

Installing Metal Panel Roofs

A high-angle photograph shows two construction workers on a roof. One worker, wearing a white t-shirt and shorts, is kneeling and using a utility knife to cut a long, white metal panel. The other worker, wearing a grey cap and a white t-shirt, is kneeling nearby, observing the process. The roof is made of wooden sheathing, and several wooden battens are visible. The background shows some greenery and a concrete area.

Our family-owned contracting company has been specializing in metal roofing for over 30 years. Recently there has been a significant increase in the use of metal roofing. A variety of metals, including steel, aluminum, and copper, are used for roofing, and several configurations are possible, including panel roofing, standing-seam roofing, and metal tiles.

by Chad Taylor

With proper attention to flashing details, screw-down metal panels will provide a durable, attractive roof

Standing-seam metal roofing is attached to the roof with concealed fasteners. The panels lock together, forming a roof that is uniquely resistant to wind-driven rain. However, standing-seam roofs are significantly more expensive than metal panel roofs with visible screws. Because standing-seam panels are custom-made and seamed with specialized tools, the work is almost always left to a standing-seam contractor.

By contrast, a properly detailed metal panel roof — similar to the “ag panel” roofs that have kept barns dry for decades — is just as leak-proof and long-

lasting, and arguably just as attractive, as a standing-seam roof, but will cost considerably less. And because the installation of metal panel roofs does not require special tools, a builder could consider doing his own roofing.

What Type of Metal?

By far the most common metal used for roofing is steel. Steel roofing can be purchased as galvanized (with a zinc coating), as Galvalume (with an aluminum-zinc alloy coating), or as Acrylume, also known as Galvalume Plus (Galvalume with an acrylic coat-

ing). The most common gauges of steel roofing panels are 24-, 26-, and 29-gauge. The higher the number, the thinner the metal.

The rib pattern in metal roofing varies from manufacturer to manufacturer and region to region. In Florida, a popular profile is called “5-vee crimp.” These panels have a 24-inch-wide exposure, with a double-vee profile along each edge, and a single-vee profile down the center.

We install a lot of mill-finish steel roofing, usually 26-gauge Acrylume. Although the use of factory-painted

panels is growing, many customers in Florida still prefer the mill-finish (unpainted) panels, because these roofs give their homes the old “Key West” look.

Ordering panels. In the old days, when metal panel roofing was installed mostly on farm buildings, suppliers stocked panels in standard lengths, in 2-foot increments from 8 to 16 feet, just like lumber. Roofs longer than 16 feet were covered with lapped panels. These days, it is easy to order roofing panels in any length, down to the fraction of an inch, from a lumberyard or roofing supplier. In general, the length of the panels will be the ridge-to-eaves measurement. In most cases, the 1½ inches added for the eaves overhang is balanced by the 1½ inches subtracted for ventilation at the ridge. Because a cap flashing is installed at the ridge, there is room to fudge an inch or two up top, and still cover any discrepancies with the cap.

Sheathing and Felt Paper

In most cases, when metal roofing is specified for a new house, it is installed over solid plywood sheathing.

To reroof over existing asphalt shingles, the first thing to determine is how many layers of shingles there are on the



Figure 1. The same 3x3-inch flashing profile is used for the rake flashing and the drip-edge. The flashings are mitered at the corner.

roof. If there are two or more layers of shingles, the roof should be stripped to the sheathing. If there is a single layer of shingles, and the shingles aren't curled, it is possible leave the shingles in place. After nailing down 30-pound felt over the shingles, the metal panel roofing can be installed directly on top, as long as the roof sheathing is sound. If the old shingles are uneven or curled, the metal roofing can be installed over purlins installed 16 inches on-center.



Figure 2. The L-flashing at wall intersections is installed before the siding goes up (left). This flashing is installed above the plane of the roof sheathing, to leave enough room for the roofing panels to be slid under it (right).



Underlayment. We always install 30-pound felt under our roofing panels. The felt is installed with plastic cap nails, never metal buttons. I have stripped old metal roofs that were installed over felt attached with metal buttons. When we pulled the panels up, there were rust spots on the underside of the roofing panels above each button. Electrolysis between the roofing buttons and the metal panel can cause the panel to rust from the underside. If you have to install metal roofing on a job where metal buttons have been used on the felt, you should install a rosin-paper slipsheet over the felt. The rosin paper is run from ridge to eaves, and there is no need to fasten it — the panel screws will hold it.

Flashing

When we get to the site, the first step is to install the drip-edge and valley

flashing. We make our own flashings at the shop, using the same type of metal used for the roofing panels. We use the same profile of drip-edge at the eaves and rakes — usually a 3x3-inch flashing. Drip-edge and valley flashing come in 10-foot lengths, the width of a standard brake. We nail the drip-edge every 12 inches; it will later be secured by the panel screws as well. The drip-edge is nailed into the roof sheathing, but not on the exposed face. Adjacent pieces of drip-edge are lapped 3 or 4 inches. Mitering the corners of the drip-edge makes for a neater installation (see Figure 1). Some installers put the rake flashing on top of the panels, but we prefer to install it under the panels. That way you don't have to trample on the panels after they're up to install the rake metal.

If any of the roof planes intersect a wall — for example, at dormer cheeks — the intersection must be flashed. We use an L-flashing with a 4x5-inch profile. The 4-inch dimension goes against the wall, and the 5-inch dimension goes along the roof. This flashing is installed before the siding goes up. It should be installed above the plane of the roof sheathing, to allow enough clearance under the flashing for the roofing panel to be inserted later (Figure 2). The front of the dormer gets the same type of flashing as the cheeks, but bent to a wider angle.

Making the Panels

In addition to our roofing contracting business, we have a separate business supplying metal roofing panels. We have four roll-forming machines — three for making standing-seam panels, and one that produces 5-vee crimp panels that are attached with visible screws.

Most of the time, our roll-forming machines are parked in our yard. But since they are mounted on trailers, they are easily brought to the job site to produce panels of virtually any length. When the panels get over 40 feet long, it is easier to make them on site. We have made panels as long as 65 feet.

We buy our 28-inch-wide metal in 1,500-foot rolls that weigh as much as 3,500 pounds. We can buy the steel as Acrylume — which is Galvalume with an acrylic finish — or as prepainted Galvalume with a Kynar 500 finish.

To manufacture a panel, a sheet-metal coil is fed through a series of rollers. Each set of rollers has a different shape. The rollers progressively change the metal profile, until the last set of rollers produces the familiar 5-vee shape. The machine is programmed to cut the panels automatically to the desired length.



Valley flashing. We make our valley flashing 10x10 inches, with a 1-inch-high inverted vee in the center. This profile is called a “W valley” (Figure 3). When the roof slopes on either side of a valley have unequal areas, large amounts of water rushing into one side of the valley can run up the other side; the inverted vee is intended to prevent this.

When the valley is longer than 10 feet, we overlap the valley flashing by 6 inches, and we always install caulk or butyl tape at the overlap. Never use asphalt roofing cement on a metal roofing job. In areas requiring a sealant, we use butyl tape or a urethane caulk like Bradco 518 (Bradco Supply, 877/427-2326). Since many silicone caulks contain acids, they should never be used on metal roofs (see “Sealing and Flashing Metal Roofs,” 1/00).

Where the tops of two valleys meet at a dormer ridge, the flashing must be carefully cut and folded to create a water-tight intersection (Figure 4). Caulk should be installed at vulnerable corners of this intersection.

Preparing the Panels

Since metal panel roofs have exposed fasteners, it’s important that the screw heads all line up. Nothing looks worse on a metal roof than a wandering line of screw heads. The fastener locations should be marked while the panels are on the ground or, better yet, the screw holes should all be predrilled. Panels are always drilled from the underside. It is usually possible to predrill four or five panels at once.

We screw the roofing panels every 16 inches along the ribs. With 5-vee panels, which have a 24-inch-wide exposure, each panel gets screwed in the center vee, and on each edge. Since different panel profiles may have different fastening requirements, always follow the panel manufacturer’s recommendations for fastening.

Establishing a string line. We stretch a string line 1½ inches off the eaves to locate the bottom edge of the panels. An out-of-square roof can cause more problems with metal roofing than with

asphalt shingles, because the panels are large, and each succeeding panel will be parallel to the first panel installed. In most cases, a roof can be checked for square by test-fitting the first panel at the rake. If the bottom of the panel is aligned with the string line, it should be parallel to the rake as well (Figure 5).

The most important guide is the string line at the eaves. All of the panels should be square to the string. If the roof is out-of-square, then let the panel be out of square at the rake. If the panel is installed parallel to the rake on an out-of-square roof, you can end up with a saw-tooth pattern at the eaves.

A typical rake overhang is 1 inch, but we can taper from ½ to 1½ inches to make up for an out-of-square roof. If the out-of-square condition is extreme, then the panel will have to be cut with a

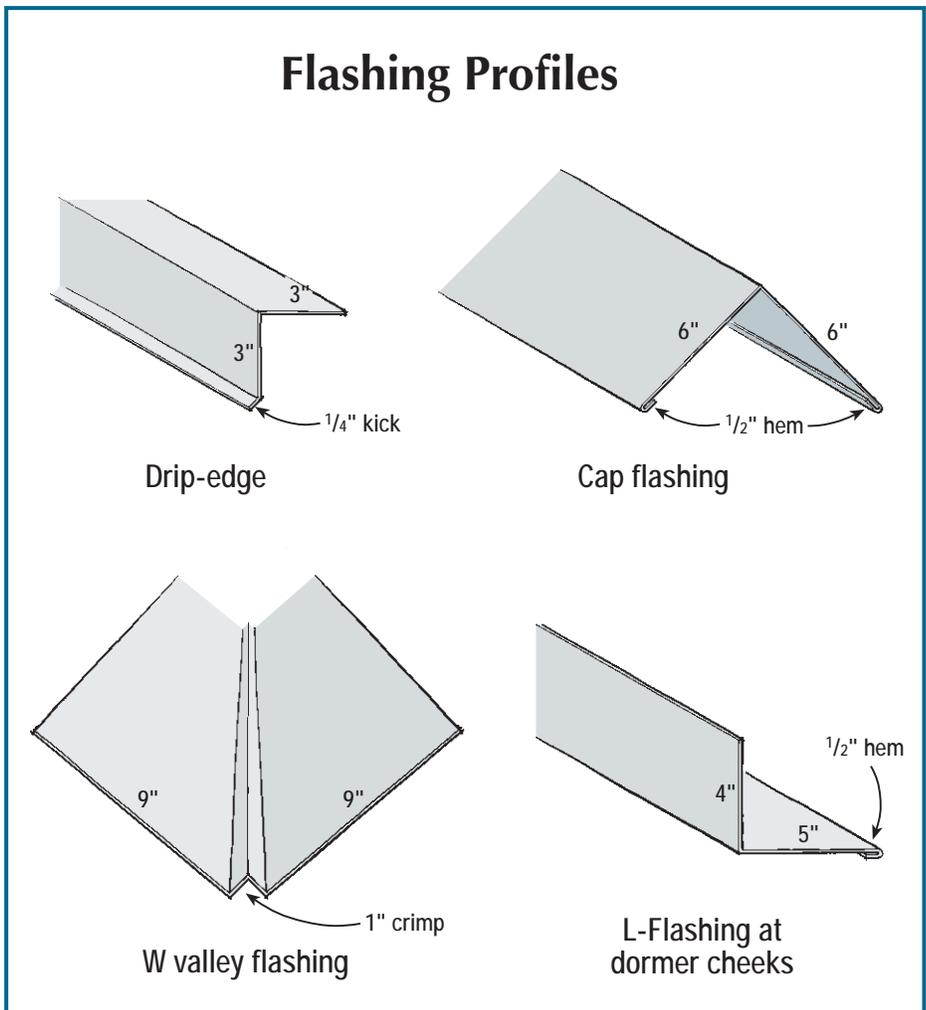


Figure 3. Flashing needs for most roofs can be handled with four simple flashing profiles.



Figure 4. Where the tops of two valleys intersect a dormer ridge, one of the valleys is run past the intersection (left). Then the valley is carefully trimmed and folded to create a tight flashing (right). Use caulk at vulnerable corners.

lengthwise taper, parallel to the rake. In that case, we install the rake flashing above the roofing panel, rather than underneath. This covers the ragged edge of the tapered cut.

Panel Installation

Metal roofing panels have a right and a left side. The side of the panel with the

“big lip” (a $\frac{1}{4}$ - to $\frac{3}{8}$ -inch flange that extends beyond the double-vees) goes underneath, and the side of the panel with the “little lip” (no flange) laps on top. The short flange is designed to provide bearing against the sheathing.

We have had good luck using $1\frac{1}{2}$ -inch Wood Zac screws with a $\frac{5}{16}$ -inch hex head (available from Construction Fasteners, 800/234-4533). These self-tapping screws are much sharper than some other brands. Although we usually predrill the panels, Wood Zac screws can cut their own hole when necessary. We also like Wood Zac screws because the screw-heads have a flange that completely protects the neoprene washer from exposure to the weather.

Screws should be installed snugly, but not so tight that the neoprene washer deforms (Figure 6, next page). Since adjacent panels overlap along the edges, we omit the screws under the leading edge of the panel. At the rake, we install screws every 8 inches, to resist wind forces.

There has been a lot of debate about whether to install screws on top of the ribs, or on the flat part of the panels. We have had good success for years with screwing at the top of the ribs. I feel there is less chance for leaks if the holes in the metal are at the high points rather than the low points of the panel.



Figure 5. Roof panels are always installed square to the eaves. If you're lucky, and the roof is square, the panel will be parallel to the rake.



Figure 6. Fastening requirements vary, depending upon the panel configuration. Typical 5-vee panels are screwed every 16 inches along the ribs.

Valleys and Dormers

When a roof panel intersects a valley, a triangular section needs to be cut out of the bottom of the panel. Measure at the roof, mark the panel, and make the cut following the valley. This cut can be fairly rough, since the final cut will be made later.

Roofing panels are always cut with snips, never with an abrasive blade in a circular saw. A “hot cut” creates hot metal shavings which can burn the acrylic coating on the roofing panel. Within a short time, these burned spots will rust, the roof will be unsightly, and you’ll have a callback.

Butyl tape or caulk should be installed between the bottom of the roofing panels and the valley flashing. In our climate, which includes very high winds during hurricane season, we usually do not install closure strips at valleys. Our company has successfully installed metal panel roofs this way for years, without problems. In other area of the country, where ice backups can occur, the installation of closure strips at valleys may be necessary.

Once all of the panels on one side of a valley are installed, we snap a line 3 inches up from the center of the valley, and trim the panels to the chalk line, using metal snips (Figure 7). Always use blue chalk, which is washable —



Figure 7. Where the panels meet a valley, the edges are trimmed to a chalk line after the panels are installed.

red chalk will leave a stain on the roofing panels. The bottoms of the panels are then screwed down at each rib, along a line 3 inches up from the ends of the panels.

At dormer cheeks and other wall intersections, the panels are cut to fit and slid under the previously installed flashing. We install butyl tape or caulk between the roofing panel and the flashing (Figure 8), then screw down the flashing every 3 or 4 inches. If a parallel panel rib falls under the flashing, then the butyl tape or caulk can be omitted.

Penetrations

A rectangular penetration, like a chimney, will require a cricket on the

upslope side, unless it is located at the ridge. A cricket is a small gable diverter that forms two valleys. We build our crickets out of plywood, and roof them first with a torch-down modified bitumen membrane. This membrane covers the cricket, runs up both valleys, and also runs 4 inches up the chimney. Once the torch-down membrane is installed, we cover it with a one-piece custom-made metal flashing. On the chimney, this flashing is covered with a counterflashing. Since chimneys in this part of Florida are usually stuccoed, the counterflashing is typically a stucco stop. Panels that intersect the cricket valleys are detailed the same as any other valley.

Plumbing vents. The best boot available for flashing plumbing vents in metal roofs is the Dektite boot, manufactured by ITW Buildex (800/284-5339). This EDPM flashing has a flexible aluminum ring at the base, allowing it to conform to any roofing profile, including the ribs of metal roofing panels. Copper or lead flashing should never be used on a Galvalume roof.

To install the boot, we cut a hole in the roofing panel for the plumbing vent, slip the panel over the pipe, and install the panel normally. The boot is then installed on top of the roofing panel. The

Figure 8. At wall intersections, it's important to install butyl tape or caulk between the L-flashing and the roof panels. Caulk can be omitted if one of the panel ribs falls under the flashing.



Figure 9. The best flashing for a plumbing vent is the Dektite boot. The boot is slipped over the pipe after the panel is installed. After installing a circle of caulk (left), the aluminum ring on the flashing is pressed down to conform to the ribs of the roofing panel. The flashing should be screwed every 3 inches (right).



Figure 10. The last step is installing the 6x6-inch cap flashing.

boot slides down over the pipe, and the aluminum ring is adjusted to conform to the profile of the roofing panel. Put a ring of caulk between the flashing and the roofing panel, and install screws around the ring, every 3 inches (Figure 9, previous page).

Installing the Ridge Cap

The final part of the job is the installation of the ridge cap. We use a 6x6 cap flashing (Figure 10). The roofing panels don't have to extend all the way to the ridge, but the cap flashing should overlap the top of the roofing panels by at least 3 or 4 inches.

For a ventilated ridge, we cut back the roof sheathing 1½ inches on either side. We use ridge venting products designed specifically for metal roofs — either Cor-A-Vent or ProfileVent (manufactured by Ventco). These plastic mesh products are unfolded or unrolled, and installed over the gap in the roof sheathing. Our 6x6-inch cap flashing is then screwed through the plastic vent.



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Sources of Supply

Atlas Bolt and Screw Co.

1628 Troy Rd.
Ashland, OH 44805
800/321-6846
www.atlasfasteners.com

Bradco Supply

13 Production Way
Avenel, NJ 07001
877/427-2326
www.bradcosupply.com
Roofing supplies, including caulk

Construction Fasteners Inc.

Spring St. and Van Reed Rd.
P.O. Box 6326
Wyomissing, PA 19610
800/234-4533
www.constructionfasteners.com
Manufacturer of Wood Zac roofing screws

Cor-A-Vent

P.O. Box 428
Mishawaka, IN 46546-0428
800/837-8368
www.cor-a-vent.com
Manufacturer of ridge vent

Dynamic Fastener

9911 E. 53rd St.
Kansas City, MO 64133
800/821-5448
www.dynamicfastener.com

East Coast Fasteners and Closures

P.O. Box Q.
Elkhart Lake, WI 53020
800/558-5895

ITW Buildex

1349 W. Bryn Mawr Ave.
Itasca, IL 60143
www.itwbuildex.com
800/284-5339
Manufacturer of Dektite flashing for plumbing vents

Ventco

115 Lismore Ave.
Glenside, PA 19038
215-887-6600
www.profilevent.com
Manufacturer of ProfileVent ridge vent