

Successful skylight flashing lets light in, keeps moisture out

Following are skylight installation techniques for shingle, slate and tile roof systems

by Eric Gockel

Improperly installed skylights in steep-slope roof systems can be dangerous—not only can they present a serious safety hazard, but they can harm a contractor's reputation, as well.

Because skylight quality has improved over the years as a result of various advances in material technology and manufacturing techniques, skylight failures are being blamed more frequently on improper installation.

Among manufacturer improvements are new glazing systems that enhance refined moisture and sound-proofing and using gaskets instead of sealants to increase reliability and ease of operation. Manufacturers use gaskets to produce impenetrable moisture and air barriers and to increase the window's energy efficiency. In addition, some manufacturers appeal to installers by including prefabricated flashing kits that reportedly make installation uncomplicated and quick.

As long as water doesn't penetrate the skylight limit itself (e.g., gaskets, seals and seams), the manufacturer usually is considered free of any responsibility for failure. However, when moisture enters through the flashing or the flashing is lacking, the installer typically is held responsible.

Every skylight installation is different, and sometimes improvisation is

necessary to make the installation dependable and reliable according to a roofing professional's standards. The installer who ties the skylight into the roof system is the one who likely will be held responsible for the watertightness of the flashing.

Before following the installation methods described in this article, the roofing professional should review the manufacturer's instructions

It is often quite difficult for a roofing contractor to blame anyone but himself for any leaks that occur.

available for the skylight; *The NRCA Steep Roofing Manual* can be used as a reference. The contractor should have a thorough understanding of the installation before beginning the project. By following the procedures described by the manufacturer and/or NRCA, whichever are more stringent, the contractor can limit his liability and complete a quality installation.

Following are flashing guidelines to

help roofing contractors limit the risk associated with improper skylight installation. Essentially, the most effective way to flash a skylight is by using the step flashing method, similar to the method that is used on walls and chimneys.

Successful flashing

There are four basic components to skylight flashing. Step flashing involves installing flashing up the skylight's sides and weaving it between the courses of the roofing material. Apron flashing is installed around the skylight's downslope side, and backer flashing is used on its upslope side. The fourth component, counterflashing, is used to overlap the step, apron and backer flashing (see Figure 1).

The type of metal used for flashing primarily depends on the roofing material used. If working on an asphalt shingle roof system, a minimum of 26-gauge (0.45-mm) galvanized steel is needed; however, 24-gauge (0.61-mm) prefinished galvanized steel is recommended by the author. If the skylight is to be installed in a slate or tile roof system, 16-ounce (0.55-mm) copper or 3-pound (1.2-mm) sheet lead are suitable flashing materials.

In addition to these general steps, there are unique factors to be

considered for different types of roof systems. Discussions of installing skylights in shingle, slate and tile roof systems follow.

Asphalt shingles

In an asphalt shingle roof system, skylight flashing can begin once the skylight is in place and appropriate underlayment has been installed on the roof area and up the skylight's sides, turned up a minimum of 3 inches (75 mm) if possible. After the specified shingles are installed up to the skylight's downslope side, the apron flashing—which should be made of either 24- or 26-gauge (0.61- or 0.45-mm) prefinished galvanized steel—should be installed around the downslope area.

The apron flashing should extend onto the roof surface at least 4 inches (100 mm) and be hemmed under. It also should extend up the skylight's side as high as possible and fit around the corners of the skylight's downslope side. The apron flashing's sides should extend 4 inches (100 mm) past the sides of the skylight. Finally, it should be fastened to the vertical face of the skylight curb with pop rivets or stainless-steel screws and washers.

The size of the metal used for the step flashing usually depends on the shingle's size; the combination of shingle and skylight sizes will determine the size of the flashing that can be used. Following are suggested step flashing sizes:

- Standard-size shingles (i.e., 12- by 36-inch [300- by 900-mm] strip shingles)—7-inch- (175-mm-) long by 8-inch- (200-mm-) wide step flashing.
- Metric-size shingles (i.e., about 13½- by 39½-inch [330- by 980-mm] strip shingle)—8-inch- (200-mm-) long by 8-inch- (200-mm-) wide step flashing.

The step flashing's length must be longer than the exposure of the shingles being used because the individual pieces of step flashing must be long enough to overlap each other by a minimum of 2 inches (50 mm). On steep-slope roof systems with

relatively low slopes or in more severe climates, longer step flashing may be used. This would allow for a longer overlap.

Typically, step flashing should extend up the skylight's side far enough to allow clearance for cladding or counterflashing to overlap the step flashing by at least 2 inches (50 mm). Step flashing projection up a wall generally is 4 inches (100 mm); however, in the case of a skylight, this dimension may have to be adjusted to allow for the limited vertical distance present. The step flashing should extend onto the roof surface about 4 inches (100 mm) over the underlying shingle. In summary, the headlap and extension onto the roof is unchanged from

typical wall step flashing configurations; however, the vertical extension may need to be adjusted to fit the size of the skylight.

After the apron flashing is installed, the first piece of step flashing should be placed so that it extends over the apron a minimum of 2 inches (50 mm); an overlap of about 4 inches (100 mm) is preferred. The step flashing should be nailed near the flange's upper outside corner, away from the break in the metal.

After the step flashing is in place, the shingle should be cut to size if necessary and placed so that the shingle's end is against the skylight's side. The shingle should not be placed so tight that it buckles or will not lay correctly; about ⅓ of an inch

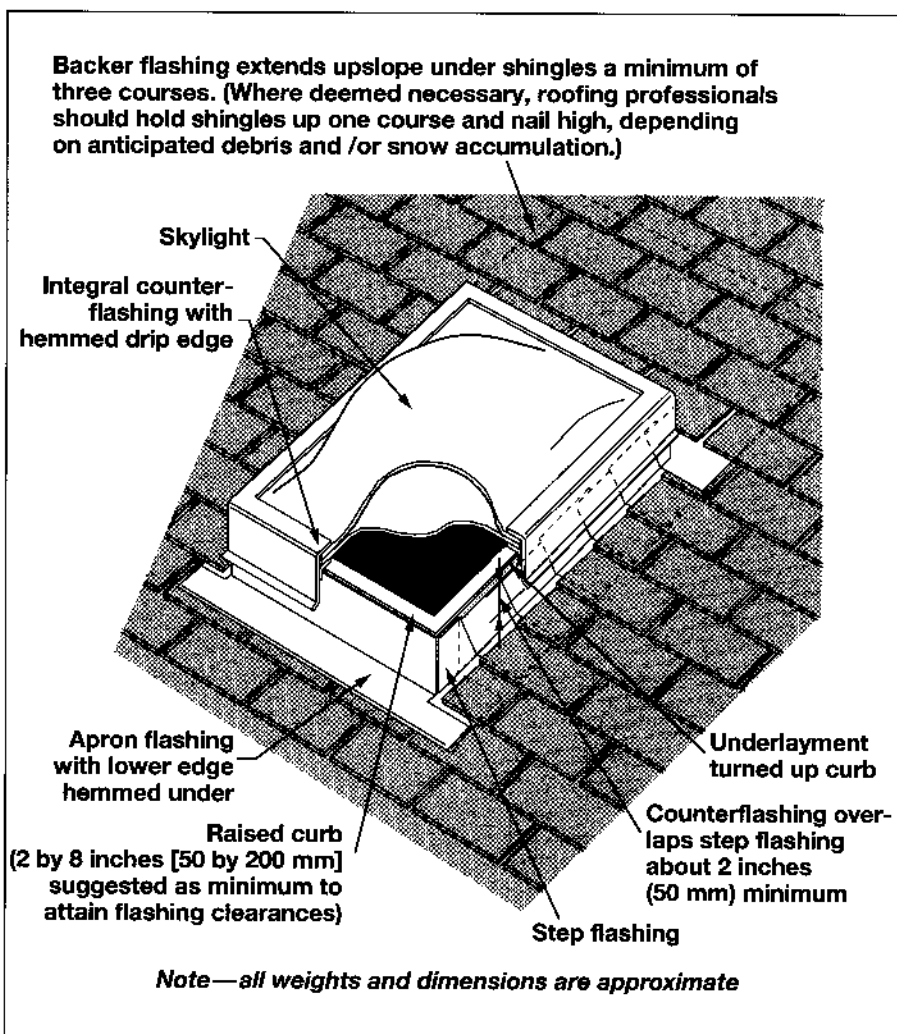


Figure 1: Basic sheet-metal flashing components used at skylight.

OSHA-approved methods provide fall protection at skylights

by Tom Shanahan

Roofing professionals working around skylights now are subject to more stringent fall protection rules under the Occupational Safety and Health Administration's (OSHA's) revised fall protection regulation.

OSHA issued the revised regulation on Aug. 9, 1994, and the new standard, Subpart M 1926.500, went into effect on Feb. 6.

In the rule, OSHA states that workers must be protected from the hazards associated with a skylight opening by one of three methods—covers, guardrails or personal fall-arrest systems. However, OSHA does not specify how, or if, a contractor is required to provide protection if the skylight opening is already covered with a skylight fixture.

The new OSHA rule changed the weight threshold so that if covers are used, they must be able to withstand two times the expected load. Under this scenario, if a crew member (including his tool belt) weighs 250 pounds (115 kg), a skylight fixture would have to be able to withstand a 500-pound (225-kg) load. Contractors no longer can assume that a skylight fixture will qualify as a cover and must use one of the previously mentioned options. (See "Fall prevention tops OSHA's hit list," October 1994, page 28, for a complete discussion of these options.)

Additional solutions

NRCA has presented to OSHA the problem that contractors would face trying to comply with the revised standard while working on roof systems with numerous skylight fixtures. It could be costly to temporarily remove all of the fixtures and place the proper covers over the openings. In addition, erecting guardrails is impractical in most situations because, at some point, work will have to be performed and the guardrails removed. Personal fall-arrest systems create other hazards, such as tripping, which make them impractical in most low-slope roof operations.

OSHA has offered an additional option—the warning line system (WLS) with a safety monitor. A WLS could be used to block off a group of skylights, and a safety monitor would be required to watch the partitioned work area once work at the skylight opening begins. NRCA is waiting for written confirmation that this additional option is acceptable to OSHA.

Although safety nets aren't listed as an option in the standard, OSHA has allowed their use. Safety nets can provide a solution to the problem because they don't interfere with work around the opening and can be easy to install.

Also, there are products available that provide skylight protection, such as portable and permanent covers and screens that fit over the skylights. Once the covers or screens are removed, however, one of the other fall protection methods is required.

Helping others comply

Roofing contractors are not the only ones affected by the new standard. For example, if a building owner's employees work on the roof (e.g., to perform routine equipment maintenance), the owner must provide skylight opening fall protection. Building owners may need to be informed of their responsibility to protect their employees from these openings as required under the OSHA general industry standard. Professional roofing contractors can help their customers comply with the new standard by offering to permanently install the covers.

Tom Shanahan is NRCA's associate executive director of risk management.

(3 mm) should be allowed for expansion and contraction.

The shingle should be nailed as usual, with one exception: The end nail should not be used because it will puncture the newly placed step flashing, which would sabotage the weathertightness of the flashing system.

Next, the second piece of step flashing should be installed over the shingle so that it overlaps the first step flashing by at least 2 inches (50 mm). Then, the next shingle should be nailed in the same manner as the first.

The roofing professional should continue to alternate between shingles and step flashing, installing them along both sides of the skylight. The last two pieces of step flashing should be wrapped around the back corners of the skylight.

At this point, if working on a relatively low-slope (6-in-12 [50 percent] or lower) roof system or in a severe climate area, an 18-inch- (450-mm-) wide piece of ice dam protection membrane can be installed just above the skylight; the width depends on the skylight's size.

Next, the backer flashing can be installed over the roof surface above the skylight. The backer must extend upslope at least 18 inches (450 mm), preferably 24 inches (600 mm) in climates where freeze-thaw cycles are common. It should extend 6 inches (150 mm) beyond the skylight's sides and extend vertically as high as possible. The backer can be fastened to the roof deck by nailing along the top edge of the sheet metal, preferably 1 inch (25 mm) from the top at 6-inch (150-mm) intervals.

After all step, apron and backer flashings are in place, the roofing contractor can install counterflashing to overlap all of the flashing that extends vertically. Some skylights, as well as some flashing kits, have integrated counterflashing under which the step flashing can be slid. If the roofing professional uses these elements, a reliable and proper installation usually will be ensured.

However, if they are not included, the roofing professional can use metal matching the skylight material

or step flashing to create counter-flashing. The step flashing should be covered by 2 inches (50 mm) if possible and slid up the side flange if one is present. Then, the roofing professional should fasten the counter-flashing with pop rivets or stainless-steel screws and washers.

Slate

Flashing skylights on a slate roof system is virtually the same as on an asphalt shingle roof system, except for a few elements.

Merely knowing correct installation procedures for skylights will not be sufficient if the installer is not familiar

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with slate roofs. Contractors should educate themselves and their employees as much as possible on the subject before attempting any work that may be new to them; *The NRCA Steep Roofing Manual* covers the basics of slate roofing.

At the onset of skylight installation, a heavy (50- or 60-pound [23- or 27-kg]) felt should be used on the area surrounding the skylight. Heavy felt is recommended as an underlayment because of its durability. The felt is just one segment of a roof system that is expected to perform for many decades; if one part is lacking, the whole system suffers. The use of 16-ounce (0.55-mm) copper for flashing material is strongly recommended for the same reason. Three-pound (1.2-mm) sheet lead also can be used for apron and backer flashing.

Some manufacturers that provide flashing kits also offer copper-clad skylights and copper flashing kits. If this option is available for a slate roof system, its use is highly recommended because of its durability and dependability.

After the felt is installed, the slate can be run up to the bottom of the skylight just as shingles would be. At this point, the apron flashing should be fitted and cut to size. The material can be 16-ounce (0.55-mm) copper, lead-coated copper or 3-pound (1.2-mm) sheet lead. The apron flashing can be fastened to the vertical curb of the skylight's bottom with copper rivets or stainless-steel screws and washers.

Step flashing should be made of 16-ounce (0.55-mm) copper and fastened with 1½-inch- (38-mm-) long copper slating nails.

The formula for determining flashing size for slate roof systems is similar to that for asphalt shingles. Four inches (100 mm) of material should extend out to cover the slate, and about 4 inches (100 mm) should extend vertically.

The length of the step flashing depends on the slate's exposure dimensions; because there are many sizes of slate, the exposures will vary widely. To calculate slate's correct exposure, the roofing professional should take the length of the slate, subtract 3 inches (75 mm) for headlap and divide by two. Then, an additional 3 inches (75 mm) should be added for overlapping the step flashing.

When installing the step flashing and slate, about ¼ of an inch (3 mm) should be allowed between the vertical plane and slate to allow for any skylight and roof movement. The roofing professional should make sure not to nail through any flashing when fastening the slates to the roof. One way to avoid puncturing the flashing is by placing two nails in the side of slate that is opposite of the flashing rather than placing one nail in each side.

After finishing both sides of the skylight, the backer flashing should be installed. Again, 16-ounce (0.55-mm) copper, lead-coated copper or 3-pound (1.2-mm) sheet lead are recommended flashing materials.

If installation is taking place on a steep-slope roof system with a relatively low slope or climatic conditions allow for freeze-thaw cycles, the

roofing professional should consider placing an ice dam protection membrane under the backer flashing for added waterproofing protection. As its name implies, the ice dam protection membrane would be necessary only above the skylight, where there may be a backup of snow and ice. Installation of a membrane along the sides or bottom of the skylight would not be necessary.

After sizing and cutting the backer flashing material, the roofing professional should fasten it along its upper edge about 1 inch (25 mm) from the top at 6-inch (150-mm) intervals.

If counterflashing is not included with the skylight or if the step flashing cannot be integrated adequately into the skylight, counterflashing should be installed in a manner similar to that used with asphalt shingle roof systems, except 16-ounce (0.55-mm) copper should be used.

Tile

Flashing a skylight in a tile roof system can present some challenges to the installer. For example, some tiles that are not flat, such as Spanish, have large, rounded shapes compared to the other roofing materials mentioned previously. Following are suggestions for dealing with these unique situations.

The installer who ties the skylight into the roof system is the one who likely will be held responsible for the watertightness of the flashing.

After installing the skylight and using a heavy (50- or 60-pound [23- or 27-kg]) underlayment felt, the roofing professional should run the tile courses up to the bottom of the skylight, as with asphalt shingles.

For the apron, a flexible material may be needed to conform to the shape of the tiles.

Here, 3-pound (1.2-mm) sheet lead or a flexible flashing membrane designed especially for tile flashing can be used. It should extend at least 4 inches (100 mm) over the tiles on the skylight's downslope side and 4 inches (100 mm) past the sides. The flashing should run up under the counterflashing or flange if one is provided.

When choosing the type of step flashing, the roofing professional should decide what type will work best for the project. Ideally, step flashing made from 3-pound (1.2-mm) sheet lead should be used.

The step flashing's length is determined as the tile's length plus 2 inches (50 mm) of headlap; the width should be about 8 inches

(200 mm). The flashing should be long enough to cover the entire tile from top to bottom and fold over the top and bottom about 1 inch (25 mm). Step flashing width should extend vertically 4 inches (100 mm) if possible and onto the tile 4 inches (100 mm); however, the tile's design or cut may change this amount.

The flashing edge that will rest on the tile should be on a flat section of the tile or on a part that slopes downward to eliminate the risk of moisture seeping beneath the flashing; the tiles' and skylight's heights may make this impossible. Some manufacturers will have a flashing flange extend from the sides; if this is the case, it should be used. One-piece flashings should be used if no alternative is available.

After step flashing installation at the sides is complete, the roofing

professional can put the backer flashing in place. On a tile roof, 3-pound (1.2-mm) sheet lead is recommended and should be installed in the same way as it is for shingle and slate roof systems.

Quality installation

Skylights can be excellent selling features when reroofing. However, the roofing contractor should be comfortable with installing these units and be able to stand behind the workmanship, as well.

In the end, it is often quite difficult for a roofing contractor to blame anyone but himself for any leaks that may occur. **PR**

Eric Gockel is project manager for H.G. Roofing & Consulting Inc., Lakeville, Ind.

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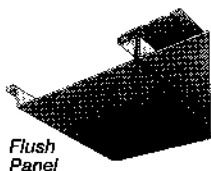
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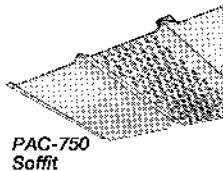
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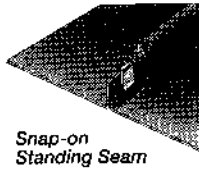
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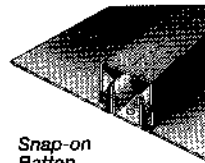
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