashes traditionally are used on double-hung, casement, and fixed-pane windows to reduce heat loss. Muntin bars should align with the sash rails on double-hungs, or they can embellish a single-lite casement or fixed-pane window.

A storm window is the sacrificial lamb that takes the brunt of the weather (and errant baseballs) so that an operable window lasts longer. When an old storm sash is beyond repair, people often turn to aluminum triple-track storms or vinyl replacement windows. But to my eye, nothing looks better on a well-weathered house than traditional divided-lite storm sashes. Divided-lite windows also minimize damage from the aforementioned baseballs: The glass repair is smaller.

Building replacement sashes for traditional windows is easily within the scope of any decent carpenter with access to a good router table. Cope-and-stick bits designed for cabinet doors but reconfigured for windows do 80% of the work. Modern weatherstripping and sash hooks make for a tight-fitting sash that's easy to remove and replace. This technique also works for building cabinet doors with divided lites.

Choose the wood and glass wisely

Ideally, the wood should be clear, vertical-grain lumber of the same species as the original window. Vertical-grain lumber is sawn perpendicular to the growth rings and is more stable than flat-sawn lumber, meaning it is less likely to cup or twist. Depending on the species native to your area, softwoods such as white pine, Douglas fir, ponderosa pine, red or white cedar, redwood, and cypress are all excellent choices.

Single-pane glass is usually standard for this type of window. According to my glazier, ⅛-in. glass is considered safe for panes with a maximum single dimension of less than 30 in. and a total area of less than 6 sq. ft.

Design is harder than building

I always say that it takes me a full day to design and build the first sash and 45 minutes to build each additional one. That may be a small exaggeration, but the design is more complicated than the actual cutting and gluing.

The storm sash I typically build has an interior framework of vertical and horizontal muntins dividing the window into six individual lites.

Once I decide on a basic layout of lites, I next choose the dimensions of the stock. Then I refine the layout into exact sizes of the various parts.

Original storm sashes are obviously the most authentic layout guide, but they're not always available. Scouting the neighborhood for similar houses with original sashes is one way to get traditional dimensions; most owners of period houses are happy to let you measure the windows.

When assembling a large gang of sashes, each of which is made up of many different pieces, all parts need to be as uniform as possible. Small variations in muntin length or width can make assembly difficult or impossible.



I have my supplier plane all the stock to ⅞-in. thickness and joint one edge so that I have a straight edge to run against the tablesaw fence. With a sharp blade on my tablesaw, each cut is smooth enough to pass directly to the router without more machining.

For consistency and efficiency, I rip all stock of each different design width before repositioning the fence, and I set up stop blocks on the miter saw for cutting each group of parts to length. Finally, I've learned (the hard way) to prepare a couple of spare blanks for each type of sash member just in case I damage a piece.

Most of the setup is for test blocks

Because the guide bearings on the router bits limit the penetration of the cut, I need to align the fence with the outer edge of the bearing. To get perfect cope-and-stick joints, the height of cut must be uniform on the mating pieces. Because I don't have two router tables, I need to change bits at some point to make these mating pieces. Changing bits means changing bit height, so I make test blocks to realign the bit with its mating

Drawings: Chuck Lockhart

ANATOMY OF A PERFECT STORM



Rails. *For strength, the rails shouldn't be less than 2½ in. wide. The head rail is traditionally narrower than the bottom rail. The bottom rail has vent holes.*

Stiles. *These vertical frame members vary from 2 in. to 3 in. wide, or wider, depending on the overall dimension of the sash; bigger sashes get wider stiles.*

Muntins. *They traditionally are cut from thinner stock, but I like to use 1½-in.-wide stock because it is safer to mill on a router table.*

Sizing the parts. *The stiles are easy: Their length is the height of the window opening minus ⅛ in. The rail length is a little trickier because you need to account for the depth of the cope-and-stick joint, or the setback distance. From the window-opening width, subtract twice the stile width (along with ⅛ in. for fitting); then add twice the setback distance of the cope bit.*

A closable vent flap allows condensation to clear by letting moist air escape. Cut flap and stop at a compound angle to force the flap tight as it closes.

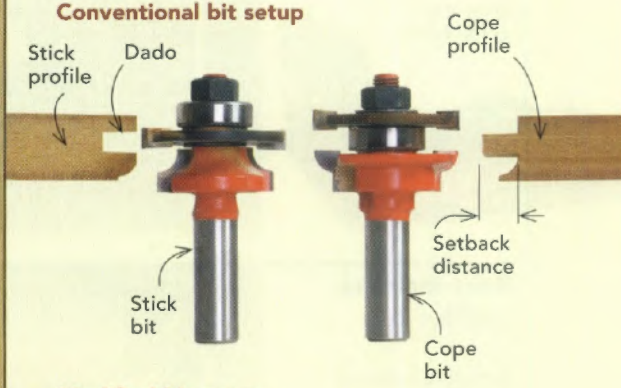
Stop

Bevel bottom rail to match windowsill.

DOUBLE THE UTILITY OF YOUR COPE-AND-STICK SET

Many cope-and-stick bits come in a cabinet-door bit set that also includes an additional panel-raising bit. When making window sashes or cabinet doors with glass, you must cut rabbets rather than dadoes; otherwise the glass will be locked in the frame. A common way to do this is to rout the dado freehand after the frame is assembled, then chisel the corners square. A better way is to remove a slot cutter from the cope bit and add it to the stick bit. I keep a small drawing similar to the photos below in the box that carries my cope-and-stick set.

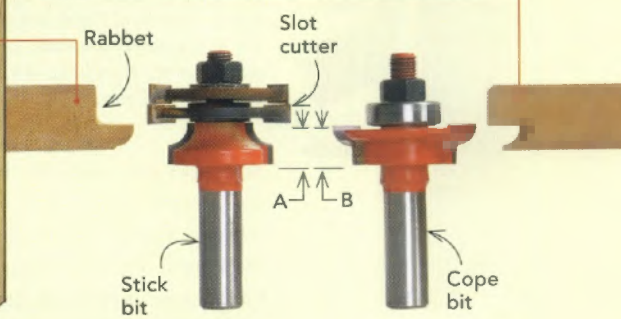
Conventional bit setup



Modified bit setup

1. *Replace bearing on stick bit with slot cutter from cope bit. Use brass shims to adjust the height of the slot cutters (A) to match the cope cutter (B).*

2. *Add second bearing to cope bit.*



PERFECT JOINERY DEPENDS ON CAREFUL SETUP

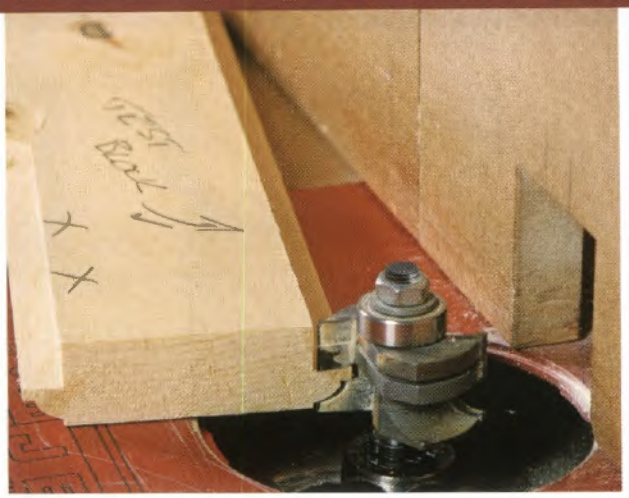


Set the bit height

Test blocks make switching bits easier.



Align the guide bearing with the fence. *The guide bearing acts as a depth gauge for the fence position. If the bearing protrudes from the plane of the fence, a bump or burn cut can result.*





Use a test block to set the bit height precisely. *A single test block aligns the bit that cuts the stick profile (photo left) and the bit that cuts the cope profile (photo above).*

Rout the cope ends first

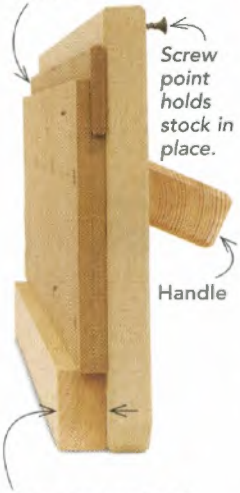




Keep the stock running square to the router-table fence. *By coping the ends first, I can remove tearout on the next pass with the stick bit. If your router table has a miter-gauge slot, you can guide the workpiece with a miter gauge. Otherwise, use a guide block.*



Rout the stick profiles last





Use a safety sled to rout muntins. *These narrow parts can't be guided safely by hand. This sled (left) holds the workpiece securely while allowing my hands to stay well clear of the bit.*





Remove tearout with the stick bit. *The window stiles are wide enough to be guided safely by hand against the router fence.*

piece. Because changing bits introduces chances for error, it's smart to change bits as infrequently as possible; starting the whole test-block process with the correct bit is important. I like to finish the routing process with a stick bit because it removes tearout left by the cope bit. This means that I need to start the test-block-making process with the stick bit.

When I start the production run, I feed the stock through with the better face down because that's the sash interior (mark the up side "up" to help keep it straight). After the copes are all cut, I change bits and machine the inside edges of the rails and stiles, and both edges of all the muntins. Machining the second edge on these skinny pieces is probably the most difficult cut in the whole job; that's where a shopmade sled comes in handy (photos this page).

Vent holes clear condensation

Because storm sashes seal out the weather completely, they also seal in moist air, so condensation is common. The great majority of old storm sashes were designed with vent holes in the bottom rail covered by a pivoting wooden flap. I drill vent holes before glue-up because it's easier to put the bottom rail on my drill-press table than it

is to put the entire sash there. A Forstner bit with a backing scrap gives a clean entry and exit cut, and a fence on the drill press ensures consistent alignment.

I make the flap from ¼-in. or ⅜-in. stock. After cutting and shaping the flap, I cut a short piece off the end to serve as the stop. I cut the stop on a compound-miter saw with a 15° miter and a 45° bevel. The miter slope is cut so that the stop piece is wider on the bottom, and the face of the bevel on the stop is toward the sash. When the flap is closed, the miter prevents it from passing the stop, and the bevel forces it against the sash for a tight seal. I use a screw as the pivot, and I glue the stop itself in place.

Use hardboard assembly blanks

In a small shop or on a job site, it's rare to have a dedicated bench large enough to handle the assembly and glue-up of a big sash. But a portable assembly table set on sawhorses works nicely. Melamine-surfaced particleboard makes a great gluing table because glue won't stick to the melamine. The worksurface should be reinforced underneath with 1x3 ribs to keep it perfectly flat. Two perpendicular 1x3 cleats screwed flat to the surface of the table form a jig to square up the sash during assembly.

Before starting the glue-up process, I cut panels of ¼-in. hardboard to the full design dimensions between the sides of the rabbeted edges. These panels are my assembly blanks. I place one blank in each lite as I assemble the sash to space the muntins and square the sash automatically. It's a good idea to rub the hardboard edges with paraffin to aid in their removal after the glue has dried.

I use bar clamps to hold things tight during glue-up, one clamp each for the top and bottom rail, plus one for each row or column of muntins. I use yellow carpenter's glue, which takes 24 hours to cure completely but sets up in about 45 minutes. After an hour, I can remove the clamps and assembly blanks, then set the sash aside to cure while I glue up the next one.

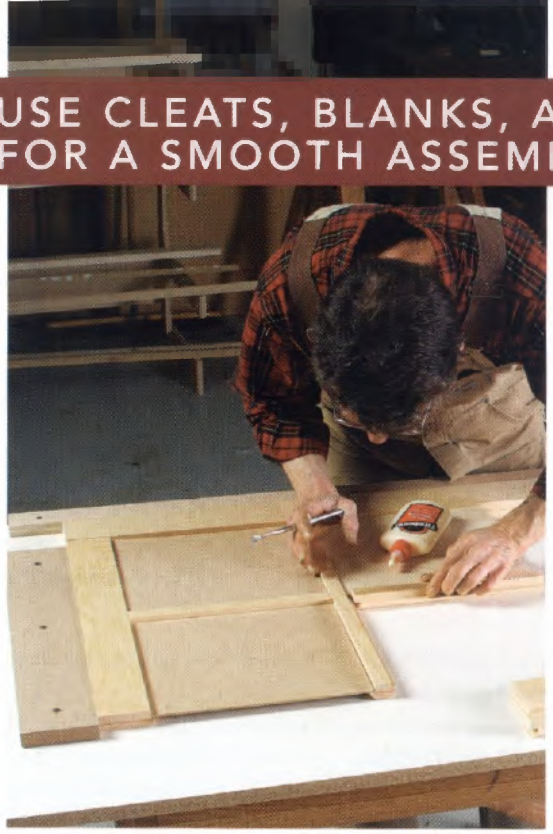
Finishing touches

I usually sand the assembled sashes with an orbital sander using 120-grit sandpaper and ease the edges with a belt sander to put a slight bevel toward the inside of the house. Whether paint or stain, apply finish to the entire window, including the rabbets that the glass will sit in. A complete coat of finish helps the window to resist moisture damage.

I do my own glazing, but you also can take the finished sashes to a glazier. Virtually all glaziers today use silicone or latex caulk to seal glass in place. Traditional glazing putty is another option. Each material has pros and cons; see p. 112 for more information. Maybe it's the memories of scratching pictures of snowmen into the frost on my grandmother's windowpanes, but I like old windows and think it's worthwhile to build replacements. □

T.H. Richards is a designer and builder in Mont Tremblant, Québec. Photos by Daniel S. Morrison, except where noted.

USE CLEATS, BLANKS, AND CLAMPS FOR A SMOOTH ASSEMBLY



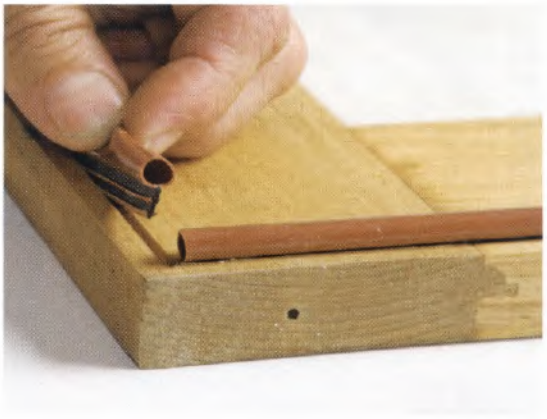
Cope-and-stick profiles provide lots of glue area. *On this ⅞-in.-thick stock, there's 1½ in. of surface area for the glue joint.*

Gluing tips

1. *Use a nonstick table surface such as melamine.*
2. *Screwed-in-place cleats provide a square starting spot.*
3. *A little glue brush allows you to coat cope-and-stick profiles fully.*
4. *Assembly blanks make muntin-spacing easier.*
5. *Don't stand the glue bottle between squeezings. Instead, lay it down to keep glue near the tip.*



Pull it all together, and keep the frame flat. *Set the bar clamps in place and loosely tightened, pull the frame flat to the table with clamps at the corners, then tighten the bar clamps and corner clamps in unison.*



Weatherstripping: where energy efficiency and tradition meet. *Barbed weatherstripping beads are available through Resource Conservation Technology Inc. (410-366-1146). I cut a groove with a standard ⅛-in. straight bit in a router, then push the barbed bead into the slot with a J-roller.*

Photo bottom right: Krysta S. Doerfler

Hip-Roof Framing Made Easier

Measuring along the bottom edge of the rafter will put your layout marks right on the money

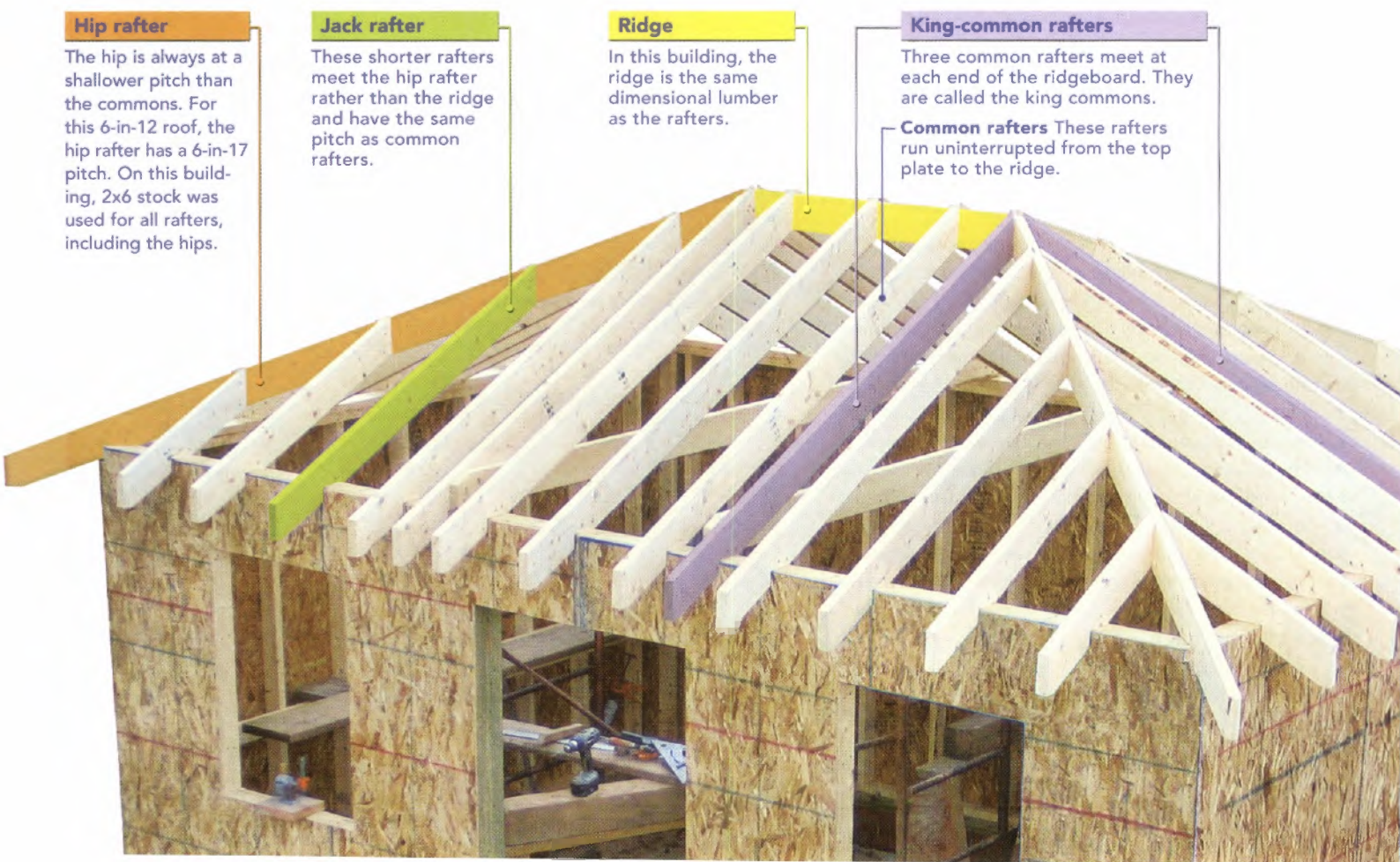
BY JOHN CARROLL

Framing a hip roof is a head-scratcher for most carpenters, but it doesn't have to be. The process became a whole lot easier for me when I realized that the primary challenge in building a hip roof is one of layout, not math. And the key to layout is to know exactly where to begin and end measurements.

In my approach, all the measurements are along the bottom edge of the rafter, short point to short point. This is not the way I learned how to do it, but once I started thinking about the bottom plane of the rafters instead of the top (or instead of some theoretical middle line), everything fell into place. Because I measure and mark along the bottom of the rafters, where I measure to is where I cut from; and because there are fewer steps, there are fewer chances for mistakes.

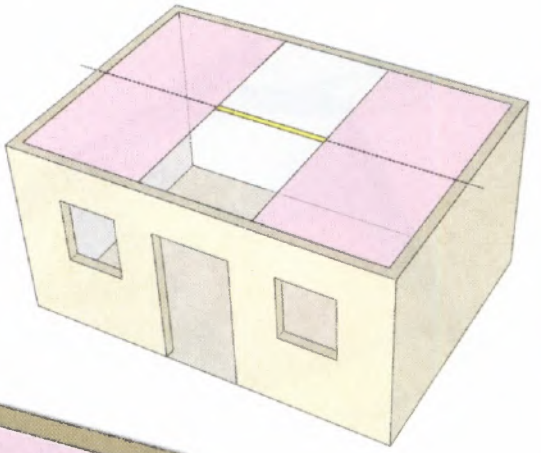
Another advantage of my approach is that I don't have to deal with dropping the hip because I use the same dimensional lumber for all the rafters and I align the bottom edges. On this roof, I used 2x6 lumber for the hips, jacks, and commons. This left the tops of the jacks ¼ in. above the hip, which allows the sheathing to clear the hip and allows air to flow over the hip and up to the ridge vent. If I had wanted to have both the bottom and top edges in plane, I could have ripped down a 2x8 to a width of 5¾ in.

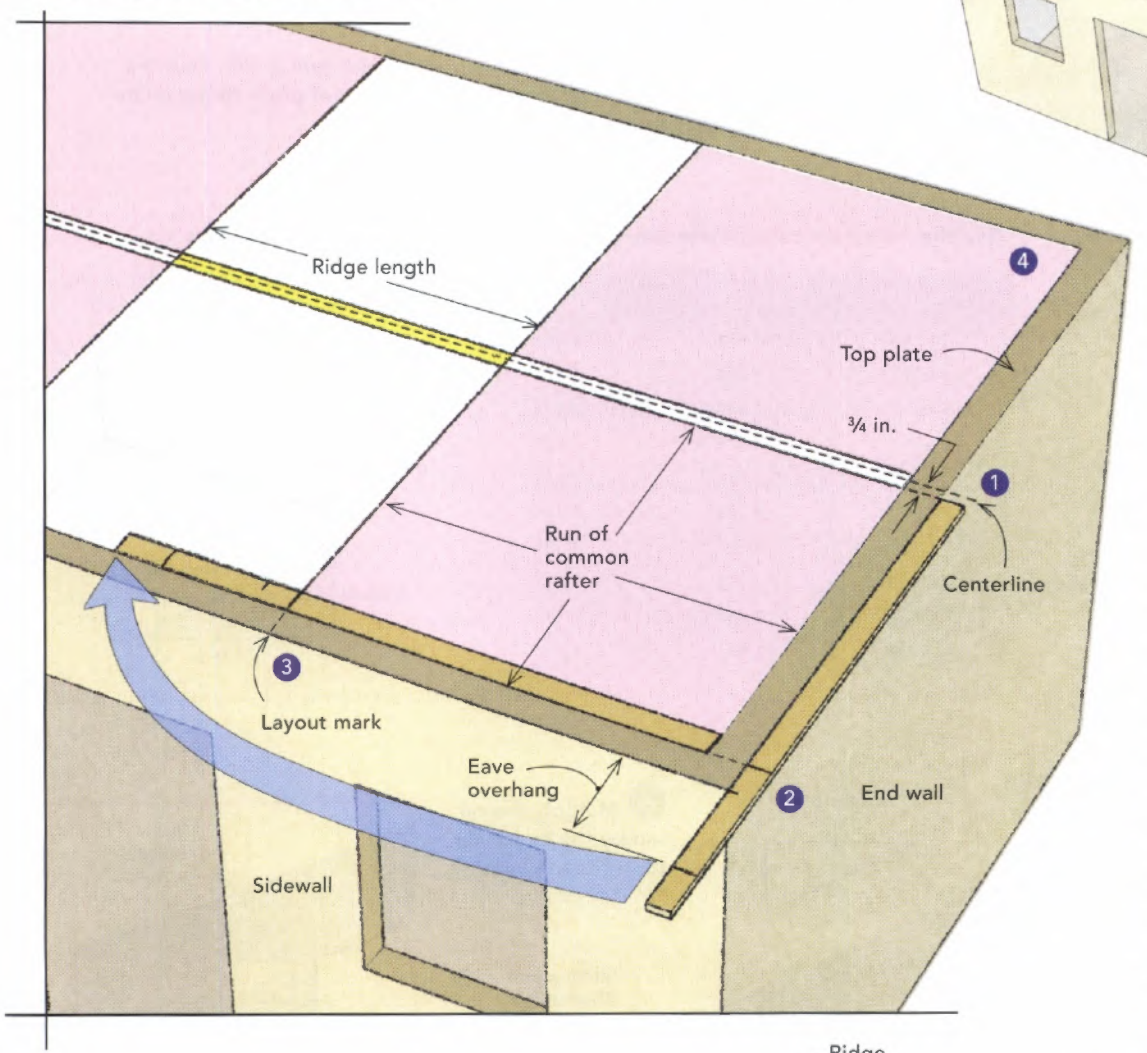
I also don't have to make adjustments for measuring from the center of the board

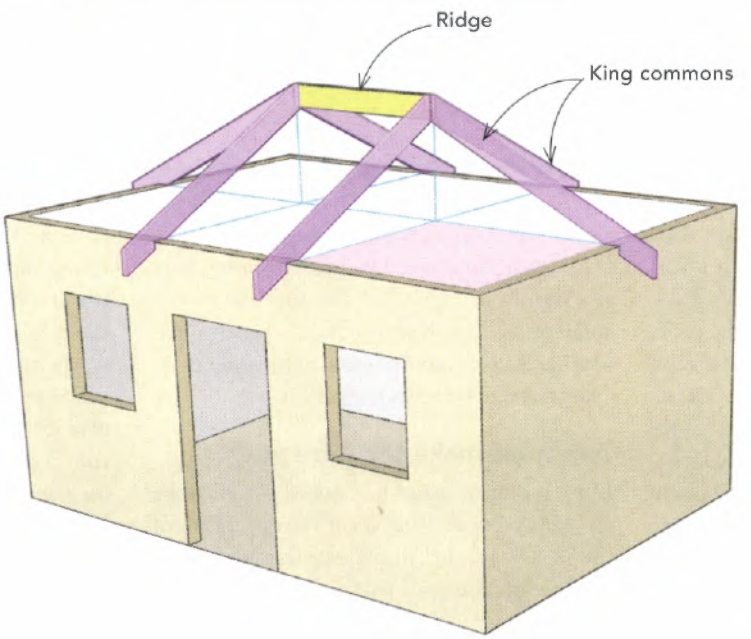


LOCATE THE SIX KING-COMMON RAFTERS

Finding the run of the common rafters allows you to locate the six king commons and establishes the length of the ridge. When viewed in plan, two king-common rafters and two exterior walls define a square (shown in pink) at each corner of the building. Ultimately, a hip rafter will bisect each square diagonally, creating two right triangles.









Use a story stick rather than a tape to minimize errors

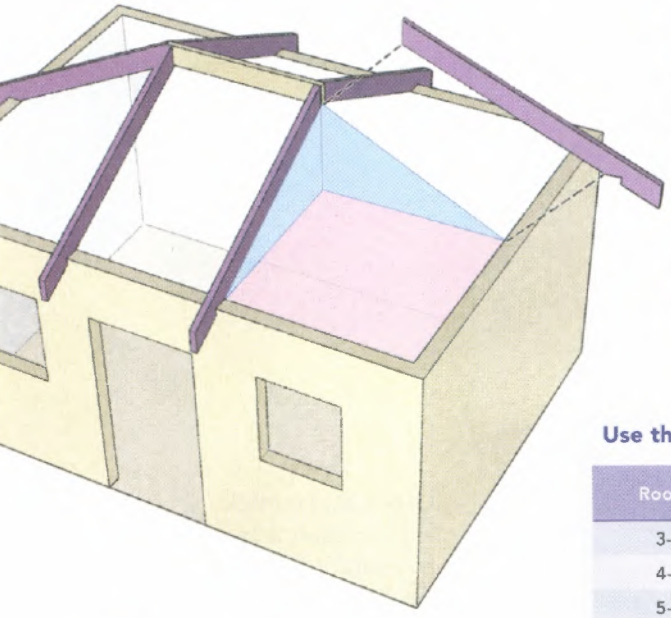
1. On the end-wall top plate, mark the centerline. Then measure back half the thickness of the ridge (in this case, ¾ in.), and mark the first king-common-rafter layout line.

2. Align the end of the story stick with the king-common layout line you just made. At the other end of the story stick, mark the inside of the sidewall. This is the common-rafter run. Also mark the outside of the wall and the eave overhang. You'll use this later to figure the tail length.

3. Flip the story stick over onto the sidewall, and mark the rafter run from the inside corner of the top plate. This is the second king-common layout line.

4. Repeat these steps in the three remaining corners. This will locate the end of the ridge and the king-common rafters.

Drawings: Toby Welles



USE A MULTIPLIER TO FIND THE COMMON-RAFTER LENGTH

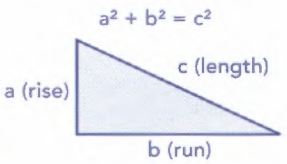
There are many ways to find a rafter length, but basically, you need to take the rafter run and convert it to the rafter length. You can use the Pythagorean theorem (explained below), or you can use the shortcut in the multiplier table. To use the multiplier, you need to know the run and the roof pitch.

1 Measure the common-rafter run on your story stick (see p. 87). Find the multiplier on the table below that corresponds to the roof pitch. Multiply the run times the multiplier to get the rafter length.

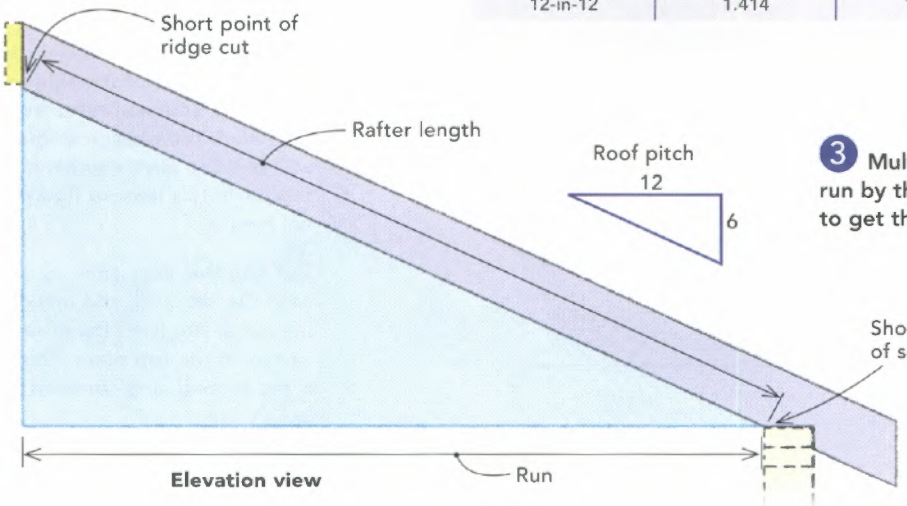
Use the multiplier table if you can, or the Pythagorean theorem if you have to

Roof pitch	Common-rafter multiplier	Hip-rafter multiplier
3-in-12	1.031	1.016
4-in-12	1.054	1.027
5-in-12	1.083	1.043
6-in-12	1.118	1.061
7-in-12	1.158	1.082
8-in-12	1.202	1.106
9-in-12	1.25	1.131
10-in-12	1.302	1.161
11-in-12	1.357	1.192
12-in-12	1.414	1.225

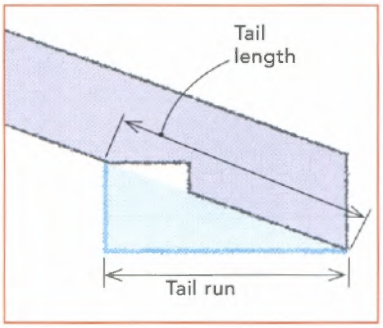
If the roof pitch is between the values in the table, say a 6.5-in-12, you can use the Pythagorean theorem. Get the run from the story stick. Get the rise by multiplying the run times the roof pitch expressed as a fraction (e.g., 6.5 ÷ 12 = 0.54; 0.54 x run = rise). Then solve for length with the Pythagorean theorem.



2 Measure the rafter length along the bottom edge of the rafter (see the sidebar on pp. 90-91 for the cut sequence). In my approach, the rafter length is the distance from the short point of the ridge cut to the short point of the seat cut.



3 Multiply the tail run by the multiplier to get the tail length.



because I take all my measurements from the edge of the board.

The other thing I do that's a little different is that I put down my English measuring tape when I finish framing the walls and pick up a metric tape to frame the roof. In my approach, the metric system is easier to use when math is involved because there are no fractions to deal with. The math itself is simple to calculate because every rafter position and measurement can be explained with right triangles and dimensions that are based on the Pythagorean theorem (drawing above right).

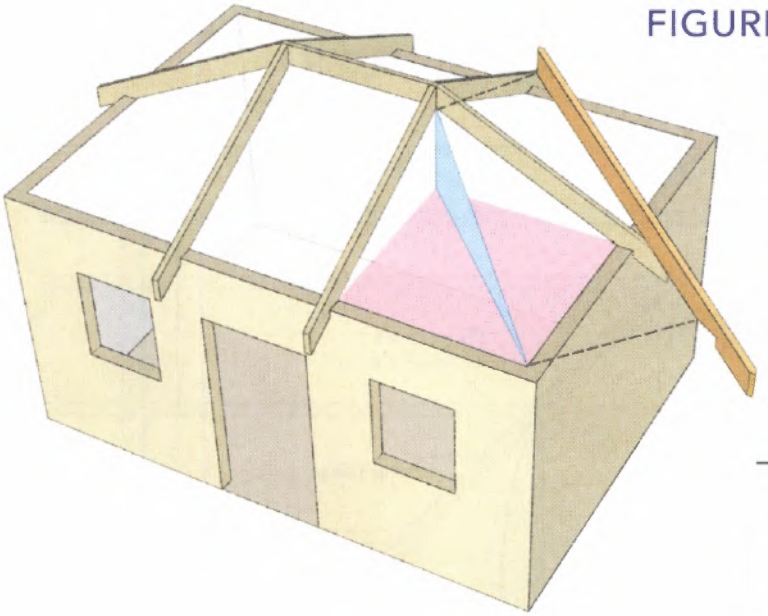
Before I consider any of this, though, the first thing I do on a new job site is get acquainted with the details and visualize how the parts fit together. The project shown here is a simple storage shed. Because the roof is small and all the framing is 2x6 dimensional lumber, I don't have to make adjustments for a larger ridge beam or hip rafters.

Two tools make the job easier

First, I make a story stick out of a 2-in.-wide rip of plywood. I lay it on the top plate of the end wall and mark out the common-rafter run, the wall thickness (for the seat cut), and the eave overhang (drawing p. 87). The beauty of the story stick is that I can have all the initial measurements I need to frame the roof in one place. Then I can take the story stick down to the cut station and use it to make all the cuts without having to waste time running back and forth.

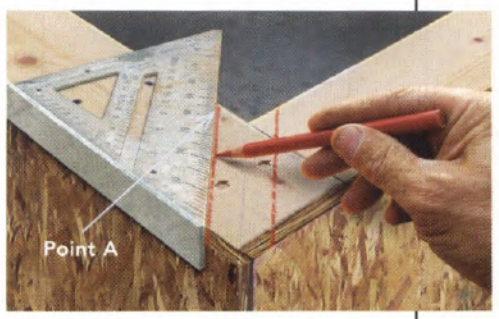
The second tool is a table of multipliers that give the ratio of hypotenuse to run for given roof pitches (sidebar above). One column is for common rafters, and one is for hip rafters. In other words, the table serves as my cheat sheet for figuring rafter lengths. The multiplier times the run is the rafter length. I

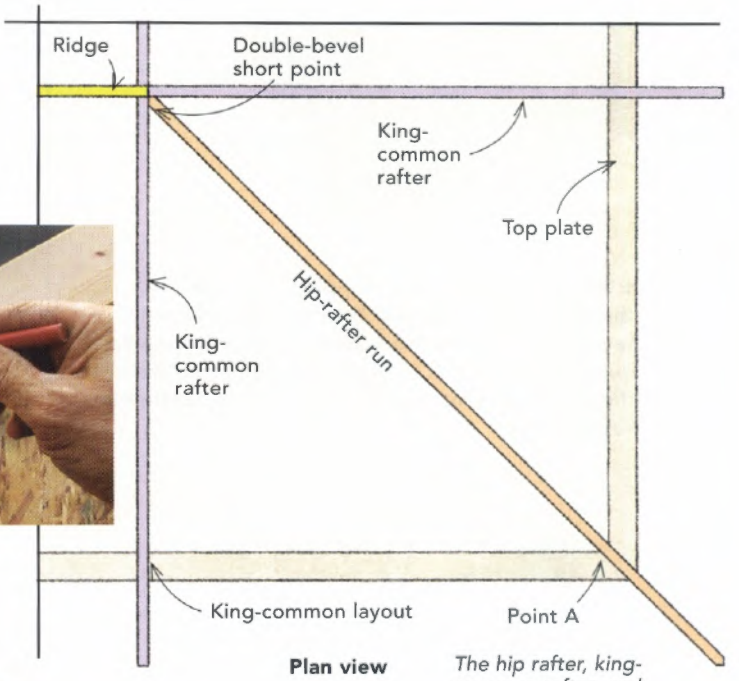
FIGURE HIP-RAFTER RUN, THEN LENGTH



The hip rafter is a little different from a common rafter: It has a shallower pitch, a double-bevel ridge cut, a longer run, and typically a longer seat cut. Find the run first (see plan view below), then use the hip-rafter multiplier (table facing page) to get the rafter length and the tail length.

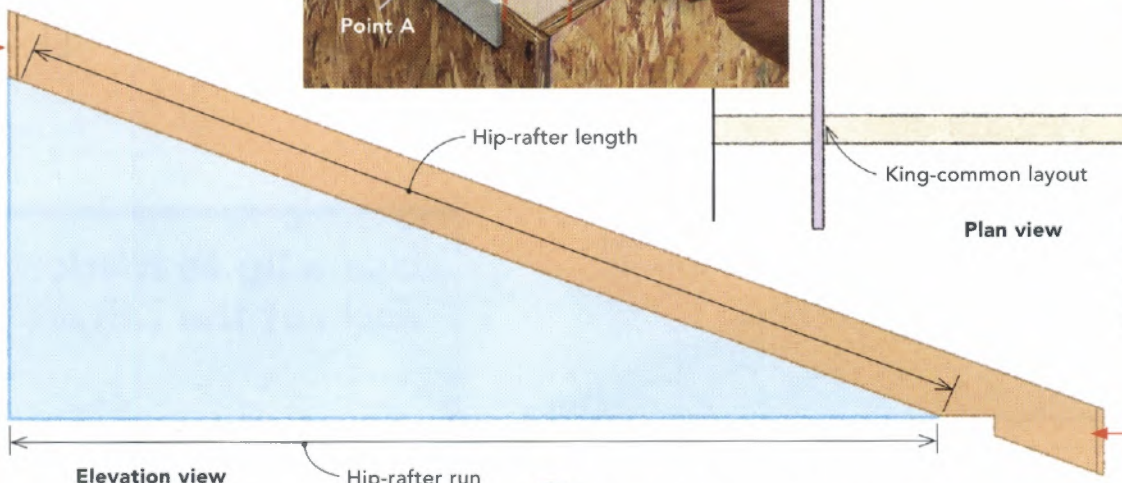
1 Mark the hip-rafter layout on the top plate (photo below). Establish point A where the hip-rafter layout line intersects the inside of the top plate. Measure back to the nearest king common (this is the layout line you already made with the story stick). Multiply this distance by the square root of 2 (1.414) to get the hip-rafter run.





Plan view

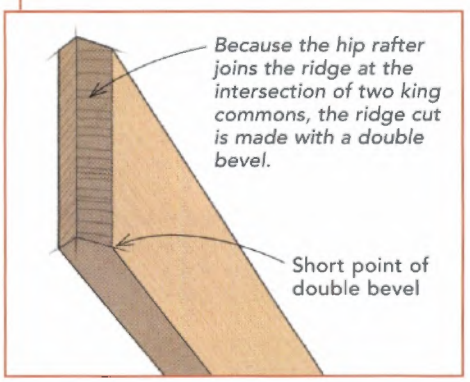
The hip rafter, king-common rafter, and top plate make an equal-sided right triangle in plan view.

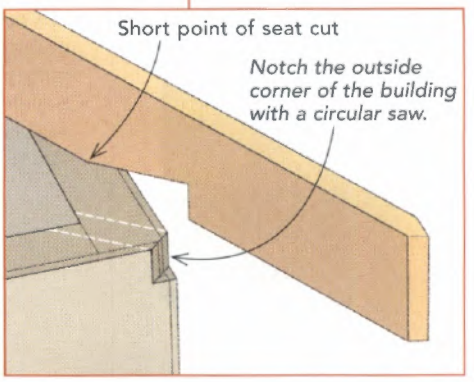


Elevation view

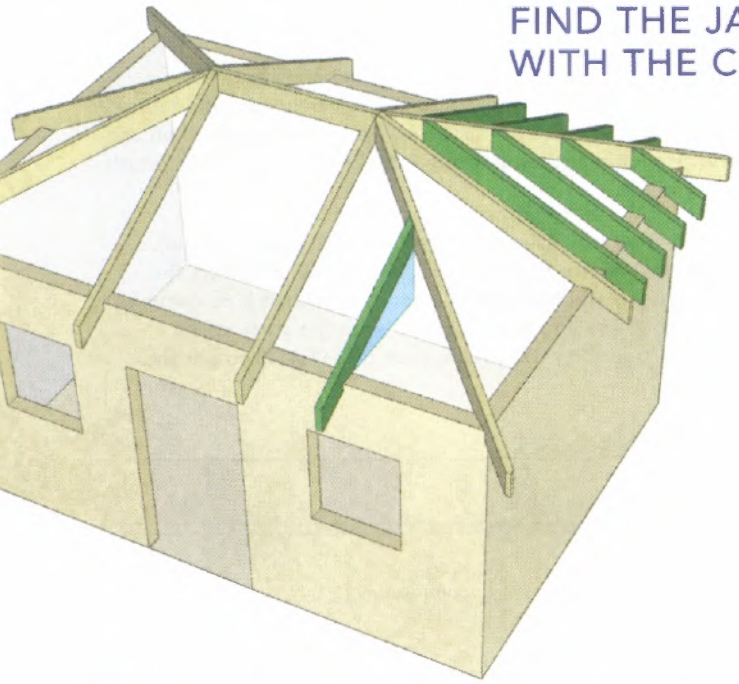
2 Multiply the hip-rafter run times the multiplier (table facing page) to get the hip-rafter length.

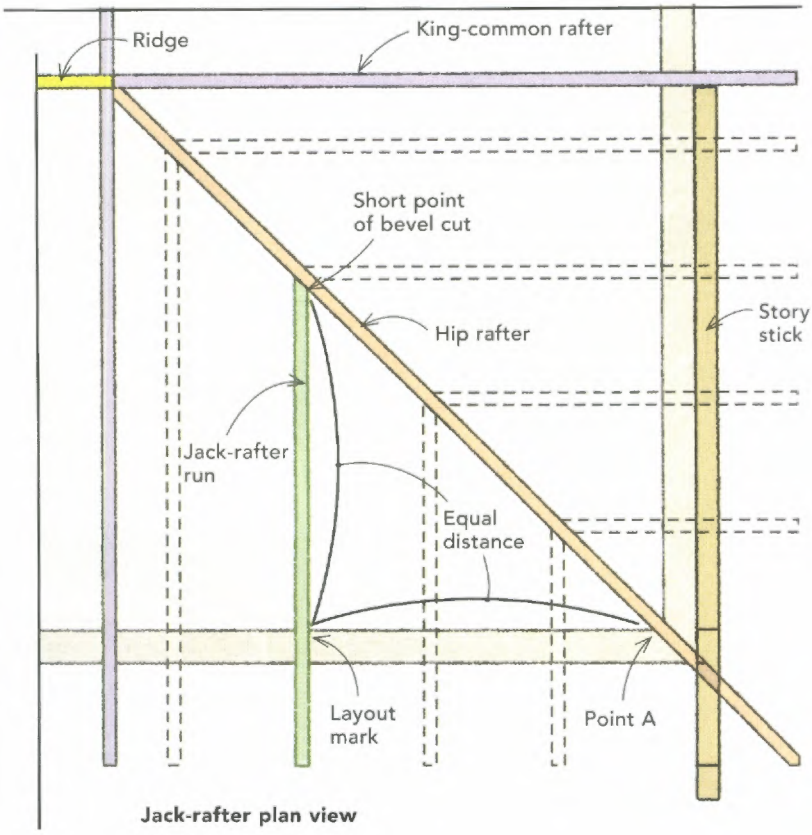
3 To lay out the hip-rafter tail, multiply the common-rafter tail run you already calculated times the square root of 2 (1.414). Then use the multiplier to get the hip-rafter tail length, measured from the short point of the seat cut to the short point of the double-bevel tail cut.





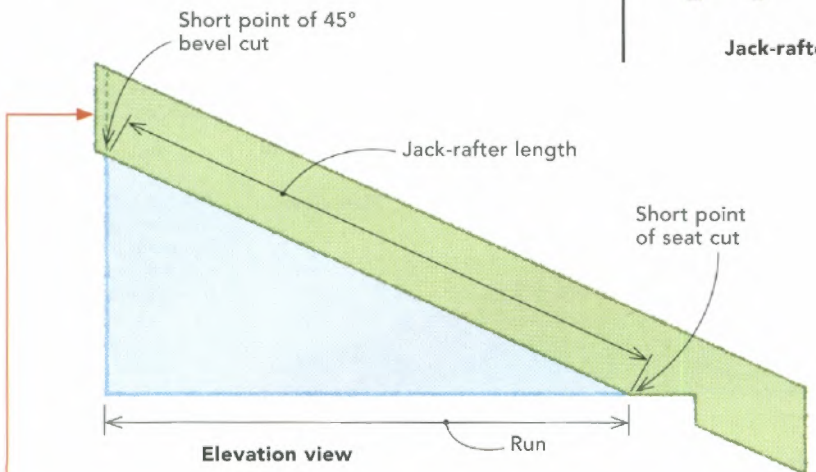
FIND THE JACK-RAFTER RUN, THEN GET THE LENGTH WITH THE COMMON-RAFTER MULTIPLIER





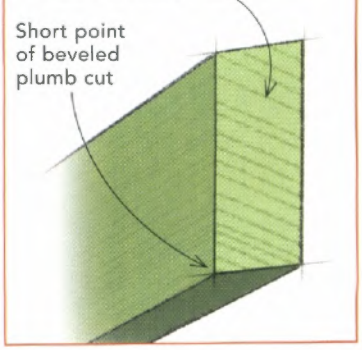
Jack-rafter plan view

1 Lay out the jack rafters on the top plate. I like to stack them over the studs of the sidewall, then transfer that same layout to the end wall with my story stick. Find the jack-rafter run by measuring from point A to the jack-rafter layout mark. As seen in the plan view, this measurement is equal to the run of the jack rafter.



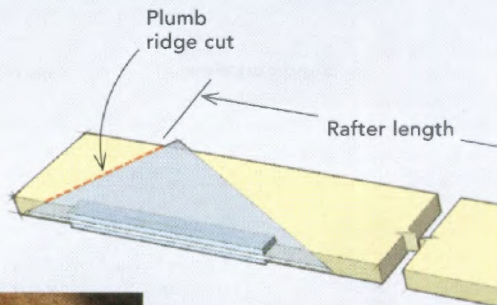
Elevation view

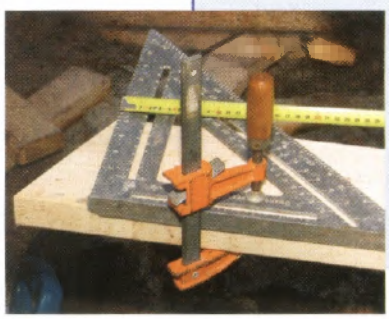
Jack rafters get the same angled plumb cut as a common rafter, but are beveled at 45°.



2 Multiply the jack-rafter run by the common-rafter multiplier to get the jack-rafter length (the short point of the bevel to the short point of the seat cut). Cut the tail exactly like the common-rafter tails.

Use a jig to mark and cut the rafters





Tip: *Clamp the Speed Square to the rafter so that you can hook the tape at the short point of the plumb cut.*

write this table in my job-site notebook, but you also can find these values in any good roof-framing book.

If you're on a roof that falls in between two values on the table, say, a 6½-in-12 roof pitch, you can resort to the equation $a^2+b^2=c^2$ (sidebar p. 88). Tip: If math is really not your thing, try thinking of the equation in plain language; i.e., the run times itself plus the rise times itself is the rafter length squared.

Look at the roof in plan view

Laying out hip rafters is one of those situations where a 3-D image is not as clear as a two-dimensional drawing. If you look at the roof from a plan view, you can see that the hip-rafter run is the hypotenuse of a simple 90° triangle with equal sides (drawing p. 89).

Use a Speed Square to lay out both sides of the hip rafter on the plate. Establish point A where the layout line meets the inside edge of the top plate (photo p. 89). Measure from point A to the layout of the nearest king-common rafter. Use this measurement to calculate first the run and then the length of the hip rafter as explained on p. 89.

Once you've got the hip rafter's length, go back to thinking in 3-D. The rafter length just calculated represents a line along the bottom edge of the board from the short point of the double-bevel cut to the short point of the seat cut. For this roof, I worked through the seat cut and the tail in the same way as the common rafters except that instead of extending the seat cut far enough to clear the top plate, I notched the corner of the double top plate to get a clean fit and to strengthen the hip rafter's tail.

Jack rafters have the common-rafter pitch

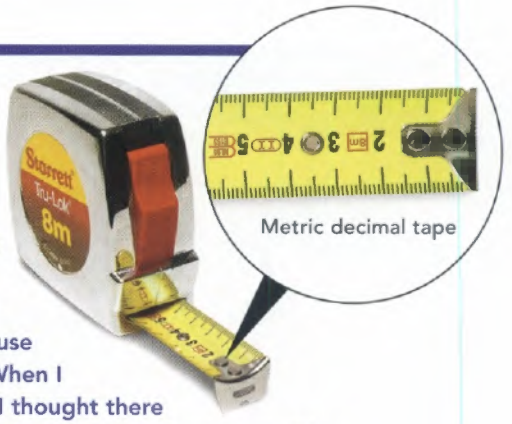
To keep the layout simple and 16 in. on center, I retain the layout from the sidewalls and use the story stick to create a mirror image on the end walls. This method will add some redundancy, but the important thing is to have each pair of jack rafters meeting at the same spot on the hip rafter.

A plan view shows that the distance from the short point of the hip rafter's seat cut (point A) to the jack-rafter layout mark is also the run of the jack rafter to the short point of the bevel cut.

Use the common-rafter multiplier to calculate the lengths of the jack rafters, and lay out the seat cuts and tails exactly the same way as you figured out the common rafters. The plumb cut then is made with your saw set at a 45° bevel, creating the jack rafter's bevel cut. □

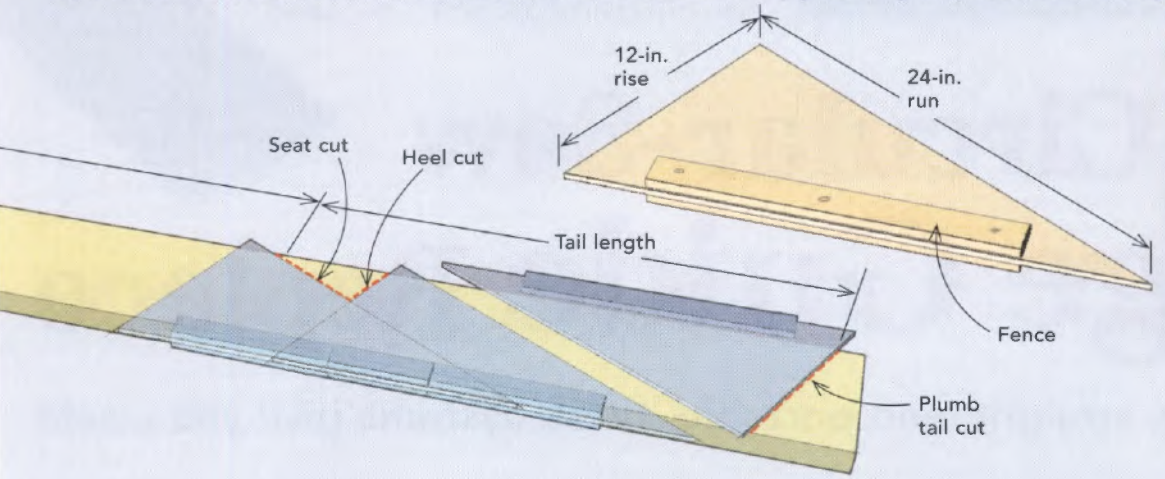
John Carroll is a general contractor in Durham, N.C. Photos by the author, except where noted.

METRIC VS. ENGLISH SYSTEM



Lumber is sized and sold based on the English system, so it makes sense to build with an English tape measure—most of the time. However, when I'm doing a framing project that involves complicated math, I like to use the metric system because it's easier to add, subtract, and multiply. When I first started using a metric tape measure, I thought there would be an adjustment period. But there wasn't: Most of us are used to looking at units divided into 10 equal increments, like the degree scale on a miter saw. Metric tapes are sold at most hardware stores or online.

Once you've taken all the measurements and written them on the story stick, you're ready to cut common rafters, hip rafters, and jack rafters. Make this layout jig and cutting guide from a piece of plywood that has a square factory corner. For the common-rafter jig (shown here), just double the roof pitch in inches. For a 6-in-12 roof, mark 12 in. on one side for the rise and 24 in. on the other edge for the run. Connect the marks to complete the triangle. After cutting the plywood, affix a 1x2 fence to the long side. When you finish the jig, write the multiplier on it in red. For the hip-rafter jig, the rise is 6 in., but the run is 17 in. Instead of doubling the rise and run for the hip-rafter jig, multiply them by 1.5, which makes the jig easier to handle.





***Tip:** Stop the fence short of the jig's plywood edge. This way, the saw can clear when you use the jig as a saw guide for plumb cuts.*

Top photos: Krysta S. Doerfler. Bottom photos: Bill Phillips.



BY MICHAEL STANDISH

Can a Circular-Saw Edge Guide Replace

Strong, straight, and portable, these systems give you a safe

The first kitchen I ever built was a modest set of boxes made from hardwood-veneer plywood. To break down the 4x8 sheets into usable cabinet components, I used an equally modest tool setup: my circular saw, a level for a straightedge, and two spring clamps. The level made a respectable straightedge for guiding the saw, and the clamps could hold it in place. But accurately positioning the level and getting clean crosscuts time after time was a little more challenging.

A shopmade shooting board (*FHB* #154, p. 66) is a big improvement, but what I really needed was a system that was reliably straight and long enough to allow 8-ft. rip cuts. I wanted fast and accurate alignment; dependable, convenient clamping; idiotproof saw control; and smooth, tearout-free cuts. Router compatibility would be handy, and—as always—affordability would be a plus. In short, I was looking for the range of features offered by the six edge-guide systems discussed in this article.

For this test, I used models that could handle an 8-ft. rip. Prices are in the $100 to $200 range, with one exception: the Festool system that includes a circular saw designed specifically for use with the Festool edge guide. I didn't test router attachments, but for each one, I did note what the cost would be to tool up for a router.

Using any of these guides is a lot easier than wrestling bulky sheet goods onto a portable tablesaw, and you're more likely to get crisp, dead-straight cuts with an edge guide. Also, you won't need the extra space for infeed and outfeed inside your shop.

The fence is more than just a straightedge

Unlike my primitive level-and-saw setup, these edge-guide systems include a carriage that holds the saw (or router) and is designed to ride on or along a fence. Rollers and rib-and-groove design keep the carriage connected to the fence, ensur-



Photo this page: John Ross

PRO ft'r

Griset Industries
www.trugrip.com
714-662-2888
Price: $115

Clamping the PRO ft'r is as neat and fleet as it gets. If this method seems familiar, it should. For years, Griset (the maker) has been manufacturing various straightedges, guides, and clamps that use the same convenient, **speedy sliding jaws.** Although you'll need a few minutes to mount your saw, the carriage plate's slippery "ultra-high molecular weight" plastic means that you'd really have to apply yourself to scratch or scrape a workpiece. The **fence on the PRO ft'r is hefty and well finished,** but if you just buy one 8-ft. fence, regularly walking around the long end when crosscutting could get aggravating. If I were using this guide in a production situation, I'd want to add the 2-ft. and 4-ft. fences for convenience, but that would add substantially to the base price. However, outfitting the PRO ft'r for a router is a reasonable $28.







Designed for a smooth finish. *The clutch-plate clamp bears on the edge of the material instead of on the bottom, so there's no risk of marring expensive sheet goods (top and left). Similarly, the blade plunges through the carriage for zero-clearance splinter-free cuts (above left).*

Veritas Power Tool Guide

Lee Valley Tools Ltd.
www.leevalley.com
800-871-8158
Price: $118

The Veritas' lack of bells and whistles may disappoint some people, but its simplicity is by no means stingy. **Fit and finish** are excellent, and everything works as it should. The minimalist knurled-brass clamps track smoothly and fasten things down with a twist of the wrist. The two 52-in. fence sections fit cleanly and quickly, the **dovetailed finger connections** being an especially nice touch. It also took about 20 minutes to square the auxiliary plywood plate (a similar effort is required to make a router plate), and another few minutes to make a gauge block. On the whole, none of this bothered me much.



You provide the carriage's ¼-in. piece of plywood *and plunge the blade through for a zero-clearance cut.*





Knurled knobs are classic Veritas. *The clamps (top photo) are easy to grip and function smoothly. The extension connection (above) uses the same knobs. This makes tightening the setscrews for putting two edge guides together a breeze.*

Your Tablesaw?

way to cut sheet goods down to size with super-clean results

ing a straight ride. Clamps hold the fence in place on the workpiece.

The fences for all the systems I tested are made of anodized aluminum, in one of three configurations. The EZ Smart, the Festool, and the PRO ft'r use comparatively thin-walled extrusions, with integral ribs for rigidity. Red-Line and Veritas are essentially heavy I-beams, while the Tool Trolley uses angle stock. All these approaches result in stiff, flex-free straightedges.

Most manufacturers make sections (good for 4-ft. cuts) that can be linked together for cuts of 6 ft., 8 ft., or longer. Festool and PRO ft'r offer various dedicated single lengths from just more than 2 ft. to just more than 8 ft. (Festool has even longer fences). While longer fences are simpler and faster for lengthwise rip cuts, dodging their overhang can become tiresome when crosscutting, and they're less convenient to transport and store.

Aligning the EZ Smart and Festool fences couldn't be easier: Set the edge of the fence on the cutline, clamp, and cut. For the other guides in this survey, you need to know the distance from the edge of the fence to the sawblade. Once this offset has been established, the best plan is to make a gauge block. You still need to strike the correct line and mark the setback before you can place and clamp the fence, but it's much quicker and less error-prone than remeasuring with a tape.

All the clamping systems worked well

The clamps need to hold the fence securely, and they all did that. But if you've ever used the level-and-clamps method, you know the clamps also need to clear the saw and be easy to operate with one hand.

Most systems reviewed use a familiar cam or screw clamp to grip the underside of the workpiece. Some manufacturers, though, don't follow suit. At the far end is Tool Trolley, for which clamping is buyer-supplied. PRO ft'r uses a clutch-plate system that attaches to the side of the workpiece. And Festool has the best clamping system I've ever seen, because there are no clamps. Instead, it uses two high-friction strips on the fence's bottom to secure it for circular-saw work. I was able to wobble the plywood severely on sawhorses without moving the fence off the cutline.

The saw carriages eliminate fussy work

The carriage should do two things. First, it holds the saw securely in place, and second, it needs to move along the fence easily yet without play or runout.

Festool and EZ Smart work in a similar way. The carriage rides on top and has a groove that fits over a raised rib on the fence. The rest carry the saw out to the side. Red-Line and Veritas require a shopmade auxiliary plate—typically, ¼-in. plywood or plastic sheet—that entails additional setup time. PRO ft'r provides a plate of high-density plastic. The Tool Trolley uses a set of rollers

EZ Smart Guide System

EurekaZone Inc.
www.eurekazone.com
732-259-9984
Price: $190

Choosing between Festool and EZ Smart is like choosing between Butch Cassidy and the Sundance Kid: Which one's the star? EZ Smart's zero-clearance antisplintering approach, like Festool's, speeds up fence placement enormously. The supplementary **baseplate inserts** provide zero clearance on both sides of the kerf. I think EZ Smart's antisplintering provision is the best of the lot.

The baseplate can be attached temporarily with the supplied hardware or fastened permanently with the super-tenacious double-sided tape that's also included. That done, the EZ Smart works like the Festool: The slotted baseplate rides smoothly and precisely on the fence's integral rib. The fence itself comes in 50-in. sections that you can connect if you need to make longer cuts.

EZ Smart's large, undermounted **wing-nut-style clamps** are simple and smooth to operate.

The EZ Smart costs almost double what some of the others do, but if someone told me it's about twice the device, I'm not sure how hard I'd argue. There is a router attachment available for $125.

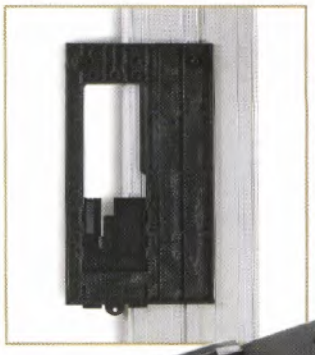


Sturdy connection. *The edge guide comes in 50-in. lengths that are connected for longer cuts. The connector rods are beefy for a secure, no-slop fit. You'll need to have an Allen wrench handy, but that's the only drawback. Wing-nut clamps slide into position and operate smoothly.*





Attached to the saw's baseplate, *a rigid-plastic carriage rides on top of the fence, positioning the blade over a replaceable white plastic strip (red arrow). When you make the first cut, you create a zero-clearance edge (bottom photo). The carriage has a second slot for making bevel cuts. Rectangular plastic inserts fit in the carriage to promote chip-free cuts. The green insert (below) provides zero clearance if you want to use the saw independently of the edge guide.*



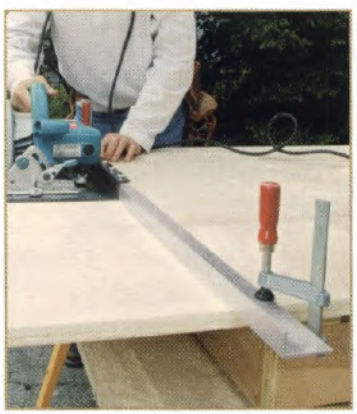




Tool Trolley

Tool Trolley, LLC
www.tooltrolley.com
800-524-1138
Price: $90

Ten or fifteen years ago, I'd have been pretty thrilled with the Tool Trolley. For breaking down sheet goods, it's probably more convenient than a job-site tablesaw, at about the same cost as an optional/aftermarket outfeed extension alone. Its fences are rigid and straight, and the **roller carriage** tracking is smooth and true. Tool attachment is simple and precise; the **baseplate's multiple holes** will accommodate any circular saw I can think of; and the mounting process is slick and easy. Having to pony up for a couple of small bar clamps wouldn't bother me that much because clamps are a good investment anyway. (Am I the only one out here who dislikes spring clamps for their built-in tendency to creep so badly?) But it's a shame that there's no provision for splinter reduction. According to company reps, a redesigned version of the Tool Trolley will be available in early 2007. You can get a **router-conversion kit for $70.**

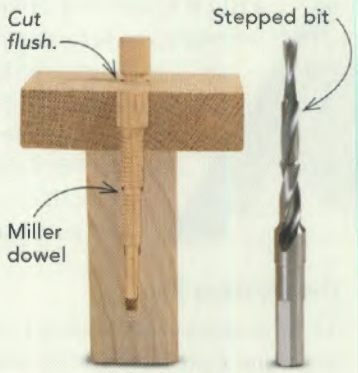


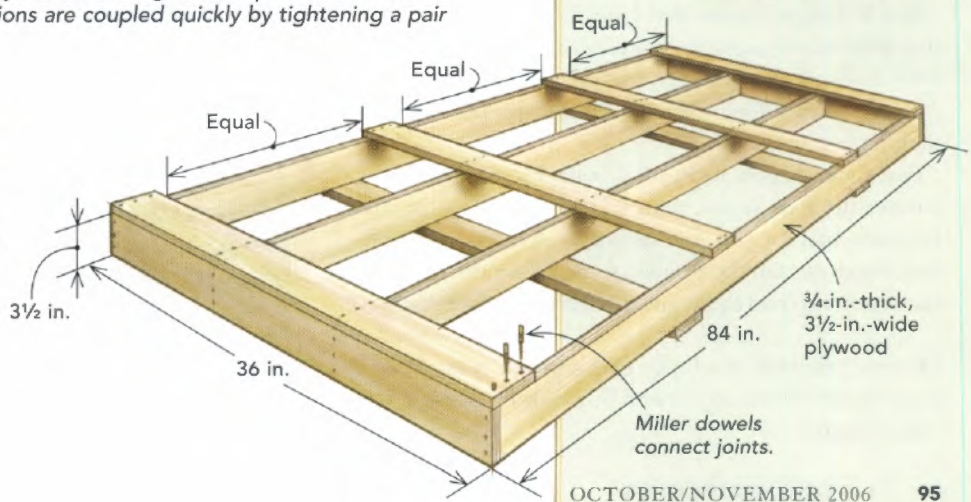


Clamps cost extra; fence connections are easy. *You have to supply the clamps for the Tool Trolley, but the offset carriage means that they won't get in the way. Thanks to registration pins on the connector plate, fence sections are coupled quickly by tightening a pair of setscrews.*

A CUTTING PLATFORM FOR SHEET GOODS

Supported on a pair of sawhorses, this platform provides flat, stable support for full and partial sheets of plywood and other panels: the perfect complement to an edge guide and circular saw. Made from 3½-in.-wide, ¾-in.-thick plywood rips, the platform is strong but light and portable. A 3-ft. by 7-ft. size works great. Join the parts without metal fasteners so that your blade won't be ruined if you kerf the top; instead, use biscuits or regular dowels. I've found tapered Miller dowels to work best. With a big setup like this, there is less fussing with clamping and gluing, and you can drive them in with a few hammer taps (www.millerdowel.com).





Job-site photo: John Ross. Drawing: Chuck Lockhart.

that pinch the vertical leg of its angled aluminum fence. The saw attaches via small eccentric disks fitted through any of two dozen or so holes drilled in the steel baseplate.

After installation, all these carriages operated smoothly and precisely; if the sun was in my eyes or dust obscured the cutline, I didn't worry that the saw might stray.

Zero-clearance cutting is a big benefit

There's an old woodworker's trick of using a sacrificial backing block to reduce tearout, the splintering that occurs where the blade exits the workpiece. Applying the same principle (i.e., backing up the workpiece) to cutting guides eliminates the need for prefinishing stock, applying burnished masking tape on the cutline, or scoring with a knife. Any or all of these methods reduces tearout, but skipping them is a huge convenience. Tearout is not a concern when only one side of a plywood workpiece shows, because the bottom face always is cut pretty cleanly due to the blade geometry. But even when you don't need both sides to be dead crisp, it's better practice to avoid any scratches or gouges (from sawhorses or other workpiece supports) by cutting with the money side face up.

Zero-clearance splinter reduction is used by all the guides I tried, except the Tool Trolley, with predictable results. Because I used a fresh blade for my field tests, even the Tool Trolley's topside crosscuts were surprisingly good; but cuts from the others were near perfect.

Routers work with all the models

One way or another, all these guides can be used with other tools, i.e., routers. At an additional cost, EZ Smart, PRO ft'r, and Tool Trolley offer auxiliary bases designed to accommodate routers; Red-Line and Veritas units can be adapted easily enough (with another scrap of ¼-in. plywood and another 20 minutes). Festool's fence works perfectly well with its router, but as with its circular saw, it can be used only with the Festool system.



The bottom line

All these guides were straight, clamped securely to the work, and guided the saw for smooth, exact cuts.

Best Value goes to the Red-Line. It's a solid workhorse that feels sturdy enough for years of use. The color is a little flashy, but other than that, it's just an affordable, straightforward tool with enough thought put into it to make it easy to use.

Best Overall goes to Festool, with EZ Smart a close runner-up. Festool is a man set out to play among the boys; too bad it's priced accordingly. EZ Smart is well-conceived; as with the Festool, someone set down all the questions and tried (quite successfully) to answer them. □

Michael Standish is a finish carpenter in West Roxbury, Mass. Photos by Krysta S. Doerfler, except where noted.



Red-Line Cutting Guide

Hartville Tool
www.hartvilletool.com
800-345-2396
Price: $110

Red-Line is short money with long value, so it gets the Best Value sticker from me. It does make you work a bit more than the EZ Smart or the Festool, which can add up in production situations. But work it does, and most likely, you won't lose the thing even in the dark.

As with the Veritas, you have to supply your own **zero-clearance plate** (a ¼-in.-thick piece of 10-in. by 12-in. plywood). To align the guide, you have to measure back from the blade to the fence for each cut. (This is also true of any guide system where the carriage is to the side of the fence.)

The fence is basically an I-beam that comes in two 55-in. lengths, which you can connect for longer cuts. Although it is a little heavy, I felt like I could throw it in the back of my truck and not worry too much about banging it up.

I like the **cam-lever clamp** system. It's easy to adjust and solid. And setting up to use a router won't cost you anything; it's just a matter of fitting another plywood insert on the carriage.



Festool Guide Rail and Saw

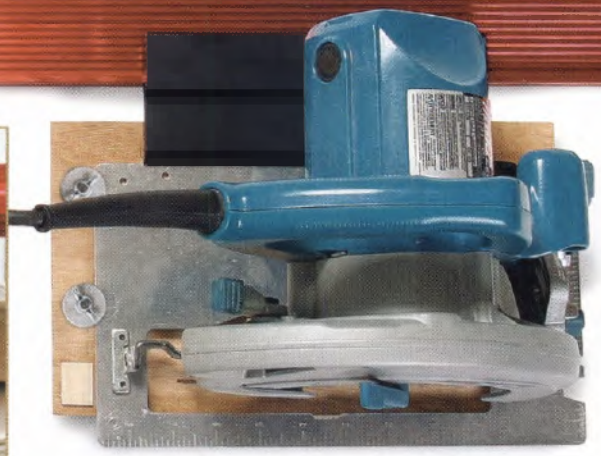
Festool USA
www.festoolusa.com
888-337-8600
Price: $504 (includes saw)

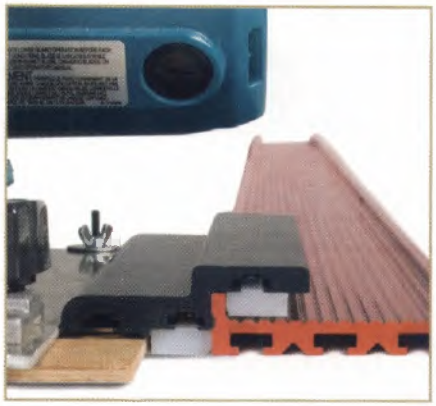
The Festool system stands out because of the **dedicated circular saw** that's integral to the system. It has a large arbor that minimizes blade runout and a built-in dust-collection system. The saw's baseplate doubles as the carriage, riding on a matching rail on the fence, and its configuration allows tilting for a bevel cut without affecting the zero-clearance qualities of the fence, an excellent feature.

The fence itself also has some standout features. The **friction strips** on the underside grip the work like tape, eliminating the need for clamps without collecting dirt or dust. The fence is light and easy to move around. If you're con-



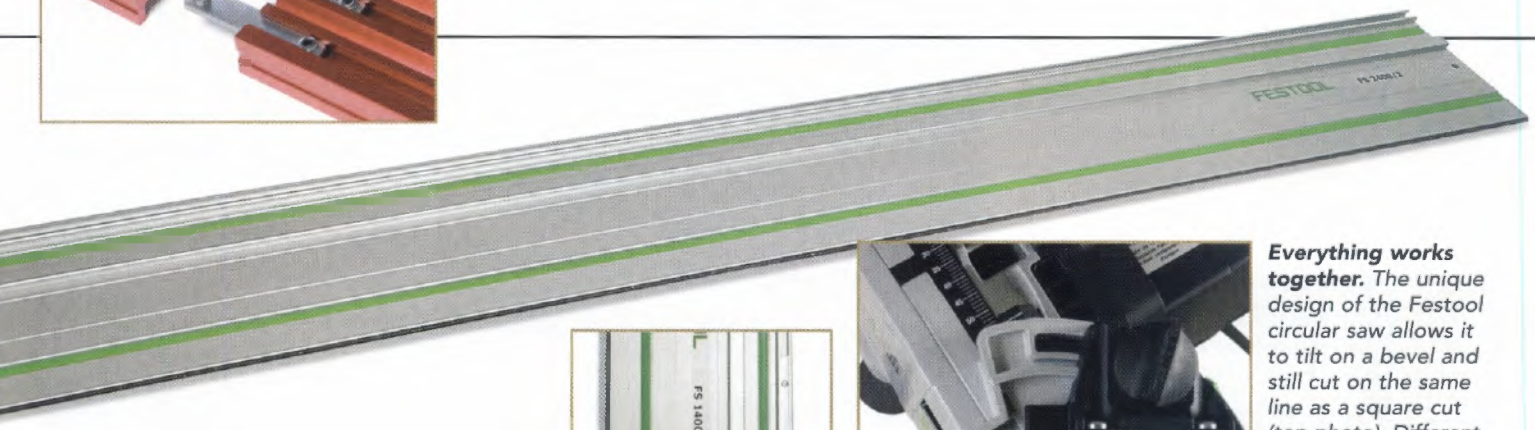






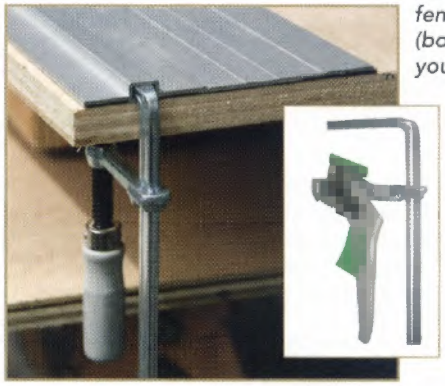


Quick clamping and a carriage for a plywood platform. *The Red-Line clamp (photo top left) is one of the best. The carriage is designed to hold a ¼-in. plywood zero-clearance base for a circular saw or router. Slick plastic inserts promote smooth movement (photo right). Unfortunately, the carriage has to slide on and off the end of the fence. Joining fence sections together involves tightening six set-screws (photo bottom left).*









Everything works together. *The unique design of the Festool circular saw allows it to tilt on a bevel and still cut on the same line as a square cut (top photo). Different-length fences can be connected with rods that slide into channels (photo far left). The channel also provides a place for a clamp to secure the fence to the work (bottom photo). If you are in a hurry or use the router attachment frequently, you might consider the quick-release clamp that's easy to use with one hand (inset photo).*

cerned about getting the fence to the job intact, you can buy shorter fences and connect them on site. Boatbuilders will be interested to know about the available one-piece 16-ft. length.

When used to guide a router, **optional mini-bar clamps** slide into the fence to provide extra holding power. You'll also need Festool's guide-rail adapter ($24 to $43) and one of the company's routers. Festool is really in the business of selling systems; their fences alone are excellent enough, but they don't make much sense without their matching, dedicated tools.

Festool's products are thus very expensive on the face of it. If you regularly need to break down sheet goods, though, their proper competition is probably portable tablesaws (see *FHB* #172, pp. 66-71), which—after you've bought the extension and outfeed tables you'll need for cutting sheet goods—can easily cost a lot more.

Concrete
emerges inside the house

It's hard and cold to the touch, but it isn't just for foundations or basement floors anymore. Concrete quickly has become a popular material for indoor applications such as countertops. Some designers have exploited concrete's versatility through other forms as well. Several of these images are from Fu-Tung Cheng's book *Concrete at Home* (The Taunton Press, 2005).



A different shape. *Designed by Johnny Grey, this dining-area floor displays delightful geometry with 1-in.-thick individually cast concrete tiles. Buddy Rhodes created voids when building the tiles by pressing the concrete into each form by hand. After the concrete dried, the voids were filled with concrete of a contrasting color. Photo by Ken Gutmaker.*



An elegant tapered trough. *The centerpiece of a master bathroom, this 12-ft.-long sink impresses with its slender symmetrical form. It's supported between walls by a steel I-beam behind the countertop's front edge. The raised section tucks into the center in tapered joints sealed with clear silicone. Designed and built by Cheng Design. Photo by Matthew Millman.*



Slabs frame the fire. *Formed and poured in the workshop of Mandala Designs, this fireplace surround is composed of five separate concrete slabs attached to the fireplace wall with lag bolts and construction adhesive. Small ebonized wood plugs mimic through-tenons, and steel railroad spikes appear to lock two of the sections to the wall. Designed by Traci Kearns of Asheville, N.C. Built by Mandala Designs of Asheville, N.C. Photo by Terry Lambert.*





Concrete and wood are good. *At right, to protect the bottom portion of this steel I-beam, Cheng Design wrapped it with concrete, highlighting the transition to Douglas fir with a scarf joint. Above, in a kitchen designed by Glen Dugas, Buddy Rhodes notched a conical table of hollowed concrete around a Douglas-fir post. Scarf-joint photo by Matthew Millman. Conical-table photo by Ken Gutmaker.*



Made by man and Mother Nature. *Completed in a single pour, this fireplace surround is 3½ ft. thick and extends 10 ft. across a raised concrete hearth. Designed and built by Cheng Design, the surround incorporates an Idaho turquoise stone that juts from the front wall, providing a natural shelf. A small recess at left provides space for kindling, while a massive wedge at the opposite end of the fireplace holds logs. Photo by Andre Ramjove.*

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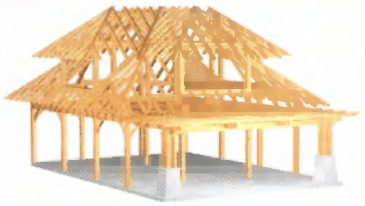
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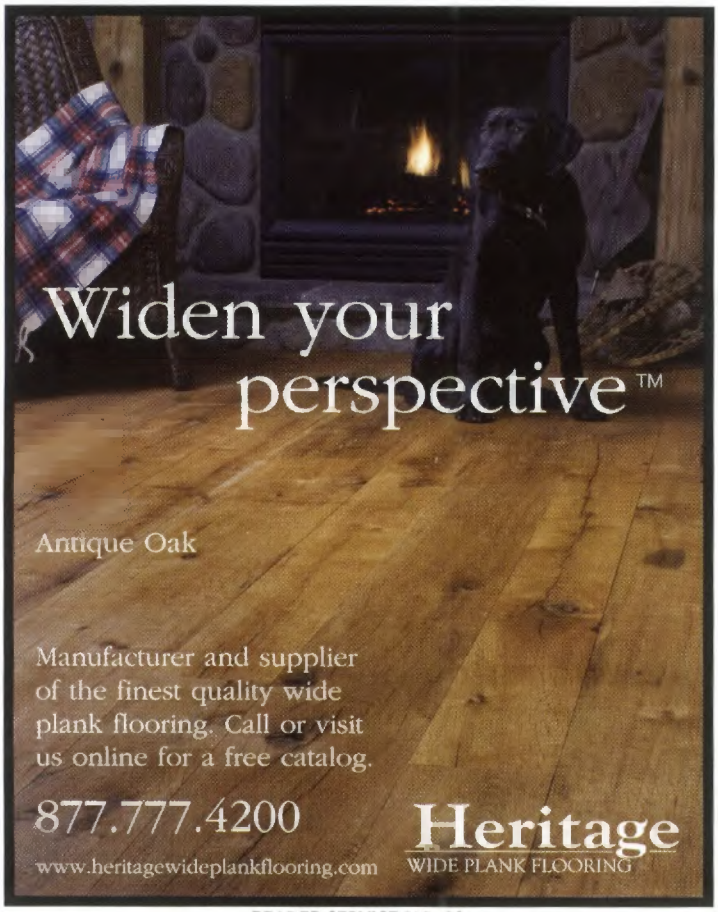




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Q+A

YOUR QUESTIONS—PRO ANSWERS

Range hood sucks smoke from the fireplace

Q When we built our new home, I bought a 48-in. gas range and vent hood. The problem is that the vent hood sucks smoke from the fireplace and draws ashes halfway across the room when I turn it on. On high speed, the hood pulls 1200 cu. ft. per minute (cfm). I have read several articles about airtight, energy-efficient homes having this problem. What should I do?

—CHERYL MORRIS
via email

A *Max H. Sherman, senior physicist at Lawrence Berkeley National Laboratory in Berkeley, Calif., replies:* Your problem occurs far too often because the house design didn't take into account the effects of a tight building envelope.

The amount of air inside your house stays fairly constant. When air is exhausted somewhere, it must be replaced somewhere else. As you've discovered, the easiest way for the makeup air to enter your house is the fireplace chimney, so your exhaust fan is pulling in (and exhausting) combustion by-products. Ashes blowing across the floor are a minor concern compared to the danger of pulling smoke and carbon monoxide into your living space when the fan is running and wood is burning in the fireplace.

So what to do about it? Here are three options. One: Lower the kitchen exhaust rates. With a decent range hood, you should be able to capture stovetop smoke effectively with a fan that runs at 100 cfm to 200 cfm. At these lower exhaust rates, the problem will be reduced and could even go away.

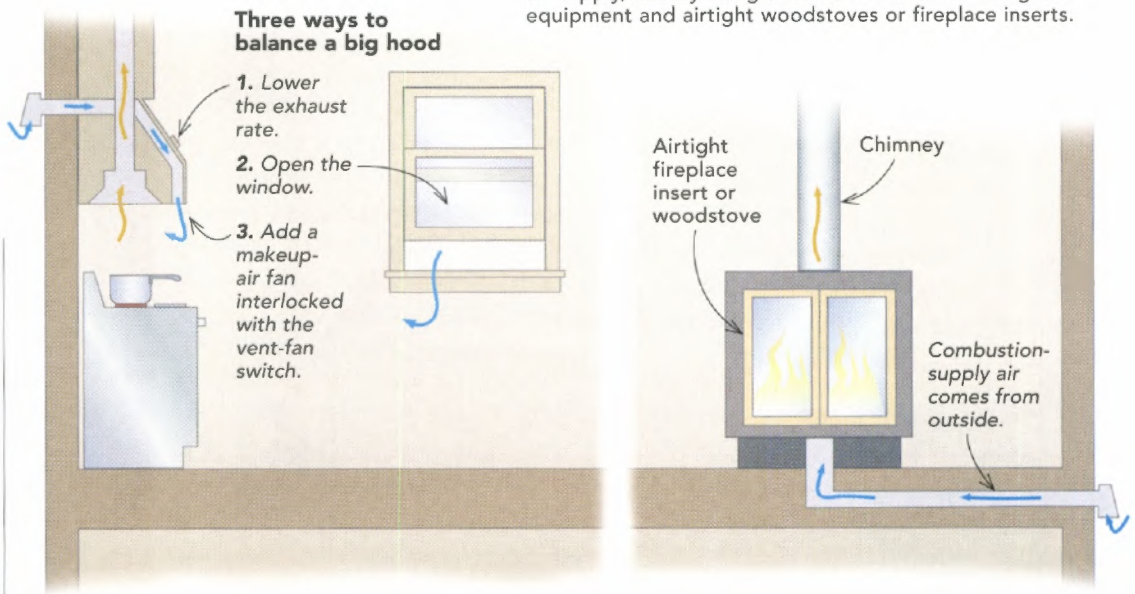
If you don't want to downsize the kitchen exhaust, the second low-tech solution is to poke a big hole in your house. Building codes in the north often require that if you have a combustion appliance that is vented through a chimney without the help of a fan (atmospherically vented), your house must have a hole (typically equipped with a damper) nearby to supply makeup air. This process works, but when the appliance is not being used, the makeup-air hole is the site of a big leak that can cause comfort problems and waste energy. You also could open a kitchen window a foot or so whenever you use the exhaust fan. Of course, this solution isn't comfortable, and it wastes energy.

Third: Because your kitchen-exhaust equipment is approaching the size used in commercial kitchens, you can do what commercial kitchens do. They have a separate supply-air system interlocked with the exhaust controls. When the exhaust fan is turned on, a compensating supply fan comes on and brings makeup air into the kitchen. The makeup-air fan often is located within the range hood. For a detailed discussion of commercial-range-hood solutions, read the design guide at the California Energy Commission's Web site: www.energy.ca.gov/reports/2003-05-05_500-03-034F.PDF.

But that's not all you have to think about; the fireplace is just as problematic. For both efficiency and safety when burning wood, you're better off with some sort of a sealed

Supplying makeup air safely

Kitchen exhaust fans can depressurize a house, causing comfort and safety problems, especially when fans operate at commercial-kitchen levels (above 800 cfm). You can avoid problems by providing a makeup-air supply, and by using sealed combustion-heating equipment and airtight woodstoves or fireplace inserts.



Drawing: Dan Thornton

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combustion system. The air required to burn wood comes from outside the house, and that's also where the smoke and the combustion gases go. High-quality woodstoves and fireplace inserts operate this way.

When the glass door of the woodstove or fireplace insert is closed, you can turn on the kitchen vent fan with no fear of flying ashes or incoming combustion gases.

I also recommend that you get a good carbon-monoxide (CO) alarm. You are not likely to have a CO problem when the exhaust fan is operating. After the exhaust fan is off and the fire has burned down, however, CO could accumulate. If the CO is not removed, the consequences could be fatal.

Green board in a shower?

Q **My builder tells me that "green-board" drywall is the proper backing for a tile shower, but I believe that cement board is better. What do you think?**

—STEVE JORDAN
via email

A *Tom Meehan, a master tilesetter and the owner of Cape Cod Tileworks in Harwich, Mass., replies:* Steve, by all means, stand your ground. Green board is not the proper backer for a shower stall unless a complete waterproof-membrane system is applied over it. Even then, I still believe that cement board is the proper substrate to use.

In the early 1970s, I was one of many tilesetters who used green board. We thought it was waterproof drywall because it has a wax coating over the paper facing. The reality, though, is that green board is moisture-resistant, not waterproof. It's not moldproof, either. When moisture gets behind the tile, the paper facing on green board becomes mold food. The waxy coating is like a mold appetizer.

In the late '70s, cement board came into the picture and has proved to be a superior product. It is a bit more work to cut and install, but when tile is installed over it with thinset cement, the system does not fail. As a test, I once installed a couple of pieces of tile on a small piece of cement board, then dropped it into a pond behind my house. After two months, I couldn't separate the tile from the board.

> **"The paper facing on green board becomes mold food. The waxy coating is like a mold appetizer."**



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FHB10.06

What type of joist hangers should I use with pressure-treated wood?

Q Recent "Breaktime" threads about joist hangers and the new pressure-treated lumber indicate that some builders use only stainless-steel joist hangers and nails. But in *FHB* #178 (p. 30), Mike Guertin uses a self-sticking waterproofing membrane (Vycor Deck Protector) with regular galvanized hangers. Who's right?

—DENNIS BROWN
via email

A *Associate editor Daniel S. Morrison replies:* They're all right, but Mike is thriftier. The new generation of pressure-treated wood (alkaline copper quaternary, or ACQ, and copper azole, or CA) is more corrosive than the old stuff (chromated copper arsenate, or CCA), which is why some builders have switched to stainless-steel hangers and nails.

Mike is using Vycor Deck Protector (www.graceathome.com) to separate a standard galvanized joist hanger from the copper in the wood preservative, thus protecting the hanger from corrosion. This solution is effective and inexpensive. Stainless-steel hangers and fasteners are the best (and also the most expensive) solution.



USP's TZ

Simpson's ZMax



Another alternative is to use triple-galvanized joist hangers and fasteners such as Simpson's ZMax line of connectors and USP's TZ line. These products are manufactured specifically for the new pressure-treated lumber. For a lot more information, see "Pressure-Treated Wood: The Next Generation" (*FHB* #160, pp. 82-85).

Photos: Krysta S. Doerfler

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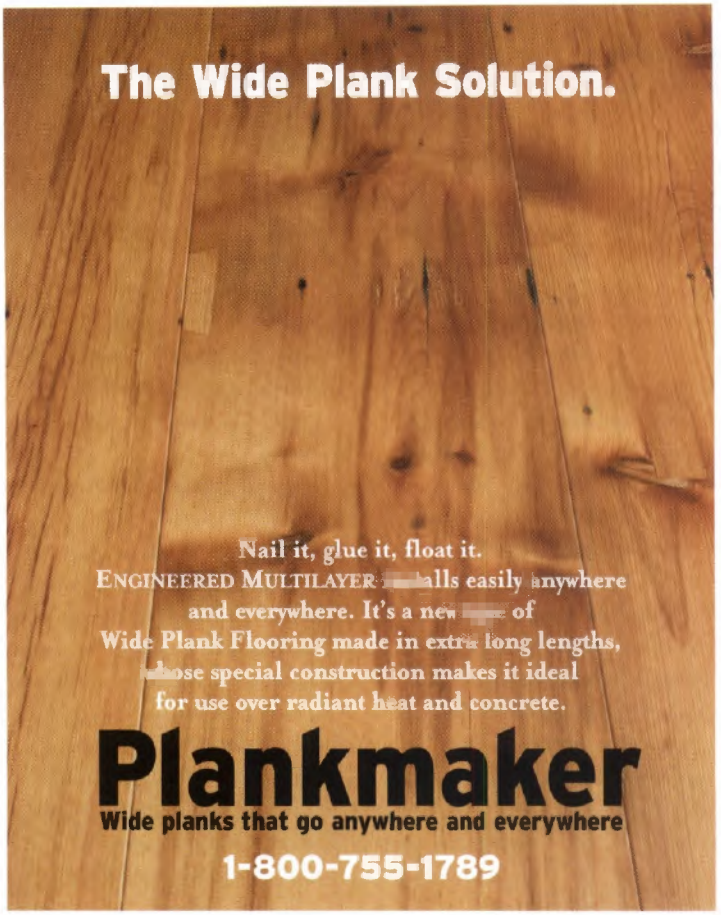


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Removing paint from brick

Q My husband and I own a house built before World War I. We've done a lot of work to it, and there's a lot more to go. Our next project is to restore the front of the house, specifically to strip the paint off the exterior brick.

Our plan is to wait for a stretch of hot Toronto weather, spread stripper over the brick, let the heat and the stripper do their job, then power-wash the brick. What kind of paint stripper should we use? The thought of a red-brick house inspires me endlessly, but I don't want to end up making a real mess.

—JANE ALLEN
Toronto, Ont.

A *Jon Tobey, a painting contractor in Seattle, replies:* That is a huge project, and I wish you luck. I think you are taking the best approach, but because of the porous nature of brick and mortar, you may never be able to remove all the paint from the nooks and crannies. However, you could follow up your technique with sandblasting for the most complete job possible. (Editor's note: The Brick Industry Association does not recommend sandblasting on brick with a "sand finish or decorative surface coating.")

The most important thing is to get a really effective stripper. The best paint strippers I've found are made by Back to Nature (www.ibacktonature.com; 800-211-5175). Their strippers are effective yet safe to work with. Contact the manufacturer directly to learn which of their products to use.

To keep a clean site, lay 3-mil plastic around the house to catch the old paint. Odds are that there will be some lead-based paint to remove, so you will want to be careful. Back to Nature strippers generally pass the test for lead encapsulation.

Even though the stripper is doing most of the work (it may take several applications), you need to let a power washer do some work, too. Use at least a 2500-psi washer. They now have rotating nozzle heads that tremendously increase washing power. But all that power comes with some caveats; for example, you might mar the brick with the washer. If you do, use the washer like an eraser to fade out any marks you make. In fact, you may have to do this regardless after you get the surface as clean as it will come; it depends on the brick's hardness.

Before you go all out on the front of your house, try a test section—say a meter square—to work out all the details. This will certainly tell you if you need to follow up with sandblasting. For more on stripping paint, see "Removing Exterior Paint" in *FHB* #148 (pp. 78-83).



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WINDOW GLAZING

Traditional putty or modern caulk?

Whether you're repairing home-run damage or building a new glass-paned window or door (see pp. 82-85), you've got several choices when it comes to sealing the glass in place and keeping the weather outside.

PUTTY IS ECONOMICAL AND TRADITIONAL

Packaged in cans or plastic pouches, claylike glazing compound (also called putty) is the material to use if historical accuracy is important. Putty costs less than other glazing compounds, and there's no such thing as waste material. Excess can be collected, returned to a can or plastic bag, and remain usable for a year or more.

Easy to shape, or tool, with a putty knife, window putty is forgiving to install, but not to remove. It can last from 10 to 15 years, but when it finally becomes brittle and begins to crack, removal is messy and time-consuming.

Putty has a few other disadvantages. It needs to be painted to improve its durability, and an oil-based primer should be used. Also, putty takes a long time to cure (one to two weeks, depending on weather conditions) before paint can be applied.

LATEX GLAZING COMPOUND IS MESSY BUT WORKABLE

This glazing option gives you the appearance of traditional putty, with the benefits of speedy application, fairly easy tooling, and water cleanup.

Unlike glazing with putty, you don't want to apply much more caulk than you need, because excess material can't be saved for later use. Latex glazing has the same cake-icing consistency as regular latex caulk. It's messier and more difficult to tool than traditional putty; dipping the knife blade in water helps. This glazing takes about three days to dry. It can be painted, but it doesn't have to be.

SILICONE IS FINE WHEN APPEARANCE ISN'T IMPORTANT

Silicone sealant forms a flexible, weathertight seal that doesn't need to be painted. Trying to shape silicone and remove excess sealant is a messy, difficult process. That's why experienced window builders like T.H. Richards prefer to apply this type of glazing with a pneumatic caulking gun. Richards's favorite caulk is Flextra (www.mulco.ca), a thermoplastic sealant with properties similar to silicone, which is more commonly available. If a pane has to be replaced, you'll appreciate silicone's ease of removal. It pulls away cleanly in a continuous string of sealant.

Tim Snyder is executive editor of Fine Homebuilding.



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Take care with silicone. *It's important to keep the application smooth and uniform because shaping the joint is difficult and messy. Photo near left by Daniel S. Morrison.*

Photos, except where noted: Krysta S. Doerfler



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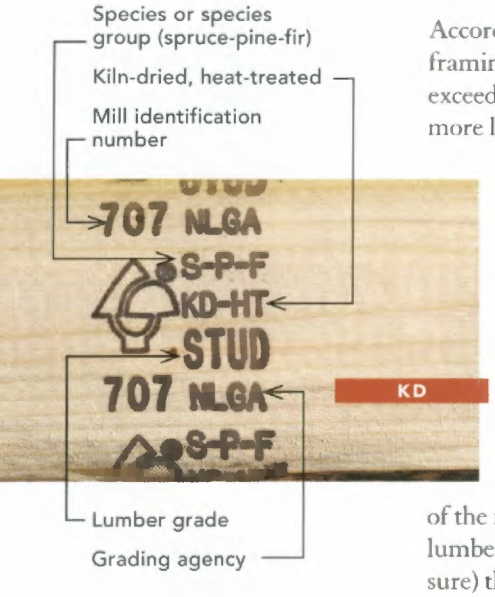
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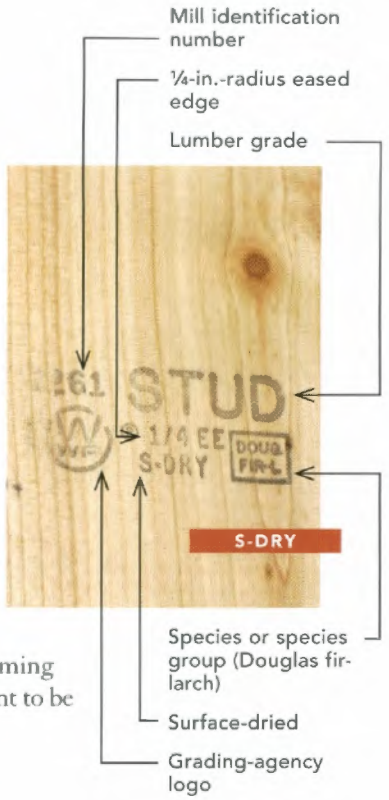
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According to the Forest Products Laboratory (www.fpl.fs.fed.us), framing lumber should not have a moisture content (MC) that exceeds 19%. Houses built with lumber above 19% MC are much more likely to develop mold and mildew problems, along with peeling paint, drywall cracks, and nail pops.

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Bill Duckworth is a freelance writer.



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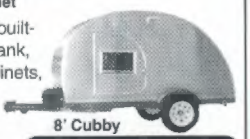
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O	1/2/9	350	Above-grade, non-load-bearing applications such as pointing repairs or parge coats
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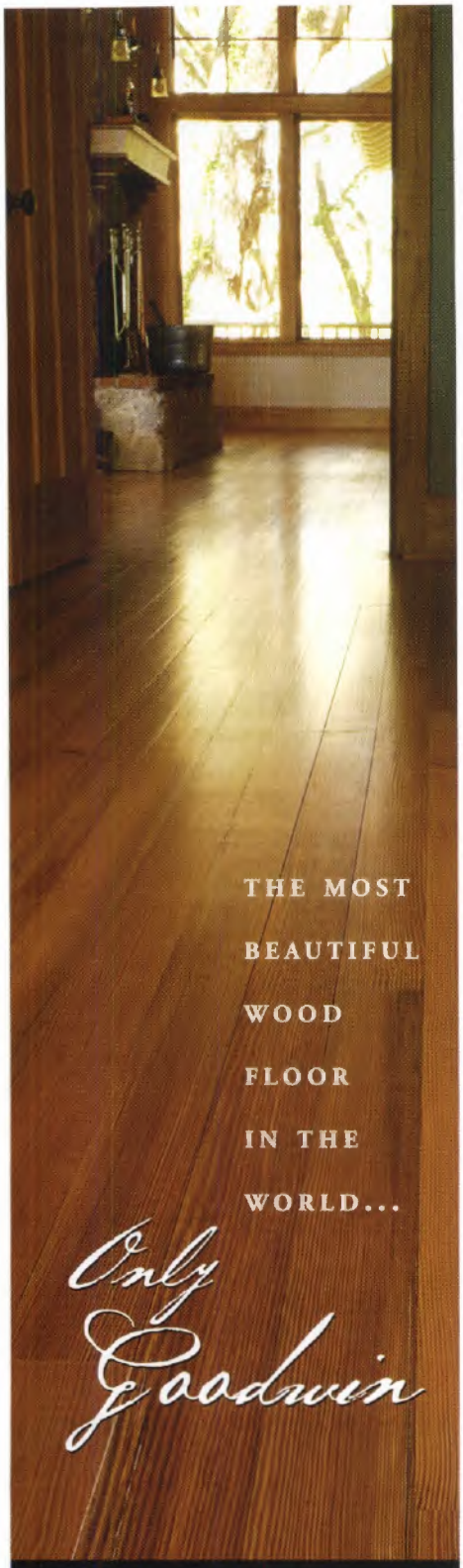
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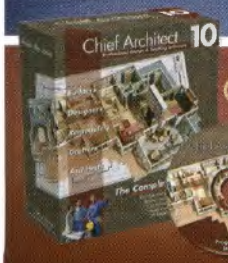
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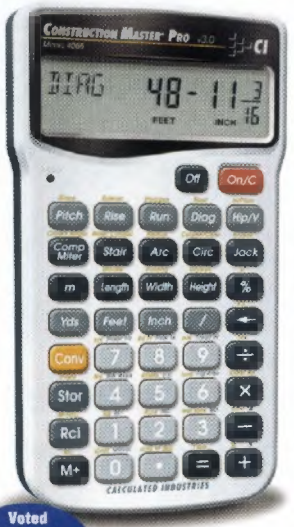
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BY GARY HERMAN

Step flashing



Basic materials get the job done: *Roofing caulk, galvanized roofing nails, tin snips, and step flashing (either flat or prebent).*

Installing step flashing correctly is one of the first things I teach a new member of my crew. The first rule of flashing is that water runs downhill. The second rule of flashing is that sometimes rule No. 1 isn't the whole truth and that water also runs uphill, as when it wicks up inside debris or backs up behind ice. For this reason, I like to lap all flashing by at least 2 in.

It's important to remember that a building always is moving. If you nail step flashing to the wall and to the roof, you're asking for trouble. Most of the time, I like to avoid putting any extra holes in the roof surface, so I nail step flashing to the sidewall only, where both the next piece of flashing and the siding will cover the nail head. The bottom corner, where you start the course of flashing, is made from two pieces of bent step flashing lapped over each other and caulked in place.

Gary Herman owns Ridgefield Roofing in Redding, Conn. Photos by Krysta S. Doerfler.

STEP BY STEP

CORNER FLASHING COMES FIRST



1 ***Make corner flashing from step flashing.*** *Once you've shingled up to the sidewall, cut a piece of step flashing at a 45° angle from the outside corner to the bent seam. Bend it down and back to sit flat on the corner. Then sink two nails in the wall near the top, one on each face.*



2 ***Lay a bead of sealant.*** *Where the next piece of flashing will overlap, apply a bead of caulk to seal the corner. This spot is prone to leaking because there is not a full 2 in. of overlap. Use a sealant designed for roofing. Not all caulks can withstand the heat and exposure of being on the roof.*

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Drawings: Clark Barre

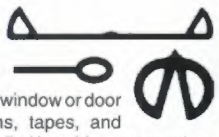
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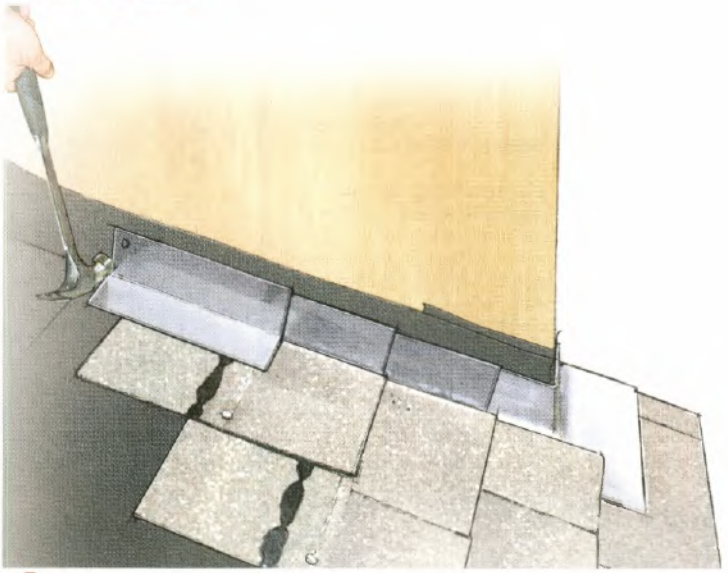
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THE FLASHING ALTERNATES WITH THE SHINGLES



3 ***Bend the first piece along the plumb line.*** *The first piece of step flashing needs one bend so that it laps cleanly over the corner flashing installed in the previous step. Make sure the caulk joint between these two pieces is bedded evenly. Then sink one nail into the sidewall to hold the step flashing in place.*



4 ***Begin the weave.*** *With step flashing, you do a little flashing, then a lot of roofing, then a little more flashing, and so on. Each piece of step flashing laps over the shingle below and under the shingle above. The bottom edge of the flashing should extend just below the nail line. Attach each piece with a single nail high enough to be covered by the next course of flashing, the building wrap, and the siding.*



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5 ***This roof ends in a peak.*** *For the first side, cut the step flashing along the fold line, and bend down the lower flap. Drive one nail to hold it in place.*



6 ***Caulk the top.*** *Once you've come up the other side with step flashing and shingles, you're ready to put on the final piece. Apply a vertical bead of caulk as shown.*



7 ***Make the last piece of flashing.*** *This is the brother to the one you already put on the peak. Cut along the fold line, bend down the flap, and press the pieces together along the caulk joint. Sink one nail into the wall to secure the last piece.*



8 ***Once you're done, half of the flashing will be covered by shingles.*** *After the building paper and the siding go on, almost all of it will be covered, which is one of the main reasons flashing has to be installed carefully to begin with.*

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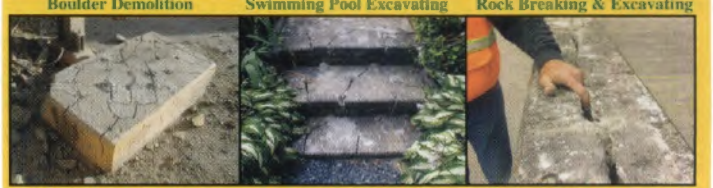
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BY DONALD POWERS

Dressing up a gable end



Most architecture is not of the Frank Gehry variety: extravagant expressions of bold forms and spaces, precious materials, and big egos. Most of the houses we drive by, live in, and build are modest structures in familiar, easily built shapes. Probably the most familiar architectural form is the traditional gable. Crayon drawings of this domestic archetype adorn countless refrigerators as if every house, regardless of actual shape, contained the simple gable somewhere in its DNA.

Unfortunately, when faced with a tight budget and the need for simple construction techniques, many designers and homeowners forgo gable embellishments, opting instead for a "pork-chop" eave return, flush rake, and expanse of beige vinyl. I believe the gable deserves more consideration and care. In the hands of a competent designer, great variety can be achieved within the silhouette of the traditional gable by varying and combining four basic elements: the level of detail; the composition; the scale; and the materials.

Dressing up the gable can be accomplished entirely within the facade of the gable without changing the framing or the size of the house. Much as a child changes the appearance of Mr. Potato Head by swapping facial features, an architect or builder uses the parts of the house—windows, doors, gable vents, porches, and roof shapes—to form patterns, arrangements, and groupings that express different architectural ideas.

Same shape, different appearance

Without modifying the overall shape of the gable, the level of detail and type of trim can add excitement and interest to this otherwise ordinary form. For example, adding one layer of trim to a rake board and creating a shadowline calls attention to the pitched roof by emphasizing its triangular shape. Or simply changing the eave detail from the unfortunately common pork chop to a boxed rafter tail transforms a house from a "builder special" to one steeped in the cottage tradition.

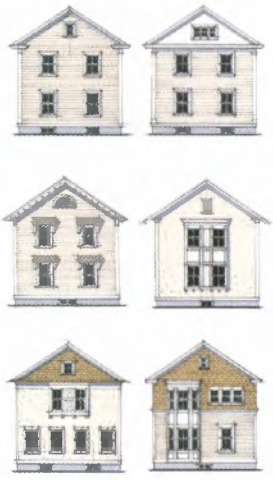
Good composition, defined as the satisfying arrangement and relationship of elements to one another, implies no extra expense. With symmetrical, hierarchical arrangement, the Greek-revival style imbues relatively simple house construction with the dignity of an ancient culture. Conversely, asymmetrical compositions are used to different effect in the romantic, Victorian, stick, and shingle styles, and in dynamic modern architecture.

Scale can be manipulated by simply joining two or more elements into one larger horizontal or vertical element. For example, joining several second-floor windows into a panelized group (photo above) creates another scale that exists between that of the individual window and the overall appearance of the house. To add richness to the facade, I look for opportunities to express this "middle scale" that spans floors or rooms.

The world was not built with clapboard alone, though in many new developments, you might doubt that. The palette of siding materials also includes board and batten, shingle, stucco, vertical board, shiplap, brick, and stone. These materials can be combined for interest and drama to great effect. Pattern and material were brought to a riotous expression in the Queen Anne style, but be careful: Nothing screams McMansion like a mishmash of too many materials badly combined. Drive through older neighborhoods, and look at the ways these combinations have been successful.

Despite swearing that he'd never do it again, Donald Powers (www.donaldpowersarchitects.com) is remodeling another century-old house for his family. Drawings by the author. Photo by Charles Miller.

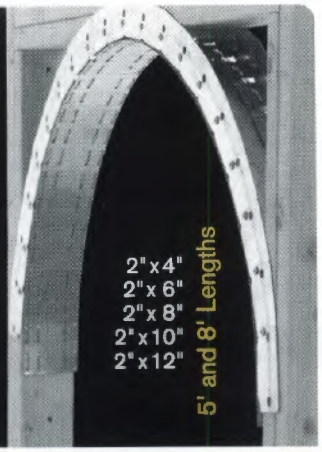
Exploiting a design opportunity. *Flared siding, grouped windows, and an attic vent that's accented rather than hidden are a few ways to dress up a gable end.*



Six styles to start the design dialogue Applying different design strategies to a two-story colonial shows how appearance can be altered dramatically. See details from the examples above on the following pages.

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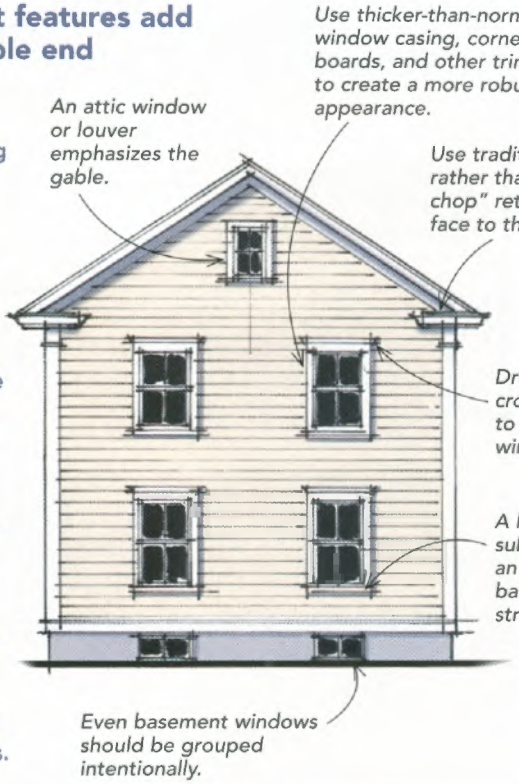
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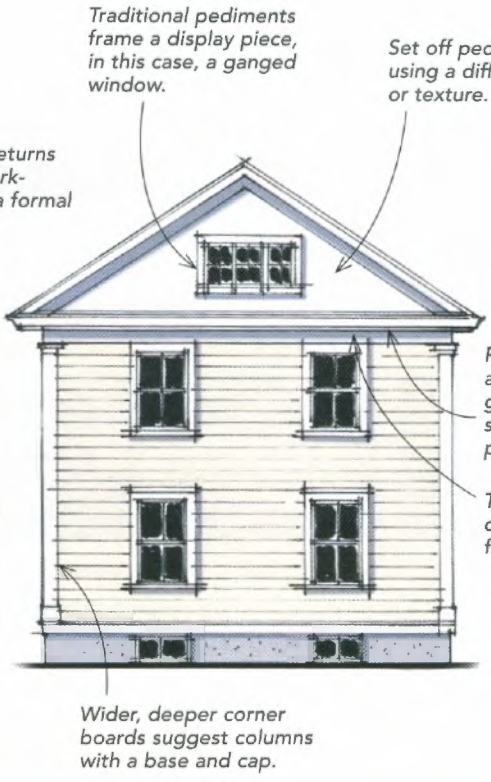
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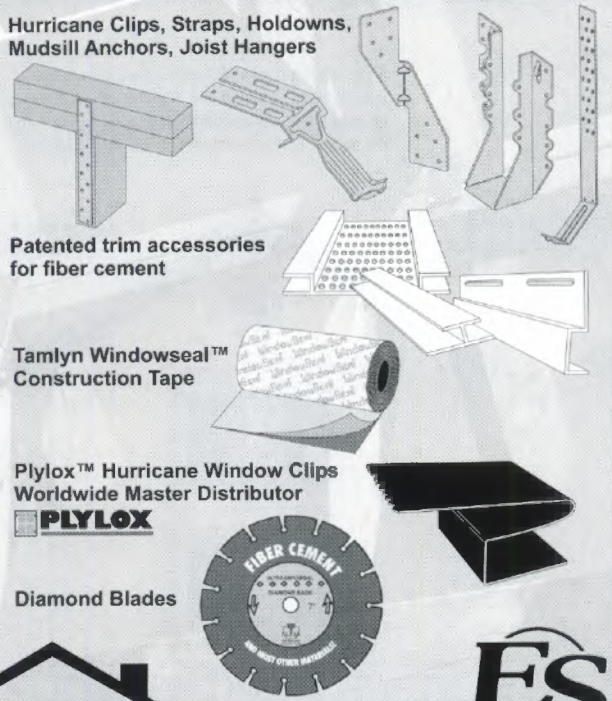
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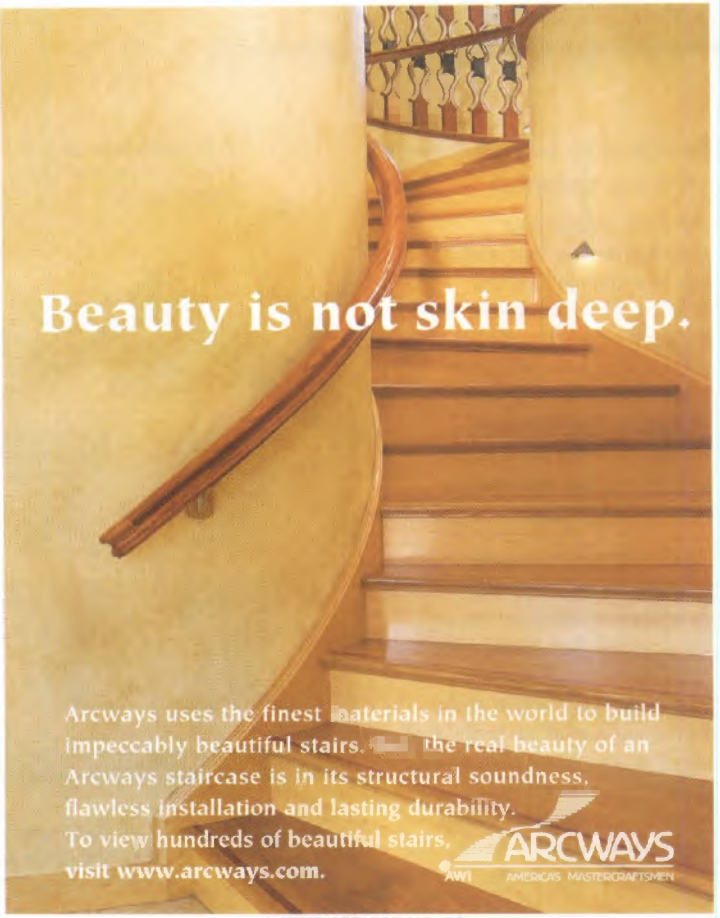
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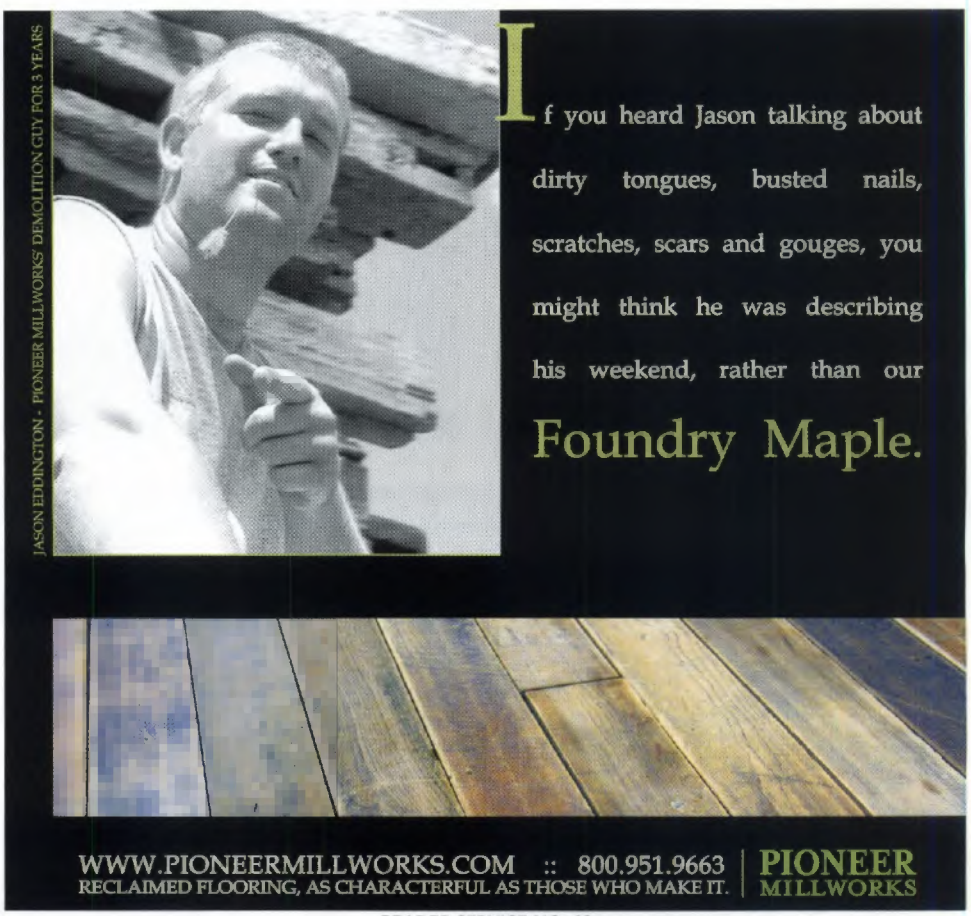
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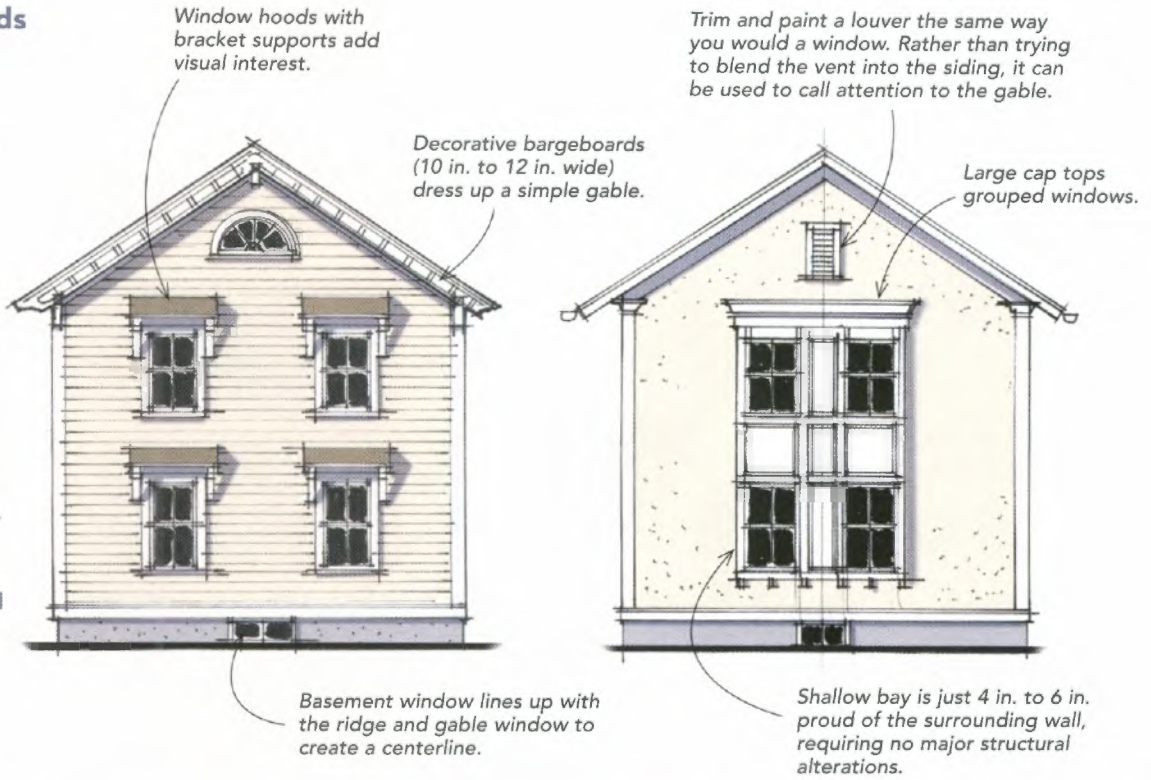


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Not every house needs to be a colonial

Applied details and ornamentation that don't require changes to the framing can change the style of a house radically. A decorative bargeboard applied to the rake and details such as window hoods (or little shed roofs) can evoke the Victorian or Scandinavian style.

For a dramatic change in scale, consider a large symmetrical window group. Joining the first- and second-story windows in a single bay creates a middle scale between that of an individual window and the gable end. It can be accomplished without structural framing and results in nice, deep interior window wells.



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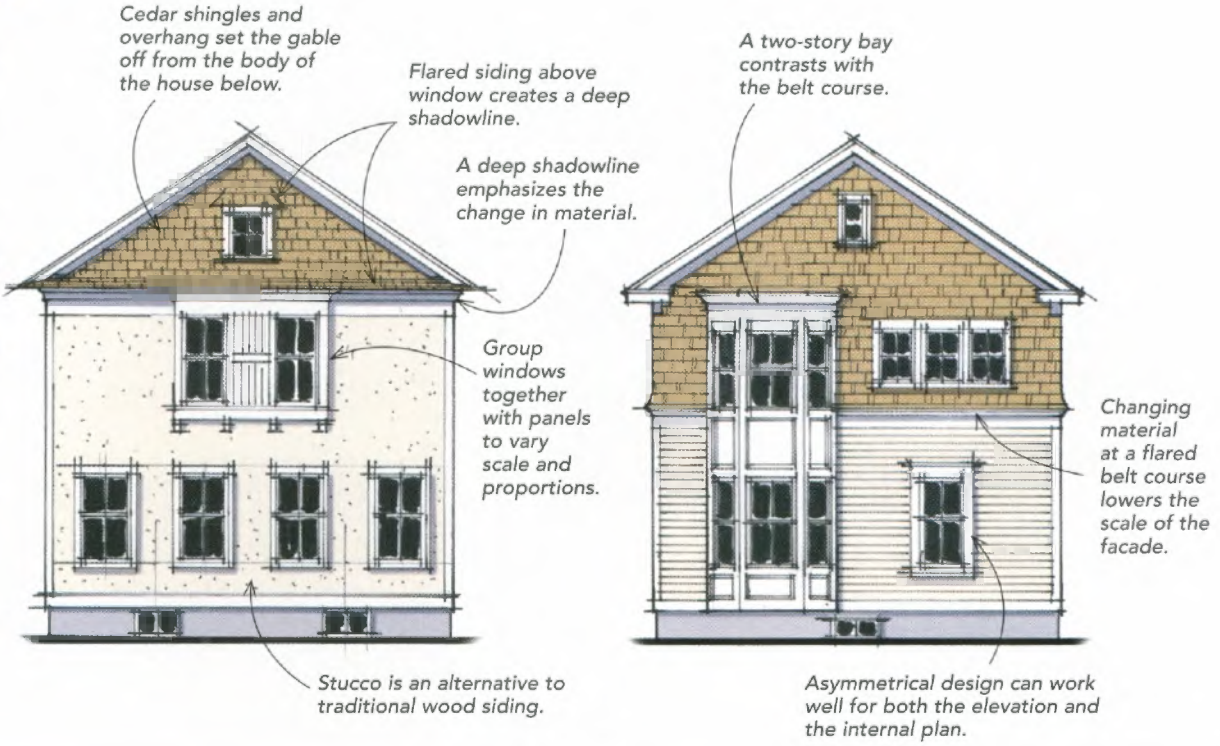
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Mix siding materials for emphasis

Different materials and textures on the gable end can be stimulating if done with restraint. Using shingles in the gable calls attention to the gable in the same way the pediment did in the example on p. 128. Changing the siding material between floors in the asymmetrical composition (far right) integrates the gable and the second story, seemingly reducing the height of the house. In both cases, a deep shadowline at the transition draws the eye to the change in materials.



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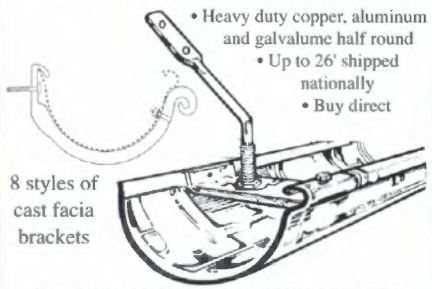
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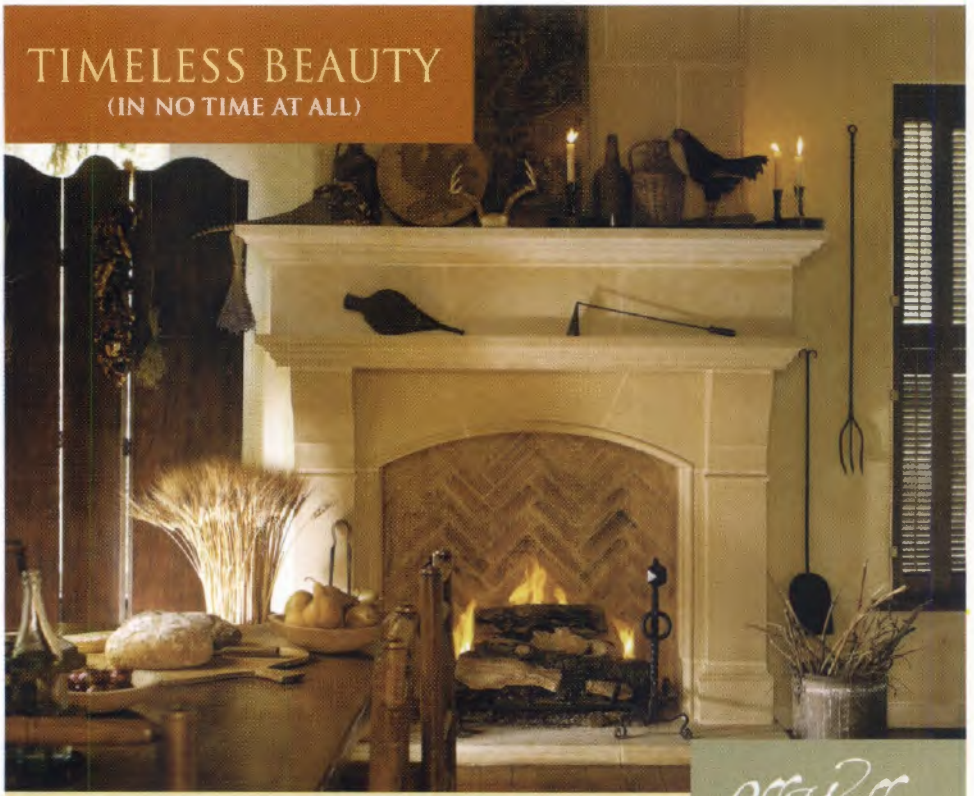
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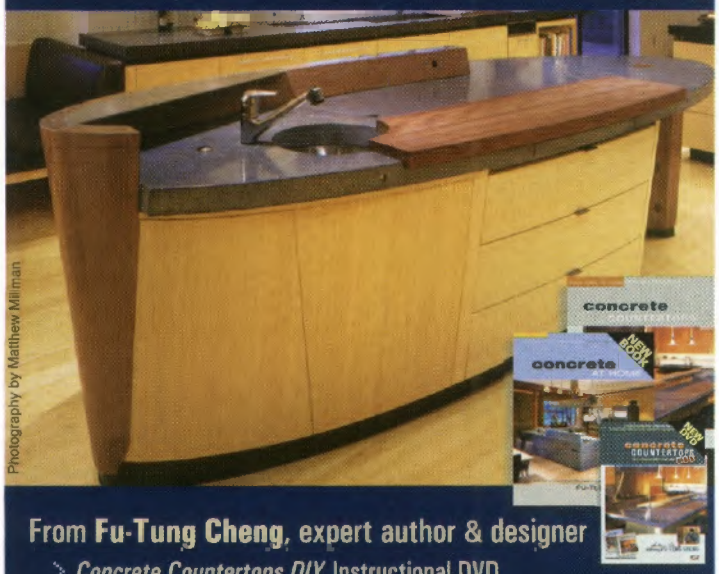


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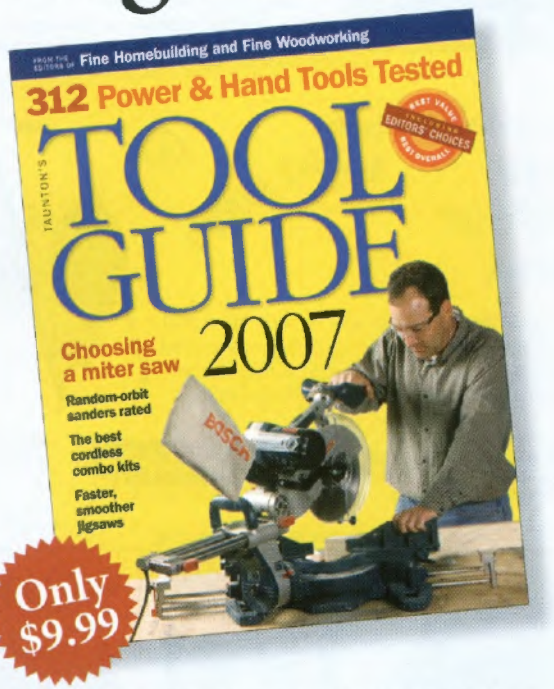
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Built-up crown in a room without corners



The good news was that we didn't have to cope or miter; the bad news was that we were trimming an ellipse, so everything had to bend. We've trimmed a couple of circular stairways, so we're getting better at it. Layout is important, but materials are, too. In this particular stairway, the railing hadn't been installed, so we set up scaffolding across the opening so that we could stand comfortably and work.

We usually snap lines for layout (see "Mastering Complex Crown," pp. 66-71). Obviously, that doesn't work in the round, so we used gauge blocks. After making a mock-up, one of my crew members cut two sets of gauge blocks. The first set established layout lines on the ceiling and wall for the blocking. The second set marked





Start with sturdy blocking. *We built plywood boxes that formed the core of the blocking. Eight-ft.-long top and bottom pieces laid out with a cardboard template were assembled over blocking and faced with ¼-in. bending plywood. Construction adhesive, temporary blocks, and shims held them in place until we screwed them into the ceiling joists with 5-in. screws. Loose tenons of poplar pin one section of box to the next.*



Mark finished soffits in place. *Cut from ¾-in. medium-density fiberboard, the soffit stock was left long so that once the first piece was up, we could mark the next in place and make the biscuited joints tight.*



A compliant fascia. *Rather than laminate layers to get the thickness we needed, we used a material called Flexboard (see p. 138). After ripping it into 10-in.-wide strips, we glued and nailed it below the blocking, where it made a smooth, seamless platform for the next layer of moldings and decorations.*

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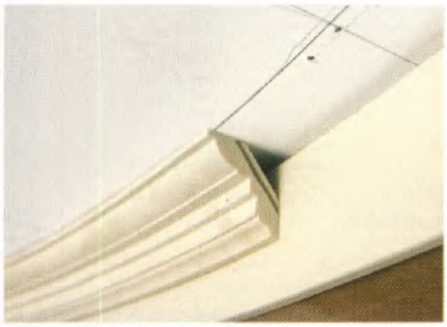
where the finished moldings would land. There's no better way than just to hold the block against the wall or ceiling and pencil in the marks as you go around the room.

After marking out the walls, we divided the room into quarters and used heavy cardboard to template one quarter, which then became our pattern to make parts for the blocking and the soffit. We installed the flat pieces first, then applied the moldings with urethane adhesive and nails. The last details were decorative blocks; we plotted the intervals on an 8-ft. strip of ¼-in. plywood, and then we used the strip to transfer the locations onto the bottom frieze.

Joe Milicia is a builder in Fairfield, Conn. Photos by Charles Bickford, except where noted.



Don't let it get away. *Flexible moldings have only a couple of drawbacks, one of which is that installation requires more than a couple of hands. If the end of the molding isn't supported, it's hard to nail the profile to its proper alignment.*





Provide the best support. *Where the molding dimensions allowed, we biscuited the butt joints aligned and tight. If the profile was too slim, we backed the joints with a scrap of MDF (photo far right).*



Dentil details on a rope. *One of the easier aspects of working in the round was the dentil application. Made of DuraFlex fabricated into an 8-ft. length, each piece was glued and nailed into an integral niche on the middle piece of crown.*

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Photo bottom right: Krysta S. Doerfler

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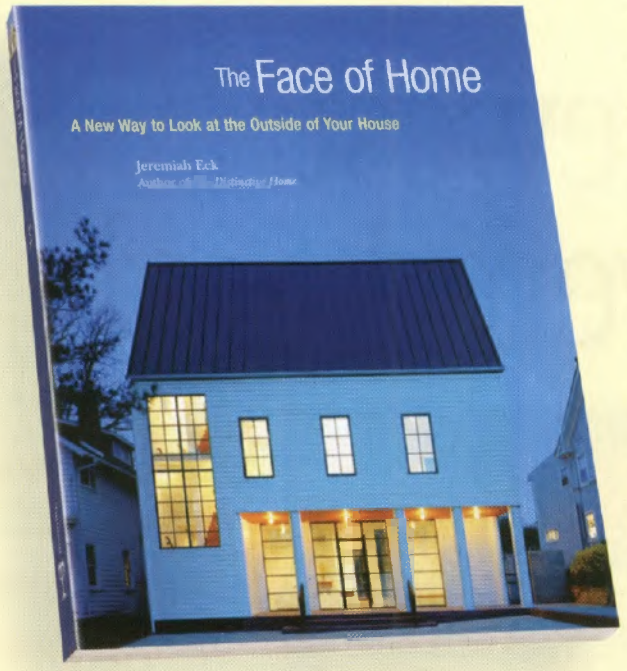
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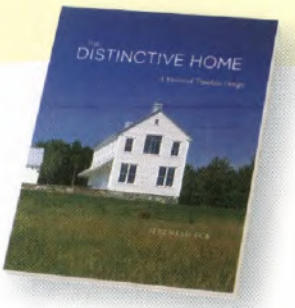
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King Cone

Remember those classic comic-book "origination" tales we read as kids, the ones that explained how various superheroes acquired their powers, often by accident? I always believed they were just stories, until two summers ago, when I learned that under the right circumstances, it could happen to anyone—even me.

I was well into a curb-strip rehab project in front of my home, a monthlong ordeal that included the removal of 4 in. of soil from the 200-ft.-long corner parkway, then dry-setting bricks over the whole area. Beach stones would encircle four mature palm trees, standing in pairs on each side of the driveway. As the work progressed, it would be necessary to route passing cars around the pallets of bricks, the equipment, and the work crew, which consisted of just me and my helper, a high-school senior.

I bought several large fluorescent-orange cones, the kind we've all driven around many times as we passed public-works projects. On the morning the first two pallets of bricks arrived, we were busy muscling the gas-powered tamping machine over the sand/cement foundation bed. (Actually, my helper was doing the muscling; I was standing by, trying to look muscular.) I placed several cones in the street to divert traffic around the bricks and our work area.

Then it happened.

The cones not only willed passing cars into instant, dutiful obedience, but they also cast an aura of respect over the project. Drivers suddenly were doing approving double-takes as they examined the site; children were pointing in awe as we tamped and measured. It seemed the project had become The Project.

Slowly, the hidden powers of the cones were revealed to me. A man with cones to distribute assumes an air of importance, officialdom, competence. Drivers may fail to stop, yield, or slow down when directed by signs, but no one questions the authority of orange cones. They are their own law and enforcement in one.

With the cones proclaiming the serious nature of the project, people began stopping to ask, "Can you take a look at my curb strip?" and "Can I get an estimate?" Thanks in part to the cones, passersby were assuming that I was a contractor. On a scale of handyman coolness, that ranks well above walking around with a tape measure clipped to your belt or even driving home with a pickup truck full of lumber.

The presence of the cones also seemed to announce to the neighbors that This Guy Means Business, and several came by to investigate. One nearby couple even brought me a cold beer on a steamy afternoon, only to comment as they walked away, "That wife of his doesn't even bring him a cold drink!" I wasn't going to share the remark with my wife, but when I came back inside the house, I could see from her tormented expression that she'd heard every word. (Those folks were absent from our next neighborhood get-together.)

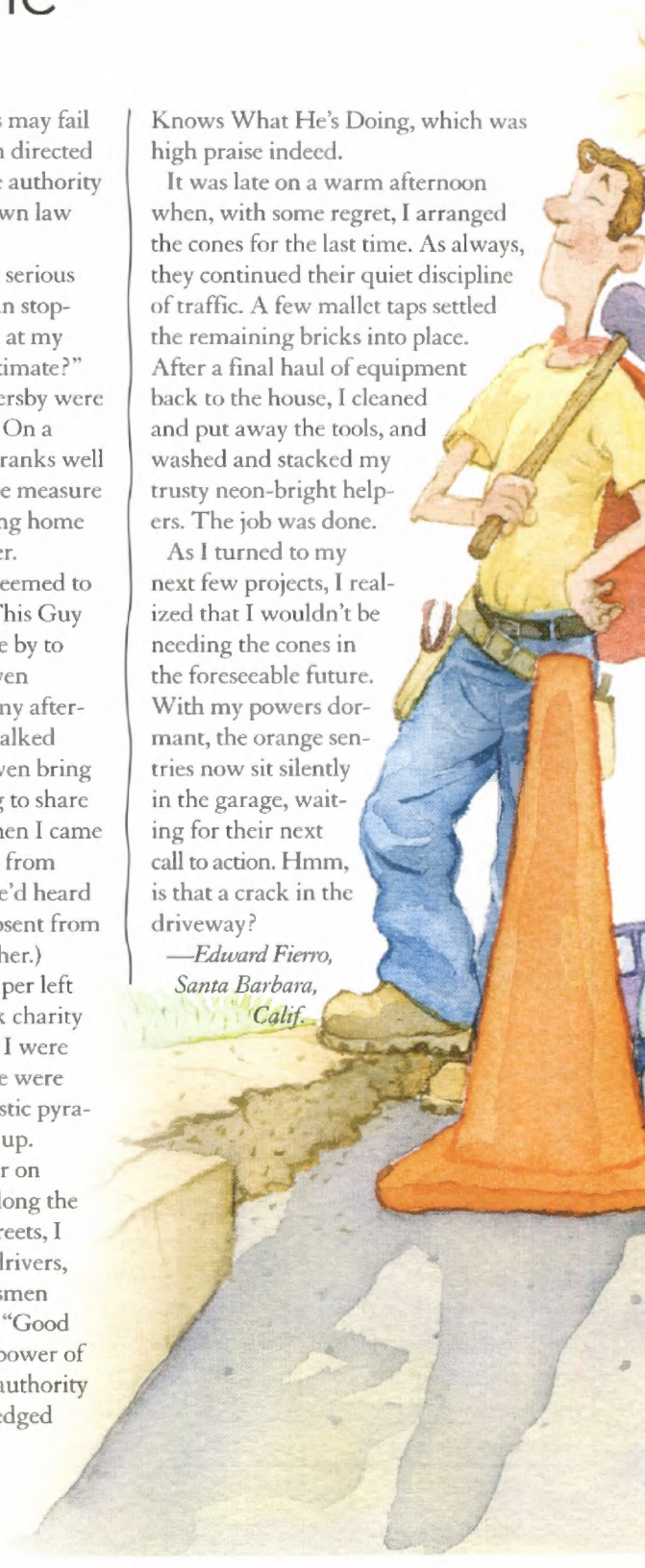
After a couple of weeks, my helper left for a cushy job as a valet at swank charity events. My orange comrades and I were left to finish the job alone, and we were equal to the task. Besides, the plastic pyramids had more magic to conjure up.

As I literally rounded the corner on the project and began working along the busier of the intersection's two streets, I came into view of more passing drivers, including various building tradesmen who often shouted a reaffirming "Good job!" Thus I witnessed the final power of the cones. Thanks largely to the authority of their presence, I was acknowledged by professionals as A Guy Who Knows What He's Doing, which was high praise indeed.

It was late on a warm afternoon when, with some regret, I arranged the cones for the last time. As always, they continued their quiet discipline of traffic. A few mallet taps settled the remaining bricks into place. After a final haul of equipment back to the house, I cleaned and put away the tools, and washed and stacked my trusty neon-bright helpers. The job was done.

As I turned to my next few projects, I realized that I wouldn't be needing the cones in the foreseeable future. With my powers dormant, the orange sentries now sit silently in the garage, waiting for their next call to action. Hmm, is that a crack in the driveway?

—Edward Fierro, Santa Barbara, Calif.



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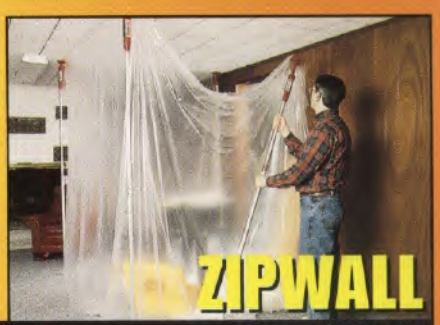
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Lessons in geometry and joinery



Nothing about framing an octagonal room is easy. But building the room with precisely made timber-frame joinery could be overwhelming. While executing this design by Hutker Architects, however, Colin Whyte's crew at Martha's Vineyard Construction measured up to the task. They built the upper three layers on the ground, then raised the structure into the air and assembled the posts and beams underneath. They hid steel plates in kerfs in each beam and supplemented beam-to-post connections with lag screws. Vertical-grain Douglas-fir 2x6s form the ceiling. A cherry inlay in the beech floor reflects the pattern of posts and rafters. —Photos by Brian Vanden Brink