

Flashing a Chimney With Soldered Copper

Traditional methods and materials prevent leaks for the life of the structure

by John Seifert and Fred Seifert Sr.

We're a third-generation custom building company here on Long Island. Back when the business was founded, tinsmiths generally installed all of a building's flashing — window pans and heads, aprons, dormers, valleys, vents, gutters, chimneys. You name it, they flashed it, using sheet copper and traditional soldering methods.

Today most builders use lead to flash their chimneys, because it's easy to work with and masons are used to installing it. But lead has its share of drawbacks: Folded corners create bulges that you have to work around, and the seams rely on caulking for a seal. Also, lead can tear at the worst possible moment — when you're gently hammering it into shape, or during a reroof because it's worn thin from corrosion. When that happens, the best option is to start over, but it's more common for the roofer to break out the caulking gun.



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For these reasons, we still rely exclusively on copper flashing. Soldered copper provides a long-lasting seamless barrier against water entry, plus it looks great. In this article, we'll look at a job we do from time to time: a midslope chimney backed with a cricket.

Materials of Choice

We use lead-coated copper for a couple of reasons. First, most of the houses we build are right off Long Island Sound, where

the salt air seems to wear out uncoated red copper too quickly. Second, the oils in western red cedar roof shingles can stain red copper, marring the overall appearance of the job. (Under other conditions, however, red copper is extremely long-lasting and typically develops that desirable verdigris patina seen on fine old work.)

As you may have heard, the price of copper has nearly quadrupled over the past five years; in just the last year, it's doubled from



Figure 1. Before soldering, author John Seifert tins the copper tip: He rubs it on a soft brick to clean it (A) and then on a block of sal ammoniac (B), a soft mineral that provides an oxide-free zone around the heated tip, thereby allowing the solder to coat it. Here, working on a vent-stack shroud, he first applies enough solder to connect the joint (C), then goes back and applies a heavier layer of solder (D) to fill possible pinholes. Flux, applied before and during the process (E), cleans the metal and helps the solder flow.

about \$2 to \$4 per pound. That surely places copper on the chopping block for many construction budgets, but so far the high-end market we serve is taking the price increase in stride.

Soldering Tips

In concept, soldering copper is a simple procedure, and a skilled tinsmith can make it look easy. As with any skill, proficiency requires practice, but anyone who follows a few basic rules can get the hang of it.

To begin with, the metal must be chemically clean — free of corrosion (oxides) and surface contaminants like dirt and grease. Cleaning is done with flux. There are many flux formulations, to match different applications; for sheet copper, we use a zinc-chloride/ammonium-chloride blend.

The parts to be soldered must be held in firm contact with each other, either with weights or by clamping. If expansion and

contraction are likely to stress a joint, it's best to form a mechanical connection first, then solder it. Make sure the solder matches the metal; for copper flashing, we use a 65-35 tin-lead alloy.

Before soldering, the iron tip should be “tinned” — covered with a thin coating of solder — to ensure good, even heat transmission (see **Figure 1, facing page**). Melt the solder by touching it to the heated metal, not to the iron. Don't overheat or you'll get contamination from oxidation of the iron; red-hot is too hot. Once you start, solder continuously and rapidly to avoid oxidation. And since it's corrosive, clean the flux residue from the surrounding metal immediately after soldering, using warm water.

We use a small portable acetylene torch that delivers steady, regulated heat to the tip. It's made by Hado Machinery, in South Plainfield, N.J., (908/561-7272) and costs \$225; if you plan to do much soldered flashing work, it will pay for itself quickly.

Coordination of the Trades

The tinsmith and the mason have to work together to develop a practical and visually pleasing design for the chimney. Our flashing intersects the masonry in stepped shoulders that follow the roof pitch. The steps continue around the back of the chimney, climbing the slope of the cricket (**Figure 2**). To guide the forming of the steps in the masonry and the fabrication of the various flashing parts, we make patterns out of tar paper. The mason follows the patterns to build the base contours, then withdraws for a couple of days while we prepare and install the flashing.

For accuracy, we trace new patterns from the completed



Figure 2. Working directly from the masonry base (A), John traces a template of the stepped shoulders (B), which co-author Fred Seifert uses to cut the side flashings (C).

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Figure 3. Fred fabricates the through-chimney counterflashings on a bench at the site, cutting and bending and then fitting (B) and soldering (C) the side pieces.



masonry shoulders before making the flashing. We transfer the patterns directly onto the copper using a steel square and a scratch awl, adding lips and overhangs as needed.

To achieve a strong soldered joint, the materials must overlap — not just butt — so the heat can draw the solder in between the two surfaces (anyone who has ever sweated copper pipe knows this). That means you have to plan your cuts so you leave extra overlapping material for the joints. In some cases, a $\frac{3}{8}$ -inch or $\frac{1}{2}$ -inch overlap is sufficient. But at corner joints, which are likely to be stressed more from movement of the metal, we leave extra material so that we can make a folded seam; it too gets soldered (see illustration, facing page).

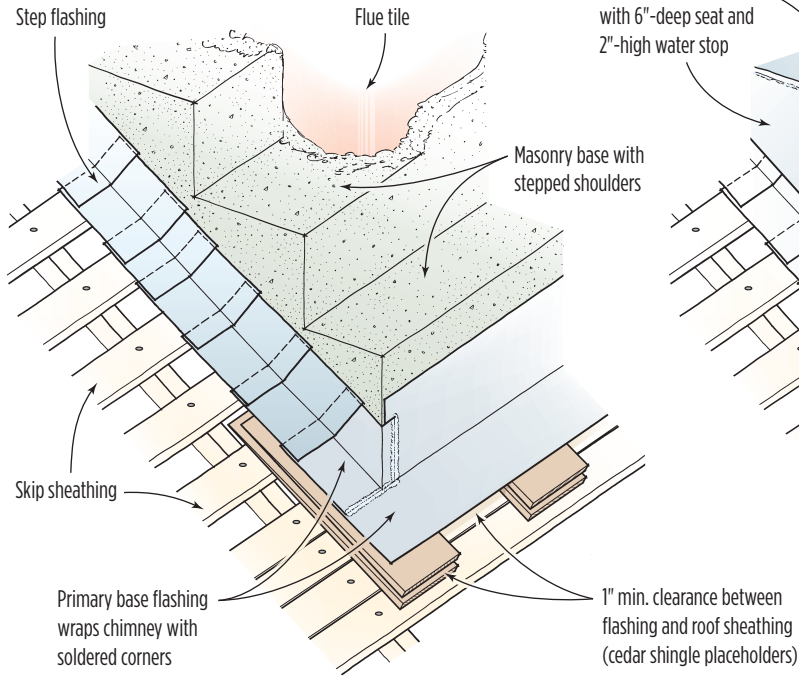
When sizing the flashing, we also allow for the thickness of



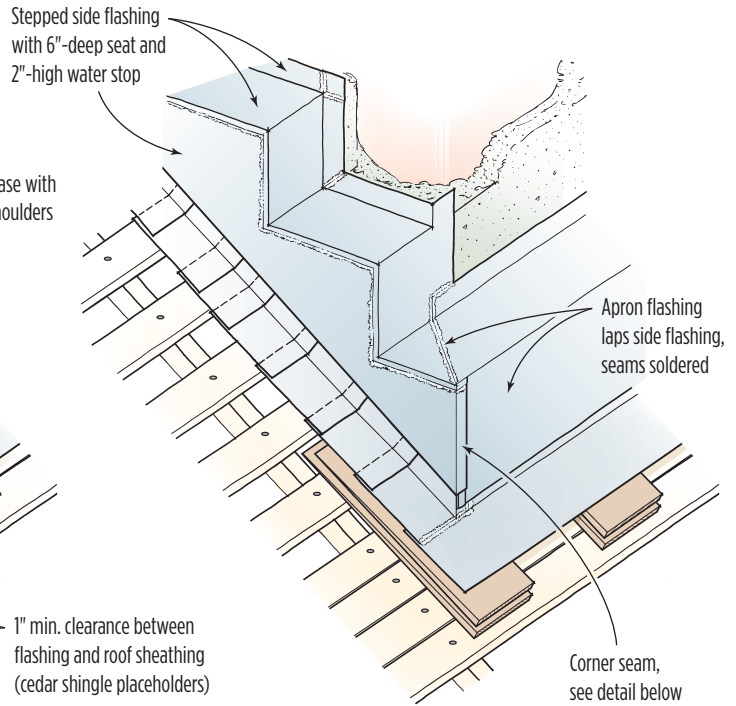
Figure 4. The base flashings — including the step flashings and front apron (A) and the cricket (B) — are installed first. The two-piece cricket is made in the shop — using a brake to ensure straight valley creases — then brought to the roof, where the ridge seam is bent in place with a hand seamer and a rawhide mallet.

Chimney Flashing Details

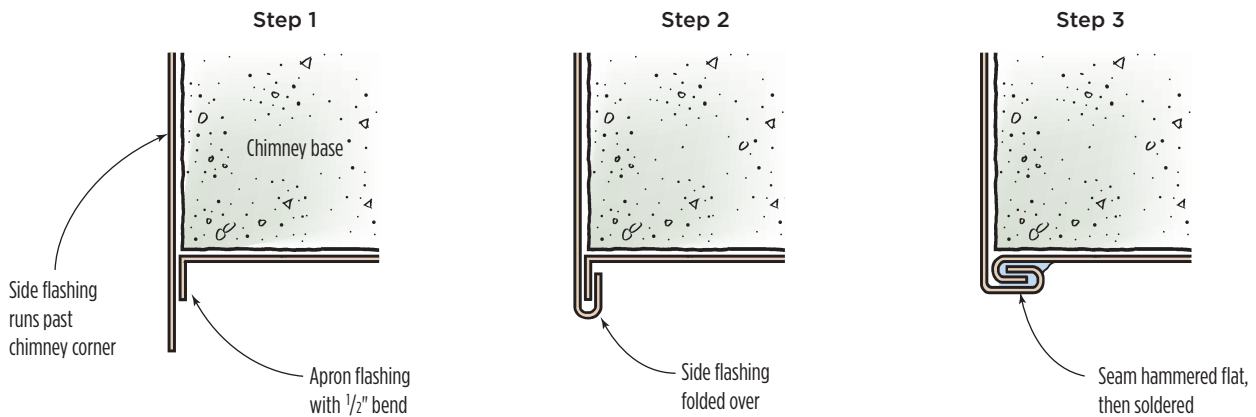
Base Flashing



Counterflashing



Making a Corner Seam — Plan View



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the finish roofing material — typically red cedar shingles — and leave at least 1 inch of clearance above the sheathing.

Stepping Up the Sides and Back

Once we've cut out the stepped pieces, which look like stair stringers, we use them to make patterns for the corresponding inside steps — the parts that run through the masonry on all four sides. These are cut and folded accordion-style in one-piece sections (Figure 3, page 44). The horizontal steps insert 6 inches into the chimney, covering the tops of the masonry steps. They have a 2-inch upturned leg on the inside to catch any water that

comes down between the chimney liner and the masonry.

The components are assembled facedown on the bench and fully soldered from the back. We use a soldering technique called “lacing,” which involves moving the torch back and forth in such a way that we can gradually feed the solder and build a smooth seam.

As every builder knows, any time you cut and fold a piece of bent flashing, you lose material at outside corners. The nice thing about soldering is that you can make a seamless patch to fill in the missing material, which we do on the outside corners of the steps. Inside corners overlap, so we clamp them tight and solder them.



Figure 5. Counterflashings cover the base flashings but are not soldered to them, so that the masonry can move separately from the roof structure without creating a leak. Here, Fred fits the apron counterflashing (A) and — with the corner seam temporarily clamped in place — solders it to the top of stepped side flashing (B). The vertical corner seams will then be folded, tightened with a mallet, and soldered. Weep channels, soldered on top of the steps (C, D), complete the job.



Figure 6. The finished flashing (A) makes a seamless transition between the roof and the stone chimney. Soldered joints (B) and weeps (C) are unnoticeable from a distance.

Base Flashings First

The components are carefully brought to the roof and assembled on the chimney for soldering. The base flashings — the parts attached to the roof but not the chimney — are installed first (Figure 4, page 44). These include the front apron — a simple folded piece with soldered outside corners — followed by the step flashing up the sides and the cricket at the rear. The two sides of the cricket are joined at the ridge with a folded, watertight seam, like the one used for standing-seam roofing — the only seam that doesn't have to be soldered. The first bends of the seam are formed on a brake, then completed in place on the roof with a hand seamer — a pliers-like tool with wide, flat jaws — and a rawhide mallet, which flattens the fold with minimal marring of the copper.

We fold and solder the outside corners where the cricket laps over the step flashings as needed to make them watertight.

Counterflashings

Next come the counterflashings — the pieces that are attached to the masonry but not the roof. They lap the upturned legs of the base flashings very snugly but still allow for differential movement between the roof and the chimney mass.

We install the right and left stepped sides first, then the rear steps, which overlap at the center and are soldered as a unit. The apron counterflashing goes on last. We use a locking hand seamer to clamp it to the overhanging metal of the side steps at

the front corners while it gets soldered on top (Figure 5, facing page). Then we fold the corner overhangs into seams — again using the seamer and mallet to tighten the flashing around the corner — and solder the corner seam. Before soldering, we make sure to clean the copper once more with a wire brush, then with the acid flux. If the job is done right, the molten solder is drawn almost invisibly into the joints by the heated metal; very little is seen on the finish side.

The last step in the process is to provide weep holes. These are inverted copper vees with notched edges that gather water and channel it to the surface. They're about 6 inches long and are lightly solder-tacked to each shoulder so they can't be dislodged by the mason.

Once the metalwork is complete, the mason can return to complete the chimney with no concern or liability for leaks. The flashing job shown here took two days and added around \$3,000 to the cost of the chimney (Figure 6).

Following two weeks or so of dry weather, with another couple of dry days in the forecast, we fill a pump-up garden sprayer with Duraseal, an acrylic concrete sealer (800/775-9474, enviroseal.com). We spray two coats on the chimney — whether it's brick or stone — as an extra weather barrier.

John Seifert co-owns Seifert Construction in Mattituck, N.Y. Former owner Fred Seifert Sr. still pitches in on a regular basis.