



# Flat Lock Metal Roofing

by Walter Jowers

A generation or two ago, sheet metal was used for just about all new installations of flat or nearly flat roofs. They were usually made of terneplate and commonly called "tin roofs." These roofs have a series of rectangular metal panels, or pans, which are bent to allow for flat, locked seams (thus the name flat-lock roof), and then malleted together by hand. The seams are laboriously hand-soldered. It's a type of roof that, with proper maintenance, can easily last a hundred years or more.

Today, there are plenty of good roofing products that are easy to install on low-pitch roofs—metallized and rubber membranes that can be flame-melted into a continuous skin, and various synthetic membranes that are sealed with adhesives, like tire patches. These are perfectly good products that might last twenty or thirty years.

But on a restoration project where the work is going to show—such as a porch roof that's visible from the street or from an upstairs window, or on a museum-quality restoration, where the new materials need to match the original—the best option may be to install a new flat-lock roof.

Flat-lock roofing is called for on roofs of less than 3-in-12 pitch. (On steeper roofs, you can go to standing-seam metal.) The material choices include:

**Terneplate.** I think it's ideal for flat-lock roofs, because you can get the material pre-fab from Follansbee

Steel (Follansbee, West Virginia, 26037; 800/624-6906), and it's relatively inexpensive (about \$75 a square). The only installation headache is that it has to be painted on the underside *before* installation, and on the top side after installation—ideally with very slow-drying paint. This is labor-intensive, but requires little skill. The maintenance headache is that it has to be repainted every 10 or 12 years. But that's no big deal on a flat roof.

**Stainless steel.** Good material, but if the project can stand a silver roof, you might as well use a modern metallized product.

**Terne-coated stainless steel (TCS).** Even better than stainless, but has the same silver-roof appearance.

**Copper and lead-coated copper.** Expensive, and the runoff stains the house. Also, copper expands and contracts more than steel, and is more difficult to work with.

**Galvanized steel.** Rusts even if you keep it painted. And you can't keep it painted because you can't get a good bond to the metal. Not worth fooling with.

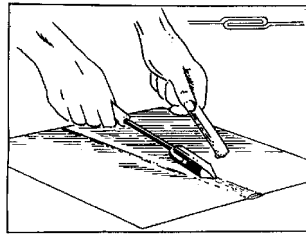
To keep things simple here, we'll stick with terne roofs. Before you start, it's a good idea to trim back any trees that hang over the roof, especially trees that drip sap, such as pecan and maple trees. This sap can burn right through the paint you'll later apply to the roof. And you

don't want to have to explain to your client next spring that the paint is bubbling off the roof because of the pecan trees.

Terne roofs must be laid on a wood deck. Plywood is fine, but treated wood isn't. Follansbee specs say that "wood treatments that are hygroscopic must not be used for wood sheathing under terne metal." Besides, if the roof is made right, what do you need a treated wood deck for?

Just about every old metal roof I ever tore off was laid directly over wood. Old sheet-metal manuals say that paper underlayment is unnecessary. Current Follansbee specs, however, say to lay terne over rosin paper that is laid loose, not nailed. The idea is to provide a "slip sheet" for the metal. Follansbee also says *not* to lay roofing felt under the rosin paper—the asphalt in the felt can attack terne.

The roofing pans are formed out of 20x28-inch sheets of 40-lb. terne, which you can buy pre-cut from Follansbee; or, you can cut the sheets yourself out of 28-inch rolls. (You can buy smaller sheets, but you don't want to, because smaller sheets mean more hand labor.) Cut and bend pans on a metal brake. The diagrams showing the process (see preceding page) are a little deceptive, in that they show only *typical* pans. Pans



All seams are carefully malletted down to form a flat overlapping surface without buckling. The seams are joined with 50/50 solder using a minimum 3-pound soldering iron.

must be laid according to the water flow. So, if you're installing pans on a shallow hip roof, you'll have to bend a few pans differently, so that all the joints are pointed downhill.

Terne pans, cleats, gutters, flashings—terne *everything*—have to be painted on all sides except where it is turned up at the seams. That means all the pans must be painted on the underside and thoroughly dried before they're placed on the roof. Be careful not to get paint in the seams where you'll be soldering later. You'll just end up scraping it off and scratching the coating on the metal, which is what bonds to the paint.

The pans are fastened to the wood deck with 2x4-inch terne cleats, which are nailed with two 7/8-inch minimum galvanized roofing nails, as shown. The cleats have to be painted on both sides before installation.

Follansbee recommends a rather esoteric paint, Calbar's Tin-O-Lin, for terne metal. (Calbar, Inc., 2626 North Martha St., Philadelphia, PA 19125; 215/739-9141.) Tin-O-Lin is a very slow-drying paint, with iron-oxide pigment ground in linseed oil. Linseed-oil paints, says Follansbee, can keep a terne roof going for well over one-hundred years. It's suitable for use as a primer and a finish coat. The big problem for a contractor who wants to use Tin-O-Lin is the

slow drying time—you'd have to paint for 48 hours until the paint's tack-free, and the stuff can't be recoated for 7 to 10 days. (The finished roof needs at least two coats of paint.) Though Follansbee sticks by Tin-O-Lin religiously, I'd bet that any high-quality paint suitable for use on ferrous metal would work fine on terne. Follansbee also specifies that the paint be brushed on—not sprayed or rolled. This spec should always be followed, to ensure a first-class paint job.

Whatever paint you choose, never use an aluminized paint, which will lead to galvanic corrosion in short order.

There's no way here to describe all the options that come under Follansbee's spec to "be governed by proper application at ridge, drip edge, end or side wall, gutter, valleys, etc." Good roofers use good judgement and common sense to decide how to handle these terminations, and just about every option is displayed graphically in the SMACNA architectural sheet metal manual (SMACNA, Box 70, Merrifield, VA 22116; 703/790-9890). Suffice it to say that all edges should terminate in drip edges or gutters; and generally, the pans are treated as base flashing when they meet a vertical surface.

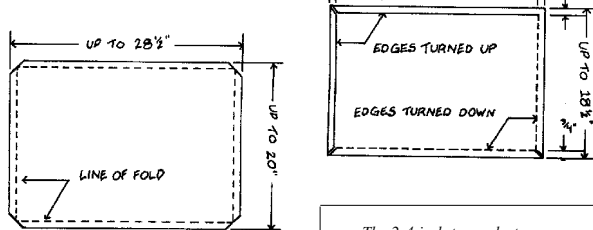
Once all the pans have been laid, the seams are malletted (with a wood mallet) to form the flat-lock seams. The seams are then soldered with 50/50 solder, using a 3-pound minimum soldering iron. I've found electric irons to be much more convenient than the irons heated in a propane stove. Who wants to sit on a hot tin roof all day with a roaring fire nearby?

Thomas J. Boyd, at Follansbee Steel, offers these soldering guidelines in the product's spec sheet:

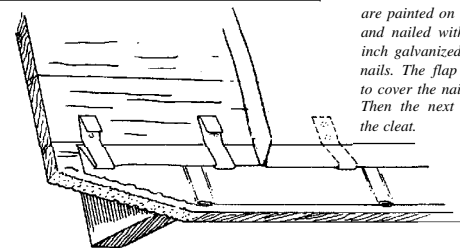
- Make sure to use sheets no larger than 20x28 inches.
  - Make sure that all edges of the metal roofing plates are single-locked a minimum of 1/2 inch.
  - Apply rosin flux to seam: Powdered rosin mixed with linseed oil is a good flux. Rosin base fluxes are commercially available. A small glue brush makes a good applicator.
  - Clean copper soldering irons by dipping in hydrochloric acid flux. Cover metal in area where coppers are cleaned. The spray caused when iron is dipped to clean is exceptionally corrosive and will cause corrosion of the surface of most metals.
  - Heat the seam close to the edge and apply solder: A damp rag may be used to cool the soldered seam. Continue soldering the edge of the seam the length or width of the metal plate.
  - Reheat the seams behind the edge and add additional solder to sweat the seam full.
  - Wipe off all excess flux.
  - This method is sometimes referred to as double soldering. If each seam is treated as recommended, no seam will be missed and an average of twice the strength of regular soldering may be expected.
- Once the soldering—and the flux cleanup—is finished, the roof is ready for its two coats of paint. After that, it shouldn't need painting for quite a few years. ■

Walter Jowers is a renovation specialist and technical writer based in Nashville, Tenn.

To make the pans, notch the corners of the sheets and bend the 3/4-inch edges. The top and one end turn up; the bottom and the other end turn down.



The 2x4-inch terne cleats are painted on both sides and nailed with two 7/8-inch galvanized roofing nails. The flap folds to cover the nail heads. Then the next pan hides the cleat.



A typical layout shows how the staggered pans cover the roof. Uphill pans should always overlap the edges of lower pans. The drip edge anchors the pans around the perimeter.

