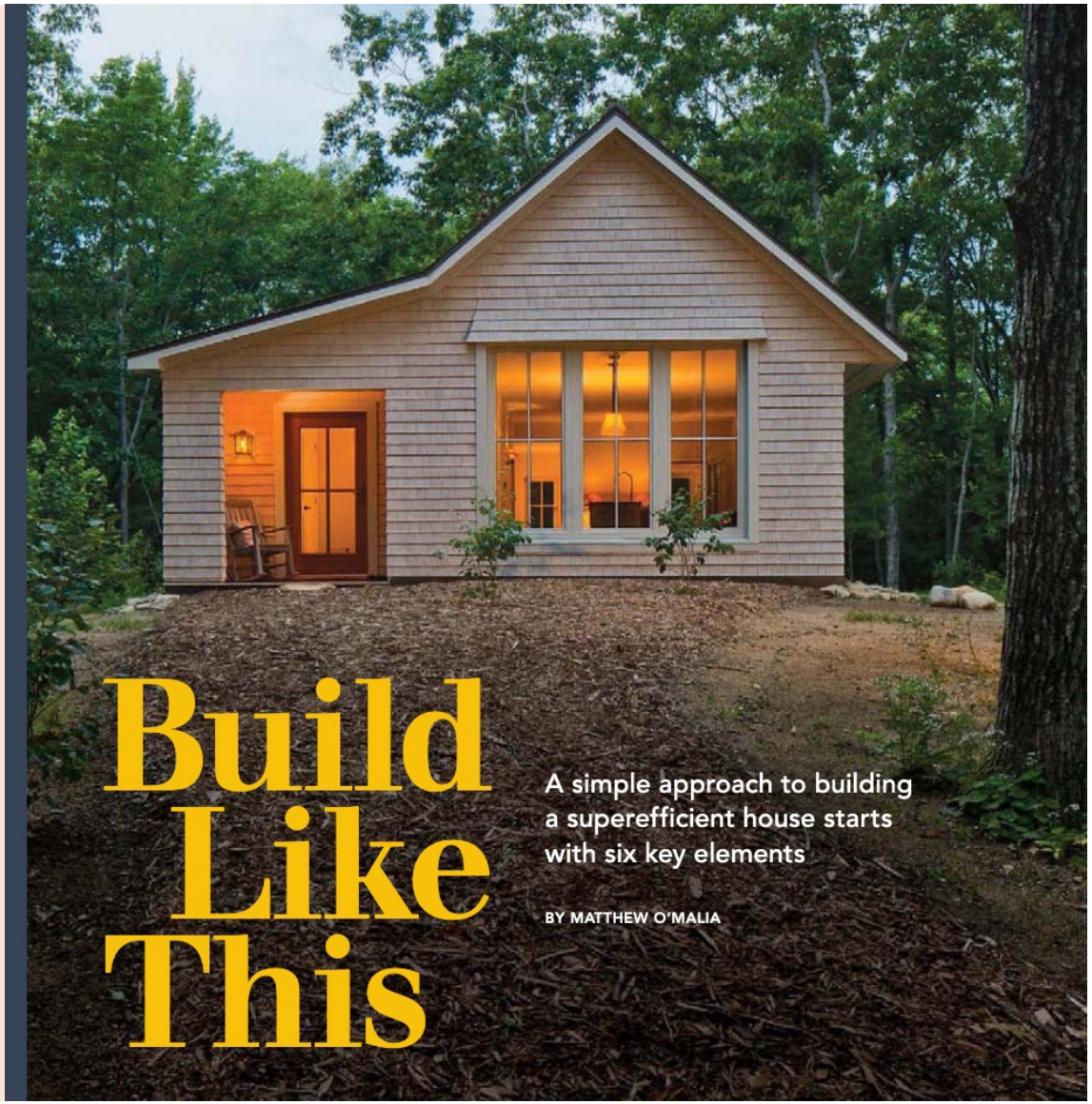
# Salisbury Building Arts Program 2.21.26

Fine Homebuilding Magazine

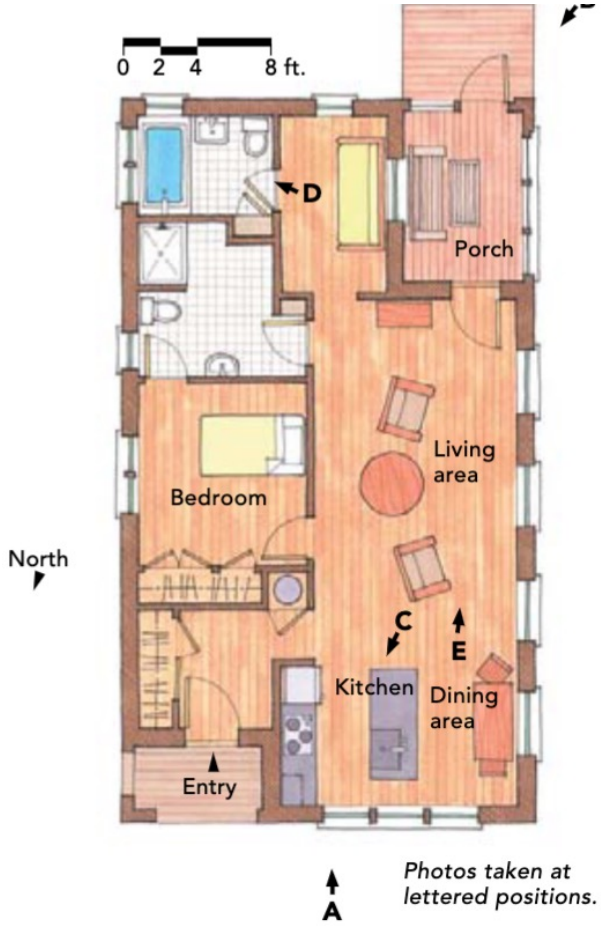



In 2008, when my business partner and I decided to form a design/build firm, we agreed to build to the highest standard of sustainability and to do so cost-effectively. With all our projects, we hoped to achieve a synergy between designing for human comfort, building in response to the site, and achieving long-term durability. We quickly agreed that the Passive House standard, which was just being introduced to the United States, would be the most comprehensive and clear measure of our success. To demonstrate that we had the ability to reach the standard, we built our first prototype, a house we called the GO Home. To reach the Passive House standard in Maine's cold climate, we developed a new way to design and build homes collaboratively. The GO Home, completed in 2009, was Passive House certified, achieved LEED platinum, and was named the U.S. Green Building Council's residential project of the year.

Since building the GO Home, we've refined our design-and-build approach in completing several other high-performance projects. This house in Bath, Maine, is based on one of our design-plan packages that delivers (depending on the site) a house that could meet the Passive House standard, that's comfortable and attractive, and that has a modest base cost—roughly $160 per sq. ft. Here is how we achieve such grand results on such a low budget.

## Design it to be compact

Wendy and Bill came to us because they were interested in building the smallest and most sustainable home they could for their retirement. Of the plans we offer, they chose to work with our 1000-sq.-ft plan, which includes one bedroom; two




*Photos taken at lettered positions.*

## SPECS

**Bedrooms:** 1 • **Bathrooms:** 2 • **Size:** 1000 sq. ft. • **Cost:** $160 per sq. ft. (base plan) • **Completed:** 2011 • **Location:** Bath, Maine

**Architect:** Matthew O'Malia; GOLogic.us • **Builder:** Alan Gibson; GOLogic.us • **Annual energy expenses:** $1000 (8124kwh)

demands, allowing the cost and complexity of the mechanical systems to be minimized. The cost savings can be invested in envelope improvements. To achieve the results O'Malia and his team are after, they need to address six critical building details.

### 1. INSULATION

To help keep interior temperatures at a constant and comfortable 70°F, 24 in. of cellulose (R-84) fills the attic floor, 8-in.-thick EPS-filled SIPs and a 2x4 bearing wall insulated with dense-pack cellulose create an R-50 wall assembly, and 12 in. of EPS rigid insulation below the slab yields an R-60 foundation.

### 2. WINDOWS

Windows typically account for one-third to one-half of a home's heat loss. For that reason alone, O'Malia uses triple-glazed windows with thermally broken frames to reduce heat loss.

### 3. AIR-SEALING

Zip System wall sheathing is attached beneath the roof trusses, and its seams are taped to reduce air movement through the ceiling. Flashing tape seals the top of the wall assembly and the seams between the SIPs. Self-adhesive membrane is used to seal the subslab poly vapor barrier to the SIPs.

### 4. THERMAL BRIDGING

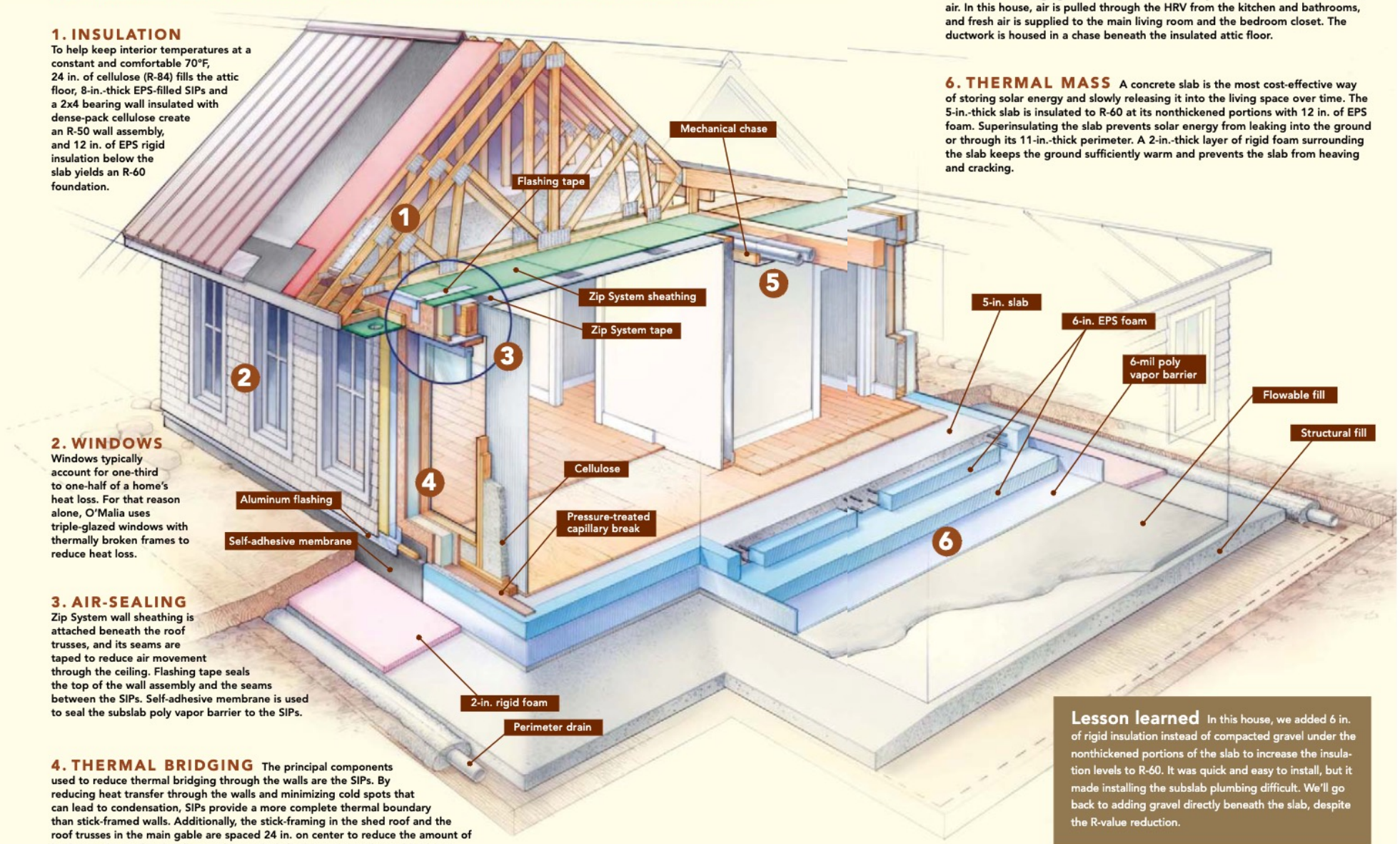
The principal components used to reduce thermal bridging through the walls are the SIPs. By reducing heat transfer through the walls and minimizing cold spots that can lead to condensation, SIPs provide a more complete thermal boundary than stick-framed walls. Additionally, the stick-framing in the shed roof and the roof trusses in the main gable are spaced 24 in. on center to reduce the amount of lumber in the roof and wall assemblies, which further reduces thermal bridging.

### 5. VENTILATION

A heat-recovery ventilator (HRV) draws outside air into a heat-exchanging core, where it is warmed by conditioned interior-exhaust air. In this house, air is pulled through the HRV from the kitchen and bathrooms, and fresh air is supplied to the main living room and the bedroom closet. The ductwork is housed in a chase beneath the insulated attic floor.

### 6. THERMAL MASS

A concrete slab is the most cost-effective way of storing solar energy and slowly releasing it into the living space over time. The 5-in.-thick slab is insulated to R-60 at its nonthickened portions with 12 in. of EPS foam. Superinsulating the slab prevents solar energy from leaking into the ground or through its 11-in.-thick perimeter. A 2-in.-thick layer of rigid foam surrounding the slab keeps the ground sufficiently warm and prevents the slab from heaving and cracking.




**Lesson learned** In this house, we added 6 in. of rigid insulation instead of compacted gravel under the nonthickened portions of the slab to increase the insulation levels to R-60. It was quick and easy to install, but it made installing the subslab plumbing difficult. We'll go back to adding gravel directly beneath the slab, despite the R-value reduction.

Drawing: Bruce Morser

ing space; and a small study.

The shape of the house was influenced by our desire to create a simple but well-proportioned home. The main living space lies beneath the gabled portion of the house, with the supporting functions beneath a shed roof that wraps the side and back of this main space. The entry porch is recessed under the shed roof on the south facade, and the screened-in porch is carved into the northeast corner of the house.

To create interior spaces that have a small footprint but still feel generous, we designed an open floor plan for the kitchen, living, and dining areas. These spaces also provide direct access to the bedroom and the bathrooms to avoid hallways and redundant circulation. We also increased the height of the ceiling to 9 ft. and the size of the windows in the main space. The result is an open interior with a strong exterior connection.

## Adapt it to its site

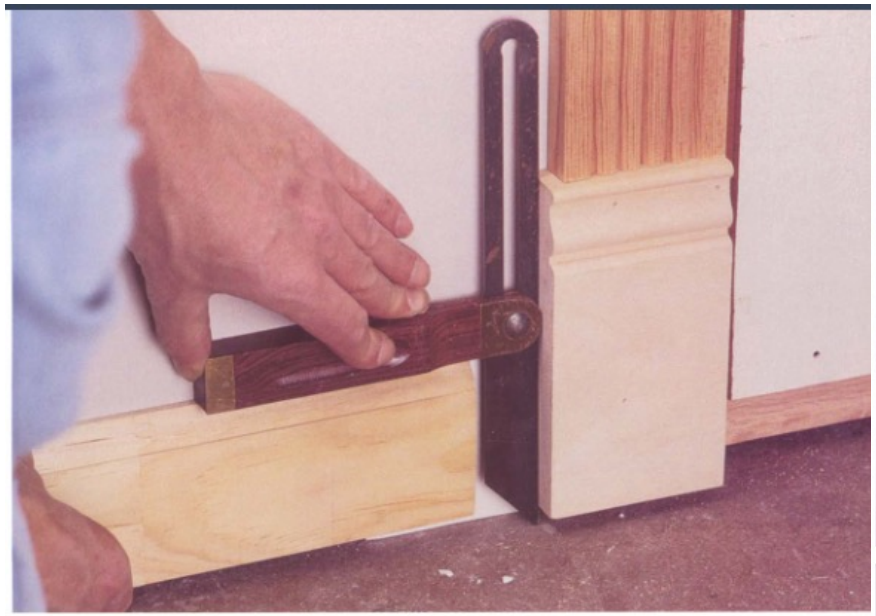
Wendy and Bill's site was challenging, and in many ways, it tempered the performance potential of the house. The site is surrounded by beautiful, mature hardwood trees, which made it difficult to get the solar gain required for the Passive House standard. We all agreed that the trees were more important than the standard, given that the house would still perform exceptionally well.

The house plan was developed with the intention of having its longest axis running east to west so that the living-room wall full of windows would face the sun to the south. On this narrow site, however, the longest axis runs north to south, and the window-filled living-room wall faces east. While the siting of the house doesn't provide ideal access to the sun, it does provide terrific views. We didn't totally give up on passive solar gain, though. We modified the plan and placed three massive tilt-turn windows on the south-facing gable end. The windows provide abundant daylight in the kitchen, dining, and living areas, and much-needed solar gain during the heating season. Such large windows in a small house also create an unexpected but welcoming look upon approach and give the simple house character.

## Make it efficient and buildable

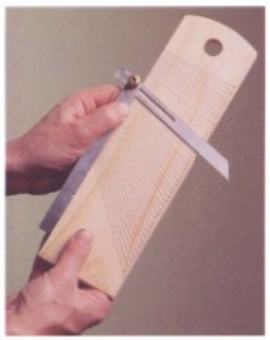
Our version of high-performance, cost-effective construction relies on a superinsulated slab on grade, hybrid SIP walls, a truss

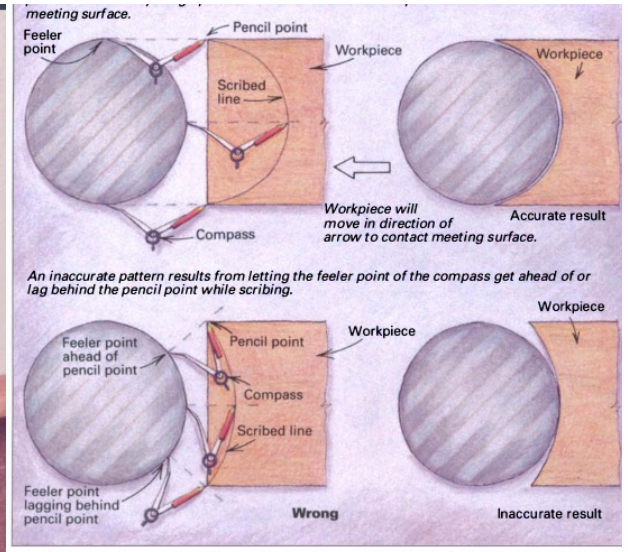
# Basic Scribing Techniques: FHB Issue 77



***Fitting baseboard.*** Author Jim Tolpin uses either a bevel square (photo above) or a homemade base hook (photo below right) to lay out baseboards for a tight fit against door casings. Bumpy floors can fool a bevel square, so Tolpin always measures the bevel off of a straightedge or a piece of the baseboard itself. The base hook is used by holding it hard against the casing (or plinth block in this case) while scribing a cutline directly on the baseboard.

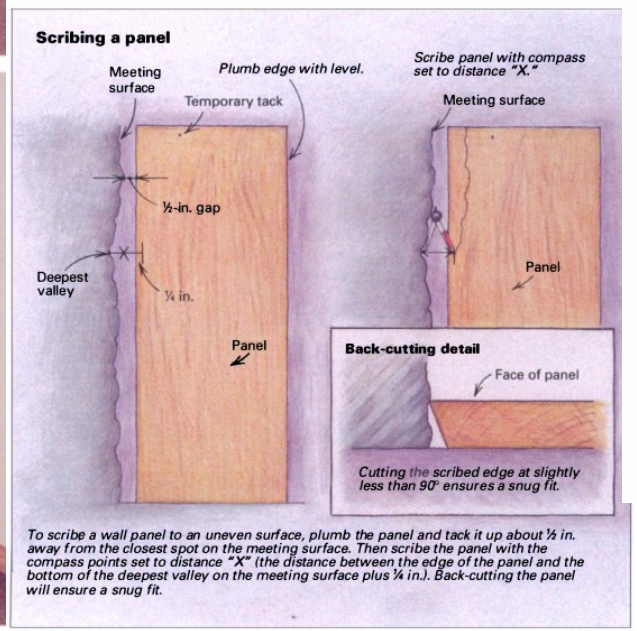
***Boat builder's bevel board.*** Etched with 46 labeled lines spaced 1° apart, the homemade bevel board (photo below) makes it easy to read an angle off a bevel square, then adjust a saw to that angle.






*An inaccurate pattern results from letting the feeler point of the compass get ahead of or lag behind the pencil point while scribing.*




*To scribe a wall panel to an uneven surface, plumb the panel and tack it up about ½ in. away from the closest spot on the meeting surface. Then scribe the panel with the compass points set to distance "X" (the distance between the edge of the panel and the bottom of the deepest valley on the meeting surface plus ¼ in.). Back-cutting the panel will ensure a snug fit.*

by Jim Tolpin

The first thing I learned as a finish carpenter was that square corners, plumb walls and level floors and ceilings don't exist on this planet. And because that's just the way it is, it was up to me to learn how to work with these unfortunate divergencies from the way it ought to be. As the finish man, my job was to fit the pretty stuff to the structures that framers and rockers left behind, no matter how crooked they were.

In my quest for perfect fits, I learned how to use bevel squares and base hooks, among other tools, and became proficient in the use of a slightly customized pencil compass. I learned from legendary boat builder Bud MacIntosh how to use something called a spiling batten to solve certain awkward scribing problems, such as fitting the last ceiling board. I even paid homage to the linoleum trade and learned the ingeniously simple "Joe Frogger" method of creating a template that can produce dead-accurate fits every time.

**Using the bevel square—**A bevel square is a layout tool with a wood, metal or plastic body having an adjustable metal blade attached to one end. The square is used mostly for determining the angle at which a piece of trim needs to be cut to fit tightly against a surface.

My first bevel square came from my grandfather. It's a nice rosewood-bodied job with a 6-in. long blade. It's pretty and has sentimental value, but like many contemporary bevel squares, it's not the best tool for taking angles. This is because its locking lever, which is located at the pivot point of the tool, often sticks beyond the edge of the body and gets in the way. Also, the body is quite thick, which holds the blade away from the stock. This can throw off the angle measurement. What's more, the body is relatively short, which can also produce inaccurate readings.

I like my all-metal Japanese bevel square better (bottom left photo, facing page). It's much thinner than a conventional bevel square; the lock is a knurled knob that's out of the way; and it can be held and locked with one hand.

Although the use of a bevel square may seem straightforward, it's not. Always extend the blade fully before pressing the outside edge of the body against a surface to measure an angle (such as when measuring an inside corner where two walls meet). Any protrusion of the blade beyond the outside edge of the body will hold the body away from the surface it's resting against, throwing off the angle reading.

Also, don't assume that you can simply press the square against converging surfaces to get an accurate reading. Say, for instance, that you want to fit a baseboard to a door casing (top photo, facing page). To measure the angle of the end cut, set the baseboard where you want it on the floor, then place the body of your bevel square on top of the baseboard to measure the angle of the casing. If you simply lay the body of the square on the floor, any bumps or dips in the floor next to the joint will fool the square into measuring a false angle. An alternative is to set a level or a straightedge on the floor and to measure the angle off of that.

Once you measure an angle, be careful not to jar the bevel before you scribe the workpiece. Fortunately, there's an easy way to ensure against the loss of an angle setting on a bevel: Record it with the help of a boat-builder's bevel board.

**Saving angles—**Boat builders, who confront compound angles on nearly every piece they fit, have developed a simple, shop-made accessory that makes it easy to measure and record a series of angles for future reference at the saw table. Called a bevel board, it's a board with a bunch of lines drawn across it at angles ranging from 0° to 45° (bottom left photo, facing page). The bevel board allows you to measure an angle with your bevel square and then read the degrees of the angle directly from the board. If the angle scale on your bandsaw, table saw or chopsaw is calibrated to the bevel board, you need only to set the saw to the appropriate degree mark and cut away. If more than one angle is being taken at once, the angles are simply recorded on a scrap of wood or paper that represents a story board of the piece or pieces to be cut.

The bevel board should be made of a stable wood, such as mahogany or teak, that has an interlocking, split-resistant grain. You can also use a scrap of ¾-in. plywood. Using a protractor, scribe the lines to the board with an awl and then fill them in with an indelible ink. Keep the board thin so that it will be lightweight (¾-in. thick is sufficient); leave room at both ends of the board for indexing the body of the bevel against it; and radius or chamfer the top edge of the board so that you can orient it at a glance. An alternative board, sans the romance (and not quite as easy to read), is made by scratching the lines deeply into a piece of Lexan plastic.

In lieu of a bevel board, you can scribe and label each angle on a wood block right after you measure it, then reset your bevel square from the block to mark your trim. If you need to quantify an angle in degrees, measure it on the block with a Speed Square.

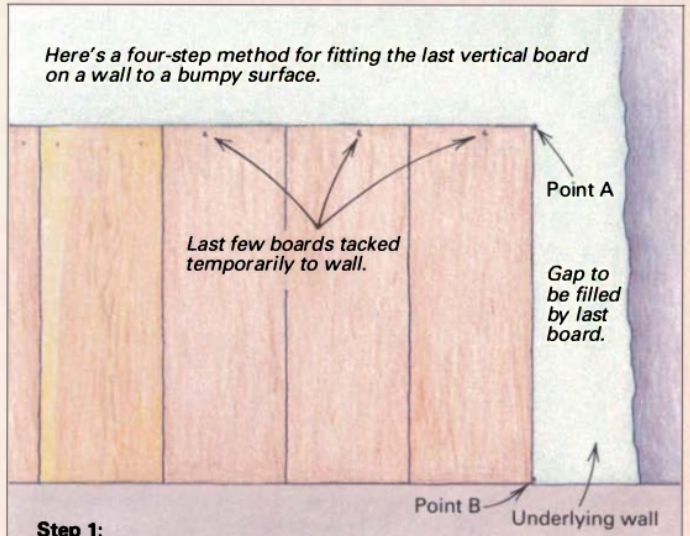
**The base hook—**Another homemade tool, called a base hook, eliminates the need for a bevel square in some applications. Similar in concept to a siding gauge (see the cover of *FHB* #47), it's simply an L-shaped piece of a stable, split-resistant wood used primarily for laying out the end cut of baseboard where it butts against standing moldings such as door casings (bottom right photo, facing page). To use the hook, lap it over the baseboard and hold it hard against the standing molding while scribing a cutline across the baseboard. Be sure the faces of your base hook are perfectly square to the edges, or you'll introduce a margin of error.

**Scribing to irregular surfaces—**Shortly after I became a finish carpenter, I bought a $5 pencil compass like the kind my kids tote in their school bags. It has two adjustable arms, with a metal feeler point at the end of one arm and a pencil at the end of the other (bottom photo, p. 62). For improved accuracy, I heated and bent out the feeler point of my compass slightly so that the point, rather than a portion of its side, contacts the meeting surface. (The meeting surface is whatever is being scribed to; I'll call the piece to be cut the workpiece.)

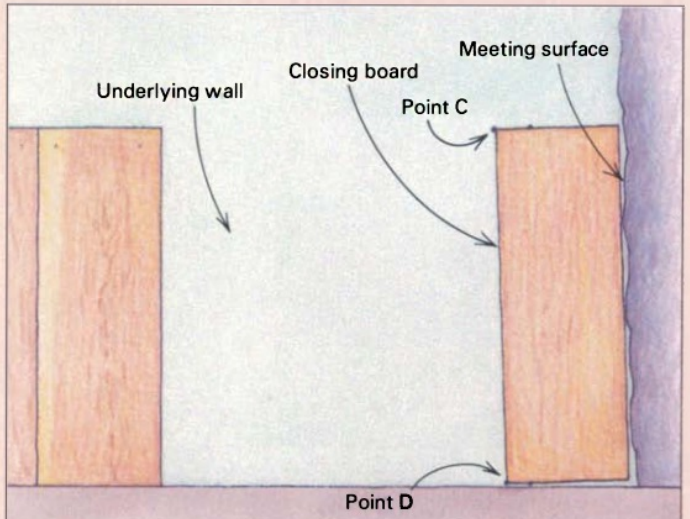
Although I haven't tried it yet, I recently learned a tip from Gary Katz, a contractor in Encino, California. To ensure that he can always scribe a fine line, Katz fits his compass with a Cross #3503 mechanical pencil (A. T. Cross Co./ATX Marketing, One Albion Road, Lincoln, R. I. 02865; 401-333-1200). This pencil is expensive ($15.50), but it scribes a very fine line, is well made and has a wonderful warranty. No matter how you damage it and regardless of its age, you can return it to Cross, and they'll send you a new one.

When scribing a line with a compass, you are actually transferring the pattern of the meeting surface onto the workpiece. It is very important, as you scribe the line, that the feeler point on one side of the compass not get ahead of or lag behind the pencil point on the other side. Throughout the scribing process, these two points must align parallel to the direction the workpiece will move to contact the meeting surface. If they don't, the result will be an inaccurate pattern and, ultimately, a sloppy fit. (top

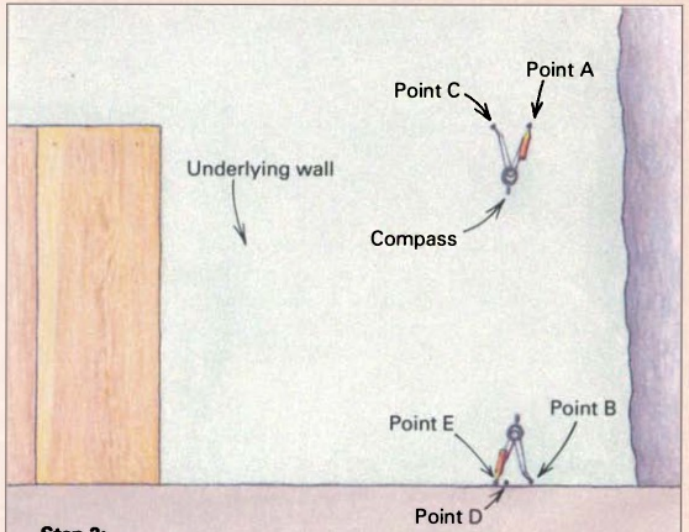
*Here's a four-step method for fitting the last vertical board on a wall to a bumpy surface.*



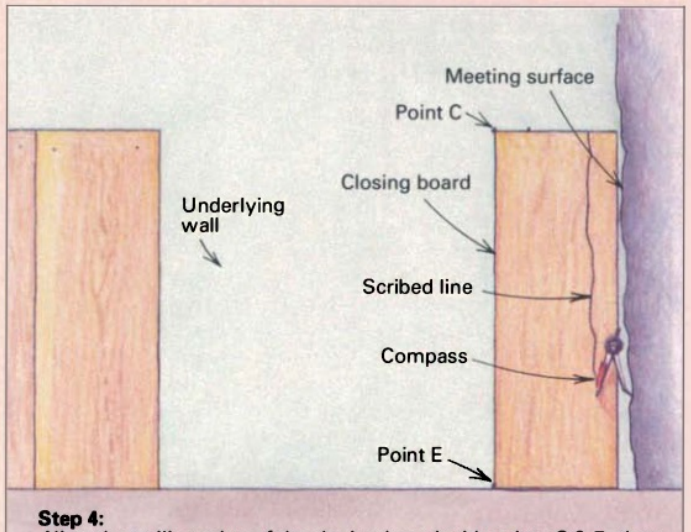

**Step 1:**
*Install all but the last board on the wall, tacking up the last few boards for easy removal. Mark the leading edge of the second-to-last board on the wall (points A & B).*




**Step 2:**
*Remove the tacked-up boards, hold the closing board hard against the meeting surface and mark the top and the bottom of the board along its trailing edge (points C & D).*




**Step 3:**
*Adjust a pencil compass to span either the top or the bottom two marks, whichever are the farthest apart (points A and C this time). Use the compass at this setting to mark point E on the wall.*




**Step 4:**
*Align the trailing edge of the closing board with points C & E, then scribe the board off of the meeting surface with the compass setting unchanged. Once the board is cut to fit, spring it and the remaining boards in place and nail them to the wall.*

# Edge Banding Plywood

https://youtu.be/HeYOFn80wns?si=BXUVsCrF8sD3rbrD


https://youtu.be/Tiv2phTkZ0s?si=OhtdkMMi9vT61M5l

# Pin Nailers

# Larry Haun: Floor, Wall & Roof Framing

https://youtu.be/GP-JfA5RPLs?si=eeVWx8cfdYyTtcjP

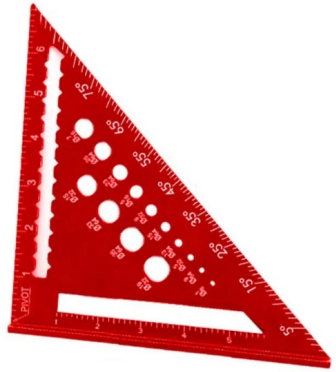
# Toolbelt & What to Fill it With


Plumb 16 oz. straight claw

Bucket Boss Canvas Belt

Framing gloves


Tape



Triangle Square.


Carpenter pencil

Utiliity Knife

Caulk Box Line

# How to Hammer


https://youtu.be/AH7NIgPkXFw?si=3jQgsDA3PoZi2V0Z