Guide to Metal Roofing

At a glance, the metal roofing industry can seem a bit overwhelming. There is such a wide variety of types and styles of products out there, how do you determine what will work best—both functionally and aesthetically? Are there products designed specifically for residential use? Which ones? How are these different from commercial or agricultural products? Unfortunately, there are many examples out there of metal roofing products being used inappropriately, on projects for which they were never intended to be used.

The goal of this guide is to help make sure this misuse happens as rarely as possible. It is intended to help you select the perfect metal roof for your project by arming you with information on the metals, product types, product profiles, installation issues and overall features and benefits of today's metal roofing systems.

When choosing a metal roof, you should consider all options. First and foremost, though, make certain that the manufacturer of the roofing supports the manner in which the chosen roof system will be used and installed. Keep in mind that residential metal roofing is a rapidly-growing industry. As such, there are individuals selling metal roofing who may not be as well-informed of products and limitations as they should be. A metal roof is a considerable and crucial investment—don't leave things to chance.

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Metals

Many people automatically assume, when they hear "metal roofing" that the "metal" is steel. Yes, a majority of metal roofing products are manufactured from various types of steel, but there are several other quality metals used more frequently today than ever (and some used less commonly today than in eras past). What follows is a summary of these various metals and their relative applicability in relation to one another.

Galvanized Steel

Because the traditional carbon/iron steel alloy is rust prone when exposed to the elements, steels used for the metal roofing industry are coated with a specific thickness of another metal or alloy on both sides of the base carbon/iron steel strip. The process used to accomplish this is called the hot-dip process, and involves running the steel through a molten bath of the metal to be applied. The hot-dipped process is basically a cheaper, more efficient alternative to a similar process with which you might be pretty familiar: electroplating.

Steels, then, are classified and named according to the metal that is applied. Galvanized steel is base carbon/iron steel with a metallic coating of zinc. The coating metal offers two kinds of protection: galvanic or barrier. Galvanic protection is a self-sacrificial process by which the metal coating gives itself up rather than allow the base metal to corrode. Barrier protection is simply that the coating metal keeps the elements from reaching the base metal.

In the metal roofing industry, galvanized steel is used more often than any other metal and is available in most metal roofing profiles. It is lower cost than most other metals, strong and has a great affinity to hold paint. Because zinc provides galvanic protection, scratches on galvanized steel are somewhat self-protected or "band-aided," preserving the steel from rust. Therefore, the life-span of galvanized steel depends largely on the thickness of its metallic coating since the more zinc that is present the longer the steel is able to remain protected and rust-free. G-90, the most common zinc thickness used in the metal roofing industry, means that 0.90 ounces of zinc are coated per square foot of steel surface. Lesser grade galvanized steels are G-30 and G-60 and should usually be avoided for residential applications. Always check the manufacturer's specifications to determine the thickness of the steel's metallic coating.

It is important to note that G-90 *only* refers to the thickness of the zinc coating, not the thickness of the steel itself. That thickness is measured in gauge number (26 Gauge, 24 Gauge, etc.) and depends on the profile of the steel metal roofing product to be used. In regards to the overall metal thickness, the higher the gauge number, the thinner the metal is. With a few exceptions, such as mill-finished shingles or other metal roof styles, all galvanized steel systems are coated with a base paint coat of some sort. In addition, many of the higher quality galvanized steel metal roofing products, especially shake, shingle and tile systems that are used largely on residential applications, come with an added "post-forming" coat to help protect against corrosion in areas where the metal had been refashioned during the manufacturing process. This is discussed in further detail in the Coatings section.

Because of its strength, galvanized steel is a good option for homeowners in hail prone areas. Galvanized steel may not be a good option for homeowners in coastal areas

or areas with an above average amount of corrosive elements in the air. Salt spray and these other elements can speed up corrosion and shorten the life of galvanized steel. Overall, though, with consideration just for the metal itself, galvanized steel is very applicable for residential products.

Galvanized Steel Summary
Advantages: Strong, lower cost, comes in almost any look.
Disadvantages: Shorter life span than other metals, can rust prematurely if not used or installed properly, can be more difficult to work with, must be cut with a shearing action rather than saw-cut.
Thicknesses: 26-28 gauge (.018" - .014") are most common for shake, shingle, tile and slate profiles. 24 gauge (.024") is most common for standing seam systems, with a good amount of 26 gauge as well.
Weight: Between 100 and 150 lbs. per square (100 sq. ft.).
Recycled Content: Usually around 35%.

Galvalume Steel

Base carbon/iron steel coated with an alloy of aluminum *and* zinc is known as Galvalume Steel. When aluminum is added with zinc, both of the positive and negative attributes of aluminum are magnified. Because aluminum itself is a very corrosion-resistant metal, Galvalume steel is also very corrosion resistant, i.e. the aluminum/zinc alloy provides barrier protection, as opposed to galvanic. The negative aspect of aluminum in the alloy, though, is that galvalume doesn't self-protect scratches or cut edges nearly as well as galvanized steel does.

Additionally, galvalume steel is also more susceptible to a process known as "Tension Bend Staining." When the steels are formed into the various metal roofing profiles, the galvalume zinc/aluminum and the galvanized zinc coatings are spread very thin over areas in the metal where there are deep folds or tight bends—so thin, in fact, that the coating has a tendency to form microscopic cracks. Because of galvanic action of zinc, galvanized steel is able to protect these scratches with little harm. With galvalume steel, however, the aluminum in the alloy somewhat neutralizes zinc's galvanic properties and therefore the galvalume steel isn't able to self-protect the cracks, or other scratches in general. Tension Bend Staining occurs when moisture or other corrosive elements permeate these cracks and facilitate rusting. The result is "stains" of rust in areas with folds and bends in the metal.

For this reason, galvalume steel is used most commonly in rather simple profiles, such as standing seam, because there isn't quite as much bending in the metal. Because galvalume steel is more corrosion-resistant than galvanized, it is sometimes installed unpainted. While this is most often done in commercial applications, homeowners who like the bright, shiny metallic look have selected unpainted galvalume as well. Most galvalume, though, like galvanized, is painted for added durability and beauty.

Galvalume Steel Summary
Advantages: Very corrosion resistant, strong, relatively inexpensive (but often slightly more expensive than galvanized).
Disadvantages: Susceptible to tension bend staining, limited profile availability (mostly standing seam or simple shingle styles), must be cut with a shearing action rather than saw-cut.
Thicknesses: 24 gauge (.024") is most common for standing seam systems
Weight: Between 100 and 150 lbs. per square (100 sq. ft.).
Recycled Content: Usually around 35%.

Aluminum

Light weight, durable, and corrosion resistant, aluminum is a good option for almost any residential metal roofing system, including standing seam, shake, shingle, tile and slate profiles. Aluminum will never rust, so it is an ideal metal for coastal applications and other areas where steel might be in danger. Aluminum's propensity to resist rust gives it an extremely long life span. One of the first architectural aluminum applications was the cap on the Washington Monument in 1885. It was around this time that processes to separate aluminum from bauxite and then manufacture building grade aluminum alloys became efficient enough to make aluminum a viable option for the building industry. Prior to that, aluminum had been considered a precious metal.

Nowadays, virtually all aluminum roofing is prepainted, and aluminum can be found in just about any profile in which metal roofing is manufactured. In fact, more heavily formed products lend themselves very well to aluminum due to its high malleability and the fact that heavy forming adds additional structural strength. Aluminum roofing is usually manufactured from a large percentage of recycled material, a majority of which is post-consumer material, such as beverage cans. One square of aluminum roofing (.019" thick) can use as many as 1,152 aluminum beverage cans—closing the recycling loop for the consumer.

Aluminum Summary
Advantages: Lightweight, rust free, attractive, energy efficient.
Disadvantages: More expensive than steel. Not as hail resistant, particularly in less-formed profiles.
Thicknesses: .019" for shake, shingle and tile. Minimum .032" for standing seam. .032" for some heavier tile profiles.
Weight: As low as 45 lbs. per square.
Recycled Content: Usually around 95% (mostly post-consumer).

Copper

Copper is generally recognized as one of the most attractive metal roofing options. Unfortunately, it carries a pretty hefty price tag as well. Copper is the most expensive of the three most popular roofing metals (steel, aluminum, copper – in increasing order of expense). Rarely used over an entire residential roof, copper is mainly used for accents over bay windows, on dormers, or other areas where a touch of elegance is desired. Copper is used often commercially on older buildings, church steeples, cupolas, and the like. Copper is installed in short standing seam panels or sheeting, but there are some copper shingles available as well.

Sometimes, copper is used as a flashing material in conjunction with other roofing materials, but that's not a recommended use with aluminum or steel roofing, not only because most residential metal roof systems come with their own preformed flashings anyway, but also because if copper is left in direct contact with a dissimilar metal, it will speed up the deterioration of the other metal through galvanic action. Besides, as the copper patinates, the water runoff has a tendency to stain other metals, brick, concrete, and almost anything else with which it comes in contact. Therefore, it's important to understand where the water runoff over a copper portion of a roof is being directed and how it is channeled off of the roof. As an alternative, and to solve this problem, lead-coated copper is sometimes used as a replacement for pure copper. This is being done less often, though, due to the public outcry against anything lead-related in building products.

Copper is best known for its attractive blue-green, or verdigris patina that forms when left exposed for 8-15 years. The actual length of time to completed patination depends on what is in the air; salt spray in a coastal environment, for example, dramatically hastens the process. The patina is like a barrier against corrosive elements and is part of the reason for copper's extremely long life. While copper can be treated to speed up or slow down the patination process, or even be purchased pre-patinated, most homeowners elect to allow copper to weather naturally so as to ensure the rich, luxurious verdigris look.

Because copper is relatively soft and malleable, it is fairly easy to work with and usually solders well. Copper is extremely durable and has a very long life—sometimes more than 100 years. Copper has been used extensively for hundreds of years in the United States. One of the first applications was the Massachusetts State House. The copper for this project was one of the first orders for Paul Revere's newly founded copper rolling mill, in 1801.

Copper Summary

Advantages: Beautiful, extremely durable, easy to work with, easily solderable.
Disadvantages: Expensive, runoff can stain, natural patination takes some time.
Thicknesses: 12 oz. (.016") and 16 oz. (.022") are common for pre-formed shingles, 16 oz. (.022") and 20 oz. (.027") are common for vertical seam. Copper is still measured by the ounce because it is considered a precious metal.
Weight: Between 150 and 200 lbs per square.
Recycled Content: Varies but is often very high.

Terne (II) and TCS (II)

Manufactured by Follansbee Steel in West Virginia, Terne steel is a zinc-tin alloy (ZT alloy) coating over base carbon steel. The original Terne metal was a lead-tin alloy coating over base carbon steel. This original Terne had been used extensively in the 18th and 19th century as a residential roofing material. Today, Terne II, as the new version of the metal is called, is often selected residentially for historical retrofit projects. Terne II is initially a dull gray color and over time, patinates into a weathered gray that achieves a certain historical charm. Terne is very durable and corrosion resistant – it will last for centuries, but the cost is similar to that of copper.

TCS II, Terne Coated Stainless, is stainless steel coated with the ZT alloy. It looks very similar to Terne, the dull gray color, only is more durable and a little more costly.

Zinc

Zinc has been used for hundreds of years in Europe, especially Paris, and is just starting to make some headway in the United States on residential projects. Like copper, zinc is very soft and malleable. It starts out as a dull gray, and patinates into an attractive charcoal color. Zinc is mostly commonly used in standing seam, but some companies are now offering pre-formed zinc shingles as well. These can be really stunning on residential projects but do come at substantial cost.

Other Exotic Metals

There are other metals available for roofing as well including stainless steel and titanium. Generally, roofs made from these more exotic metals will be architect-specified and will be custom-formed by a manufacturer for a particular application. If you have interest in one of these more specialized metals, contact metal roofing manufacturers to check on availability and suitability for your end use.

Terminology and Product Types

Most of the consumer confusion concerning metal roofing products stems from subtle differences between the product types and a lack of knowledge of the relative applicability of them. Even the terminology of the metal roofing industry can be a bit intimidating for the average homeowner. The following section is intended to provide information about some of the technology, terms, and types of products that are used in today's metal roofing industry.

Structural vs. Architectural

Most residential metal roofing products fall under the blanket definition of Architectural. Architectural metal roofing products are designed to shed water in an efficient manner, and also to accentuate the other architectural elements of the home. What sets apart architectural metal roofing products from structural products is that they are applied over solid decking and therefore are manufactured from thinner metals than structural metal roofing products. In essence, architectural products are designed to pass rooftop weight loads through to the roof decking beneath them rather than support weight loads and pass them through to the building's structural members. Architectural metal roof systems allow for standard attic ventilation methods.

Structural metal roofing products are installed without a solid decking beneath them. That is, they are generally used in applications where the metal roofing is installed over purlins, also known as lathe boards. The spacing of such purlins is a function of the structural strength of the metal roofing and can be determined through load tables supplied by the roofing manufacturer. Structural metal roofs, because they are designed as part of the "structure" of the building, are manufactured from thicker metals. Structural metal roofing is generally intended for commercial applications such as university buildings, industrial facilities, strip malls, warehouses, and other industrial applications. Rarely are structural metal roofing products used for residential applications. Because of the potential for direct contact with the back side of the roofing panels and warm, moist air inside the structure, special ventilation issues can exist with structural metal roof systems especially on smaller buildings. This should be discussed with the roofing manufacturer and the installing contractor.

Steep vs. Low Slope

Roof pitch factors are stated in terms of rise over run. For example, 3:12 refers to a roof that is framed such that, for every 12' the roof goes back horizontally ("run"), it will "rise" 3' vertically.

The industry defines "steep sloped roofing" as anything with a pitch of 3:12 or greater. Virtually all metal roofing products are appropriate on steep sloped applications, however, 3:12 is usually the minimum pitch for which shake, shingle, slate, and some tile profile are applicable. In heavy snow load areas, some shake and shingle products are appropriate only on pitches of 4:12 and higher. Steep-slope roofing products are also referred to as "hydrokinetic," because they are designed to shed water.

Most standing seam profiles are applicable on certain low slope roofs, usually down to 2:12 pitch. Any roof with less than a 2:12 pitch requires a mechanically seamed profile to help ensure water tightness. Typically used on commercial buildings, availability of these products for residential use may be limited. Such very low-sloped roofing products are said to be "hydrostatic," because they allow for pooled water without allowing it to penetrate into the structure.

It is not at all uncommon for homes with a combination of steep and low sloped roof sections to use a combination of metal roofing products to appropriately accent the different roof configurations. For example, a homeowner may choose a metal shingle profile for the majority of the roof, but select a standing seam profile for a portion of the roof, an overhang over a porch, for example, that is low-sloped.

Under absolutely no circumstances should a metal roofing product ever be used on a roof of lower pitch than that recommended by the roofing manufacturer.

Through-Fastened vs. Clip-Fastened Systems

Through-fastened panels refer to metal roof systems in which the screw or nail that secures the metal roofing to the deck, purlin, lathe, etc., actually penetrates through the panel itself. Conversely, clip fastened panels utilize a specialized clip system that attaches to the panel or shingle. The fasteners are then driven through the clips and therefore have no direct contact with the metal panels themselves. In most cases, clip fastened panels are designed so that the clip and fastener are concealed (concealed fastener system). The fastener can also be concealed on certain types of through fastened panels as well. Some products with concealed fasteners may use a combination of through fasteners and clips.

Through-fastened panels that utilize exposed fasteners are much more common. In many cases, the exposed fastener is simply driven through an overlap in the panels' courses as well as through other strategic locations as specified by the roofing manufacturer. Exposed fastener systems are usually lesser-quality systems and therefore are subject to lesser warranties than concealed fastener systems. The reason for this is that exposed fasteners are subject to the elements and tend to break down and fail much sooner than concealed-fastener panels. Exposed fasteners are normally self-drilling screws with a hex-head drive. These screws will typically have an oversized "cap" head which protects a neoprene washer which is in place for watertightness. The screws will normally be painted to match he roof system. Although the screws are self-drilling, most installers will pre-drill holes in the roofing from the back side to ensure proper placement.

Concealed-clip fastener systems are usually regarded as higher quality and more functionally sound for another reason, too. Because metal expands and contracts when it is subjected to temperature changes, sometimes panels have a tendency to "wrinkle" or "oilcan" as it is called in the industry. The most common cause of oil canning is fasteners that are driven too tight and are therefore not allowed to move when they expand and contract. If the panels are secured with fasteners that are driven through a clip and not the panels themselves, the result is a system "floats" over the deck and is much less susceptible to oil canning. This also creates far less concern for fastener fatigue. With concealed fasteners, the fasteners are often screws for longer roofing panels and nails for

smaller “modular” sized shingles. Other causes for oilcanning can include an uneven surface of the original roof deck, improper forming of the roofing and, quite often, unavoidable stresses and chemical composition differences inherent to the metal itself.

Coatings

In most cases, the coatings that are applied to the metal roof systems are applied before the manufacturer or contractor ever even sees the metal. The finishes are applied at roll-coating facilities where the metal is cleaned, chemically, etched, coated, and baked. Then the coiled metal is shipped off to the manufacturer who fashions it into the various profiles. The finishes used in the metal roofing industry consist of three main components: 1) the pigment (also referred to as “solids”), which gives the coating its color, 2) the solvent, which is the liquid medium that is baked off after the coating has been applied, and 3) the resin, which binds the pigment to the surface after the solvent is gone. The finishes used in the metal roofing industry are classified by the quality of their resins.

There are three main types of finishes used in the metal roofing industry: the first is the water-based acrylic emulsions. In terms of the quality of coatings, the maxim “You get what you pay for” holds true. Therefore, because the acrylic emulsions are the least costly, they are also among the lowest quality of coatings and will carry a relatively weak warranty against fade and chalk (if warranted at all). Acrylic emulsions are typically two-coat systems consisting of a primer coat followed by a top coat.

The second type is polyesters including a number of formulations such as siliconized modified polyester (SMP). Polyesters are also lower cost and last only slightly longer than acrylics before fade and chalk are noticeable. SMPs are higher quality than more generic polyester paints, but still won’t achieve the performance of the standard for today’s metal roofing industry: polyvinylidene fluoride (PVDF).

PVDF coatings are usually sold and applied to metal as the trade names Kynar and Hylar. These are two-coat systems with a primer coat followed by a top coat. If the formulation is made up of the standard 70% Kynar or Hylar resin, it can use the full Kynar 500 or Hylar 5000 trade names. These trade names are used so that consumer, contractors, and architects can tell for sure that the finish on the metal roof system they are selecting is of the highest quality possible. There is no substantive difference between Kynar PVDF resin and Hylar PVDF resin, except that they are manufactured by two different companies, and thus marketed under two separate trade names. Kynar 500 / Hylar 5000 finishes usually carry a 30 year fade warranty up to five Delta E units. A Delta E unit is the smallest recognizable color shade shift seen by the naked eye. PVDF represents the highest quality coatings available for use on metal roof systems. Most metal roofing manufacturers and contractors would never recommend selecting a residential product that uses something other than a PVDF – Kynar 500 / Hylar 5000 finish.

In addition to these base coating options, many steel shake, shingle and tile profiles include an extra layer of coating to add both beauty and functionality to the products. The two coatings are applied “post-forming,” which means they are applied after the profile is fashioned by the manufacturer. The advantage of these post-forming coats, in addition to creating a gorgeous look, is that they can help seal off any cracks or

fissures in the zinc or zinc/aluminum coating over the steel that may have occurred during the fashioning of the profile.

The two main options here are stone-coatings and Kynar powder coatings.

Stone coated steel products (also called "aggregate" or "granular" coated) are used very extensively for residential applications, primarily on the West Coast and in the Southwest. These attractive coatings present a multi-hued, textured appearance and are primarily used on shake and tile profiles. The coatings consist of ceramic-coated sand or stones which are bonded to the base steel and then covered with a clear acrylic coating.

The other post-forming coating option is Kynar powder coat. This coat is an electro-statically applied Kynar powder coat that is then baked into the base Kynar coat. The result is a beautiful, long-lasting, scratch-resistant, multi-hued coat that represents the pinnacle of modern coating technology.

The newest development under the "coatings" headline is probably the most exciting due to its potential impact on the entire roofing industry: reflective pigment technology. These specially formulated pigments, which were first developed by the military in order to help camouflage tanks against infrared detection, are able to reflect a much larger percentage of the sun's rays even in darker colors. On a residential application, this means that less heat is absorbed into the attic space, and therefore less energy is required to keep the home at a comfortable temperature during the hot summer months. The end result is a reduction in the home's energy bills! Manufacturers are marketing their versions under various names, and the stone coatings are developing this technology as well.

Please note that all galvanized steel, galvalume, and aluminum roofs should have some sort of protective coating on the back side of the metal as well. It is acceptable for this to be a low cost coating. In many cases, it might be colorless.

Underlayment

Most contractors, out of force of habit, use asphaltic-based 15-lb or 30-lb felt underlayment on any type of project no matter the roofing type. While this is usually enough to satisfy a building inspector, many metal roofing manufacturers now offer an alternative to the traditional felt underlayments. These new polymer underlayments are beneficial in that they are much lighter and easier to install for the contractor. Also, in the event of a construction delay, they can be left exposed for up to three months with no ill-effects. These polymer underlayments also last much, much longer than asphalt-based 30-lb felt, and if you're installing a "lifetime" metal roof on your home, don't you want an underlayment that will last at least as long as the roof itself? Of course, if all goes well, the type of underlayment will not be a factor at all. But in the unfortunate event of a breach in the roofing material or a flashing, it's good to know that the roof's second line of defense, the underlayment, is still intact enough to handle the problem. This might not be the case if using the traditional 30-lb felt, especially with standing seam. In hot weather, the asphaltic-based 30-lb felt may stick to the back side of the standing seam panels, and when the panels expand and contract, the underlayment can tear. Most responsible contractors, if they do use 30-lb felt with metal roofing applications, will use a "slip sheet," most commonly red rosin paper, between the 30-lb. felt and the backside of the panels. With the use of the polymer underlayments, this slip sheet is not necessary.

Additionally, many contractors will use specialized self-adhering ice and water barrier underlayments near the eaves and down the length of all valleys. In colder climates with heavier snow loads, these products may be used over the entire roof. Building codes in certain areas will mandate the use of at least some of this type of underlayment material.

In all cases, the underlayment used beneath metal roofing should have a smooth, non-granulated surface. Granulated surfaces can cause damage to the back of the metal roofing panels over time.

Profiles

There are literally dozens of different "looks" and "feels" that can be achieved with metal roofing—from the traditional, sleek standing seam look, to the old-world tile look, to the more agricultural corrugated look. The variety of attractive metal roofing profiles is one of the great advantages of the industry. No matter what the style or look of your home, there is almost certainly a metal roof system out there that will complement it perfectly! Unfortunately, the variety of profiles is sometimes one of the industry's detriments as well because it can lead to improper products being used for less than ideal applications. The following section should help you make an informed choice about the product that will work best, both aesthetically and functionally, for your home.

Sheet Roofing

Sheet metal roofing is available in many different profiles, all going by different names. "5V" Crimp, "R" Panel, corrugated roofing, face-fastened panels, through-fastened panels, or screw down panels are some of the synonyms for the style of metal roofing that is encompassed under the umbrella term "sheet." Metal sheet roofing is manufactured primarily from galvalume or galvanized steel in thicknesses that vary between 24 and 30 gauge. The defining characteristic of all sheet roofing is large panels (or sheets) of varying widths and lengths that overlap and have exposed fasteners. The fasteners are driven through the overlapping portions of the panels, as well as in other strategic locations and into the roof decking, purlin, or spaced sheathing below. A neoprene washer is located beneath the head of the fastener to ensure watertightness.

One common residential type of sheet roofing is the 5V Crimp pattern. It has five small V crimps per panel. Other corrugated patterns of sheet roofing give a more "wavy" look. The look of any of these products is sometimes construed as an agricultural or rural look. Sheet can also give a historical look, particularly if used unpainted.

Sheet roofing can be installed painted or unpainted. Because sheet roofing is often chosen as a more economical type of metal roofing, the paints used on sheet metal roofing are often lesser quality. This saves even more money on the overall system. Generally, sheet roofing systems should be examined closely before being selected for residential projects looking for a lifetime roof. While most sheet roofing is still higher

quality than many traditional roofing materials, it contrasts pretty sharply with some of the more technologically-advanced metal roofing options available to homeowners who want to make lasting investments in their homes.

Sheet roofing is the most economical form of metal roofing. It is also one of the easier-to-install types of metal roofing. The disadvantages of sheet roofing are that it's not as long lasting, both functionally and aesthetically, as some other types of metal roof systems.

Standing Seam

Standing seam is probably the most recognizable profile of metal roofing for both commercial and residential projects. The popularity of standing seam has grown so much in recent decades that many people automatically assume that standing seam is implied by the term "metal roofing." Standing seam provides a very contemporary, distinctive look, and is chosen to complement homes of all styles. The key, though, to choosing the right standing seam depends on the actual dimensions of the roof. More often than not, residential roofs are smaller, more compact, and more complex than commercial roofs. For this reason, it's advisable to select a standing seam roof with a relatively small panel width – usually around 12″. Wider panels will present a more commercial look to the roof, obviously a condition to be avoided when selecting metal roof for a home.

As mentioned in the section on through fastener vs. clip fastened systems above, standing seams can be either through- or clip-fastened. Through-fastened standing seam systems are less common and utilize a nailing "flange" that runs the length of the panels. The fasteners are driven through this flange and then concealed by the subsequent panel. So, although the fastener is concealed to the elements, it is still fastened directly through the panels themselves. These systems are more cost effective options, but since most quality standing seams used residentially are continuous panels—meaning the panels are custom formed to the length of the rafter—using these through-fastened panels is not recommended on longer rafter lengths. The reason is that the longer the panel, the more it will expand and contract, and the more likely to fatigue fasteners, "wallow out" fastener holes and also to oil can. These through-fastened panels are a good option, however, for shorter runs such as porch accents or bay windows.

For longer runs, the better option is a standing seam system that utilizes a clip system. The clip should be manufactured from a similar metal as the standing seam itself, or from a metal like stainless steel that is not conducive to the galvanic action between dissimilar metals. The clip is fastened to the roof deck so that the panels are allowed to "float." This helps to ensure that the system will maintain its watertightness much longer, and also its aesthetics, as oil canning will be less of a concern. For longer runs, it is also recommended that a system with a higher rib is used. The rib is the portion of the standing seam that gives it its dimension, and is also the joint of the two adjacent panels. Higher ribs will give the panels more capability to carry water down the entire length, and thus prevent water from spilling over the panels and possibly backing up under an overwhelmed rib or other flashing.

Standing seam roofs are most commonly manufactured from galvanized or galvalume steel and range in gauge from 18 for the heavier structural products (rarely used residentially) to a lighter 26 or even 28 gauge for simpler projects. Gauge 24 and 26

are the most common for residential steel standing seams. Some high quality standing seams are manufactured in heavy gauge aluminum ranging typically from .032" to .050" with .032" common for residential applications.

Many standing seam systems come with an entire array of preformed flashings. These flashings help reduce installer error and help ensure a watertight roof for many decades to come. Flashings for true standing seam systems usually need to be custom-made for each job in order to exactly meet the pitch and other geometry of each individual roof.

Shake, Shingle, Tile, and Slate

The growth in demand for standing seam in the residential roofing market over the past few years may be exceeded only by the growth in popularity of the "new metal roofs" – the shake, shingle, tile, and slate profiles. Many of these specialty profiles are designed almost exclusively for residential use. Very early profiles of this type were designed for commercial applications (Pizza Hut or Dairy Queen, for example) and, with updates in manufacturing and coatings technology, have evolved into the beautiful residential systems that homeowners can't seem to get enough of. The four different types of "modular" panels can vary greatly in terms of look and use. Following is a description of all four.

Metal shakes are designed to mimic the look of hand split cedar shakes. While many homeowners select these shake systems because of their resemblance to wood shakes and also because of the long-term performance metal provides, many other homeowners enjoy these specialty metal shake systems for their own, unique and distinctive look. These modular panels come in various sizes with common dimensions of 2' x 1' and 5' x 1' and are usually fastened to the roof deck with a concealed clip system or a nailing flange formed into the top of the shingle. Shake and shingle facsimile profiles are installed on the roof in a staggered pattern to avoid vertical line repetition. The shake systems are usually more "high-profile" than shingle systems, meaning that they are designed with a little more dimension and texture. Many times, this added dimension to the shingle allows it to be installed directly over previous roof layers, even some thin wood shingles. Metal shakes are usually manufactured from steel or aluminum, either 26 or 28 gauge steel, or .019" or .024". Steel metal shakes are commonly coated with a post-forming stone coat or Kynar powder coat. This helps seal the edges in areas where the zinc or zinc/aluminum alloy coating has been spread thin over areas of tight bends. Some manufacturers also offer aluminum shakes with the special post-forming coats, but in the case of aluminum, these coats are selected more for aesthetic reasons than to ensure the functional soundness of the system.

Most metal shake systems come with a complete line of pre-formed flashings which usually include hip caps, ridge caps, gable trim or flashing, sidewall flashing, eave starter strips, and valley. These are typically universal flashings designed to work with any roof pitch. Higher-quality metal shake systems utilize an open valley system to help ensure that leaves, ice, pine straw, etc. do not block up the valley and cause water to back up under the panels or the valley itself. It is usually a good idea to inquire with your contractor about the type of valley flashing used with the metal roof system you are considering.

Metal shingles are similar to metal shakes except with a lower-profile design. Many homeowners who are fed up with the short lives of the traditional machine split wood shingle select metal shingles for their durability and beauty. Also since metal shingles look more like dimensional standard shingles, some homeowners choose them for their ability to blend in with a more modest neighborhood look. Like the shake profiles, the single metal roof systems are modularized panels fastened to the roof deck most commonly with a clip system, or sometimes with a nailing flange formed into the top of the shingle.

Metal tile profiles come in a wide variety of looks and feels, from the exotic Mediterranean barrel tile look to the stately S-Serpentine look. Most tile profiles are through-fastened, and some utilize a batten grid attached to the roof deck to which the panels are attached. Most metal tile systems are made in large sheets that typically stretch from eave to ridge. Fewer seams and quicker installation are a plus, but waste can be dramatically increased with such systems.

Metal slate profiles are manufactured in steel, aluminum, and copper to replicate the look of natural slate. The advantage of metal facsimile slate profiles is that they are about ½ to 1/3 the cost of real slate, and are also much, much lighter than traditional slate – which can help prolong the life of older buildings.

Some other, more exotic profiles, such as diamond shapes, scalloped, and flat tiles are available in metal roofing.

Common Issues & Concerns

Selecting and purchasing a metal roof is a significant event. Property owners who do their research and have complete information available to them are the ones who end up making wise investment choices when it comes to roofing. Following are several concerns which arise fairly frequently during the roofing decision making process.

Installing Over Existing Roofing Materials

Due to their very low weight, many metal roofs can be installed over existing roofing materials. This is particularly the case when going over old composition shingles. Additionally, the formation of many of the heavily-profiled shake and tile profiles of metal roofing can even permit installation over wood shingles or wood shakes.

Before deciding to install over an existing roof, the manufacturer or an experienced contractor must be consulted as weight is not the only issue. In many cases, building codes prohibit more than two layers of roofing, although building inspectors have been known to waive that restriction for metal roof lay-over installations. If there is an existing weight problem with the structure or if there is question as to the integrity of the structure or roof decking, those issues must be addressed before installing over the existing shingles.

In some cases, particularly with wood shingles and shakes, the old roofing can be removed from the edge perimeter of the roof and even the lumber can be removed and replaced with fresh lumber before proceeding with the roof installation.

Metal can also sometimes be installed over existing slate and asbestos slate roofs though, again, the manufacturer or an experienced contractor should be consulted. Existing tile roofs and, in most cases, existing metal roofs, need to be removed prior to installation of the new roof.

Lightning

It is common for homeowners to wonder whether a metal roof might attract lightning. Fact is, metal conducts electricity but it does not "draw" it. There is no evidence that metal roofing puts a home at greater risk of a lightning strike. Typically, lightning will hit the highest object around and rarely is that the top of the house. Just the same, metal roofs can be grounded by a lightning protection specialist if desired.

Fire Safety

Most metal roofs are approved for Class A, B, and C fire ratings. In some cases, a special underlayment may be required to meet certain code and fire classification requirements. However, metal roofing is widely recognized for its resistance to airborne sparks and burning debris.

Sound Transmission

Most residential metal roofs are installed over solid decking and, in most cases, there is an attic space beneath that. These factors help to reduce noise transmission and avoid objectionable noise from rain hitting the roof. Additionally, the more heavily-profiled metal roof styles are very good at breaking up any "sound board effect." Whereas rain may create a slightly louder sound hitting metal roofing than other products, it will not create a "tinny" sound. If your home has areas where there is no attic space or insulation, talk to your metal roofing contractor about this and see whether there is a way to add insulation for sound deadening as well as energy efficiency.

Ventilation

In most cases, metal roofing does not increase the need for attic ventilation. However, it also doesn't decrease it. Fact is, homes are being built more airtight today than ever before. This is resulting in moisture getting trapped inside the house. This moisture generally migrates to the attic and needs to be exhausted out year-round, as does the excessive attic heat which can build during the summer months. The most proven method of venting is a combination of soffit vents and a roof ridge vent. Most metal roof systems will offer some sort of ridge vent option. If moisture is not vented from an attic, unhealthy and damaging conditions including mold and rot can occur.

In the rare instances when structural metal roofing (i.e., metal roofing that is installed over purlin or lathe rather than solid decking) is used on a residential-scale building, good ventilation is critical to prevent the collection of condensation on the exposed bottom side of the roofing panels.

Stress Skin "Sandwich" Panels

Increasingly, homes are being built from stress skin panels which consist of foam sandwiched between two layers of decking or outer decking and inner gypsum board. These panels can pose potential condensation issues because they often do not have any

venting. This goes against the International Building Code which requires a 1″ vented airspace in the United States and 1½″ in Canada. One answer is to have a complete vapor barrier on the bottom side of the panels. Before proceeding with the installation of any roofing over stress skin panels, consult with panel manufacturers, roofing suppliers, and building officials as necessary to ensure that steps are being taken to avoid condensation issues.

Hail

Metal roofing is widely respected for its hail resistance. While there can certainly be storms which no roofing material will escape unscathed, metal roofing offers good protection from leaks even if aesthetic damages do occur. The most widely-accepted test of hail-resistance is Underwriters Lab (U.L.) 2218, a steel-ball drop test that simulates the effect of hail impact on roofing products. Metal roofs pass U.L. 2218 at Class IV, the highest rating. As a result, homeowners in many hail-prone states can obtain discounts on their insurance premiums. Additionally, unlike other roofing materials, metal roofing resists hail damage even as it ages.

Walkability

Most metal roofs can be safely walked without damage. Inquire with the roofing manufacturer as to the correct methods for foot traffic on the roof. Some of the shingles and shake style metal roofing products have optional foam backers for even greater rigidity and walkability.

Environmental Impact

Metal roofing is increasingly being recognized for its many "green" benefits. The durability of metal roofing makes it a very sustainable product. Additionally, should it ever need to be removed in the future, it is 100% recyclable. Most metals used in roofing have very high initial recycled content. This is as high as 95% with aluminum. The production of metal from recycled stock also has very low embodied energy in comparison to producing metal from original ores.

With the onset of various "cool roofing" initiatives in the country, metal is being recognized for its ability to keep buildings cooler in hot weather. This is done through a combination of reflectivity and emissivity, often enhanced by coatings on metal roofing. Additionally, shake, shingle, and tile profile metal roofing products have minimal contact with the home's structure, blocking heat transfer by conduction as well.

Finally, the ability to install metal roofing over old roofing materials means that landfills are not being burdened with the old roofing.

Warranties

Metal roofing has a long history. Many metal roofs can be found in the United States today which are 100+ years old. Those roofs did not have the benefit of today's coating and manufacturing technology either. Metal roofing manufacturers provide warranties covering such things as manufacturer's defects, product integrity, and coating integrity. The coating warranties may include such things as fade and chalk. Homeowners are reminded though that, as is the case with all building materials, the actual installation workmanship is warranted by the installing contractor, not by the product manufacturer.

Compare warranties both from the product manufacturers and the installing contractors before making a final choice.

Proper Installation

As is the case with any building material, metal roofing must be properly installed in order to be successful. Property owners are encouraged to fully investigate both the metal roofing materials they are considering and the contractors they are considering for installing those materials. This investigation should include looking at past jobs and talking with past customers. If the manufacturer and/or the contractor are unwilling or unable to share information with you concerning proper installation procedures, it might be best to find different suppliers.

Benefits of Metal Roofing

Metal roofing offers many benefits to property owners. As you investigate various products, the manufacturers and suppliers should be very happy to provide you with details as to the particular benefits and attributes of their products. However, the benefits of metal roofing frequently include:

- Distinctive Beauty
- Increased Home Value
- Worry-Free Lasting Durability
- Fire Safety
- Low Weight
- Wind Resistance
- Energy Efficiency
- Recycled Content, and 100% Recyclable
- Installation Over Existing Roof