

Leakproof Details for Shallow Roofs

by Charles Wardell

To make steep-roof materials work on shallow slopes, use good flashing details and a watertight underlayment

Asphalt shingles, clay and cement tiles, and wood shingles and shakes work well on steep slopes, where rain and melting snow drain rapidly. On shallow slopes, however, wind-driven rain and ice dams at the eaves can cause water to back up under the roofing and find its way into the house. That's why single-ply roofing materials, such as EPDM and modified bitumen, are a better choice for shallow slopes.

But in many cases, putting a single-ply material on a shallow roof — a porch or a shed dormer, for example — clashes with the shingles used on steeper roof planes on the same house. Builders who want to use shingles on a shallow roof, need to take extra precautions against leaks.

How Low Can You Go?

Building codes are not much help when it comes to shallow slopes. CABO's *One and Two Family Dwelling Code*, for example, sets a minimum slope of 3-in-12 for tiles, 2-in-12 for asphalt shingles, and 3-in-12 for wood shakes and shingles.

Roofs below these minimums are not permitted without approval of the building inspector.

There are two problems with these code minimums. First, porch roofs and shed dormers are often shallower than code minimums, but the code leaves it up to the builder to devise a roofing application that will meet approval. Second, depending on what part of the country you work in, the code recommendations for underlayment may not provide sufficient protection, even at permitted minimum slopes.

Underlayment. The most important factor in devising a watertight roof at



Workers place self-adhering bituminous membrane at the edge of a shallow-pitched roof. The membrane is installed by unrolling it across the roof while peeling off the backing paper. The job requires at least two sets of hands — one to hold the roll and another to smooth out the wrinkles.

shallow slopes is the type of underlayment you use. An underlayment is a backup watershed installed beneath the shingles that prevents water from reaching the sheathing. On a shallow roof, it's wise to lavish some extra care on this part of the job.

The most current (1989) edition of the *Steep Roof Manual*, published by the NRCA (National Roofing Contractors Association, One O'Hare Centre, 6250 River Rd., Rosemont, IL 60018; 708/299-9070) recommends two layers of 15-pound, asphalt-saturated felt glued together with plastic asphalt cement. To keep water from seeping between the layers, the cement must be spread uniformly with a comb trowel, at a rate of two gallons per 100 square feet, so that the two layers of felt don't touch at any point.

This method, however, is messy and time-consuming, and the final quality depends heavily on workmanship. And because the two layers of felt are glued to each other but not to the roof sheathing, any water that does get beneath the membrane can travel to other parts of the roof.

All of the roofers I've spoken with agree that the best underlayment is a self-adhering bituminous membrane, like Grace's Ice and Water Shield — a 4-mil polyethylene film backed by a

36-mil layer of rubberized asphalt adhesive. At about 60¢ to 80¢ per square foot installed, bituminous membranes are fast becoming standard fare for lining valleys and eaves, but they're also good for shallow roofs.

Compared to felt-based systems, membranes are easier to install and are relatively foolproof. They're also self-healing in that they automatically seal nail penetrations. And because membranes are fully adhered, water can't travel beneath them, so any leaks remain localized.

In fact, NRCA Deputy Director of Research and Technology Mark Graham says that a revised manual due out later this year will add bituminous membranes as a second underlayment option. (By the way, the association won't be recommending single-ply roofing membranes, like EPDM rubber, for roof underlayment. Those membranes are cumbersome to work with — if you want them fully adhered, you have to use messy adhesives — and they're not self-healing.)

Roofers who start using bituminous membranes are easily hooked. "We cover the entire roof with Ice and Water Shield whenever the slope is 5-in-12 or below," notes Joe Cazeault, a Weymouth, Mass., roofing contractor with 30 years in the business. It

may not be required by code, he says, but there's just too much chance that snow will back up under the shingles. Cazeault recommends laying the membrane from the edge of the roof to the ridge or to a point 12 to 18 inches above a change to a steeper pitch (Figure 1).

Membrane Tips

Properly installing self-adhering membranes takes practice. First, roll the membrane out and cut it into 10-foot to 15-foot lengths, then reroll it. Sweep the roof clean and apply the membrane by peeling off the paper while unrolling the membrane across the roof. This takes at least two sets of hands: one to work the roll, and a second to smooth the membrane onto the roof. The membrane should be applied with a 6-inch top lap (the amount of each course that's covered by the succeeding course) and a 3½-inch side lap (the amount adjacent sheets overlap at the ends). Peel-and-stick membranes are slippery, so they're more dangerous to walk on than felt systems. Rubber-soled shoes are a good idea.

Wrinkles. A big problem with membranes installed by inexperienced workers is excessive wrinkling. "It's like putting up wallpaper for the first

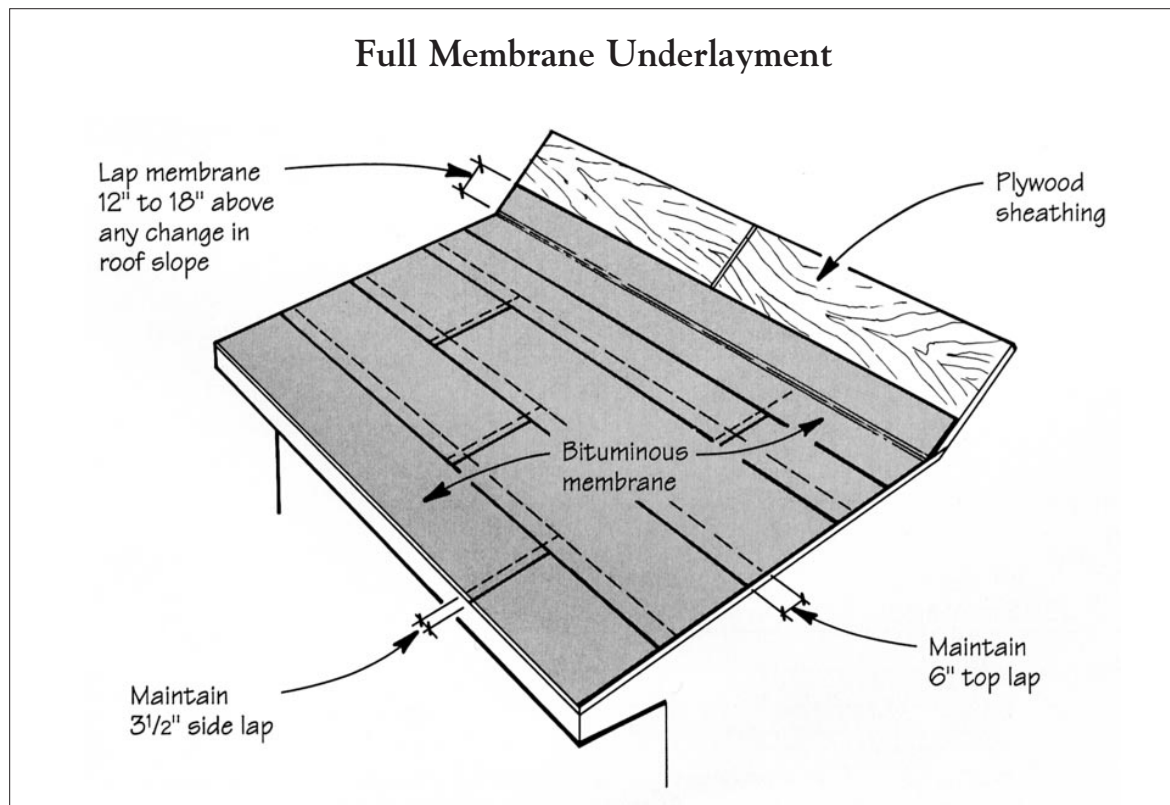


Figure 1. On shallow slopes, lay a bituminous membrane from the eaves to the ridge, or from the eaves to a point 12 to 18 inches above any change in slope.

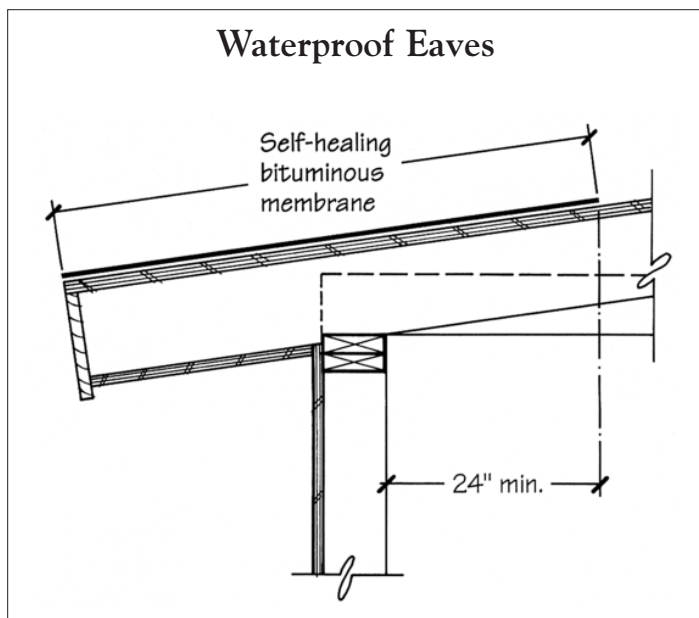


Figure 2. To prevent water backed up behind an ice dam from entering the building, place a self-adhering bituminous membrane from the edge of the roof to a point 24 inches inside the living space. Install metal drip edge on top of the membrane.

Shallow Slope Roof Details

Whether you use felt paper or a bituminous membrane, shallow slope roofs require special care.

Asphalt shingles. CABO sets the minimum slope for asphalt shingles at 2-in-12, and requires that any roof below 4-in-12 be covered first with a double layer of building paper. The eaves must also be protected with underlayment, whether lapped-and-glued felt or a bituminous membrane.

Although codes allow a double layer of cemented saturated felt at the eaves, bituminous membranes offer the best eaves protection. Manufacturers recommend placing the membrane from the edge of the sheathing to a point at least 24 inches, measured horizontally, inside the living space (Figure 2). Where metal drip edge is used, place it on top of the membrane.

Wood shingles and shakes. CABO sets a minimum slope of 3-in-12 for wood shingles and shakes. At those slopes, however, you'll have to reduce the weather exposure according to the length of the shake or shingle (Figure 3). And remember that decreasing exposure increases the number of shingles needed to cover a square of roof area.

For slopes below these minimums, NRCA and the Cedar Shake and Shingle Bureau (515 116th Ave. NE, Suite 275, Bellevue, WA 98004; 206/453-1323) recommend installing wood roofing on a latticelike framework of strapping over a watertight membrane (Figure 4). First, install the membrane over solid sheathing, making sure that water will drain freely over the drip edge. Next, lay 1x2 pressure-treated strapping from the eaves to the ridge, spaced at 24 inches on-center. Over this, install a layer of horizontal strapping, spaced to ensure proper shingle exposure. The wood roof does most of the water-shedding and protects the membrane from UV degradation. The double strapping provides air circulation and permits free drainage of any water that does get beneath the shingles.

Slate, clay, and concrete tile. The minimum slope CABO allows for flat concrete, slate, and clay tile is 3-in-12, but in snow country, some

time," says Larry Shapiro, a product manager at Grace. The membrane sticks to the sheathing on contact, so there's little room for error. A nail driven through a wrinkle won't seal properly and may leak. Wrinkles can be repaired by cutting them away with a utility knife, then patching them with a small piece of membrane.

Temperature. Shapiro stresses the need to follow the manufacturer's application instructions, especially the minimum installation temperatures. Membranes don't stick well below 40°F, making them more vulnerable to leaks. Some products may also have upper temperature limits, above which the adhesive tends to melt. In the worst cases, says Shapiro, a gooey mess can seep out from beneath the membrane at the eaves. To prevent seepage during peak summer temperatures, make sure the product you choose is rated for at least 180°F.

UV damage. Membranes are also subject to damage from the sun's ultraviolet rays. While short-term

exposure to the sun — up to several months, depending on the product — doesn't harm them, long exposure can cause the polyethylene film to become brittle and crack. Some brands of membrane last longer in the sun than others, but none is designed as a finish roof material. Of course, a membrane used as an underlayment is protected by the finish roof.

Nailing. The self-healing properties of bituminous membranes effectively seal smooth-shank roofing nails, but you'll need to be more careful with other types of fasteners. Ring-shank nails, for example, may tear the membrane instead of slicing cleanly through it. The result is a slew of isolated leaks.

Ventilation. Membrane manufacturers also caution that their products should be installed over a well-ventilated roof deck. On inadequately ventilated roofs, a membrane acts as a cold-side vapor barrier, making it more apt to trap heat and moisture. In the worst cases, this results in damage to the roof sheathing and framing.

Maximum Exposures for Wood Roofs

Length of Shingles/Shakes	Shingles (3:12 min. slope)	Shakes (4:12 min. slope)
16"	3 ³ / ₄ "	—
18"	4 ¹ / ₄ "	7 ¹ / ₂ "
24"	5 ³ / ₄ "	10"

Figure 3. These exposures will work at slopes below 3-in-12 for wood shingles and 4-in-12 for shakes, but only in conjunction with a watertight subroof and a double-strapping system.

Wood Shingles and Shakes on Shallow Roofs

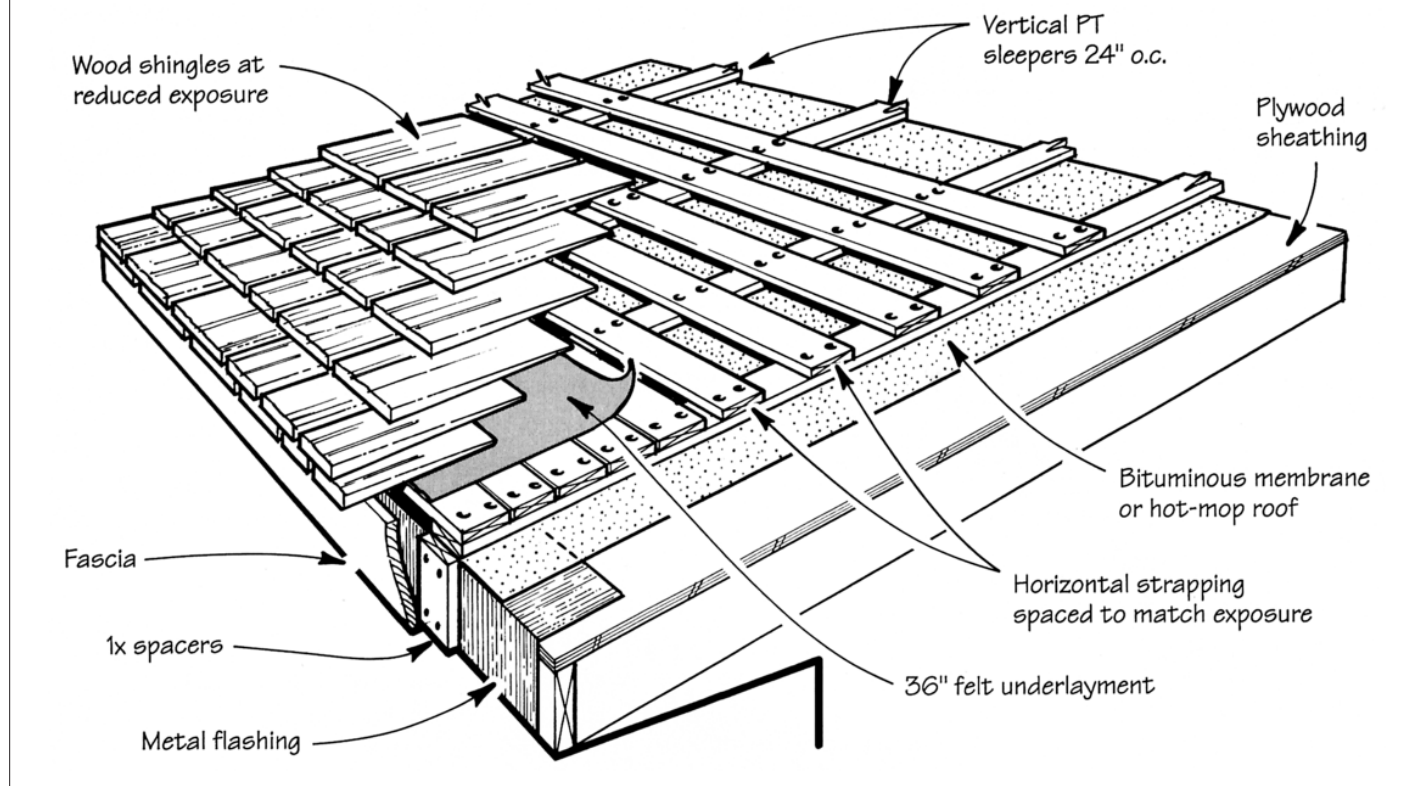


Figure 4. On shallow slopes, install wood shingles and shakes over a watertight subroof and a framework of pressure-treated strapping. The fascia is spaced out from the metal flashing at the eaves to allow any water that gets under the roofing to drain from the subroof.

manufacturers won't guarantee their tiles below 4-in-12.

As a general rule for shallow slopes, install the tiles with a minimum 4-inch top lap on the same type of double strapping and waterproof membrane system used for wood roofs. The tiles function like shingles and shakes, shedding most, if not all, of the water and protecting the membrane from damage.

In coastal regions and other windy areas, you'll need to nail all the tiles, and you may need to place hurricane clips along the eaves. In most other parts of the country, the first three tiles or courses should be nailed at eaves, rakes, valleys, and hips. On the rest of the roof, the tile's head lug grabs the batten to keep the tile from sliding down the roof, while the weight of the tiles themselves hold them down. Details should be available from the tile manufacturer.

Flashings

Whatever the roofing surface, remember that flashings are a weak link, especially on shallow roofs. A good flashing job takes time, so you

can expect to pay your roofing sub a little extra for this part of the job.

For a watertight subroof, the flashing should be installed before the roofing goes down, and the joints should be soldered. Use at least 28-gauge galvanized steel or an equivalent noncorrosive, non-staining material, such as lead or alu-

minum. Copper is an excellent flashing material, but water runoff from copper can leave stains on the house siding. Lead-coated copper has the advantages of copper, but doesn't cause stains. ■

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Bituminous Membrane Manufacturers

Bird Inc.
1077 Pleasant St.
Norwood, MA 02060
617/551-0656
Ice and Water Barrier

Celotex Corp.
996 Old Eagle School Rd.
Wayne, PA 19087
610/964-8047
Celoguard

Certainteed Corp.
P.O. Box 750
Valley Forge, PA 19482
800/782-8777
Winter Guard

GAF Building Materials Corp.
1361 Alps Rd.
Wayne, NH 07470
800/411-7663
Weather Watch

W.R. Grace & Co.
62 Whittemore Ave.
Cambridge, MA 02140
800/354-5414
Ice and Water Shield