Flashing the Tough Spots

by Joseph Cazeault

A good part of my metalworking business is specialty flashings. If a builder has a large chimney, a barrel dormer, a cricket, or some other complex shape to flash, I'll get a call. Not only do most builders lack the equipment to do these jobs, but they have an incomplete knowledge of how flashings work. For instance, most forget that water can run uphill as well as downhill. Many of the leaks I see occur when high winds or melting snow and ice cause water to work its way up the slope of a roof. The flashing works fine under normal conditions, but as soon as a big northeaster comes along, the builder gets a callback. Fortunately, problems like this are easily avoided. The trick is to choose the right materials and to make proper use of soldered and lapped joints (see "Soldering Tips").

Metal Choices

Flashing should last at least as long as the roof covering, preferably longer. In the long run, it doesn't pay to skimp on quality materials. Upgrading from lead to copper, for example, will only add $50 to the cost of the average chimney, but the flashing will last as long as the building. And on a big job like a chimney pan, most of the cost is for labor anyway.

High-quality metal, soldered joints, and watertight details will make roof flashings last the life of the house

Before putting different types of metals together (say, aluminum and copper or lead), make sure you understand the galvanic series, which classifies metals by how chemically active they are (see Figure 1). The gist of it is that when two dissimilar metals come into contact in the presence of moisture, the more active metal corrodes by transferring ions to the more passive; the more passive metal remains unharmed. The farther apart the metals are on the list, the faster the ion exchange, and the greater the corrosion. (This same process is used to advantage to protect steel by galvanizing: The

Soldering Tips

Soldering is like anything else — it takes practice to get comfortable with the techniques. But if you're careful you can make a tight joint on the first try. If you follow the steps outlined here, you will be able to solder copper, steel, and lead-coated copper. Aluminum requires special techniques and materials that are best left to the pros.

Tools and Materials

You'll need a good soldering iron, 60/40 tin-lead solder (which comes in bars and sells by the pound), an acid-based flux, a brush to apply it, and a soldering iron.

Flux is a liquid cleansing agent; it removes tarnish that might interfere with adhesion and acts as a wetting agent to help the molten solder penetrate the joint. I use a flux called Ruby Fluid (Ruby Chemical Co., 1601 Woodland Ave., Columbus, OH 43219; 614/252-9000). You can make an excellent homemade flux by laying some pieces of zinc flashing in a tin cup and pouring in enough muriatic acid to cover them. The mixture will then boil for about 15 minutes, as the zinc reacts with the copper. When it's done, you'll have what I've found to be a perfect flux for soldering copper and other flashings.

Soldering irons have copper tips and can be electric or nonelectric. The best bet for most occasional users is a number 4 electric soldering iron. Professional metalworkers use non-electric irons of various sizes that are heated in a special propane stove.

Preparing the Joint

Don't rely on solder for mechanical strength; instead, make a secure mechanical connection before you solder. I join flashing pieces with 1/2-inch-wide flat-lock seams (see photo, below left). I use my brake to make a bend in the ends of adjacent pieces, hook them together, flatten the seam with a mallet, then lock it in place by putting an awl on the joint and hitting it with a hammer. This makes a dimple that keeps the joint from sliding.

Tinning the Iron

Whatever iron you use, the tip must be kept tinned (coated with solder) at all times. Tinning aids heat transfer and prevents pitting, corrosion, and tarnishing. When you get a new soldering iron, file or sand its tip down to bare copper. If you have an old iron with a pitted or blackened tip, rub it back and forth on a piece of medium-grade sandpaper until the copper shows through, then clean the tip by rubbing it on a block of solid salimoniac (available from any hardware store). Heat up the iron, brush some flux on the tip, and hold the solder to the tip, turning the iron's handle to help spread the solder evenly. Flux must flow before the solder melts, so never tin with the tip at full heat. Remove excess solder with a clean rag.

Soldering

Once the iron is ready, I use a flux brush to coat the joint with flux. (The flux brush's bristles stand up to acid better than the bristles on a paintbrush.) I then lay the soldering iron on the top of the joint to heat it, using the flat surface of the tip to maximize heat transfer (see photo, below right). I touch the solder to the hot joint rather than to the tip of the iron; the heat will draw the solder into the joint, binding the parts together. The joint must be heated to the right temperature. If it's too cold it won't draw in the solder; if it's too hot it will draw it in so fast that you'll use more solder than you need, and may even burn it. Getting the right temperature is something that comes with practice. — *J.C.*

For extra strength, the author first joins large pieces of metal with a flat lock seam, then solders the joint (left). When soldering, heat the joint with the iron, then touch the solder to the heated metal (right).

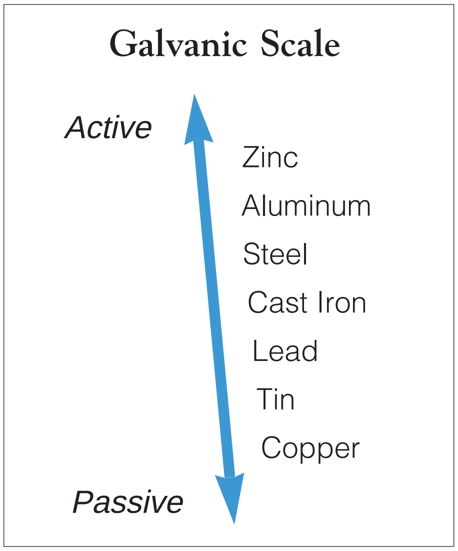


Figure 1. *When two dissimilar metals come together in the presence of moisture, the more "active" metal will corrode — a process called galvanic corrosion. The farther apart the metals are on the galvanic series, the greater the corrosion. To prevent galvanic corrosion, don't put dissimilar metals together, or — if you must — separate them with building paper or a bituminous membrane.*

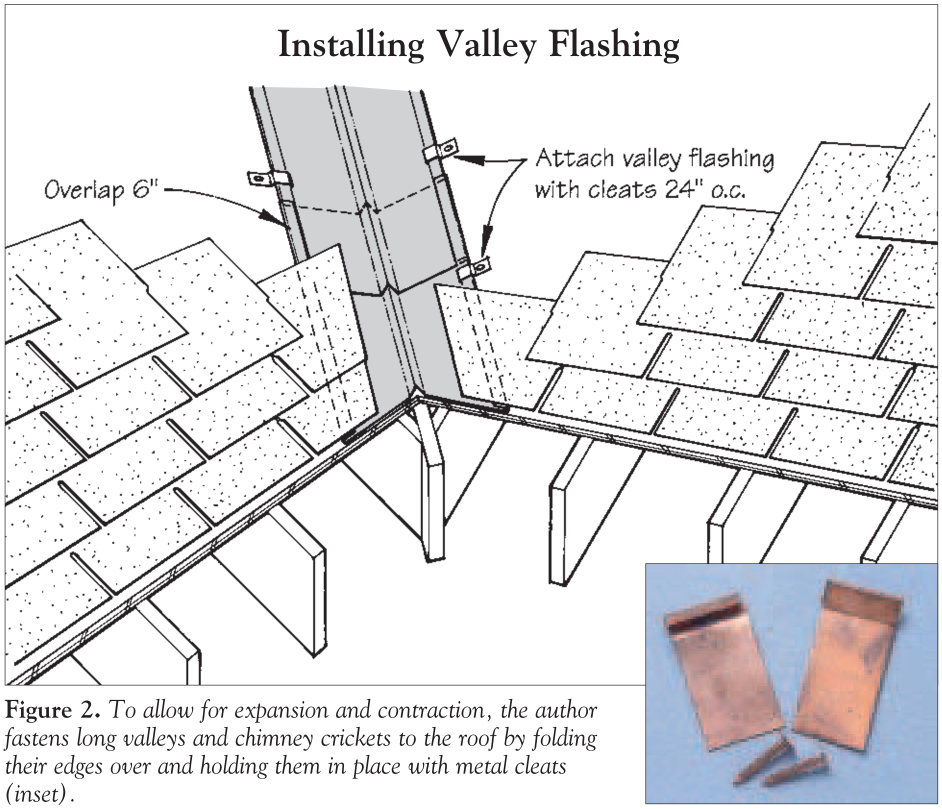


Figure 2. *To allow for expansion and contraction, the author fastens long valleys and chimney crickets to the roof by folding their edges over and holding them in place with metal cleats (inset).*

zinc coating on a piece of galvanized steel corrodes instead of the underlying steel.) The best way to prevent galvanic corrosion is to not use dissimilar metals in the same place; if that's impossible, combine only those metals that are close together on the list. Painting the metal surfaces with a primer may help, but I typically separate dissimilar metals with a piece of eaves membrane.

Here is a rundown of the main choices for flashings:

Galvanized steel is probably the least expensive flashing material, but I rarely use it because it will eventually rust. If you've ever seen a metal roof on an old shed, you know that once the protective zinc coating corrodes, the underlying steel is left bare to the elements. The rust stains will then run down the siding.

Zinc is also common in my area. I never use zinc, however, because it becomes pitted when exposed to salt or acid. This includes acid rain and chimney exhaust from an oil burner or wood stove.

Aluminum is widely used for step flashings, which are generally covered by roofing and siding. But I don't recommend aluminum in other areas. For one thing, it can't be soldered by normal means. For another, it tends to pit and oxidize, especially in salty or polluted air. If you must use aluminum in these environments, the .032-inch thickness will last substantially longer. Anodized or painted aluminum is less prone to oxidation, but remember that a cut edge will eventually deteriorate.

Aluminum is also inappropriate around masonry, because the lime and acids in the masonry will eat the aluminum. If you must put aluminum flashing against masonry, either paint the flashing or separate the flashing from the masonry with a membrane.

Copper flashings can be fabricated from either cold-rolled or soft copper. Soft copper is easily worked, making it useful for decorative jobs, as well as for complicated shapes like the tops of valleys, where malleability is a real asset. Cold-rolled copper is harder to work with, but it's far stronger.

The green patina that eventually appears on copper can stain trim and shingles when rain runs off it. Even new copper isn't immune, as its surface is etched by acid. The main symptoms are bright red streaks on the roof and green stains on the siding.

Lead is durable and malleable, making it a favorite for cap flashing. It's also very common at the tops of valleys or at the bases of dormers and chimneys. Lead won't stain and is paintable. Before painting lead, let it weather for a bit, then scrub it with a good household cleaner to remove any oily film. Lead is a good choice for use in industrial environments.

The main problem with lead is the very softness that makes it popular. Lead tears easily, making it a poor choice for places where workers might walk at some point. Lead is also more durable if left hanging fairly free, as on a apron; when fastened on all sides, it will fatigue from movement.

Lead-coated copper is my first choice for most jobs, since it combines copper's durability with lead's resistance to staining. It consists of a sheet of 6-ounce cold-rolled copper with a coating of lead on each side. It has the same working properties as cold-rolled copper.

For added insurance, I install metal flashing over a self-adhering bituminous membrane (see "Leakproof Details for Shallow Roofs," 5/94), which serves as a backup watershed if the flashing develops any leaks. Membranes are easy to install and are relatively foolproof. They're also self-healing, which means that they automatically seal nail penetrations and the laps between sheets. And they're fully adhered, so water can't travel beneath them. Any leaks will remain localized. This prevents any water that gets under the roofing from reaching the sheathing.

Tools and Techniques

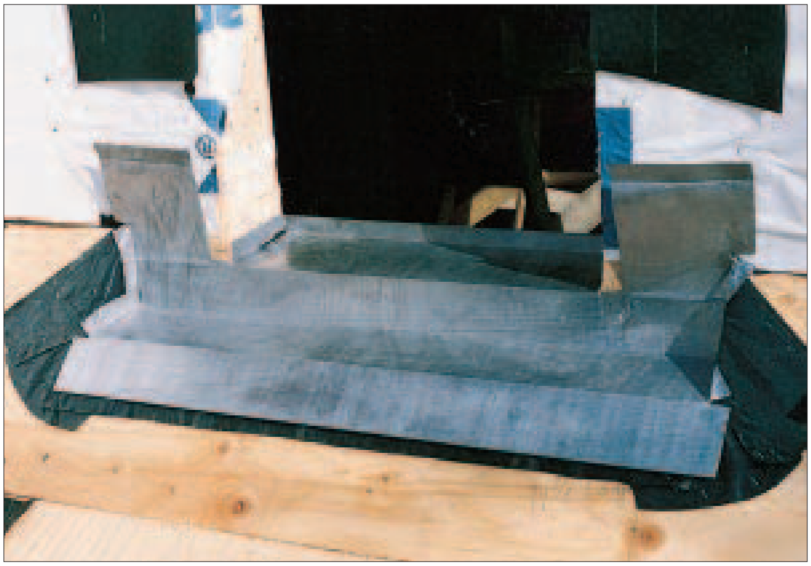


Figure 3. *To protect recessed windows, the author first covers the sloping shelf with bituminous eaves membrane, then covers the membrane with a one-piece soldered pan. Counterflashings are soldered on as needed.*

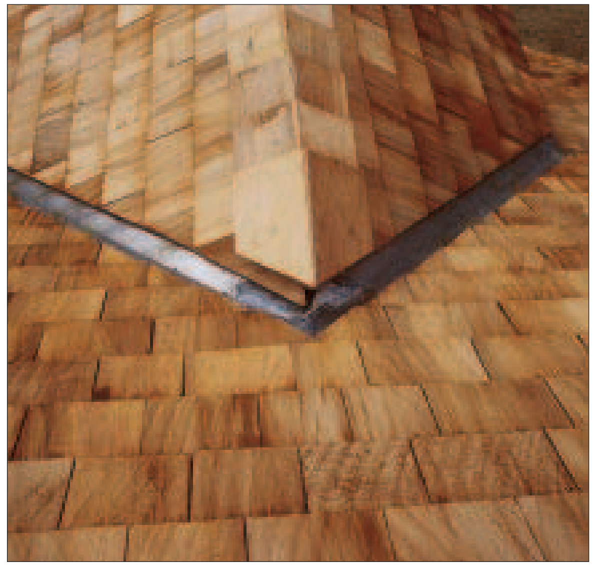


Figure 4. *A soldered joint at the top of a valley will break when the valley expands and contracts. Instead, the author laps a lead cap over the top of the valley flashing.*

To cut and bend flashing, you'll need a good pair of gloves, left- and right-handed aviation snips for cutting, and a pair of hand seamers — also known as a hand brake — to make small bends. A sheet-metal brake is good for fabricating flashing pieces, but a full-size, 12 1/2-foot-long brake can cost over $1,000, so few builders own one. For the occasional large piece, you can sub the work out to a sheet-metal shop or rent a brake. You can also improvise by clamping the metal between a pair of boards at the end of a worktable and bending the flashing with a wooden mallet.

To join sheets of metal on flat areas, I flat-lock the sheets together and solder the seam. On sloped roofs, I can use a lap joint. Long pieces, like valleys, should be free-floating. I fasten them to the roof by folding their edges back toward the center and hold them in place with metal cleats that I make with my hand seamers (Figure 2). The cleats serve two purposes. They permit the flashing to expand and contract, and since the nails go through the cleats instead of the pan, water that backs up under the shingles won't have any nail holes to seep through. (This, by the way, is why you use step flashing at the cheek of a dormer or chimney; a continuous flashing would be too much work because it would have to be cleated to prevent expansion from buckling it.)

The details that follow explain how some of these principles are applied in the field.

Recessed Windows

A good example of a tough flashing job is the three second-story windows that I recently recessed into the top edge of a shed roof — an application where sloppy flashings could spell disaster. Framing is important in these windows.

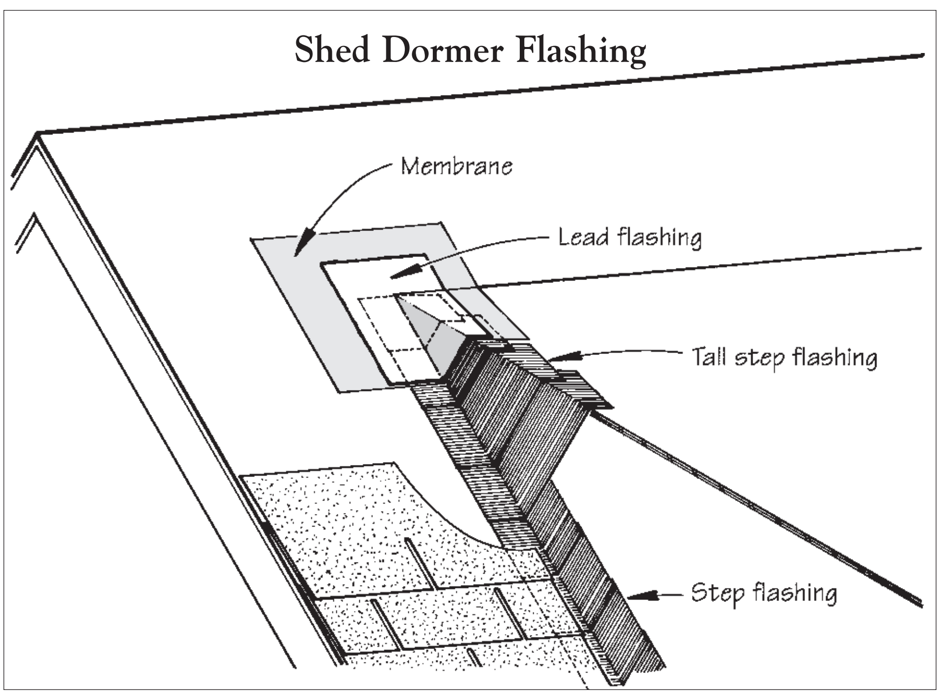
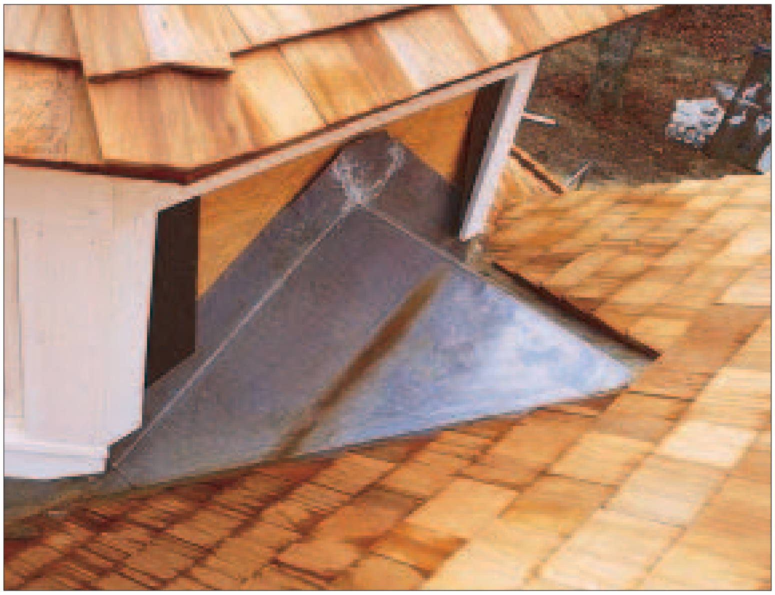


Figure 5. *Using taller step flashings along the top few feet of a shed dormer will keep melting snow and windblown water out of the intersection.*

Figure 6. *The author catches water at the junction of two cross gables with a soldered, cone-shaped scupper. Besides being attractive, the cone lets excess water spill over rather than backing up beneath the roof.*



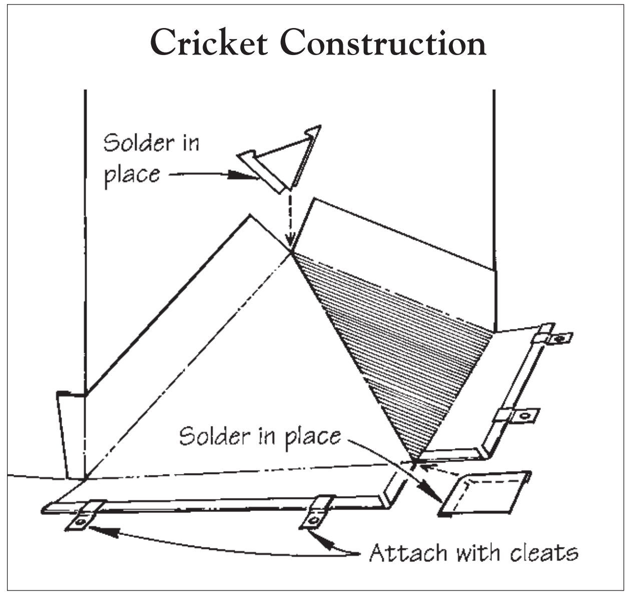


Figure 7. *A cricket should be a single piece of metal, whether shop-fabricated or soldered together on site. To permit expansion and contraction, attach a cricket with cleats.*

I've seen recessed windows that sit right on the floor of the recess — a mistake that practically begs melting snow to seep under the sill. To prevent this, I asked the framer to step the rough sill at least 4 inches up from the recess. It's also good practice to slope the recess away from the window and toward the edge of the roof; the more slope, the better.

After lining the opening with a membrane, I soldered together a lead-coated copper pan that covered the rough sill and the floor of the recess, as well as bending about 8 inches onto the shed roof (Figure 3). The asphalt roof shingles would later be tucked beneath this bend. I then set the pan in place and carefully soldered on a series of counterflashing pieces, making the flashing along the sides of the recess wide enough to extend a few inches beneath the roofing. The pan was left free-floating so that expansion and contraction wouldn't break the solder joint. To keep out drafts and windblown rain, we set the window in a thick bead of caulk, holding the bead 1$^1/_2$ inches back from the sides of the opening to allow for drainage.

Valleys

One place to avoid a soldered joint is where two valleys meet at the peak of a roof. Some builders cap the valleys with the same metal they use in the valley, and solder the valleys to the cap. But expansion and contraction of the valley will eventually break the soldered joint. The solution is to lap the cap over the valley as much as possible. I use lead flashing for this application (Figure 4). If the overlap is sufficient, it will keep out windblown water without soldering. Six inches overlay is usually sufficient on a valley.

Shed Dormers

Another problem area is where the sidewall of a shed dormer dies into the main roof, since snow can pile up at the intersection and water can blow up under the dormer's eaves. The cheek of the dormer is generally lined with step flashings, so the solution is to install taller step flashings along the top few feet of the dormer, and to fold these over the top of the roof sheathing (Figure 5). The intersection where the dormer roof and sidewall meet the main roof is then covered with a continuous sheet of lead (which can be molded to fit the intersection) and isolated from the step flashings with a bituminous membrane. This takes some extra planning on the part of the builder, since the tall step flashing must be installed before the rake boards on the dormer. But it can save a callback down the road.

Scuppers

Where a pair of cross gables meet at an outside corner, drainage can be a headache. Since there's no place to put a gutter here, water is usually left to dump on the ground. But this invites water to puddle up against the foundation, and can soak the siding. The traditional way to drain these trouble spots was with a conductor head — a cylindrical catch basin poised at the top of a downspout. But if the downspout gets clogged, the conductor head can fill up with water and freeze. This can break it apart at the seams and cause water to back up under the roof.

A better solution is to use a cone-shaped scupper (Figure 6). If the downspout stops up, the scupper's cone shape lets excess water spill over the sides instead of backing up under the roof; if it freezes, the ice will push itself up out of the cone, rather than pushing the cone apart.

Crickets

Chimneys aren't the only places that need crickets. (For more on flashing chimneys, see "Flashing a Chimney the Right Way," 11/92). You need a cricket anywhere a roof slope runs into a vertical surface — such as the small towers that commonly break the roof line in Victorian houses (Figure 7). A cricket should be a single piece of metal, whether bent in the shop or soldered together on site. The cricket needs firm support underneath, usually a base made of plywood.

Since a cricket is typically a large sheet of metal, it shouldn't be locked in place with nails, which will restrict expansion and contraction. Instead, it should be held with cleats like a valley flashing. ■

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