Metal Roofing Options

From basic galvanized ag panels to metal shakes, shingles, and tiles, there's a material and finish for every taste and budget

by Patrick McCombe

Metal roofing has long been popular for agricultural and industrial buildings, but it's also a practical choice for residential use in every part of the country. Homeowners and builders in the snowbelt can benefit from metal's ability to shrug off ice and snow. In wildfire-prone regions of the West, its natural fire resistance is a major selling point, and its resistance to wind makes it an attractive choice in coastal areas. It's virtually immune to the unsightly mildew growth (actually a variety of algae) that often forms on asphalt shingles in the warm, humid southern states. The reflective qualities of metal also enable southern homeowners to trim their utility bills: According to a 2001 study by Florida Power and Light, some types of metal roofing can reduce cooling costs by up to 23% compared to asphalt shingles.

On the Great Plains, where hailstorms can destroy a roof in minutes, some metal panels can withstand the impact of even golf ball–sized hail without damage, and many insurance companies offer discounts to homeowners for installing them. At 50 to 150 pounds per


FABRAL


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Figure 1. Exposed-fastener metal roofing has long been used for barns and industrial buildings because it's inexpensive, installs quickly, and lasts 30 or 40 years. It also makes a great residential roof in areas with a rural character, especially in hot or snowy regions.

square, metal has the lowest weight of any residential roofing, making it attractive in seismically active areas, where heavier roof systems can stress framing members during earthquakes. In many cases, its light weight permits installations over an existing roof, eliminating the labor-intensive tear-off process and the cost of disposal.

The installed cost of metal is higher than that of asphalt shingles, but when life expectancy and maintenance costs are factored in, metal compares favorably to less expensive roofing materials, especially in the South, where asphalt shingles last an average of just 17 years. Environment-conscious consumers and trade groups also like to point out that while asphalt roofing ends up in the landfill at the end of its life span, metal roofing can be recycled.

Those benefits are characteristic of all metal roofing, but selecting the right material for a given application requires some thought. The range of choices — in type of metal, thickness, finish, and method of application — is wider than it's ever been and continues to grow. For organizational purposes, though, all metal roofing products can be divided into three general categories: exposed-fastener panels, standing-seam roofing, and modular panels.

Exposed-Fastener Panels

For many people, the words "metal roofing" bring to mind the screw-down or nail-down agricultural material, or "ag panel," used on barns and industrial buildings, as well as some residences (see Figure 1). Easily identified by the lengthwise ridges that stiffen the panels and overlap to provide a weathertight seal at the edges, exposed-fastener panels are attached with galvanized screws or nails over a plywood deck or on spaced purlins.

Ridges or flats? The panels are fastened to the deck or purlins with special-purpose nails or screws equipped with neoprene or EPDM washers, which compress beneath the fastener head to seal the puncture left by the shank. Nails — the fastener of choice in the days before reliable battery-powered screw guns and still used in some areas — should always be driven through the raised ridges between flats.


MARTIN HOLLADAY

Figure 2. Many installers put screws in the ribs even though manufacturers discourage it. The practice is a holdover from when the dominant fasteners were nails. Using screws and installing them in the flat sections of the panel is considered a better practice by manufacturers, because of screws' lower shear strength and better sealing compared to nails.

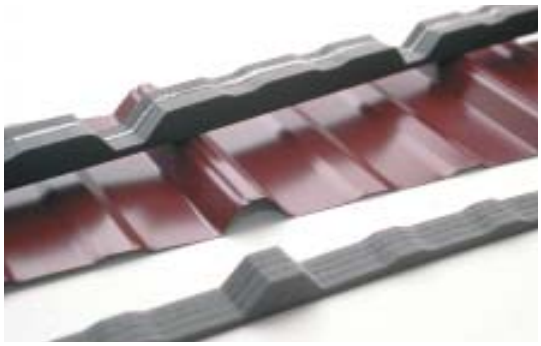

Figure 3. Rubber closure strips seal up the cavities under the ribs of exposed-fastener panels. Inside closure strips go under the panel, sealing eaves; outside closure strips lie on top, sealing under the ridge cap. Adhesive strips (shown on the outside closure) keep strips properly positioned while the roofing or ridge cap is fastened.

Most roofs today, however, are fastened with screws, and while many installers also run screws through the ridges, manufacturers advise against it. Screws have lower shear strength than nails, which makes them vulnerable to breakage when they're left sticking out far enough to clear the ribs, and adequately tightening screws without crushing the ridge takes a delicate touch (Figure 2, previous page).

While it may seem counterintuitive to those used to fastening with nails, screws should be driven into the flats, at the spacing specified by the manufacturer.

Because each screw hole represents a potential leak, it's worth taking the time to do this part of the job right. Frank Farmer of American Roofs in Flushing, Mich., frequently sees problems with screws from improper installation. "Installers run them in at an angle, or they don't tighten them enough so the washers don't seal correctly — and small leaks can eventually rot the sheathing," he says. Troy Thomas of Fabral, one of North America's largest metal roofing producers, notes that choosing screws with EPDM washers, rather than lower-cost neoprene, will reduce the possibility of leaks at fasteners.

With installed prices starting at about $150 per square, exposed-fastener panels are the least expensive variety of metal roofing, but this approach does have some drawbacks. Its rustic appearance is inappropriate for some applications, and the protruding fasteners tend to catch leaves and other debris as well as inhibiting snow from sliding off the roof. The panel ridges also create voids beneath the panels that provide ideal habitat for some insects and small animals. While manufacturers provide foam rubber closure strips to seal these cavities, skeptics wonder if the closure strips will last as long as the panels (Figure 3). But Jerry Iselin of Metal Roof Specialties in Tacoma, Wash., says, "I've only seen problems with closure strips maybe a half-dozen times, where they shrunk from poor manufacturing or birds pecked them out to use for nesting material." High-quality closure strips are laminations of two types of foam rubber: A softer outer layer for sealing is bonded to a more rigid internal foam that resists compression.

Originally made for barns and industrial buildings, screw-down panels frequently use trim accessories that look out of scale on smaller, residential structures. Many installers make their own on a metal brake or have panel fabricators make smaller versions of their standard trim pieces (Figure 4). When ordering exposed-fastener panels for a residential application, ask your supplier what accessories will look best.

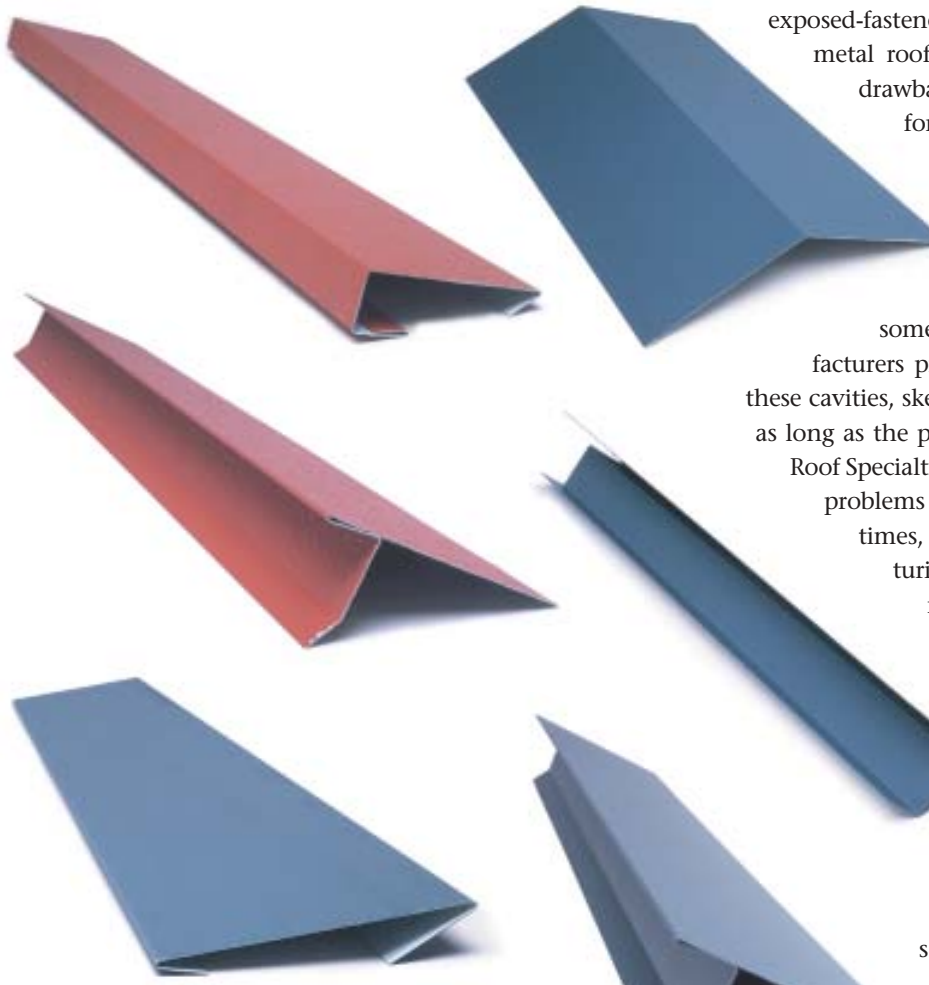

Figure 4. Color-matched flashings, drip-edge, and ridge caps like these from Atas mean that installing metal roofing requires little custom fabrication, but flat sheets for custom crickets and trim are available in the manufacturer's palette of colors.

Standing-Seam Roofing

Standing-seam roofing takes its name from the vertical ridges created where the roll-formed panels are joined at the edges. In traditional standing-seam construction, L-shaped metal cleats nailed to the deck or spaced purlins are crimped between adjoining panels to provide a watertight joint that also locks the roofing in place. The absence of exposed fasteners gives it a more finished look than nail- or screw-down panels, making it a popular choice for a wide variety of traditional and contemporary building types.

MARTIN HOLLADAY

Figure 5. Forming standing-seam panels on site used to mean folding and crimping sheet stock with hand tools, but modern tow-behind roll-forming equipment can quickly make standing-seam and exposed-fastener panels to virtually any length.

Site-fabricated roofing. In the past, all standing-seam roofing was made from metal plates or sheets that were formed into panels with hand tools on the job site. Today, coil stock is used instead of plates or sheets, and mechanized metal-forming equipment has made the process faster and easier (Figure 5). Factory-produced panels are also available, and although they can be difficult to ship (unlike exposed-fastener panels, they can't be stacked, so manufacturers often charge a premium for the necessary crating and handling), some roofers feel that the heavier stationary equipment results in a better-quality product. Jerry Iselin notes that using factory-produced panels also increases the builder's chances of getting satisfaction if there are problems with the material. With a site-fabricated roof, you have only the roofer to deal with — if he's uncooperative or out of business, you're out of luck.

CAROLYN BATES

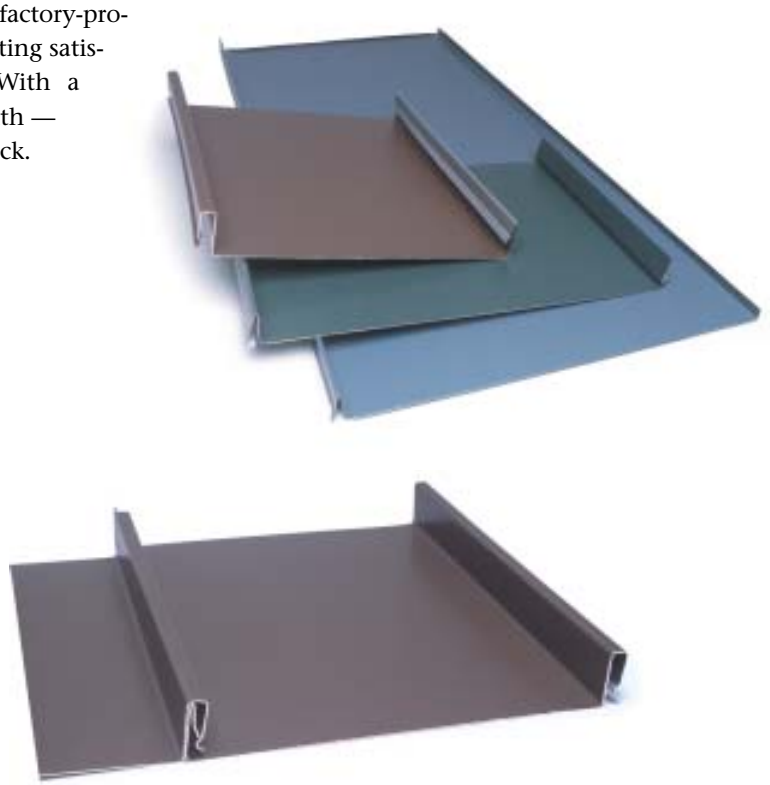

Figure 6. Motorized crimpers (left) seam panels with little effort but lots of time. Manufacturers are now producing snap-together panels that look hand-seamed but install faster (above).

TASMAN

GEORGIA-PACIFIC

ASC PROFILES INC.

Figure 7. Modular roofing products, the fastest-growing segment of the metal roofing industry, fit well in older neighborhoods. They blend easily with more conventional roofing materials like asphalt, cedar shingles, and concrete tile but offer the longevity, durability, and weight advantage of metal. Clockwise from left are the Tasman Decra Shingle, ASC Tek Guard, and GP Centura.

Self-locking panels. Traditional standing-seam roofing calls for special tools like brakes and shears, and installers need advanced metalworking skills more often associated with custom duct fabricating than roofing. To streamline the process, many roofers are turning to so-called snap lock panels, which can be assembled without crimping (Figure 6, previous page).

Underlayment. While other types of metal roofing can be installed directly over existing roofing, Frank Farmer of American Roofs won't put a standing-seam roof over anything but a flat deck. According to Farmer, surface irregularities created by the old roofing will bind the panels, preventing them from moving with changes in temperature. The resulting ripples in the flat sections of the panel, or "oil-canning," are painfully obvious. "The one time we tried it, we ended up removing half the roof that was already installed because it looked terrible," Farmer says.

Some standing-seam installers will leave the old roofing in place, installing the new roofing over wood or metal purlins spaced 24 inches on-center, running parallel to the eaves. In addition to providing a smooth surface, the purlins provide convenient footholds for working on steep slopes, and they can be shimmed to compensate for sagging rafters or other surface irregularities.

Modular Panels

Pressed into lightweight copper, steel, or aluminum to resemble shakes, shingles, or tiles, modular panels are the newest and fastest-growing segment of the industry (Figure 7). Consumers appreciate their traditional look, and installers familiar with asphalt shingles or

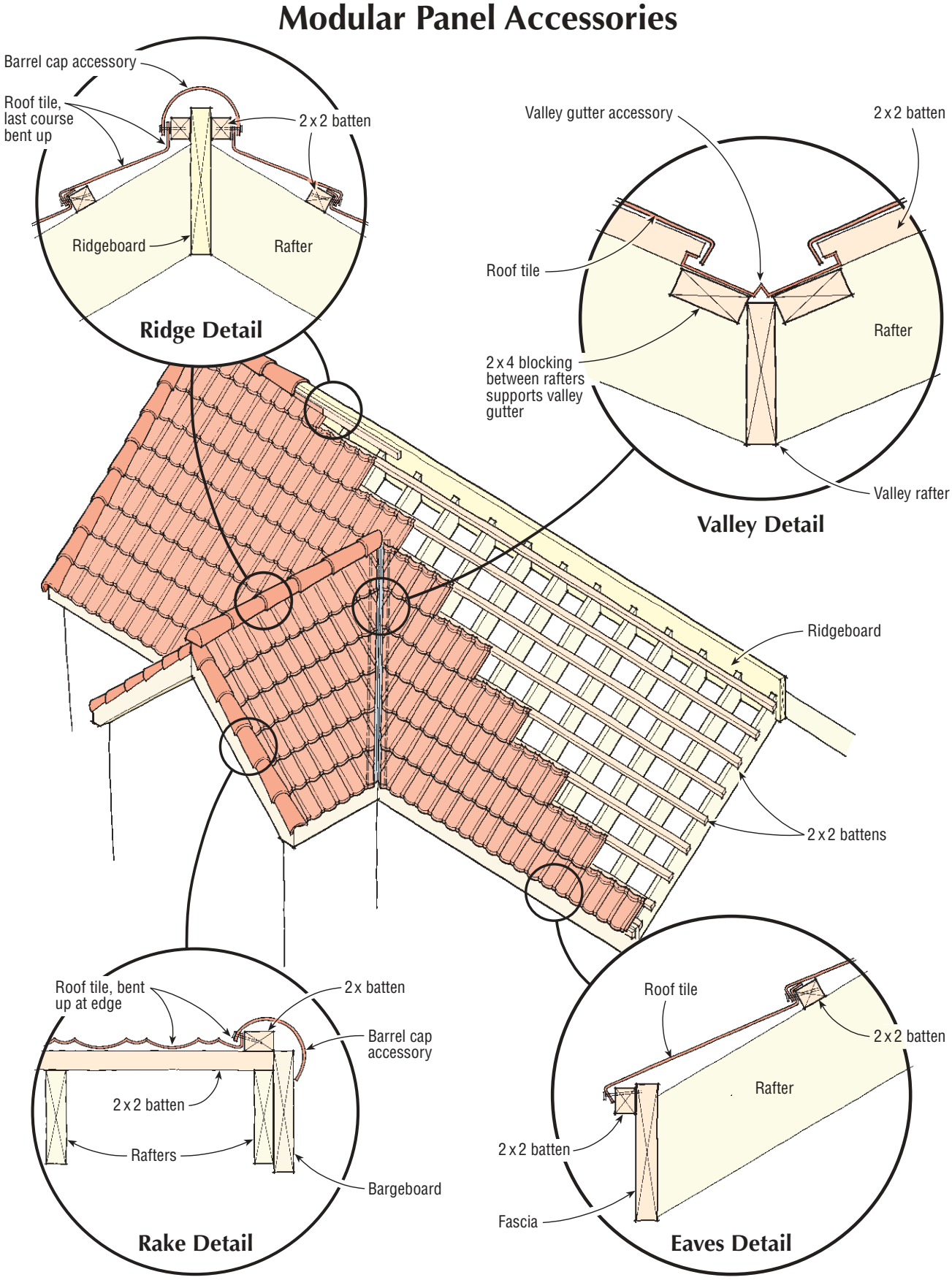

Figure 8. Matching trim accessories hide the 2x2 battens from view and give the roof a neat, finished appearance. The names of specific accessories are frequently shared among the various types of metal roofing, simplifying ordering and job-site terminology.

ASC PROFILES INC.

Figure 9. Modular panels are installed over felt or proprietary underlayment either directly to the roof deck or on 2x2 battens. Systems without batten boards speed installation by eliminating the need to cut and nail down the wood pieces, but they can look flat compared to the deeply textured systems that use battens.

Figure 10. As with standing-seam and exposed-fastener panels, installing modular panels is made easier by coordinating trim accessories. Clockwise from top left are starter, hip cap, ridge caps, and rake trim from Classic Products.

tile can usually make an easy transition to metal without investing heavily in equipment or training.

Modular panels are either nailed directly to the roof deck or installed on 2x2-inch battens spaced approximately 14 inches apart (Figure 8, previous page). Installing battens is extra labor but levels out surface irregularities caused by old roofing and allows more elaborate profiles to be stamped into the panel. Modulars installed without battens have folds along the sides and bottom edge that hook on to preceding shingles and are nailed directly to the roof deck, through the old roofing (Figure 9). On both types, manufacturers specify felt or polyethylene underlayment to keep sheathing and old roofing from abrading the back of the panels and to offer some protection as a secondary water barrier.

Modular panels are frequently manufactured from the lightest-gauge metal (.015 inch), but stamping patterns into the metal adds strength, so careful footsteps are unlikely to crush them, although walking on the highest raised portions of the panel can be damaging. For roof areas with an unusual amount of foot traffic — adjacent to air-conditioning equipment, for example — manufacturers recommend optional foam backers to reinforce raised portions of the panel.

Manufacturers offer many preformed accessory pieces that speed installation, but complicated roof profiles can slow it considerably (Figure 10). Hips and valleys require custom cutting and bending, and although modular panels are easier to cut than the concrete or clay tile they're often made to resemble, you can't make cuts up on the roof with a utility knife like you can with asphalt shingles.

Modular panels are the priciest form of metal roofing. Depending on the metal used, the type of finish, and the pattern, installed prices run from $500 to $1,000 per square.

Steel

Once you've settled on a general roofing category — exposed-fastener, standing-seam, or modular panels — the next important choice is type of metal.

In many parts of the U.S., that means steel. Steel has some obvious benefits: It's usually the lowest-cost option, and it expands and contracts relatively little in response to changes in temperature. As a

result, it can be used in continuous lengths of as much as 36 feet without the risk of panel deformation or elongation of fastener holes. And while steel's susceptibility to rust has limited its use for some residential applications, recent developments in protective finishes and rust-resistant alloys have made it appealing to consumers and specifiers who might not have considered a steel roof in the past.

RECLA METALS

Figure 11. Using uncoated or Cor-Ten steel roofing helps new buildings fit in with historic surroundings. This exposed-fastener roof uses plain cold-rolled steel, but Cor-Ten steel, more traditionally used on bridges and guardrails, creates a similar look.

Galvanizing. One time-tested approach to protecting steel from rust, long used for everything from water pipes to roofing nails, is galvanizing, or coating with zinc. The biggest advantage zinc has over other rust-preventive coatings is its ability to heal itself. When galvanized material is exposed to water, tiny amounts of dissolved zinc flow to scratches, cut edges, and other areas where the base metal is exposed, preventing the underlying steel from rusting.

This fluidity eventually exposes the steel, leaving it at the mercy of the elements, but the thicker the coating, the longer the protection will last. The Metal Roof Alliance recommends that a steel roof have a zinc coating rated at G-90 or better, which translates to .9 ounces of zinc per square foot. In most areas, unpainted G-90 galvanized steel should last about 30 years before corrosion becomes visible, according to Fabral's Troy Thomas. But in coastal and industrial areas, 15 to 20 years is a more realistic expectation. Galvanized steel is widely available preformed into a variety of exposed-fastener panels and as coil stock suitable for fabricating into standing-seam roofing.

Let it rust. Oddly enough, some consumers actually prefer the appearance of rusted steel. The rusted look is especially popular in resort areas in the western mountains, where the rustic "mining town" look is in style. Some roofers use locally manufactured exposed-fastener panels made from plain, ungalvanized steel, sometimes washing them with a vinegar solution after installation to speed the development of a uniform coating of rust (Figure 11). Although the unprotected roofing will eventually rust through, advocates of this approach claim that it provides a reasonably long-lasting roof in dry climates.

A more conservative approach to rusted roofing is to use Cor-Ten steel, which is a chromium- and nickel-rich alloy often used for bridges and guardrails. When

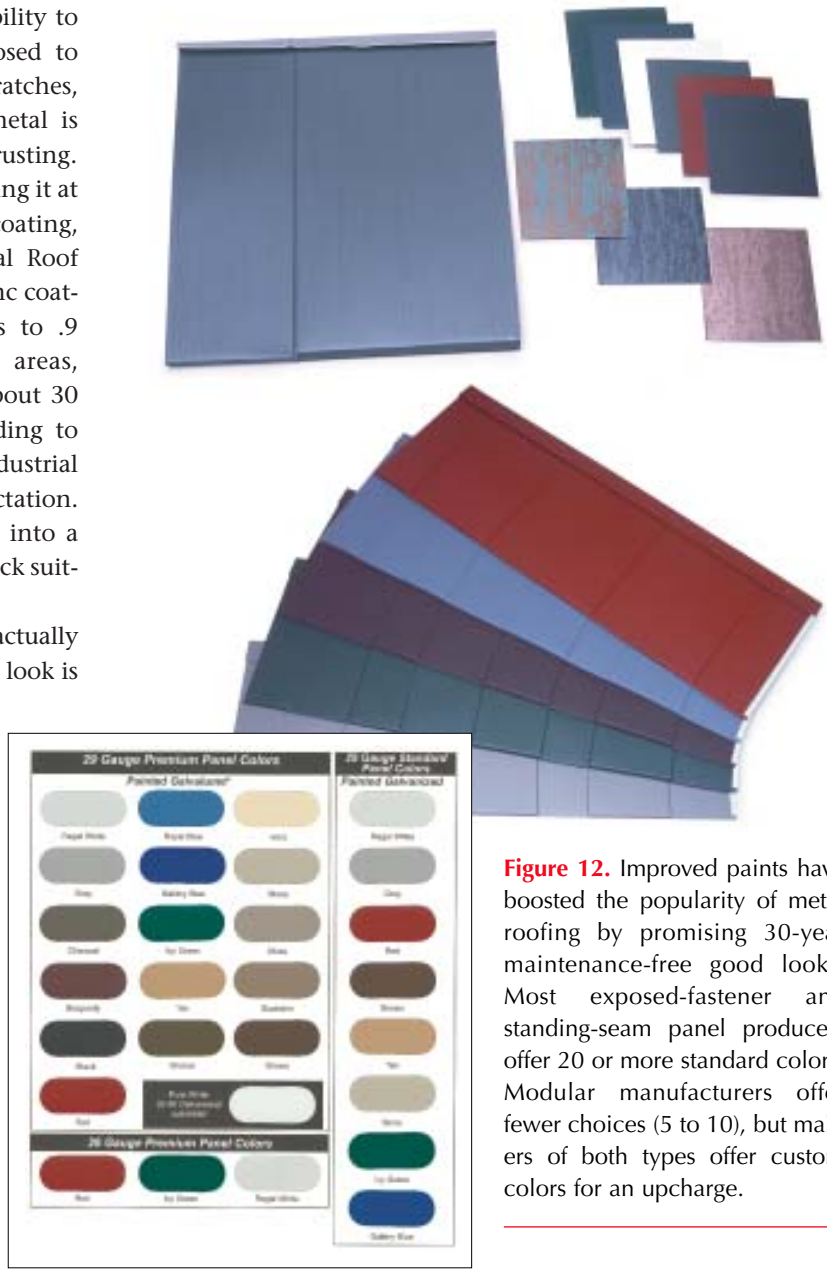

Figure 12. Improved paints have boosted the popularity of metal roofing by promising 30-year maintenance-free good looks. Most exposed-fastener and standing-seam panel producers offer 20 or more standard colors. Modular manufacturers offer fewer choices (5 to 10), but makers of both types offer custom colors for an upcharge.

Figure 13. Stone coating uses granules like those found on asphalt roofing to add a wear-resistant surface that won't fade. Products like these from Metro Roof Products also offer excellent hail resistance; homeowners installing them in hail-prone Texas receive mandated insurance discounts.

exposed to weather, Cor-Ten quickly develops a surface layer of rust that also serves to protect the metal beneath from damage.

Aluminum and aluminum-zinc coatings. Aluminized coatings formulated for steel are extremely corrosion resistant, generally last longer than galvanizing, and reflect heat well, reducing cooling requirements. Unlike galvanizing, though, aluminized coatings are not self healing. The material must be handled very carefully, because any scratches in the surface will provide a potential foothold for rust. Cut edges are also susceptible to rust.

Galvalume and Zincalume coatings, two similar proprietary products, combine the durability and reflectivity of aluminum coatings with the "flowability" of traditional galvanizing. Both are about 55% aluminum and 45% zinc, and they share a life expectancy of 40 to 50 years under normal atmospheric conditions. They cost about 5% to 10% more than G-90 galvanized roofing.

Roof paints. Not everyone likes the look of bare metal, so the development of improved paints and coatings makes metal roofing an attractive choice to more buyers than ever before (Figure 12, previous page). Unlike site-applied paints, most modern factory-applied finishes are tough and flexible enough to withstand the sharp bends required of standing-seam roofing.

The least expensive coatings are polyester resins, which have a glossy finish to begin with but quickly lose their brilliance, typically within five years. Polyester coatings are widely used on screw-down panels because of their low cost. Jerry Iselin of Metal Roof Specialties says the problem with the less expensive paints is not that they crack or peel but that they fade faster. He advises clients who want a less expensive paint system to choose light colors. "If I pick a bright red roof and it turns pink, I'm going to be more upset than if I have a tan roof and it turns a lighter shade of tan," he says. Another problem of cheaper paint finishes is that they seldom weather uniformly; solar-facing elevations show fading and damage first.

Silicone-modified polymers are polyester resins with silicone additives to improve their durability. These coatings have better fade resistance than unmodified polyester, and their 30-year durability approaches the life span of fluoropolymers, the best-performing paint finishes.

Fluoropolymers. Commonly referred to by their trade names, Kynar 500 and Hylar 5000, fluoropolymers are less shiny than polyester finishes, but they offer excellent protection against fading and chalking. Fluoropolymer finishes also resist the damaging effects of pollution and salt spray better than other paints. Warranties that protect against chipping, cracking, and peeling for 25 years or longer are common, often with prorated guarantees against fading for 10 to 20 years. Warranty protection for fluoropolymers typically limits fading to 5 Hunter units in the first 10 to 20 years (one Hunter unit is the smallest change in color detectable by the average person). A disadvantage to fluoropolymer finishes is that they are softer than siliconized-polyester systems, increasing the likelihood of paint damage during installation, and sometimes frustrating crews who are used to working with polyester-based paint systems.

Stone coating, which originated in New Zealand and Australia, uses an acrylic resin to bond ceramic granules — much like those on asphalt shingles — to the metal surface (Figure 13). Stone-coated pan-

els offer good resistance to hail damage and frequently carry UL's highest hail damage resistance rating, class-4. Although hail may still cause dents, manufacturers claim that they're seldom visible from more than 6 feet away and do not affect a roof's ability to shed water. Customers seeking insurance discounts must sign a waiver freeing insurers from claims for "cosmetic damage."

No matter what paint finish you choose, engineers suggest a neutral-cure silicone or one-part polyurethane for caulking and sealing, because the cheaper acid-cure silicones (which smell like vinegar) damage paint and protective coatings. End laps and side laps should be sealed with butyl sealant or tape because they absorb panel movement best.

Aluminum

While aluminum typically costs more than steel, aluminum roofing panels have a strong following in coastal and southern regions because their natural reflectivity helps reduce cooling costs. Also, aluminum's natural resistance to rust means the corrosion protection can't wear off or be damaged from rough handling like protective coatings on steel. For customers who don't want a bright, reflective finish, aluminum coil stock and exposed-fastener panels are available with the same factory-applied paint finishes found on steel. Aluminum and steel modular panels are typically painted with a Kynar or Hylar finish. Aluminum has the highest coefficient of expansion of any commonly used metal roofing material, so exposed-fastener panels should be limited to 16 feet. Also, aluminum panels will corrode when installed directly on pressure-treated lumber without an underlayment.

Specialty Metals

Although steel and aluminum are by far the most common residential metal roofing materials, other metals are occasionally used for special effect, although the relatively high prices of most of these options limit their use. Most are available as coil stock for standing-seam applications, but some, such as copper, are also available as shingles or modular panels.

Terne. Thanks to its durability, terne-coated steel — which consists of sheet steel coated with a lead-tin alloy — has been a highly regarded material for nearly two centuries. Because of health concerns associated with its lead content, original terne roofing is no longer manufactured, but it has recently been replaced by a new zinc-tin formulation called Terne II from Follansbee Steel in Follansbee, W.V.

Terne II still has one substantial drawback of the original terne: It must be painted soon after installation and repainted every eight years thereafter, or rust will bleed through the plating. As a result, it's less popular than prepainted steel or aluminum for most applications, although it's a more historically appropriate alternative for replacing an original terne roof. Follansbee also makes a terne coating on a stainless-steel base, called TCS II, which never needs painting; but the cost is so high that its use is pretty much limited to commercial projects.

Copper. Sheet copper is another material sometimes used for high-end roofing jobs. Copper is traditionally formed in standing-seam panels, but more recently it's been available in modular panels and shingles (Figure 14). It can be soldered for difficult flashings and low-slope applications, but perhaps the greatest advantage of copper is that it doesn't rely on coatings or paint finishes for corrosion resis-

Figure 14. Copper, used for centuries to make long-lasting standing-seam panels, has more recently lent its longevity and beautiful coloration to shingle-style panels like these from Zappone. The locking hems on these shingles, also found on steel and aluminum styles, give them unsurpassed wind resistance.

MILLENNIUM TILES

Figure 15. Offering the greatest corrosion protection possible, recently introduced stainless modular shingles look modern and seem ideal for coastal areas, where salt spray corrodes other metals.

tance. In most areas, it eventually weathers to a green color, although in dry regions it may remain a red-bronze or purplish color.

Drawbacks include its high cost and the possibility that the runoff will leave a green stain on siding or flatwork. Because it's so soft, copper also has a tendency to take on a slightly wavy appearance in flat areas between seams. This is more a characteristic of the material than a defect, however, since it doesn't compromise the integrity of the roofing. A new copper-plated stainless coil stock material called SUSCOP, available from Sure Roofing Systems, is said to be more rigid than pure copper and to cost significantly less.

Stainless steel, perhaps the longest lasting of any metal, can be formed into standing-seam profiles and was recently introduced as a line of modular shingles by Millennium Tiles (Figure 15). Variations in the protective chromium oxide layer permit four different colors, from naturally shiny stainless to more muted tones resembling weathered bronze and slate. The $600-per-square price (material only) may be an obstacle for many, but the roof should last forever.

Metal Roofing Manufacturers

American Building Components
800/877-8709
www.abcmetalroofing.com
Steel exposed-fastener and standing-seam panels

ASC Profiles
800/360-2477
www.ascprofiles.com
Steel exposed-fastener, standing-seam, and modular panels

Atas International
800/468-1441
www.atas.com
Steel and aluminum standing-seam and modular panels

Classic Products
800/543-8938
www.classicroof.com
Steel and aluminum modular panels and shingles

Custom-Bilt Metals
800/826-7813
www.custombiltmetals.com
Steel, aluminum, and copper standing-seam and modular panels

Englert
800/638-2507
www.englertinc.com
Steel and aluminum exposed-fastener, standing-seam, and modular panels

Fabral
800/477-2741
www.fabral.com
Steel and aluminum exposed-fastener and modular panels

Follansbee Steel
800/624-6906
www.follansbeeroofing.com
Terne-coated steel and stainless steel

Gerard Roofing Technologies
800/237-6637
www.gerardusa.com
Stone-coated steel modular panels

GP Corporation
800/284-5347
www.gp.com/metals
Steel modular panels

Met-Tile
800/899-0311
www.met-tile.com
Exposed-fastener steel panels that resemble clay and concrete tile

Metro Roof Products
866/638-7648
www.metroroofproducts.com
Stone-coated steel modular panels

Millennium Tiles
866/842-8585
www.millenniumtiles.com
Colored stainless modular panels

Recla Metals
888/621-0807
www.reclametals.com
Rusted exposed-fastener panels

Stillwater Products
800/326-5355
www.decoroof.com
Copper shingles and roofs for bay windows

Tasman Roofing Products
877/463-3272
www.decra.com
Stone-coated steel modular panels

Zappone Manufacturing
800/285-2677
www.zappone.com
Copper and aluminum modular shingles