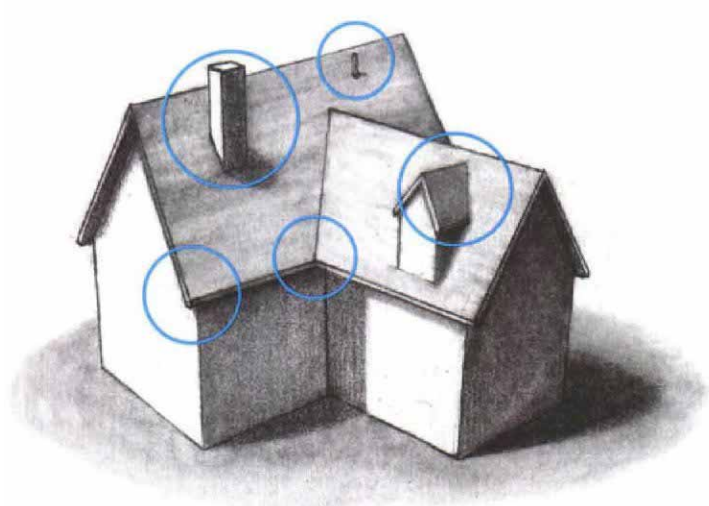
Roof Flashing

Installation details can make the difference between a trouble-free roof and an expensive callback

by Scott McBride

I once heard about a man with a perpetually leaking roof. He said that he couldn't very well fix it in the rain, and that when the sun was shining, he didn't need to. Most likely, the problem could have been avoided if the roof flashing had been done right in the first place.

My article in *FHB* #100 (pp. 58-63) discussed sidewall flashing. Now I'll take a look at roof flashing. Although the underlying principles are the same for both systems, roof flashings are more severely tested; rain strikes a roof directly, and the sun bakes it throughout the day. Good sidewall flashings can extend the life of a structure, but roof flashing keeps the living room from turning into a rice paddy.



Extra protection at edges, seams and penetrations. *Flashing is like long underwear: an extra layer of protection against the weather. The illustration above highlights critical flashing areas on a typical roof, and in the drawings that accompany this article, the illustration serves as an icon to identify where on the roof a particular flashing is located.*

Edge flashings go on first—The first flashing to be installed on a typical roof is the edge flashing (drawings facing page). Metal roof edge, also known as drip edge, protects the edge of the roof sheathing from water splashing out of the gutter and from the moisture present in gutter debris. It also fends off moisture that gets drawn under shingles by capillary action. Finally, it makes for a neat appearance, especially along the rake.

In northern climates, where ice dams are a problem, the use of self-adhesive bituminous sheeting at the eaves is becoming almost routine. Typically, one 3-ft. wide sheet of bituminous membrane is installed at the eave with the rest of the roof covered in overlapping courses of roofing felt. Nail the drip edge to the deck along the eaves and nail it over the roofing felt and bituminous sheeting along the rakes.

Metal roof edge generally is available in one of two profiles, one that resembles an L and another that looks like a lopsided T. I like the T-profile because it supports the shingle overhang. Drip edges are sometimes available in a variety of widths; if you've got a choice of materials, wider is better than narrower. With the wider stock, nails can be placed slightly higher on the roof, thereby reducing the risk of water damage to the sheathing.

I nail roof edge directly to roof sheathing, about 12 in. o. c., placing the nails as high as possible without weakening the flashing. At the corner where the rake meets the eave, I run the eave flashing first (drawings facing page). The small overhang that sticks out past the eave is allowed to project a bit past the rake as well. When the rake flashing comes down, it captures the overhang. A slit along the crease of the rake flashing then allows its vertical fin to bend around the corner.

There are two types of vented eave flashing available (drawings p. 86). They can be used where traditional soffit vents won't work. One of these, the ComboVent (also sold as the SmartAir intake vent; The ComboVent Co., 24128 Ecorse Road, Taylor, Mich. 48180; 800-298-7610) is a new product made of PVC, and is larger than typical metal drip edge. The bottom leg, about 4 in. long, is held away from the fascia, allowing air to pass behind the gutter and under the roof sheathing.

Valley flashing: open or closed?—Good valley flashings are critical because roofs drain into the valleys. Most roof leaks can be traced to faulty valleys. Valley flashings fall into two categories: open and closed. Open valleys have exposed flashing, and closed valleys do not. The chief problem with closed valleys is that they tend to collect debris. Without maintenance, the debris can cause water to back up under the shingles. Debris also holds moisture, which leads to the premature decay of both roofing and flashing.

When you're working with an asphalt-shingle roof, closed valleys are easy to achieve. The shingles are flexible, so they can act as their own flashing. The two types of self-flashing closed valleys are woven and straight cut (top drawing, p. 87). When roofing with an inflexible shingle, such as wood, slate or tile, closed valleys require metal flashing. The flashing is in the form of concealed metal "shingles" woven into the roofing one course at a time, like step flashing.

Open valleys are functional—Open valleys, commonly made of galvanized steel, aluminum or copper, are quick to install, and they drain well. I install valley flashings over the roof underlayment (felt or bituminous membrane). The underlayment cushions the flashing against any

Drawings: Chuck Lockhart

protruding nail heads and flashing. Each course of underlayment is extended across the valley and onto the adjoining roof. Successive courses are woven together in this fashion, creating a double thickness of underlayment in the valley that serves as a backup in case the flashing fails.

On shallowly pitched roofs, metal flashing will lay nicely in an open valley without a crease. With steeper pitches, I crease the middle of the valley on my brake, a tool I use for bending flashings. When there's more water coming down into a valley from one side than from the other, a V-crimp down the middle is recommended. This ridge keeps the heavier runoff of one side from flowing over the middle of the valley and up under the shingles on the opposite side. To fasten an open-valley flashing, I drive roofing nails just beyond the edge of the flashing at 24 in. o. c. The head of the nail holds down the sheet metal but allows it to expand lengthwise. I through-nail only at the top end to keep the flashing from slipping downhill.

To avoid galvanic corrosion, it's wise to use the same materials for flashings that will be in contact, such as valley flashing and roof edge.

Cleats allow valley metal to expand—To ensure that valley flashing doesn't buckle as it expands in heat, you can also attach it to the roof with cleats instead of nails. Cleats hook over a fold turned along the edges of the valley (bottom drawing, p. 87). The fold is free to slide in the cleat, thereby accommodating expansion. The fold also turns back water that reaches under the shingles, and it lets a little air circulate between roofing and flashing.

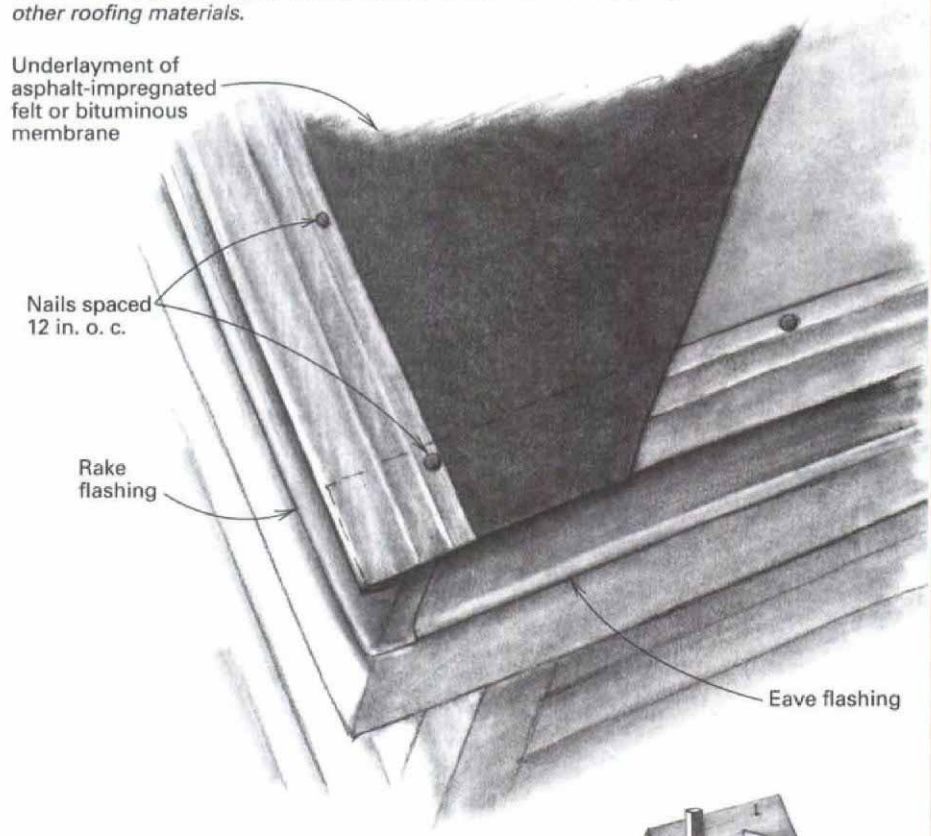
Limiting the length of each valley sheet to 10 ft. also will help to control expansion. If more than one sheet is required in a valley, the upper sheet should overlap the lower sheet by about 12 in.

At the bottom of an open valley, where the valley meets the eave, the valley should be trimmed so that it overhangs the roof slightly (½ in. to 1 in.). This way, water will be carried past the inside corner of the roof. Take care not to extend the valley too far, though, or the runoff could flow past the gutter.

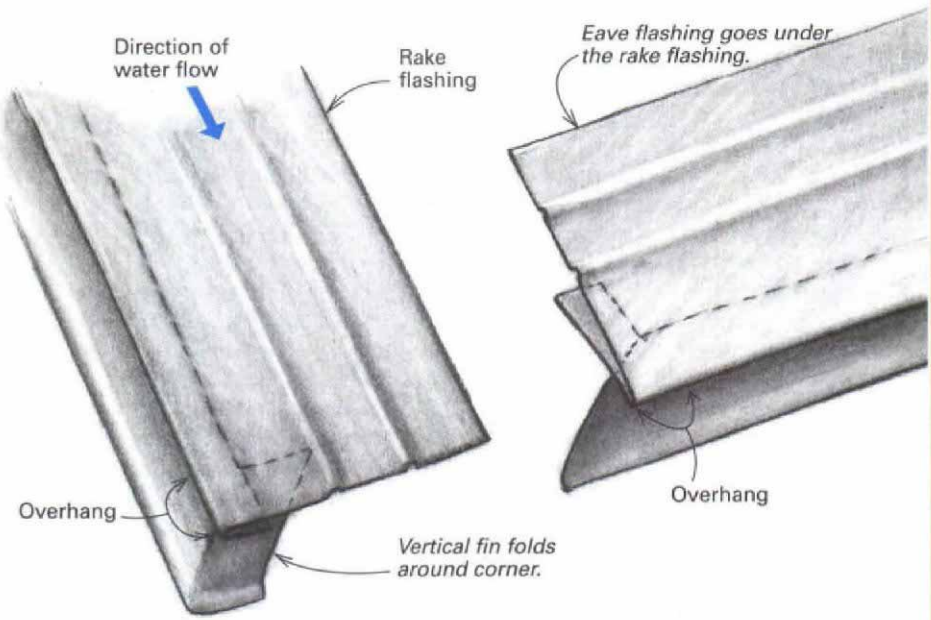
Typically, the valley flashing is run up to and cut off in line with the ridge. The end of the valley flashing then is covered by the ridge-cap shingles or the ridge vent.

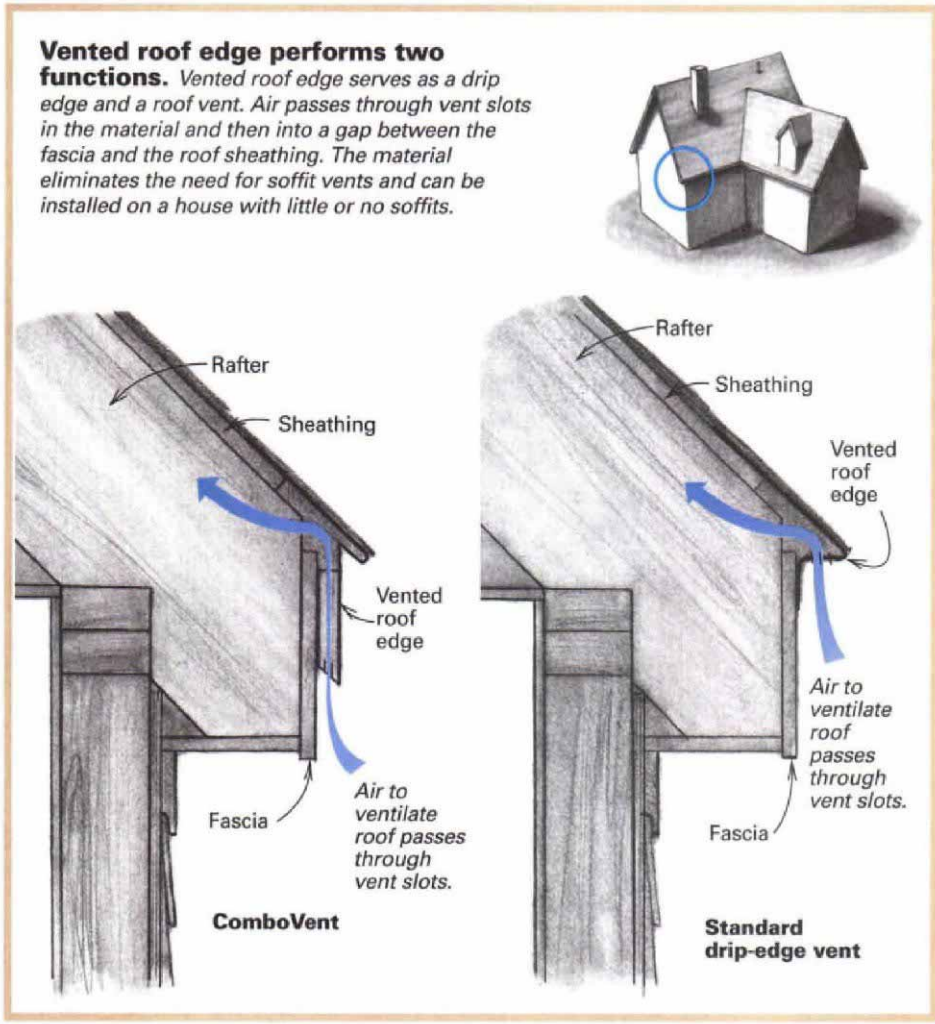
The same principle applies at the intersection of two valleys, such as at the back of a dormer. One way to handle this condition is to run both pieces of valley flashing long, past the intersection of the dormer ridge and the main roof (drawing top left, p. 88). The flashing from both valleys is cut down the middle, at the crease. The four sections of flashing are then woven together, with two halves lying flat and overlapping on the main roof. The other halves meet

Roof-edge flashing bridges the gap between roof and fascia. *Roof-edge, or drip-edge, flashing is installed along the eave first, directly over the sheathing. Then roofing felt goes on. Finally, drip edge is installed along the rake. The nails are placed near the upper lip of the roof-edge flashing to ensure the nail holes will be covered by other roofing materials.*



Interlocking roof edge keeps the water out. *To join sections of T-shaped drip edge at the corner of the rake and eave, the author cuts and bends the two pieces as shown. The eave flashing is installed first, and then the rake flashing is slipped over it. Water running down the rake is directed over the eave section and off the roof.*





Vented roof edge performs two functions. *Vented roof edge serves as a drip edge and a roof vent. Air passes through vent slots in the material and then into a gap between the fascia and the roof sheathing. The material eliminates the need for soffit vents and can be installed on a house with little or no soffits.*

Synthetic flashings are cheap and easy to use

Metal still figures prominently as a roof-flashing material, but in recent years some inexpensive and highly workable synthetic alternatives have come on the market.

The first synthetic-flashing material was asphalt-impregnated felt, which is known universally as tar paper. It's still used in low-stress situations where the entire flashing is protected by another material, such as when it's used around windows.

Felt breaks down quickly when it's exposed to the weather. Heavier felts, known as roll roofing or 90-lb. roofing, can be used for exposed-valley flashing. A gravel coating on roll roofing gives it some protection from the damaging effects of sunlight. Valleys flashed with roll roofing can be color-coordinated with a roof's asphalt shingles. Unfortunately, roll roofing has a short life span compared with metal and is highly susceptible to punctures. As with roll roofing, synthetic materials that were recently developed as roof membranes have been carried over into flashing work. EPDM is a synthetic rubber sheet that can be solvent-welded. Modified bitumen is a sheet material welded with a flame. The ability to join separate pieces of these materials makes them a rival of copper, especially in low-pitch situations where overlapping alone will not create an adequate water barrier.

For example, built-in gutters can now be relined with these materials at a fraction of the cost of relining them with copper. Prefabricated rubber fittings are an added time-saver. For example, you can buy a flashing boot for 4x4 posts that solvent-welds to an EPDM deck membrane.—*S. M.*

on the ridge of the dormer and are soldered or folded and crimped together.

Mineral-surfaced roll roofing, also known as 90-lb. roofing, can be substituted for metal in open valleys. To increase strength, a double layer is used. The first layer is at least 12 in. wide, laid gravel side down. The second layer is at least 24 in. wide, laid gravel side up. The two layers are laminated together with a troweled-on roof cement. Despite this precaution, boot heels will easily puncture a roll-roofing valley.

After installing an open valley, I snap chalklines indicating the lines at which the overlying shingles will be cut. The exposed width of the valley starts at about 6 in. at the ridge (3 in. per side), and gets wider as the valley descends to accommodate the increasing volume of runoff. The recommended taper is ⅛ in. per ft. For instance, a valley 16 ft. long would measure 6 in. wide at the ridge and 8 in. wide at the eaves.

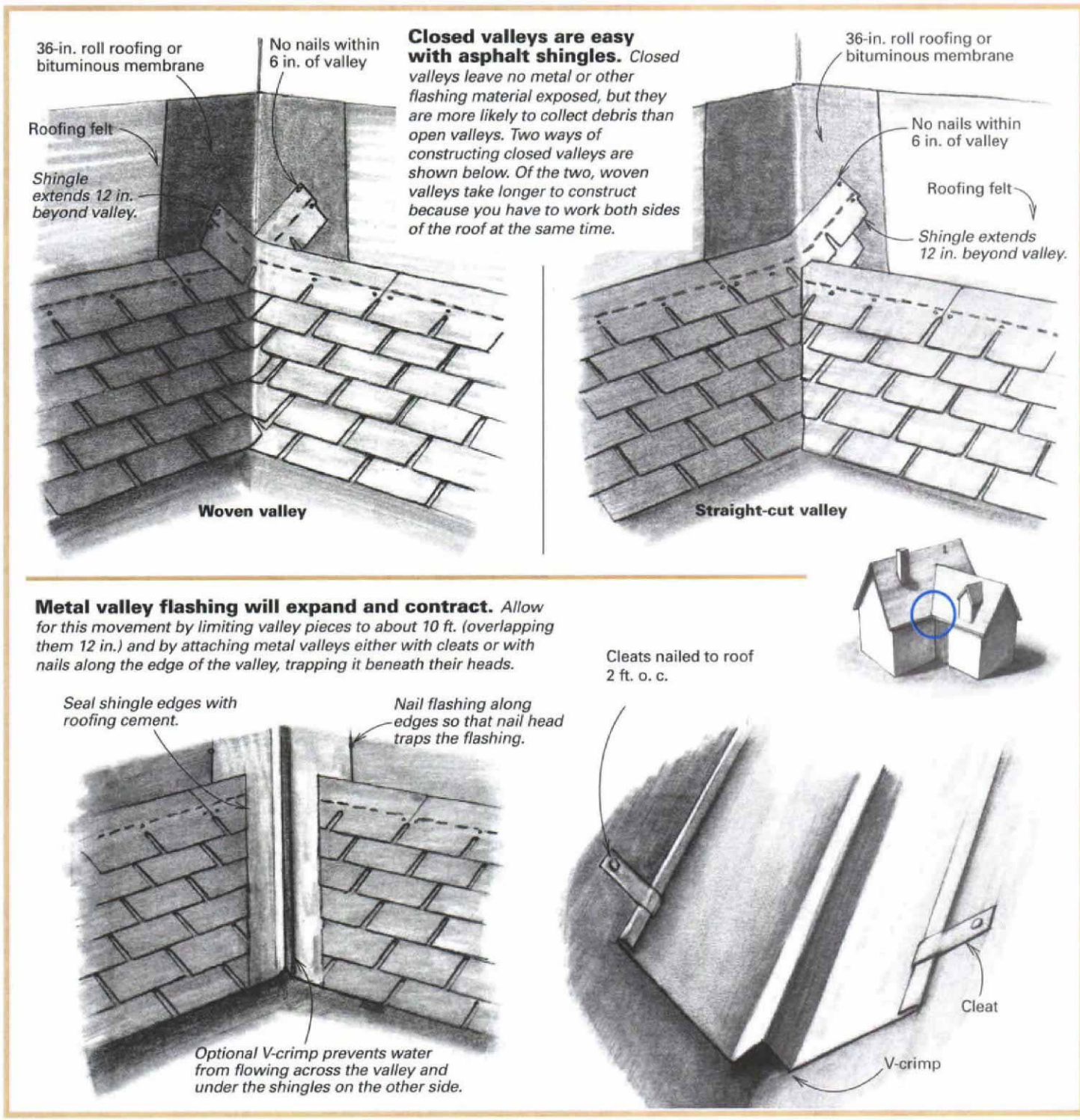
When shingling at a valley, keep the nails at least 2 in. back from the line where the shingles are trimmed. If this leaves a shingle sticking out more than 6 in. from a nail, secure it with a small dab of roof cement.

Chimney flashing is folded into masonry— Chimneys are flashed in much the same way as dormer walls. The difference lies mainly in what covers the upturned sides of the apron, or base, flashing and the step flashings. Whereas dormers have siding that comes down over the flashing, masonry chimneys use counterflashing, which I'll discuss later.

The first piece of chimney flashing to go on is the apron flashing, which laps at least 4 in. over the shingles below and at least 12 in. up the vertical face of the chimney. Then step flashings are installed along the sides of the chimney, woven in with the adjoining shingles.

What happens next depends on the chimney's location on the roof. When a chimney is situated at the ridge, the step flashings simply culminate with a top step that straddles both sides of the roof. But when a chimney is built downslope from the ridge, a cricket is employed (bottom drawing, p. 88). A cricket, or saddle, is a miniature gable roof on the upslope side of the chimney that diverts water around the chimney *(FHB* #47, pp. 61-63). Some crickets are big enough actually to be shingled, but most are covered with a metal skin bent and soldered to fit the slope of the roof. A metal cricket is part valley flashing, part step flashing and part metal roof.

The last step, whether a chimney is at the ridge or downslope, is the installation of counterflashing (bottom drawing, p. 88). Counterflashing overlaps all the lower flashing pieces, including the apron or aprons, the step flashings along the side and the cricket, if there is one. The top edge of the counterflashing is bent at a



Closed valleys are easy with asphalt shingles. *Closed valleys leave no metal or other flashing material exposed, but they are more likely to collect debris than open valleys. Two ways of constructing closed valleys are shown below. Of the two, woven valleys take longer to construct because you have to work both sides of the roof at the same time.*

Metal valley flashing will expand and contract. *Allow for this movement by limiting valley pieces to about 10 ft. (overlapping them 12 in.) and by attaching metal valleys either with cleats or with nails along the edge of the valley, trapping it beneath their heads.*

right angle and let into successive mortar joints in the chimney.

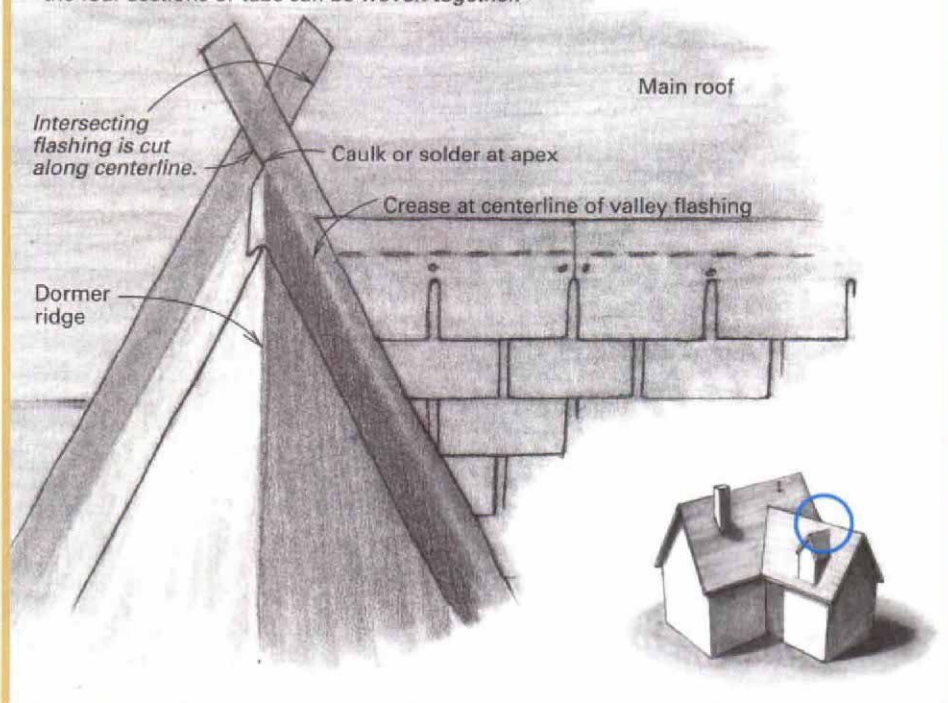
For a stone chimney, the irregularity of the material makes it tough to let in the step flashing neatly. To provide straight joints for step flashing, a mason can substitute brick for stone at the roofline. Brick is hidden in the attic space and concealed from the outside by step flashing.

A good mason leaves the appropriate mortar joints unpointed, making it easy for the roofer to install counterflashing. To pin the folded-over lip of the counterflashing in the mortar joint, I use rolled-up strips of lead flashing. The plugs are mashed into the joint to hold the flashing in place, and the joint is either caulked or pointed with mortar.

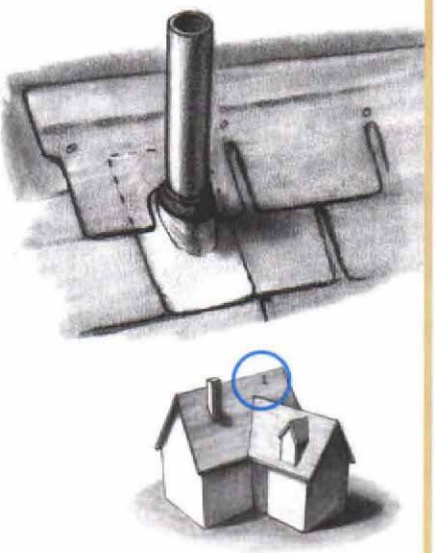
In remodeling work it is sometimes necessary to flash a new roof where it dies into an existing chimney. Rather than chisel out mortar joints to receive new flashing, I prefer to cut a continuous kerf parallel to the new roof. I use an abrasive blade mounted in a circular saw for this operation. The top edge of a continuous counterflashing can be folded into this kerf, which is then sealed with caulk.

Through-pan chimney flashing stops moisture—Although most of the water striking a chimney runs off its sides, some moisture is absorbed into the porous masonry. This is espe-

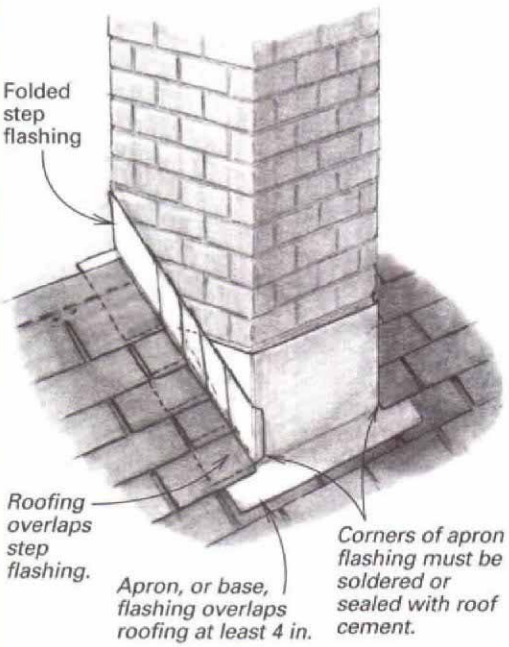
Intersecting valleys are cut and woven together. *When flashing from two valleys intersects, such as at the back of a dormer, the flashing can be cut down the middle, along the crease, and the four sections or tabs can be woven together.*

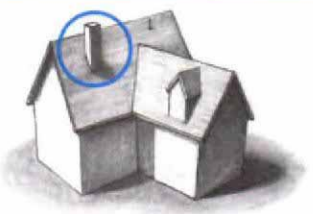


Vent-pipe flashing goes on quickly. *Once the area around the pipe has been shingled, the metal flange and rubber or neoprene gasket is slipped over the pipe and bedded in roof cement. The next course of shingles is notched to fit around the flashing, leaving 1 in. of clearance.*

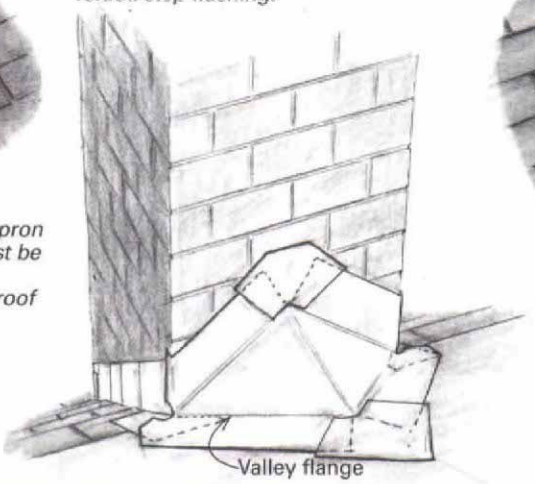


Chimney flashing begins at lowest point. *Typically, the first piece of flashing to be installed on a chimney is the lowest piece, the apron, or base, flashing. Folded step flashing then is installed along the side of the chimney, one piece for each course of shingles.*

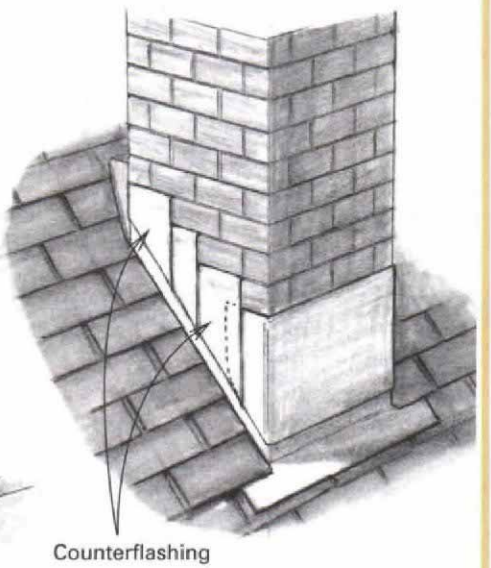




Cricket bridges the valley between chimney and roof. *If the chimney comes through the roof below the ridgeline, a soldered sheet-metal cricket can be installed on the uphill side of the chimney. The valley flange on the cricket is covered by the roofing. At the corner of the chimney, the flange wraps around and over the folded step flashing.*



Counterflashing is woven into masonry. *The lower flashings on all four sides of the chimney are covered with counterflashing. The upper edge of the counterflashing is bent at a right angle and inserted about an inch into the mortar joints between the brick or stone of the chimney.*



daily true of stonework, with its wide, irregular mortar joints. This moisture can migrate far, eventually finding its way into the house. The solution is through-pan flashing, an expensive but effective alternative to regular chimney counterflashing *(FHB* #21, pp. 4849).

First, the mason brings the chimney just above the roofline. Base flashing and step flashing are installed. A sheet of copper or lead flashing with a hole in the middle for the flue then covers the whole chimney. The masonry then continues upward, built on top of the flashing. Through-pan flashing creates a complete break in mortar bond just above the roofline. There is debate among masons about the wisdom of doing this. Some argue that mortar has little tensile strength anyway, and that the mass of a through-flashed chimney will hold it in place. Others feel that the mortar bond is an indispensable part of a chimney's vertical integrity. Common sense suggests that through-pan flashing might not be a good idea for tall, unsupported chimneys. On the other hand, chimneys that extend only a few feet above the ridge aren't going to blow down, through-pan flashing or otherwise.

Follow the directions when flashing skylights–Skylights are furnished with their own flashing kits, so the manufacturers' directions are your best guide to installation. For sloped roofs, the better skylights employ step flashing rather than continuous side flashing. The trouble with continuous side flashing is that water spreads out laterally as it flows downhill. As the length of a skylight from top to bottom increases, so does the likelihood that water will find its way out past the edge of the flashing and into the structure. Step flashings prevent this by shunting water out onto the roof surface. This system ensures that water will be promptly shunted onto the roof surface, as with sidewall step flashing.

Sloped-skylight flashing kits typically consist of a few basic elements. An apron piece surrounds the bottom of the unit, extending out over the shingles below. Step flashings run up the sides, woven in with the shingles. A rubber or metal U-channel covers the top edges of the step flashings. Finally, a wraparound shroud covers the upslope side of the unit with a flange that slips under the shingles above.

Flashing skylights in a metal roof

**I recently installed skylights on my shop building, which has prefab metal roofing, sometimes referred to as "ag panels" (agricultural panels). I wanted to shed the runoff from the skylight safely beyond the panel ribs flanking the opening. To achieve this, I first built an auxiliary curb of 2x4s around the opening, which raised the level of the skylight jamb above the panel ribs. I flashed and counterflashed the curb with a custom-made galvanized flashing that extended beyond the ribs (photo right), and then mounted the skylight with its own flashing on top of the curb (photo below).–*S. M.*

From lead boots to rubber sleeves–In bygone days, the most common flashing for plumbing vent stacks was a lead boot. The boot fit over the stack, and its top edge was beaten down over the rim of the pipe. The surrounding flange of the boot lapped over the roofing below and slipped under the roofing above. The lead boot has been supplanted largely by a metal flange, usually aluminum, attached to a neoprene or rubber gasket (drawing top right, facing page). The rubber stretches around the pipe to accommodate different roof pitches. Although not as durable as lead, the newer hybrid boot gives good service at minimal cost. When replacing an asphalt-shingle roof, it pays to inspect the stack flashings and replace them if the rubber has deteriorated.

To install a stack flashing, first bring the roofing up to or just past the stack. Slip the boot over the stack and bed it in roof cement. Then continue with the roofing so that the lower half of the flashing is exposed while the upper half is covered. I trim the overlapping shingles at least 1 in. away from the base of the boot so that pine needles and such can be washed away. □

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