Underlayment, drip-edge recommendations for roof coverings

Steep-slope roof systems require different underlayment, drip-edge installations

by **Jack Robinson, RRC**

The underlayments and drip-edge details employed on steep-slope roof systems are critical to longevity and performance. Different steep-slope roof coverings (e.g., asphalt shingles, wood shakes/shingles, slate, tile) require underlayments and drip edges that match the primary covering's anticipated service life, as well as the slope on which they are applied.

This article provides recommendations on the different types of underlayments and proper downslope detailing to use on various steep-slope roof systems, in addition to edge-metal positioning.

General principles

Steep-slope roof systems generally are intended to be watershedding rather than water-barrier systems. Because the slope at which the primary roof covering is installed will affect the rate at which water is shed, the slope must be considered when choosing and installing an underlayment.

NRCA recommends using an underlayment with every steep-slope roof covering. Underlayments serve several important purposes in the long-term performance of steep-slope roof systems. They provide a temporary watershedding surface before the final roof covering is installed. They offer temporary protection for the building, should the final roof covering become damaged or displaced (e.g., shingles are blown off or slates or tiles crack and break). And they act as a secondary water-shedding surface for water that finds its way below the roof covering as a result of capillary action (i.e., the wicking of water between two shingle surfaces in close proximity), blowing wind or ice damming.

There are several general principles that should govern which type of underlayment is installed. First, the underlayment should match the primary roof covering's anticipated service life. A heavier, more durable underlayment (e.g., a double layer or heavier felts) should be installed when applying a more durable, longer-lasting primary roof covering (e.g., slate). Less substantial underlayments (e.g., a single layer of No. 15 felt) may be used with shorter-lived primary roof coverings.

Second, the lower the slope, the more substantial the underlayment should be; conversely, the steeper the slope, the less important the underlayment becomes as a secondary roof covering because water is shed more rapidly. The quicker the primary roof covering sheds water, the less likely the water will enter below it. For example, water that is shed rapidly is less likely to be blown under the primary roof covering by strong winds. And water and ice on steep-slope roof systems are less likely to be forced under the primary roof covering by means of ice damming or capillary action.

Yet on lower-slope roof systems, there is a greater chance that water will, at some point, be forced under the primary roof covering. Therefore, more efficient, watershedding underlayments should be chosen as the secondary roof covering.

Third, ice-dam protection should be considered in areas with mean January temperatures of 30 F (-1 C) or less. It also should be matched to the roof system's slope and type of primary roof covering. Depending on the type of primary roof covering, ice-dam protection on relatively steep slopes should be installed from the roof system's lowest point, continuing upslope to a point a minimum of 24 inches (600 mm) past the inside of the exterior wall. On lower slopes, the protection should be extended to a point at least 36 inches (900 mm) upslope from the inside of the exterior wall (see Table 1 and Figures 1 and 2).

Finally, in severe climates where

substantial rain, heat and snow are expected, metal drip edges should be used to support less rigid primary roof coverings (e.g., asphalt underlayment felts and shingles). They also should allow water to drip off of the roof system's edge without affecting the underlying construction.

With more rigid roof coverings (e.g., slate, wood shakes/shingles or clay tiles), however, metal drip edges may not be needed to perform the critical support function. But with these primary roof coverings, they may help improve the roof system's ability to shed water further away from the building, as well as the roof system's vulnerable edge.

Installation practices

NRCA recommends that all underlayments be installed horizontally (i.e., perpendicular to the slope) and in "shingle" fashion, starting at the low point and moving toward the high point (see Figures 1 and 2). When roofing felts are used for underlayments, they always should be nonperforated and conform to ASTM D 226-89, "Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing," or ASTM D 4869-88, "Asphalt-Saturated Organic Felt Shingle Underlayment Used in Roofing."

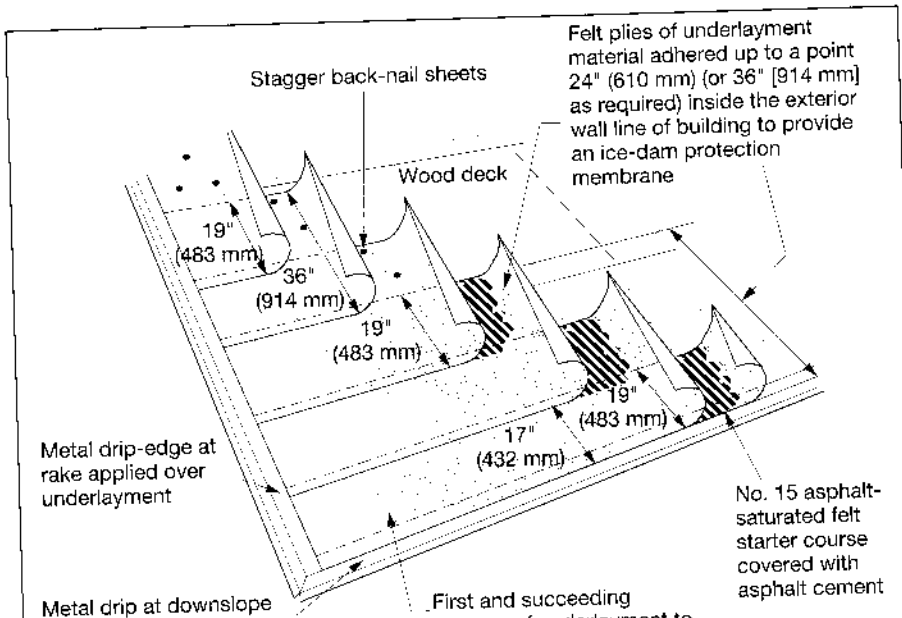

Figure 1: *Application of double-layer felt underlayment and eave flashing as ice-dam protection membrane.*

When the underlayment is to be installed in a single layer, full-width felts should be laid horizontally with 2-inch (50-mm) side laps and 4-inch (100-mm) end laps. The underlayment should be fastened appropriate for the roof system's slope, using as many fasteners as necessary to hold the felts in place until the primary roof covering is installed.

If the underlayment is to be installed in a double layer, a 19-inch-(475-mm-) wide starter strip first should be fastened along the downslope edge (i.e., along the eave's edge), and a full-width felt then should be fastened over the starter strip. The succeeding full felts should be laid to overlap the previous ones by 19 inches (475 mm), leaving a 17-inch (425-mm) exposure.

Ice-dam protection membranes may consist of the following: 1. Two plies of No. 15 or No. 30 asphalt-saturated organic felt, one nailed to the deck and the other set in hot Type III or Type IV asphalt or asphalt roof

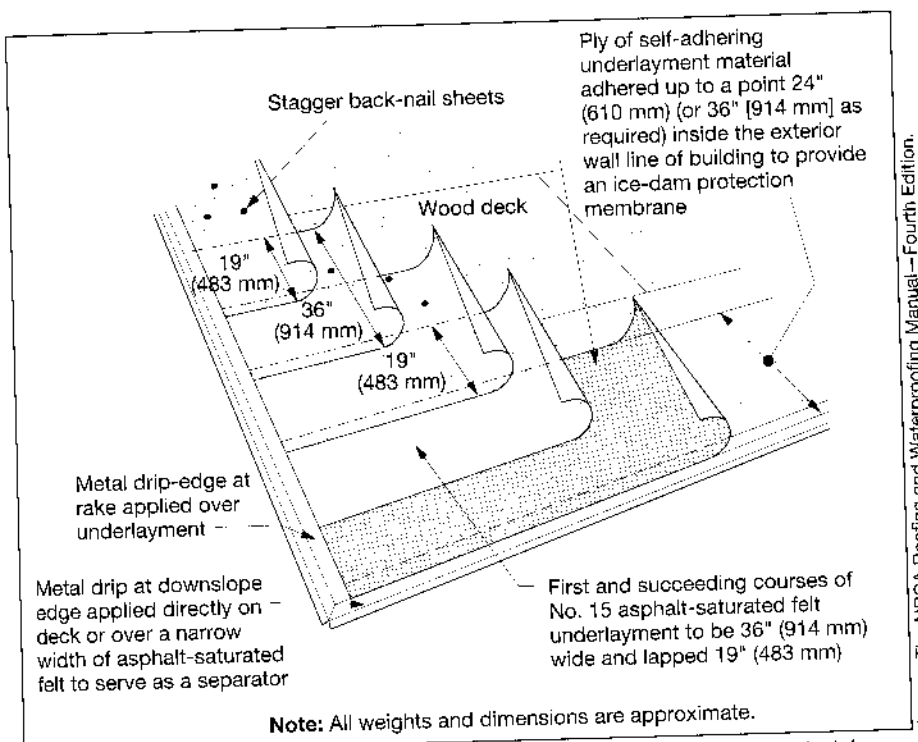

Figure 2: *Application of self-adhering modified bitumen underlayment material as ice-dam protection membrane.*

Primary roof covering	Slope	Minimum recommended underlayment	Minimum recommended ice-dam protection	Recommended metal drip edge/position	
				eave	rake
Asphalt shingles (three-tab, self-sealing)	less than 2½-in-12 (21 percent)*	—	—	—	—
Asphalt shingles (three-tab, self-sealing)	3-in-12 (25 percent) to 4-in-12 (33 percent)	Two layers No. 15 asphalt-saturated felt	Extend ice-dam protection a minimum of 36 inches (900 mm) upslope from the inside of the exterior wall of the building	Below underlayment: minimum 26-gauge (0.45-mm) galvanized steel	Above underlayment: minimum 26-gauge (0.45-mm) galvanized steel
Asphalt shingles (three-tab, self-sealing)	greater than 4-in-12 (33 percent)	One layer No. 15 asphalt-saturated felt, 2-inch (50-mm) minimum sidelap	Extend ice-dam protection a minimum of 24 inches (600 mm) upslope from the inside of the exterior wall of the building	Below underlayment: minimum 26-gauge (0.45-mm) galvanized steel	Above underlayment: minimum 26-gauge (0.45-mm) galvanized steel
Wood shakes installed over deck of solid or skip sheathing	less than 4-in-12 (33 percent)*	—	—	—	—
Wood shakes installed over deck of solid or skip sheathing	greater than 4-in-12 (33 percent)	Use solid sheathing to a point 24 to 36 inches (600 to 900 mm) inside wall; then one layer of No. 30 felt or ice-dam protection; interlayment of No. 30 asphalt-saturated felt	Extend entire width of solid sheathing at eave	Not mandatory if used below underlayment; minimum 26-gauge (0.45-mm) galvanized, prepainted metal	Not mandatory if used above underlayment; fasten directly to skip sheathing, if used; minimum 26-gauge (0.45-mm) galvanized, prepainted metal
Wood shingles installed over deck of solid sheathing	less than 4-in-12 (33 percent)*	—	—	—	—
Wood shingles installed over skip sheathing	greater than 4-in-12 (33 percent)	One layer No. 30 asphalt-saturated felt, 2-inch (50-mm) minimum sidelap	Extend ice-dam protection a minimum of 24 inches (600 mm) upslope from the inside of the exterior wall of the building	Not mandatory; if used, install minimum 26-gauge (0.45-mm) galvanized, prepainted metal below underlayment	Not mandatory; if used, install above underlayment; fasten directly to skip sheathing, if used
Slate, standard size; 4-inch (100-mm) minimum headlap	less than 4-in-12 (33 percent)*	—	—	—	—
Slate, standard size; 4-inch (100-mm) minimum headlap	4-in-12 (33 percent) to 8-in-12 (67 percent)	Two layers of No. 30 asphalt-saturated felts; alternate one layer of No. 40 asphalt-saturated and coated felt	Extend ice-dam protection a minimum of 36 inches (900 mm) upslope from the inside of the exterior wall of the building	Not mandatory; where used, install 20-ounce (0.69-mm) copper below underlayment	Not mandatory; where used, install 20-ounce (0.69-mm) copper or equivalent above underlayment

*This roof covering is not recommended at this slope.

Table 1

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Primary roof covering	Slope	Minimum recommended underlayment	Minimum recommended ice-dam protection	Recommended metal drip edge/position	
				eave	rake
Slate, standard 3-inch (75-mm) minimum headlap	8-in-12 (67 percent) to 20-in-12 (167 percent)	Two layers of No. 30 asphalt-saturated felts; alternate one layer of No. 40 asphalt-saturated and coated felt	Extend ice-dam protection a minimum of 24 inches (600 mm) upslope from the inside of the exterior wall of the building	Not mandatory; where used, install 20-ounce (0.69-mm) copper below underlayment	Not mandatory; where used, install 20-ounce (0.69-mm) copper or equivalent above underlayment
Slate, standard size; 2-inch (50-mm) minimum headlap	greater than 20-in-12 (167 percent)	One layer of No. 30 asphalt-saturated felt, 2-inch (50-mm) minimum sidelap	Extend ice-dam protection a minimum of 24 inches (600 mm) upslope from the inside of the exterior wall of the building	Not mandatory; where used, install 20-ounce (0.69-mm) copper below underlayment	Not mandatory; where used, install 20-ounce (0.69-mm) copper or equivalent above underlayment
Clay and concrete tiles, standard exposures; 3-inch (75-mm) minimum and overlaps	less than 4-in-12 (33 percent)*	—	—	—	—
Clay and concrete tiles, standard exposures; 3-inch (75-mm) minimum and overlaps	4-in-12 (33 percent) to 8-in-12 (67 percent)	Two No. 30 asphalt-saturated and coated felts; alternate one No. 40 asphalt-saturated and coated felt	Extend ice-dam protection a minimum of 36 inches (900 mm) upslope from the inside of the exterior wall of the building	Not mandatory; where used, install heavy-gauge (e.g., 24-gauge [0.61-mm]), prepainted, galvanized steel, aluminum, copper or stainless steel below the underlayment	Not mandatory; where used, install heavy-gauge (e.g., 24-gauge [0.61-mm]), prepainted, galvanized steel, aluminum, copper or stainless steel above the underlayment
Clay and concrete tiles, standard exposures; 3-inch (75-mm) minimum and overlaps	8-in-12 (67 percent) to 20-in-12 (167 percent)	Two No. 30 asphalt-saturated and coated felts; alternate one No. 40 asphalt-saturated and coated felt	Extend ice-dam protection a minimum of 36 inches (900 mm) upslope from the inside of the exterior wall of the building	Not mandatory; where used, install heavy-gauge (e.g., 24-gauge [0.61-mm]), prepainted, galvanized steel, aluminum, copper or stainless steel below the underlayment	Not mandatory; where used, install heavy-gauge (e.g., 24-gauge [0.61-mm]), prepainted, galvanized steel, aluminum, copper or stainless steel above the underlayment
Clay and concrete tiles, standard exposures; 3-inch (75-mm) minimum and overlaps	greater than 20-in-12 (167 percent)	One No. 30 or one No. 40 asphalt-saturated and coated felt	Extend ice-dam protection a minimum of 24 inches (600 mm) upslope from the inside of the exterior wall of the building	Not mandatory; where used, install heavy-gauge (e.g., 24-gauge [0.61-mm]), prepainted, galvanized steel, aluminum, copper or stainless steel below the underlayment	Not mandatory; where used, install heavy-gauge (e.g., 24-gauge [0.61-mm]), prepainted, galvanized steel, aluminum, copper or stainless steel above the underlayment
Slate, heavier than standard	greater than 6-in-12 (50 percent)	Use heavier underlayments	Extend ice-dam protection a minimum of 24 inches (600 mm) upslope from the inside of the exterior wall of the building	Not mandatory; where used, install 20-ounce (0.69-mm) copper below underlayment	Not mandatory; where used, install 20-ounce (0.69-mm) copper or equivalent above underlayment

*This roof covering is not recommended at this slope.

Table 1 (continued)

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cement; 2. A combination of a heavyweight, coated base sheet nailed to the deck and another felt or ply sheet set in hot, steep asphalt or asphalt roof cement; 3. A self-adhering modified bitumen membrane complying with the requirements of ASTM D 1970, "Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection."

Metal drip edges

Where climate dictates the need for perimeter metal drip-edge flashing, NRCA recommends using a minimum 26-gauge (0.45-mm), galvanized, prepainted metal or an equivalent noncorrosive metal. When installing primary roof coverings of greater anticipated longevity (e.g., slate), a more substantial metal (e.g., copper, stainless steel), which should be corrosion-resistant (e.g., 20-ounce [0.69-mm] copper), should be used for drip edges.

Metal drip edges should be installed on top of the underlayment at the rake edges. They should be installed below the underlayment at the downslope edges to help prevent any water shed by the underlayment from becoming trapped below the metal at the downslope edge. If there is concern that trapped ice or snow in a gutter at the downslope edge will back up under the metal edge, then an additional strip of underlayment should be installed first under the metal at the downslope edge (see Figures 1 and 2).

Summing it up

When installing steep-slope roof systems, underlayments and metal drip edges should be matched to the roof system's slope and primary roof covering's anticipated service life. In severe climates, contractors should consider upgrading these components to achieve a high-performance roof system. Contractors interested in more information should consult the fourth edition of *The NRCA Steep Roofing Manual.* PR

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