Guide to Roofing

Low-Risk Reroof

Plus:

▶ 5 Roofs That Will Last a Lifetime
▶ Synthetic Roofing Underlayments
▶ Venting a Tricky Old Roof
▶ Leak-Free Skylights
Low-Risk Reroof

Protect the outside and the inside of the house, and tear off only what you can reroof in a day.

I am a roofing contractor by trade and a problem solver by nature. The biggest problem I solve every day is how to tear the roof safely off an occupied home and install a new roof while protecting the interior, the siding, the landscaping, the windows and doors, and the neighbors’ property. I don’t have a secret, esoteric process for quick, safe, foolproof tearoffs, but planning and meticulous efficiency come as close as possible. I carry a big tarp behind the seat of my truck to cover the house with, but thankfully, I’ve never had to use it.

On second thought, maybe there is a secret to this type of work: Don’t tear off more than you can reroof quickly, and keep a big tarp handy.

The most important tool is information

When planning a roof replacement, a lot of information should be gathered in advance: roof pitch, type of decking, number of existing layers of roofing, the history of roof leaks, and the way leaks were resolved.

Writing the proposal is the next step in planning the workflow. I break down the project into a logical progression: what my crew and I can accomplish each day. In doing this, I take into account ladder and scaffolding placements, access for dump and delivery trucks, and electrical-outlet locations. The most-important things I look for are:

- **Safe Tearoff:** This means keeping the roof intact and making sure that the crew is not injured. I always use scaffolding and ladders, and I ensure that all safety equipment is in place.
- **Quick Reroof:** This means that the new roof is installed quickly to minimize disruption to the homeowner.
- **Proper Protection:** I ensure that all surfaces, both inside and outside the house, are protected from debris and damage.

Smart roofers choose their tools wisely. This heavy-duty pry bar is notched to pull nails while prying shingles off the roof deck. Nicknamed a “shingle eater,” the manufacturer calls it a Shing-Go shovel.
Sweating the details keeps the job running smoothly

BE PREPARED AT THE START

- Have materials delivered a day early. This ensures an early start if weather permits.
- Know the thickness of the roof sheathing, and have plenty of patch stock on hand for the inevitable repairs.
- Begin tracking the weather early. By 7 a.m., you’ll be able to make a fairly safe guess as to whether the reroof is a go or a no-go.

DIFFERENT SITES CALL FOR DIFFERENT STRATEGIES

- Each house requires a different level of protection. Simple jobs might need no more than ground tarps. Houses with close neighbors might need plywood and tarps to protect walls.
- Plan for debris removal. A ground-tarp landing zone, a dump truck parked in the driveway, or subcontracted waste removal are common ways to handle this.
- Keep an extralarge tarp in the truck. A roofer’s badge of honor is the roof-size tarp that’s still in the wrapper behind the seat of his pickup truck. Tip: Don’t take the tarp out of the wrapper unless you really need to cover the roof; you’ll never get the tarp back into the package.

MANAGE THE WORKFLOW

- Buy doughnuts for the crew. Roofers love doughnuts, and these carbs go a long way if rainclouds start moving in and you need everyone to work through lunch.
- Only unbutton what can be buttoned up in a day. If the weather is unsettled, break the job down into what can be reshingled before and after lunch.
- Keep ahead of the tasks. As one task is completed, another is usually ready to begin. By thinking ahead and shifting personnel strategically, you can optimize workflow with less wasted time. If you’re racing the weather, this mode can be a big time-saver.

Cleanup is the last step. A large ground tarp catches most of the debris, but it’s a good idea to sweep the lawn with a rolling magnet to pick up errant nails.

Protect sidewalls. When neighbors are close, tarps and plywood shield walls in the shingle landing zone. Keep panels close to vertical, or they’ll damage the house when heavy piles of shingles hit them.

Carry waste to the truck. If the driveway can accommodate a dump truck, carry shingles to it rather than pushing them off the roof onto a tarp. A crew member can switch between tearoff and cleanup.
are where the old roof debris is going to land and how I can avoid damaging the siding, the landscaping, the awnings, and the lawn.

When I measure roof area, I confirm the thickness of the roof decking so that I'll have patch stock on hand. In my area, many of the homes built in the `20s were sheathed in #2 southern yellow pine. This ¾-in.-thick decking tends to hold up better than the ⅜-in. or ⅝-in. plywood sheathing used in houses built in the `60s, `70s, and `80s.

Some roofing contractors prefer to have materials delivered to the rooftop after the old roofing has been torn off, but I have materials delivered at least a day before work starts. We enjoy the peace of mind that comes from knowing we have everything we need on site before the first shingle is torn off.

Because every project we do involves an occupied home, weather always is a concern. The morning a reroof is scheduled to begin, I start tracking the weather at 5:30 a.m. I make a “go” or a “no-go” decision by 7 a.m., based on the size and complexity of the roof, the size of the crew, and the rain’s estimated time of arrival.

If the job is a go, I notify the crew between 7 a.m. and 7:15 a.m., and we are on site by 8. If I decide the project is a no-go, I notify the homeowner that the project has been postponed.

**Protect the house with plywood and tarps**

Once we arrive on site, we are in constant motion. Everything has been planned, so there is no need to waste time. The first things off the truck each morning are usually an assortment of large ground tarps. The ground tarps are spread out beneath the work area. Anything thrown off the roof lands on them. We have an assortment of sizes from 30 ft. by 40 ft. to narrow runners that fit between garages and fences, and in other tight spots.

Delicate shrubs and flowers often are covered with sawhorses, empty trash barrels, or sheets of oriented strand board (OSB), along with more tarps. Some houses need no more protection than ground tarps and shrub shields, but a couple of additional steps might be useful. We often use bungee cords to hang a large tarp along the lower edge of a roof and down to the ground. This allows the gutters to catch nails and small debris, and the tarp often can be used as a chute to direct larger roof debris to a specific location. We sometimes install roof jacks and planks along the lower roof edge to catch debris and to protect awnings or a swimming pool. This is also a good strategy when houses are extremely close to each other. In that case, all debris is tossed carefully to a specific safe landing area.

**Tear off a little at a time**

Our main tearoff tool is the Shing-Go shovel, which we call a shingle eater. We can remove 99% of the shingles from the roof with shingle eaters; for the rest, we use an assortment of pry bars, flat bars, and tin snips (for stubborn flashing). Shingle eat-

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**Chimney flashing matters**

This roof was replaced at least a couple of times with no attention paid to the chimney flashing. Obviously, there is a history of leaks—just look at the black tar buildup. Rather than fix the flashing the right way during a reroof, someone took the easy (expensive in the long run) way out. Worse, this chimney was replaced recently, and the mason didn’t insert counterflashing into the mortar. The leaks rotted the decking around the chimney and required substantial replacement. The step flashing installed between the shingles and the chimney should be covered by counterflashing set into the mortar as the chimney is built. In retrofit situations, however, this isn’t possible. The next-best thing is to grind deeply into the mortar and insert counterflashing.
ers can damage siding easily, so we stay about a foot away from sidewalls. I generally use my Estwing Roofer’s Bar to clear out the wall flashing and the adjacent shingles. This bar works better for me than the common flat bars that most roofers use.

We prefer to start from the ridge and work our way down the roof, each worker tearing off a swath (we call it a rack) about 5 ft. wide. A race always is going on to see who can tear off their rack first. A crew of three workers usually tears off an area about 15 ft. wide from the ridge to the gutter in one pass, then moves down the ridge and tears off the next 15-ft.-wide section.

The trick to using a shingle eater is to get it under shingles and not pull it back out. The teeth on the blade of the tool allow you to hook each roofing nail and pull it out with a levering action. I have found that it is less strenuous and more productive to sit on the roof and tear off shingles to my left or below me (I am right-handed). This position is safer because it keeps my center of gravity low. It also allows me to employ my body weight favorably in a rocking motion while pulling down on the handle and levering the shingles and nails off the deck. Inexperienced crew members who bend over and push the shingle eater with their arms and shoulders simply can’t keep up with my pace.

Plywood decking allows a much faster tearoff because there are far fewer board edges to catch the teeth of the shingle eater. I find that 1x8 decking is difficult to work with; sometimes I have to tear off sideways along the length of each deck board to avoid catching an edge every...
few inches. Tearing off along the length of each board also puts less torque on the decking and causes fewer split boards.

With experienced roofers, tear-off can go surprisingly quickly, often within an hour. If I am working solo, I might tear off the old roof until about 10 a.m. before I start reroofing. Remember, there is a finished, occupied home underneath the roof.

**Clean, repair, and dry in the roof**

Once the old roofing is torn off, we use a plastic lawn rake to clear off loose shingle pieces; then we sweep down the roof deck to remove the loose debris and shingle grit that can make footing hazardous. Next, we cut out rotten wood and replace it with new solid material. Anyone not needed to replace decking pulls out nails left by the shingle eaters. After the wood replacement is finished, we nail off the entire roof deck with 8d nails in a nail gun and then sweep off the roof deck one last time.

With a clean, solid, safe roof deck, the tearoff is complete, and we can begin the new-roof installation. We install drip edge around the perimeter of the roof. Then we install peel-and-stick membrane along the lower edge of the roof. We install at least one 3-ft.-high course along the bottom edge. If a single course doesn’t extend high enough up the roof to correspond with a point at least 12 in. inside the wall, then we might need to install a second course. Check local codes for this detail because unexpectedly doubling the peel-and-stick membrane on a large job can take several hundred dollars out of your pocket. I also put peel-and-stick membrane in valleys and around chimneys.

I use #30 builder’s felt to dry in any roof decking not covered with the peel-and-stick membrane. After the whole roof is dried in, we usually snap a chalkline, marking every other shingle course. If three-tab shin-

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**Extra steps improve durability**

Roofing membrane, heavy-duty felt, and metal drip edge (photo below right) are often skipped to save time or money, but they’re cheap insurance. Drip edge directs water away from roof edges and protects the roof deck from windblown rain.

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**Dry in with heavy-duty felt.** Use peel-and-stick membrane along the eaves, and #30 builder’s felt for the field. The felt paper is held in place with staples if it is to be shingled right away. On new construction, the felt sometimes is nailed with button-cap nails until it can be shingled.

**Step in to establish the pattern.** Nail drip edge along the roof perimeter, then begin to shingle. Stepping each shingle back 6 in. allows one roofer to establish the pattern while another fills the field.
gles are being used, we snap a couple of vertical lines to maintain a 6-in. shingle offset. We like to rack three-tab shingles straight up the roof on smaller or steep roofs and stairstep larger or easy-to-walk roof areas. No vertical chalklines are necessary for dimensional shingles, only a few horizontal course lines.

Lunchtime is anywhere from 10:30 a.m. to 1 p.m., depending on progress and the weather outlook. I like to have all chalklines snapped before lunch so that when we return, we can begin installing new shingles immediately. I frequently use lunchtime as a chance to grind out the mortar joints in the chimney for reflashing. Doing this work at lunch means that I won’t spew dust and grit on my coworkers.

Shingling the roof is the easy part

We use air guns to install roofs. I usually establish either the vertical “rack” pattern or the stairstep pattern myself, while the next-experienced roofer extends the pattern across the roof. At this point in the job, if we have a third man on the crew, he often is kept busy stocking the roof with bundles of shingles. We try to arrange our work so that once shingles have been laid, we won’t need to climb or walk on them again.

After the roof pattern has been stepped in, I jump over to flashing work, and the third man moves to shingling. On this job, there were no valleys to replace, but you can read my previous article, “A Durable Roof-Valley Repair” (FHB #182, FineHomebuilding.com), for a discussion of that. This roof, however, had a couple of chimneys that needed counterflashing retrofit into them (“Chimney flashing matters,” p. 76). The chimneys had been rebuilt only a few years ago, but as is common, the mason didn’t incorporate counterflashing into the brickwork. If the counterflashing isn’t built in to the brickwork, you have to cut it in deeply with a grinder. During a heavy rain, water can be absorbed far into the brick, allowing it to get behind flashing that’s not inset deeply.

About a half hour before we are through for the day, the third man on the crew starts folding tarps, packing up tools, loading the truck, and cleaning the yard of errant nails with a rolling magnet (www.ajctools.com).

These details about protecting the outside and inside of a house during reroofing go a long way with my customers as well as my insurance agent. Most of all, though, it’s the way I would want to be treated if I were the customer.

Stephen Hazlett owns Hazlett Roofing & Renovation in Akron, Ohio. Photos by Daniel S. Morrison, except where noted.
I’m an architect specializing in moisture problems and solutions. Unfortunately, much of my consulting work involves roofing failures. To me, this is lunacy; we’ve been building roofs that don’t leak for a long time, starting with thatch about 30,000 years ago. Clay-tile roofing appeared around 10,000 B.C., followed by copper (3000 B.C.), slate (2500 B.C.), and wood shakes (12th century A.D.).

Today, these ancient roofing materials are overshadowed easily by asphalt shingles, which are used on about 60% of houses. But asphalt shingles don’t satisfy the needs of all homeowners. Historic homes often require traditional materials, and extreme climates can narrow roofing choices. And some people just don’t like the look of asphalt.

Consider regional style and the house’s scale

If price is your only consideration, then 15-year three-tab asphalt shingles beat any other material hands down. If durability is most important, then a permanent solution such as standing-seam copper might bubble to the top of your list. But these things aren’t the only considerations.

Think about the style and structural integrity of your house. Clay tiles are common along the southern tier of the United States, but less common in New England. Also, the scale of the roofing material ought to match the scale of the house. Small roofs look goofy with large concrete tiles. The existing roof structure might dictate what you can and cannot do easily. Some old houses have 2x4 roof framing on 2-ft. centers. This framing simply isn’t strong enough to support a heavy roof. But a lighter material, such as metal, often can be installed directly over existing shingles.

Climate matters, too. Traditional choices typically evolve in an area...
While most folks are familiar with 25-year warranties for asphalt shingles, manufacturers now offer premium architectural or dimensional grades that compete with tile, slate, and wood shingles for longevity. Or at least the warranties do: 50-year warranties are now common, and some manufacturers offer transferable lifetime warranties. These extended warranties beg the question as to what has changed in the asphalt-shingle industry.

“More weight and better design,” explains Husnu Kalkanoglu, vice president of research and development at CertainTeed’s exterior products division. “A 20-year three-tab shingle may weigh approximately 200 lb. per square, whereas a higher-warranty shingle will be much, much heavier, up to 500 lb. per square. This is because of two things: more asphalt and multiple layers.”

Asphalt sheds water and provides a base for embedding granules. Made from different sizes of ceramic-coated crushed rock or ceramic beads, the granules do more than provide color; they also protect the asphalt from UV-degradation. More asphalt allows the granules to bed deeper, which means the asphalt can provide waterproofing protection longer. The other part of the design—multiple fiberglass-mat layers—also boosts life expectancy by adding strength and protection against weathering.
because they work well. Tile roofs do well in hurricane-prone areas (with proper detailing). A standing-seam terne-coated stainless-steel roof resists the corrosive salt air of a coastal climate. A lifetime roof might not be worth the investment if you’re planning to move within a few years. And depending on your roofing choice, you could get a break (or take a hit) on your homeowner’s insurance. Finally, think about repairing the roof. If a large branch falls on your roof after a storm, will you need a total reroof? Can you actually walk on it to make the repair? Clay tile and slate are brittle, so repair can be a challenge; metal roofs can be slippery to walk on.

**Installation matters because warranties are relative**

Proper installation is critical with any type of roofing material. Improperly installed roofs can leak. Sloppy installation details can void the warranty. Installation details are specified according to how a material is developed and tested in the manufacturer’s lab, and the warranty is written according to this research to provide a consistent product that the manufacturer can stand behind.

But realize how warranties originate: as a sales tool. Asphalt shingles, for example, used to be differentiated by their weight: 200 lb. per square as opposed to 250 lb. per square (a square equals 100 sq. ft.). This means little to a consumer, so marketers translated these numbers into serviceable life: 15-year, 30-year, and—more recently—even lifetime warranties.

Some features in a warranty, however, are aimed more at the sales aspect and less at the “stand behind their product” part. Prorated warranties (those that pay less as time goes on) are a good example. This sliding-scale compensation limits losses while allowing the manufacturer to put a big number on the time scale. Another warranty hook is transferability. Some manufacturers take advantage of the average homeowners’ 10-year stay in a house.

### WOOD ROOFING IS SIMPLE TO INSTALL ON COMPLEX ROOFS

Available in red cedar, white cedar, Alaskan yellow cedar (which is actually cypress), white oak, and southern yellow pine, wood shakes and shingles have a long track record (see “What’s the Difference?” p. 106). But for all that’s available, red-cedar shakes from British Columbia are the most prevalent. Canada produces 90% of the world’s shakes and shingles.

In spite of the red, white, and yellow in their names, all shakes and shingles weather to gray after a year or so. While it’s possible to use kiln-dried (KD) prestained shingles on a roof, it’s difficult to maintain the color, especially if you want it to match a house’s side-walls. Prestained shingles also require extra installation attention. “Be very careful of your spacing,” advises Lloyd Clefstad, president of woodroof.com. “When wet, KD shingles can expand 4%, which, without the proper spacing, will cause buckling, breaking, and eventually roof leaks.”

Class A, B, and C fire ratings are available based on factory-applied treatments, but some cities in California don’t allow any type of wood roofing regardless of its fire rating.

#### Noteworthy details

- OK to walk on
- Easy to repair
- Maintenance: Leaves should be swept off roof to allow drying
- Suitable for complex roof designs
- Limited color range: They all fade to gray
- Good installers are plentiful

### STANDING SEAM IS THE BEST METAL ROOF

Corrugated-aluminum roofing long has been a favorite due to its long-lasting, low-maintenance qualities and its fire- and wind-resistance capabilities. But aluminum is extremely soft, and corrugated sheets have exposed fasteners, which can leak over time. Steel is considerably stronger but heavier; its longevity depends on a rust-resistant coating. Factory-applied coatings (Enduracote, Galvalume, Kynar, terne) afford the best protection as well as a varied color selection. Light-colored roofs can reduce air-conditioning costs substantially.

“Standing-seam copper roofing is my favorite residential-roof system, for its durability and good looks” says Rick Ragan, owner of Southern Roofing Inc. in Nashville, Tenn. “Because standing-seam panels have concealed fasteners, the roof should never need to be replaced.”

Metal roof panels also are manufactured with contours or textures to imitate the look of roof tiles and wood shakes, but these lightweight preformed panels dent under foot traffic or storm-related damage. “Those panels may be OK in places without many trees or high winds, but I’ve pulled enough trees off of roofs after hurricanes to stay away from them,” says builder Michael Chandler in Chapel Hill, N.C.

### Specs

- **Materials to labor ratio:** 60% materials/40% labor
- **Weight:** 0.35 lb. to 1.5 lb. per sq. ft.
Shakes and shingles are easy to cut and install, and wood roofs can last a long time. Red cedar can last up to 30 years, Alaskan yellow even longer. Pressure-treated pine is warranted for 50 years, and white oak often lasts for 75 years. All wood roofs last longer if they can dry evenly. If the back can’t dry as quickly as the front, shingles can cup, crack, and work loose. To promote even drying, you can install the roofing on skip sheathing, weaving felt paper between courses, or install shingles over a drainage mat such as Cedarbreather (www.cedarbreather.com).

As in the photo at left, a standing-seam roof can be fabricated on site with shears, brakes, and other tools that turn flat sheet metal (copper, in this case) into seamed panels. More often, factory-made panels are used (photos above). Installation details for site-made and factory-made panels are similar. Panels join along vertical seams that either snap or are crimped together. Panels are held in place with clips that are nailed to roof sheathing. Installation details must account for expansion and contraction to avoid buckling.
and void a warranty when the original buyer transfers ownership.

“I don’t have any faith in our ability ever to collect on an asphalt-shingle warranty,” says roofing contractor Stephen Hazlett of Akron, Ohio. “On almost every roof, I have to deviate from the recommended procedures.” Such deviations are often from the specified nailing pattern. A shingle could butt against a chimney or a waste-stack flashing, requiring a nail a couple of inches away from the specified location. If the placement doesn’t match the shingle company’s specs, the manufacturer might not honor the warranty. While some manufacturers offer more liberal nail-placement specs, most are strict about nail location.

While Hazlett hasn’t had a warranty problem, he thinks a warranty’s real value is relative: A 50-year shingle might or might not last 50 years, but it will outlast a 15-year shingle substantially. Bottom line for warranty shoppers: Look for transferable warranties and, if possible, warranties that aren’t prorated.

For asphalt roofs, qualified installation contractors are ubiquitous, but for more exotic materials, qualified installers can be scarce. Look to trade organizations for local contacts (“Sources,” facing page).

What’s on my house?
I always have liked California mission- or Mediterranean-style homes. The mission “pan and barrel” tile, set in mortar, is my favorite residential roof. Copper is my metal roof of choice for its looks and durability. Did I use either when I reroofed my own house last year? No. I used a laminated 30-year asphalt shingle because mission tiles would have looked silly on my brick ranch and asphalt shingles were about one-third the price of copper.

Harrison McCampbell, AIA, specializes in moisture issues within the building envelope. He lives and works in Brentwood, Tenn. Photos by Krysta S. Doerfler, except where noted.

### SLATE IS A TRADITIONAL CHOICE THAT LASTS HUNDREDS OF YEARS

One of the most prestigious building materials is experiencing a rebirth. Slate production and use essentially have doubled in the last decade, and many quarries have modernized their facilities to handle slate more efficiently. Most slate quarries are in the Eastern United States and Canada, each producing its own distinct colors.

Slate roofing went through a bottleneck in the 1950s with the increased use of asphalt roofing, and many old-timers who knew trade secrets are gone. That’s why it can be challenging today to find truly skilled installers who know the correct details for starter courses, valleys, ridges, and even the staging that allows an installation to be completed without anyone walking on the slate. The advent of power tools hasn’t had much effect on how slate roofs are installed. It’s still a process done largely by hand. But the reward for this labor-intensive process is a roof with exceptional character and longevity.

### Noteworthy details
- Shouldn’t be walked on
- Colors vary by region and batch
- No maintenance
- Repairs aren’t difficult but require ladders and staging
- Suitable for complex roof designs
- Good installers are scarce
- Copper nails and flashing are recommended

### Online extra

### Specs
- **Material cost per square:** $350 to $800
- **Installed cost per square:** $1000 to $1340
- **Materials-to-labor ratio:** 60% materials/40% labor
- **Weight:** 6 lb. to 11 lb. per sq. ft.

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A soft, metamorphic rock, slate is cut readily with a shear; holes are punched with the pointed end of a Slater's hammer.

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Harrison McCampbell, AIA, specializes in moisture issues within the building envelope. He lives and works in Brentwood, Tenn. Photos by Krysta S. Doerfler, except where noted.
ROOF TILES ARE MADE WITH CLAY OR CONCRETE

The earliest clay-roofing tiles were made by bending moist sheets of freshly mixed clay over the thighs of workers, thus forming a tapered half-barrel shape that allowed for a distinctive over-under pattern across the roof. With the mass production of clay tiles, both barrel and flat, features such as lugs and dips were incorporated to help interlock and stabilize the tiles as they were laid one on another. From a limited range of options, colors now are almost limitless, finishes are either dull or glazed, and some tile even is textured to look like wood shakes.

Both clay and concrete are fireproof, with excellent wind resistance when installed properly. But installation can be tricky: You need to install wood battens on the roof and along the hips and ridges as well, tiles need to be cut with a diamond-blade saw, and underlayment must be exceptional, often #90 rolled roofing. Because roof tiles last a long time, you need to use durable fasteners and flashings. Tests by the Tile Roofing Institute have shown that wind clips and specially placed adhesives let tile roofs sustain 125-mph winds. The biggest disadvantage with concrete and clay is weight, but this problem is solved easily with beefed-up framing.

CLAY

Specs
Material cost per square: $600 to $750
Installed cost per square: $1200 to $1500
Materials-to-labor ratio: 50% materials/50% labor
Weight: 11 lb. to 14 lb. per sq. ft.

CONCRETE

Specs
Material cost per square: $280 to $320
Installed cost per square: $700 to $800
Materials-to-labor ratio: 40% materials/60% labor
Weight: 8 lb. to 18 lb. per sq. ft.
SYNTHETIC VS. FELT: THE CHOICE ISN’T CUT-AND-DRIED

TYPICAL SIZE
Synthetic: About 4 ft. by 250 ft.
Felt: 3 ft. by 72 ft. to 144 ft.

VAPOR PERMEABILITY
Synthetic: Typically not vapor permeable
Felt: Vapor permeable

EXPOSURE
Synthetic: Pliable and resilient; can be exposed even to cold weather for between four and 12 months
Felt: Wrinkles when wet; cracks and splits in cold weather

DURABILITY
Synthetic: Highly tear-resistant and hard-wearing
Felt: Tears easily in high winds and under foot traffic

REQUIRED FASTENERS
Synthetic: Must be installed with cap nails or cap staples
Felt: Can be installed with staples or roofing nails

COST (per sq. ft.)
Synthetic: Vapor impermeable: 11¢ to 15¢;
vapor permeable: 20¢ to 90¢
Felt: #15: 5¢; #30: 10¢

BOTTOM LINE

Synthetic:
When compared to asphalt felt, synthetic roofing underlayment has many of the advantages of housewrap: They install quicker and are far more durable in high winds or when left exposed for long periods of time. They also offer better traction than asphalt felt. These benefits must be balanced against the higher cost of synthetics, though, especially for vapor-permeable products. The need for cap fastening also means a standard hammer-stapler is no longer an option.

Felt: Asphalt-felt roofing underlayment has been in use for a long time, and for good reason. It’s widely available, is inexpensive, is simple to install with common tools, and is the original “smart” vapor retarder, changing its permeance depending on whether it’s dry or wet. It’s still the product of choice for roofers who are drying in and installing the finished roofing with only short exposure to the elements between.
A milestone in any construction project is drying in, usually defined as the day the roof sheathing is covered with underlayment. Building codes require the installation of asphalt felt for several reasons: Underlayment keeps the sheathing dry until the roofing is installed, it provides some protection against leaks in case wind-driven rain gets past the roofing, and it provides a slight improvement in a roof’s fire resistance.

For years, roofers chose between basic #15 or heavier #30 asphalt felt, which are commodity products sold under many brand names. Both types of felt are made from recycled corrugated paper mixed with sawdust; to provide water resistance, the paper is impregnated with asphalt. These days, however, roofers also can choose from a variety of synthetic roofing underlayments: sheet products made of laminated polypropylene or polyethylene plastic.

Synthetic roofing underlayments look and feel similar to housewrap. Unlike housewrap, though, most synthetic roofing underlayments are vapor barriers, so they shouldn’t be used on unventilated roofs (sidebar p. 49). These plastic underlayments also offer higher resistance to UV radiation, better traction for roofers, and more square footage of coverage at a lower weight. They are not, however, intended or approved to replace peel-and-stick membranes in areas prone to ice dams.

**Traditional felt still competes with newer synthetics**

Although synthetic roofing underlayments have several advantages over asphalt felt,
asphalt felt remains popular as a roofing underlayment for several good reasons.

While the price of asphalt felt fluctuates somewhat, it’s still the least expensive option. Builders typically pay about 5¢ per sq. ft. for #15 felt and 10¢ per sq. ft. for #30 felt. Synthetic underlayments cost more than twice as much as #15 felt—usually between 11¢ and 15¢ per sq. ft. Vapor-permeable synthetic underlayments are even more expensive—from 20¢ to 90¢ per sq. ft.

According to Dyami Plotke, a manager at Roof Services in Islip, N.Y., “For a standard roof assembly, where the felt and asphalt shingles are installed on the same day, it doesn’t make any difference what underlayment you use, so the lower cost of the standard felt is a big advantage. Where the synthetics outperform felt by a mile is in their tear resistance. Synthetic underlayment allows us to bring a building to a watertight condition just by papering it, without installing the roofing immediately—and it will stay watertight for months. That’s why we always use synthetic underlayment under specialty steep-slope products like slate and tile, which are slow to install.”

**Cap fasteners aren’t optional**

Although asphalt felt doesn’t seal around fasteners as effectively as peel-and-stick membranes, it is less likely to leak at nail and staple penetrations than a synthetic underlayment. Synthetic underlayment punctured by staples or common roofing nails can, with the help of capillary action, lead to leaks. That’s why plastic-cap nails or staples, which help to seal penetrations, are a must when installing synthetic underlayments. Cap fasteners can be installed with a compatible pneumatic tool or, in the case of cap nails, manually.

Some roofers also have reported that synthetic underlayments allow more wicking at laps than asphalt felt. For areas that need sealing—including vulnerable laps—use caulk rather than the traditional black roofing cement.

**Exposure limits and warranties**

In their technical-data sheets, manufacturers of synthetic roofing underlayment list maximum time limits, ranging from two months to 30 months, for exposure to the weather. A word of warning, however: There is little evidence that 12-month products actually perform differently from four-month or six-
Most synthetic underlayments have permeance ratings under 1 perm, making them effective vapor barriers. Because these underlayments don’t allow roof sheathing to dry upward, manufacturers recommend that they be used only over ventilated spaces (that is, vented cathedral ceilings or vented attics) that allow downward drying.

Of course, just because an attic is currently vented doesn’t mean it will stay that way. A few years down the road, a homeowner might decide to install spray polyurethane foam on the underside of the roof sheathing; at that point, the sheathing will no longer be able to dry downward. If this possibility worries you, stick with asphalt-felt underlayment. (Asphalt felt is the original “smart” vapor retarder; it has a permeance of about 5 perms when dry, but a much higher rating of 60 perms when wet.)

Although underlayment manufacturers often don’t distinguish between different types of roofing when making ventilation recommendations, some experts do. According to building scientist Joseph Lstiburek, “Having a vapor-permeable underlayment is a big deal if you have a tile roof or a cedar-shingle roof—a roof that is assembled like a vented rain screen. It’s very beneficial to be able to dry the roof deck upwards. But the permeance of the underlayment doesn’t matter when asphalt shingles are involved.” In other words, if you are installing a type of roofing that doesn’t allow upward drying, you don’t have to worry about the permeance of your underlayment.

Lstiburek tempers his advice with the commonsense observation that underlayment permeance isn’t worth obsessing over. “The permeance of the underlayment is irrelevant if everything blows off the roof,” he says. “This vapor-permeance is arcane stuff, and none of it matters if you forget to fasten and flash everything properly.”

Although most synthetic underlayments are vapor barriers, there are exceptions. Several manufacturers produce products with a vapor permeance that is as high as, or even higher than, asphalt felt. The higher the permeance, the faster water vapor can pass through a material. Any material with a perm rating of 10 or greater is highly permeable. These products are significantly more expensive than vapor-impermeable underlayments, so if you want a vapor-permeable product, you may prefer to stick with asphalt felt.

A final note: Although it’s perfectly acceptable to use asphalt felt on the roof and as a water-resistive barrier on walls, the same isn’t true of vapor-impermeable synthetic roof underlayments. These products are not approved for use on a wall, unless, of course, you’re using one of the vapor-permeable options.

### Table: Permeance of Underlayment Products

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Product</th>
<th>Permeance*</th>
<th>Maximum Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nemco Industries</td>
<td>RoofAquaGuard UDLX</td>
<td>0.035 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>W.R. Grace</td>
<td>Tri-Flex Xtreme</td>
<td>0.04 perm</td>
<td>4 months</td>
</tr>
<tr>
<td>Pactiv</td>
<td>GreenGuard</td>
<td>0.04 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>Alpha Pro Tech</td>
<td>REX SynFelt</td>
<td>0.05 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>Berger Building Products</td>
<td>Pro-Master Roof Shield UDL &amp; UDL Plus</td>
<td>0.05 perm</td>
<td>12 months</td>
</tr>
<tr>
<td>InterWrap</td>
<td>Titanium UDL</td>
<td>0.05 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>Robetex</td>
<td>Tech Wrap 300</td>
<td>0.05 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>Robetex</td>
<td>Tech Wrap UL</td>
<td>0.05 perm</td>
<td>12 months</td>
</tr>
<tr>
<td>Kirsch Building Products</td>
<td>Sharkskin Ultra</td>
<td>0.059 perm</td>
<td>12 months</td>
</tr>
<tr>
<td>InterTape Polymer</td>
<td>NovaSeal</td>
<td>0.06 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>Robetex</td>
<td>Tech Wrap 150</td>
<td>0.08 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>Propex Operating Company</td>
<td>Opus Roof Blanket</td>
<td>0.1 perm</td>
<td>30 months</td>
</tr>
<tr>
<td>SDP Advanced Polymer Products</td>
<td>Palisade</td>
<td>0.1 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>System Components</td>
<td>FelTex</td>
<td>0.1 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>IKO</td>
<td>RoofGard-SB</td>
<td>0.18 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>CertainTeed</td>
<td>DiamondDeck</td>
<td>0.183 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>Owens Corning</td>
<td>Deck Defense</td>
<td>0.23 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>PGI-Fabrene</td>
<td>Fabrene UDL and Matrix UL</td>
<td>0.8 perm</td>
<td>2 months</td>
</tr>
<tr>
<td>Atlas Roofing</td>
<td>Summit</td>
<td>&lt; 1 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>DuPont</td>
<td>RoofLiner</td>
<td>&lt; 1 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>GAF Materials</td>
<td>TigerPaw</td>
<td>&lt; 1 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>Rosenlew RKW</td>
<td>RoofTopGuard II</td>
<td>&lt; 1 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>Perma R Products</td>
<td>PermaFelt</td>
<td>&gt; 1 perm</td>
<td>6 months</td>
</tr>
<tr>
<td>GAF Materials</td>
<td>Deck-Armor</td>
<td>16 perms</td>
<td>6 months</td>
</tr>
<tr>
<td>Cosella-Dörken</td>
<td>Delta-Maxx Titan</td>
<td>28 perms</td>
<td>ASAP</td>
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<tr>
<td>VaproShield</td>
<td>SlopeShield</td>
<td>59 perms</td>
<td>4 months</td>
</tr>
<tr>
<td>Cosella-Dörken</td>
<td>Vent S</td>
<td>120 perms</td>
<td>ASAP</td>
</tr>
<tr>
<td>Nemco Industries</td>
<td>RoofAquaGuard BREA</td>
<td>146 perms</td>
<td>4 months</td>
</tr>
<tr>
<td>Cosella-Dörken</td>
<td>Delta-Foxx</td>
<td>550 perms</td>
<td>ASAP</td>
</tr>
<tr>
<td>Berry Plastics</td>
<td>Barricade Dry Step</td>
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</tr>
<tr>
<td>PrimeSource Building Products</td>
<td>Grip-Rite ShingleLayment</td>
<td>Unknown</td>
<td>6 months</td>
</tr>
<tr>
<td>Tamko</td>
<td>Tam-Shield</td>
<td>Unknown</td>
<td>6 months</td>
</tr>
<tr>
<td>Tri-Built Materials</td>
<td>Tri-Built High Performance</td>
<td>Unknown</td>
<td>6 months</td>
</tr>
</tbody>
</table>

*ASTM E 96, procedure A
TAILOR THE INSTALLATION TO THE ROOF

Asphalt-felt roofing underlayment has specific installation instructions outlined in the code book. To date, there are no such code guidelines for synthetic underlayment, so the installation for these products is dictated by manufacturers. Below are some of the more generic details, as well as areas that may differ from brand to brand. Not installing synthetic underlayment according to manufacturer requirements is a quick way to void the warranty.

When drying in, lap underlayment over ridges and hips. When it comes time to install the ridge vents for vented roofs, cut back the underlayment.

To protect against wind-driven rain, lap underlayment under the rake edge.

Avoid end laps if possible, but where unavoidable, lap the underlayment at least 6 in.

Peel-and-stick membrane is required at eaves, should be lapped under the drip edge, and must cover the entire overhang. It then must extend up the roof deck at least 2 ft. past the front wall of the house.

The underlayment typically has reference lines to help determine horizontal overlaps, usually around 4 in.

Most synthetic underlaminents are approved for roofs as low-sloped as 3-in-12 provided that the material is overlapped by about 50%. A better approach is to cover low slopes completely with peel-and-stick membrane.

When installing synthetic underlayment, tailor the installation to the roof. month products, so it doesn’t make much sense to rely on these numbers when selecting a product.

Despite the fact that Cosella-Dörken’s underlaminents have an excellent reputation for durability, the company recommends that roofing be installed “as soon as possible.” Product manager Peter Barrett explains, “Plastic begins to degrade as soon as it is exposed to UV light. Once degradation starts, it will go on, even when covered by roofing, since heat and oxidation continue to act on the plastic. Most manufacturers are just giving a guess on the durability of their products. They’re gambling that nobody will actually uncover them to see how they’re holding up. Warranties are mostly used as marketing tools; these numbers are not an expression of durability.”

Which brand should I choose?

Most roofers aren’t too picky about which brand of synthetic underlayment they use, and in many cases, the options will be dictated by your specific region. “In terms of performance, I think that synthetic felt is a commodity product,” says Plotke. Because slippery underlaminents can be dangerous, the deciding factor for many roofers is traction. According to evaluations made by *Fine Homebuilding* editorial adviser Mike Guertin, the tested underlaminents that showed the greatest slip resistance in both wet and dry conditions were Titanium UDL, RoofLiner, and Tri-Flex Xtreme.

Under wet conditions, Sharkskin didn’t perform as well as the top-rated underlaminents. This segment of the market is growing quickly, however, and there are well over a dozen products that Mike has not had the opportunity to investigate.

To keep track of the product options as they multiply and to weigh in with your own product reviews, visit our online Material Guide at FineHomebuilding.com/materialguide.

Martin Holladay is a senior editor.
I’ve been working on this old house for a few years now. Among other projects, I retrofitted the house with central air-conditioning, which has duct runs in the attic, and updated the bathroom, swapping the original claw-foot tub for a walk-in shower. But I’m not the only remodeling contractor who has worked on this house since it was built in the 1880s. The roof has likely been replaced a few times, most recently with asphalt shingles and roof- ing underlayment. And at some point in the 1970s, the attic was insulated with loose fill.

As soon as I started working on the house, I knew that it might have attic-ventilation issues. After all, when the house was built, it wasn’t insulated and couldn’t have been as tight as it is today. Rather than strain their budget, however, the

**VENT THIS.** When this home was built in the 1880s, it likely had all the roof ventilation it needed. But add modern roof underlayment, asphalt shingles, and blown-in attic insulation to the equation, and a couple of gable-end vents can no longer provide the airflow it needs. The trick to retrofitting ventilation on this and many older homes is to recognize that the eave is often not an option for locating intake vents.

**Problem:** The shallow 8-in. soffit on this house is installed on sloped rafter tails and provides neither the room nor the access needed to install intake vents.

**Problem:** The antique cornice rules out venting drip edge or a fascia vent, two stealth options for providing air intake.

**Problem:** In the attic, blown-in insulation blocks airflow in the first few feet of the rafter bays.

**Problem:** In the attic, the shallow 8-in. soffit on this house is installed on sloped rafter tails and provides neither the room nor the access needed to install intake vents.

**Problem:** The attic, blown-in insulation blocks airflow in the first few feet of the rafter bays.
homeowners agreed to keep a close eye on the attic. After a couple of years, it became clear that the two small gable-end vents weren’t providing enough airflow to keep the attic cool and dry. In the summer, the temperature skyrocketed during the day and didn’t cool down in the evening. In the winter, moisture condensed on cold surfaces. One approach to fixing these problems is to insulate the underside of the roof with spray foam, which makes the attic semiconditioned space and brings it into the building envelope. But there are several challenges to this approach, including the high cost of installing spray foam. I decided to use a more cost-effective method and installed a balanced attic-vent system, which uses intake vents (typically installed in the soffits) and exhaust vents (typically installed at the ridge). The system creates steady airflow that helps to keep the attic cooler; carries away excess moisture vapor, reducing the chance for condensation and mold growth; and reduces the likelihood of ice damming.

Shingle-over ridge vents were a no-brainer for the exhaust vents, but choosing the style of intake vents was a bit trickier. The eaves on this house project only 8 in. from the sidewall, and the soffit boards are applied to the underside of the sloping rafter tails, which meant there was not enough room to install intake vents in the soffit. Venting drip edge would have been my next choice. But the eaves are filled with loose-fill insulation. In fact, the insulation blocks the first 2 ft. of the rafter bays. In the end, I opted to use shingle-over intake vents. These specialty vents look like a one-sided ridge vent and can be installed anywhere within the first few feet of the eave. I installed them about 2½ ft. up from the eave edge, about 6 in. above a thick layer of loose-fill insulation in the attic.

The following manufacturers sell undershingle intake vents that cost approximately $3 to $3.50 per lin. ft. with net free-vent area (NVFA) ratings of 9 sq. in. to 10 sq. in. per lin. ft.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>COR-A-VENT IN-Vent</td>
<td><a href="http://www.coravent.com">www.coravent.com</a></td>
</tr>
<tr>
<td>DCI PRODUCTS</td>
<td><a href="http://www.dciproducts.com">www.dciproducts.com</a></td>
</tr>
<tr>
<td>AIR VENT</td>
<td><a href="http://www.airvent.com">www.airvent.com</a></td>
</tr>
</tbody>
</table>

Position the intake vent. Slip the top edge of the vent under the roofing underlayment. Fasten the vent with nails provided by the manufacturer, or use 2-in. to 2½-in. roofing nails.

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Reshingle. Apply a starter strip cut from new shingles before reinstalling the old shingles (photo above).
RIDGE VENTS EXHAUST WARM AIR TO COMPLETE THE SYSTEM

There are a number of similar ridge vents available; this is the Shingle Vent II from Air Vent. Before installing any rooftop vents, check with your building inspector. High-wind and seismic zones could present structural concerns.

Strip the shingles and underlayerment. If the roof isn’t too old, you might be able to reuse the cap shingles. If not, be sure to have new cap shingles on hand. With a utility knife, expose about 2 in. of the sheathing on both sides of the ridge.

Remove a strip of sheathing. Cut the sheathing back 2 in. on conventionally framed roofs and on truss roofs with ridge blocking. On truss roofs without ridge blocking, cut a 1-in. strip. Nail or screw down the top edge of the remaining sheathing.

Balanced venting for any roof

Attic venting relies on physics. Because warm air is more buoyant than cool air, it rises and escapes through the ridge vents, in turn drawing cool air into the attic through intake vents near the eave. The trick is to make sure you provide enough ventilation for the size of the attic in question. The International Residential Code and most roofing manufacturers call for balanced venting: a minimum vent-opening area of 1 sq. ft. for every 300 sq. ft. of attic space. This ratio assumes that the venting is divided evenly between intake and exhaust. If balanced intake and exhaust aren’t possible, then the vent-opening ratio increases to 1 sq. ft. of vent for every 150 sq. ft. of attic floor area. Intake and exhaust vents are rated in square inches of net free-vent area (NFVA). Determining the necessary length or number of roof vents you need means converting square feet to square inches. Below is an example of how to determine the necessary venting for a 1200-sq.-ft. attic.

The necessary length of the vents could be less than the length of the building. Rather than stopping the vent, consider running it the length of the roof for a better appearance, stopping so that the last cap shingle lies flat before reaching the rake edge, the sidewall, or a chimney.

Example: venting for a 1200-sq.-ft. attic

| STEP 1 | 1200 sq. ft. ÷ 300 sq. ft. (for balanced vents) = 4 sq. ft. of NFVA |
| STEP 2 | 4 sq. ft. of NFVA x 144 (in. per sq. ft.) = 576 sq. in. of NFVA |
| STEP 3 | 576 sq. in. of NFVA ÷ 2 = 288 sq. in. of intake (and 288 sq. in. of exhaust) |
| STEP 4 | 288 sq. in. ÷ 9 (NFVA-per-foot rating of intake vent) = 32 lin. ft. of intake ÷ 2 = 16 ft. of intake per side of roof (Repeat step 4 for exhaust vents.) |
I used to worry every time I installed a skylight. Even with the best installation detailing, I could still expect a storm to hit from just the right direction and drive water behind the flashing. When I discovered peel-and-stick membranes, my worrying days ended. Now I follow a series of simple steps that hasn’t failed in more than 15 years’ worth of installations. The key to success is integrating the membrane and the flashings with the shingles to direct water back to the surface of the roof. Although the project shown here is a retrofit, I would flash it the same way on a new home.

Put the skylight here
This project called for adding two 22-in.-wide skylights (for 24-in. on-center framing) into rafters spaced 16 in. on center. To support the opening and tail rafters, I sistered the inside face of the existing rafters to close the overall opening down 3 in. more. Then I positioned the skylight up the roof plane so that the opening would be centered on the interior room’s ceiling. I framed the skylight openings from the inside, as shown in the drawing (facing page).

Cut the opening one layer at a time
With the rough opening framed, the easiest way to locate the skylight on the roof is to stand inside and drive screws up through the sheathing and the shingles at all four corners. Then I can go out and snap chalklines between the screws to mark the location.

To start the hole, I strip back the roof shingles, beginning three courses above the top of the skylight. To free the third course, I pull the nails at the center and at the course above. A carefully inserted thin flat bar breaks the shingles’ self-adhesive strip and wedges up under the nails. It’s easier to separate the self-adhesive strip when the shingles are cool. In

Leak-Free Skylights

A peel-and-stick membrane under the flashing guarantees that the skylight won’t leak—ever

BY MIKE GUERTIN

What is peel-and-stick membrane?
Peel-and-stick membrane (also known as self-adhesive) consists of either polyethylene sheets backed with rubberized asphalt-based adhesive or a mineral-surfaced fiber reinforced with an asphalt-based adhesive. The asphalt adhesive self-heals around fastener penetrations. The plastic-sheet type is the best choice for skylight flashing because it’s flexible and elastic, and has a more aggressive adhesive tack.
REFRAME, STRIP, AND CUT

Skylight openings sometimes need additional modifications. In this example, the center rafter was cut out to create a space wide enough for the skylight. The amount removed included the thicknesses of both headers to be added. The rafters on each side of the space must be doubled from ridge to plate if the tail rafter (the remnant below the skylight) is more than 3 ft. long. In this case, the extra rafters were added to the inside to reduce the rough opening’s width. Finally, headers were installed above and below the skylight’s position.

1. Strip back the shingles first
   Unless the entire roof is being replaced, shingles must be removed carefully so that after the skylight is attached, the shingles can be re-integrated properly with the step flashing and the waterproof membrane.

2. Fold back the underlayment
   Once I’ve located the skylight’s position and stripped back the shingles, I snap a set of chalklines on the roofing underlayment and remove that section. Next, I make 3-in.-long horizontal cuts at the bottom and 6-in.-long diagonal cuts at the top that splay out about 3 in. Then I fold away the underlayment flaps. I integrate these flaps into the flashing later.

3. Seal out grit
   I tape the leading edge of the shingles with housewrap tape to keep sawdust and grit from getting under the roofing.

4. Cut the hole
   To keep sawdust and roof debris from falling into the house, I staple a sheet of poly over the skylight opening from inside before cutting the sheathing.

5. Install the skylight frame
   Most frames mount to the roof deck with metal brackets screwed to both the skylight and the roof framing.

hot weather, I break the seal early in the morning before the sun has hit the roof. I remove full shingles to the next joint left and right of the skylight opening rather than cutting them in the middle.

Once the upper course of shingles is done, successive courses are easier to remove because the nails are exposed; just pull the nails and separate the self-adhesive strip. I remove shingles until I reach the course whose top edge is within 2 in. above or below the bottom line of the skylight opening. I save the shingles I’ve pulled to reuse around the skylight.

With the shingles removed, I snap chalklines between the screws to outline the skylight location, then remove the screws. Inside, I staple plastic over the skylight opening to contain the dust. Then I go back to the roof, where I use a circular saw to cut the roof sheathing.

After I’ve swept the roof, I separate the glass portion of the skylight from the frame and install the frame per the manufacturer’s instructions. I prefer to remove the glass from the frame to reduce the skylight’s weight and to cut the chance of scratching the glass, and to make it easier to run the peel-and-stick membrane to the top of the frame.

Peel-and-stick membrane seals the frame to the roof
Despite the layers of underlayment, shingles, and flashing, I count on the

BUILDING CODES
Check local building codes to verify framing details.

STANDARD SIZES
Many skylights are sized to fit between rafters 16 in. or 24 in. on center, and only need a header installed between the two rafters.

ROOF TRUSSES
Don’t cut trusses without consulting an engineer. For more information on framing skylights in roof trusses, see “Q&A” in FHB #132 (p. 24) and “Dramatic Skylight” in FHB #164 (pp. 92-97).
SLICE, WRAP, AND PROTECT WITH A WATERTIGHT SEAL

Although metal step flashing is the primary weather barrier between the skylight frame and the roof shingles, self-adhesive membrane, when applied first, makes a watertight seal that also self-heals around nail penetrations. I cut 9-in.- to 12-in.-wide strips of membrane for each side of the skylight (there should be a minimum of 5 in. adhered to the roof) and make each one about 12 in. longer than the skylight edge.

1. Start at the bottom
Center the membrane, and align it with the edge of the frame. Remove the top half of the release sheet, and press the strip onto the frame. Then remove the second half of the sheet, and stick the membrane to the top edge of the shingle below the skylight. Trim the membrane just above the self-adhesive strip on the shingle course so that it won’t be exposed when base flashing and shingles are reinstalled.

2. Reinforce the corners
Make vertical cuts in the membrane at the sides of the frame ½ in. to ⅞ in. from the corner. Press the narrow strip around the corner and let the ears fold down onto the roof. Because the skylight corners are potential leak points, I back up this vulnerable area with small patch pieces of membrane 1½ in. to 2 in. wide. I make them bow-tie shaped so that they have more surface area that can bond to the skylight frame. I apply the strip firmly along one edge first, then stretch it through the corner before bonding to the other edge.

3. Create side gutters
Run membrane strips up the side of the frame, and let them overlap the underlayment by 1 in. to 2 in. After adhering the strip to the frame, fold back the underlayment, bond the membrane to the underside of the underlayment, and fold the two layers back toward the frame. Apply a small patch of membrane across the top of the fold, just above the frame.

To make a gutter that directs water down and away from the frame, the side membrane is bonded to the underside of the underlayment, then folded back toward the skylight frame.

Bow-tie patches stretched around the corners reinforce areas susceptible to leaks.

The underlayment is trimmed to the edge of the membrane after the two are bonded.

4. The head membrane goes on last
Run the head membrane across everything at the top, trimming and reinforcing the corners in the same manner as the bottom membrane.

INSTALLATION TIP
After I cut strips of self-adhesive membrane, I dry-fit them in place, then flip them over and score the release sheet along the fold line. Now I can stick the membrane to one surface and apply the other half when it’s in place.
INTEGRATE THE METAL FLASHING WITH THE ROOF

Once I’ve brought the shingle courses back to the bottom of the frame, I install the base-flashing piece, then begin to alternate between the step flashing and the shingles up along the frame. This skylight was a fixed frame, so the gasket was built into the window frame. If the skylight is operable, the gasket is separate, and I tuck the top edge of the flashing beneath the gasket first, then attach the step flashing with short nails or screws to the side of the skylight frame. I position the bottom edge of each step flashing above the self-adhesive strip of the shingle below.

The key is to lap the peel-and-stick membrane over the top edge of the shingle course that runs along the bottom of the skylight. Without this step, water that reaches the membrane will empty onto the roof underlayment and have to travel the length of the roof slope beneath the shingles until it reaches the eave. Along the way, the water has hundreds of nail holes that it could leak through.

**Skylights are easy to install**

Reshingling and flashing are the simplest parts of the process. The base flashing wraps around the bottom of the curb, the step flashing is integrated into the shingle courses along the sides, and the head flashing caps the top. I slip the top edge of the flashing under the skylight gasket, then secure the base flashing to the frame with short nails or screws at the top corners. When replacing shingles, I don’t drive nails through the step flashing; their rigidity prevents the last several inches of shingle from lifting up.

With the head flashing nailed in, I slip the last couple of shingle courses beneath those still in place, lifting up the shingles to hammer the nails. Most important, I keep in mind that I have to renail the courses above the skylight. It’s a place that’s easy to forget at the end of a long day spent working on the roof.

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**1. Base flashing**

After bringing the shingles back up to the bottom of the frame, secure the base flashing to the frame with short nails or screws.

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**2. Step flashing**

Beginning at the bottom of the frame, the step flashing is woven into the shingle courses.

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**3. Head flashing**

Once the head flashing is nailed off, I overlap its upper flange with the underlayment and seal the seam with strips of membrane.

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**Trim the shingles above**

Leave a 2-in. space above the head so that it won’t collect debris.

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**Trim the shingles**

½ in. from the sides of the skylight frame.

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**The window, at last.** With the curb flashed and virtually watertight, I can fasten the window to the frame. This skylight was a fixed frame, so the counterflashing was part of the window frame. Don’t forget to remove the protective plastic sheet before you descend the ladder.