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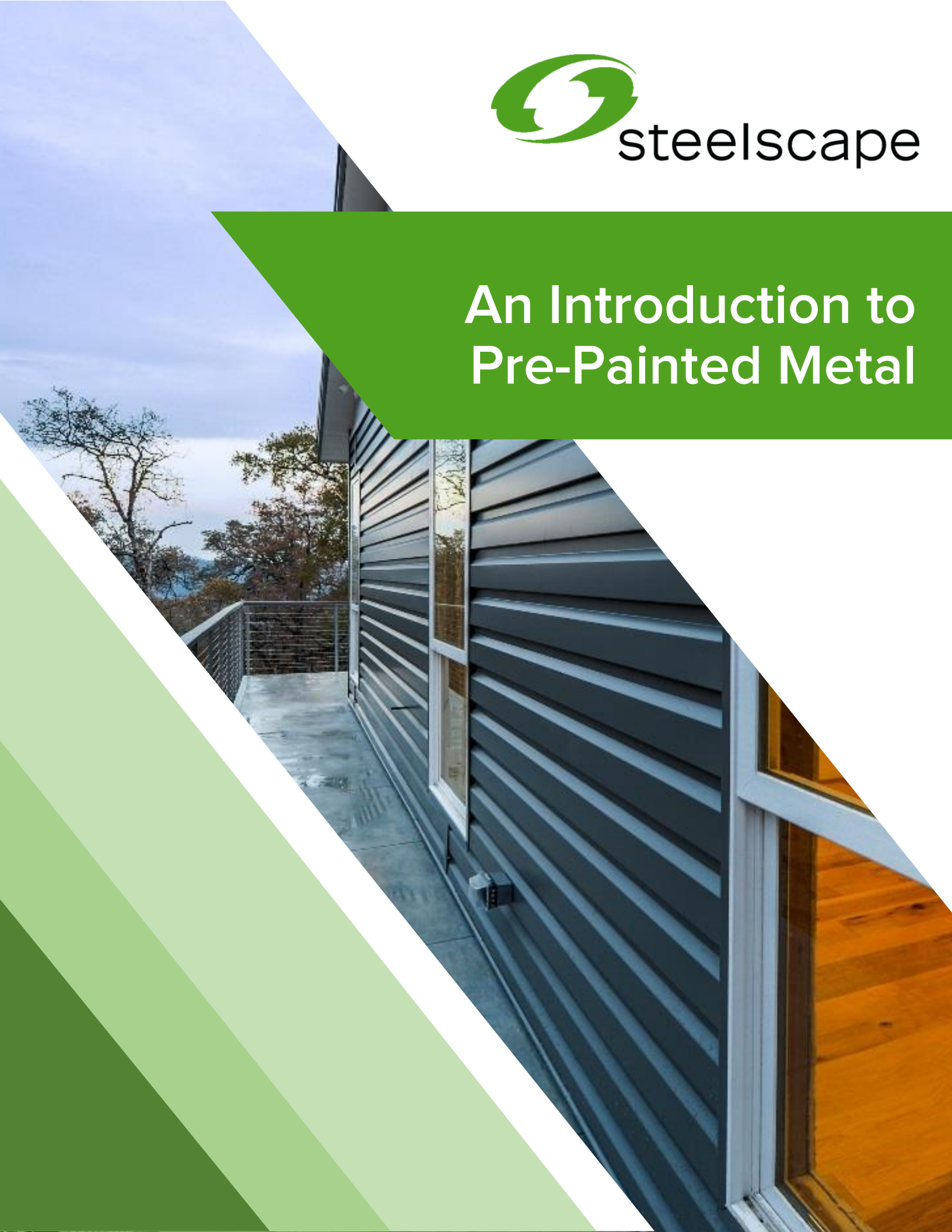
An Introduction to Pre-Painted Metal



Overview

Coated metal is an outstanding product for roof, wall and other building applications. It is durable, fire resistant and can be formed into a vast array of shapes and sizes, producing endless design-creativity and exceptional curb appeal. Pre-painted metal products offer some of the best finish warranties in the construction industry, enabling confidence, surety and delivering stunning visual appeal for years to come.

This guide assists end users of pre-painted metal products by explaining common metal and paint terminology.

For any questions or assistance with items not discussed in this guide, please contact Steelscape at (888) 285-7717.

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Contents

Introduction

Paint

Pre-painted Metal 5

Paint Systems 6

Variations and Finish Options 7

Paint Failures and Warranties 9

Cool Colors 11

Introduction

The surface coating is the first line of defense in pre-painted metal, and one of the most important elements to consider as part of your metal purchase. Selecting the right coating, finish and paint system, can affect product lifespan, energy efficiency and visual appeal. The second part of this guide provides an overview of pre-painted metal and is designed to help identify the right finish specific to your project's needs. For more detailed paint information not discussed in this guide, we encourage you to reach out to Steelscape's Technical Service Department for further information.

Paint

Pre-painted steel is a durable yet economic finish which provides endless vibrant color and finish options. Coil coating or pre-painted metal, the method in which paint is typically applied for construction products, is one of the most effective methods to achieve a durable, consistent paint finish with exceptional finish warranties of up to 40 years. Unlike most other painted surfaces, metal coating (coil coating) is applied prior to the fabrication and forming of metal into a finished product. Therefore, a coil coating must be hard, damage resistant, and flexible enough to withstand forming operations. Coil coating ensures that paint is applied in a controlled environment with precisely applied inputs, enabling excellent product quality, consistency and installed longevity.

What's involved in coating metal?

Outside of the base metal and anti-corrosive coating (ZINCALUME® or TruZinc® discussed in the previous section), painted products typically consist of three additional layers.

Primers and pre-treatment prepare the base material for painting by providing 'bite' for adhesion and directly support topcoat color and flexibility. Primers also provide corrosion resistance and can be modified based on paint requirements. For example, thicker primers can be applied for marine environments to provide enhanced corrosion protection. Alternatively primer formulation can be modified to improve the flexibility of the paint system and the adhesion of the paint.

Backers provide base color and an element of limited protection. For some paint systems these also act as a base layer for adhesion. In most applications of pre-painted metal, the final top layer of paint is only painted on one side, as the underside is usually attached to the building structure and is not visible. However, in some applications, such as eaves or overhangs, the reverse side of the steel can be exposed. As a result, a consistent and neutral backer color is useful for these applications. In most instances, backers are usually off-whites or browns to provide a neutral color that blends into the broader environment. Be sure to consider the standard backer color if an exposed steel underside forms part of your next project. For specialty applications, the final topcoat can be applied to both side of the base material, however this generally incurs a significant price premium.

Topcoats, or the final coat of paint, offer protection from outside elements and provide color and aesthetic appearance, formability, durability and weatherability. Weatherabilty reflects the resistance to moisture, sunlight and temperature changes.

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Are all paint systems the same?

There are three prominent paint systems for pre-painted metal building products. Awareness of the different attributes of these paint systems is important when assessing the suitability of a painted product for a specific application. Paint system selection can significantly influence cost, performance and the warranty length offered. Consumers should note that any paint system can be modified to use 'cool' pigmentation.

The three paint systems include:

Standard polyester paints – These are typically the most economical paint systems offering the lowest level of resistance to UV and as a result offer the shortest product warranties. Polyester systems are also very versatile and their paint structure can be modified and can vary from a generic low durability non-warranted product to those with 25 year warranties. Due to this flexibility of polyester finishes, end purchasers must be careful when comparing polyester coated products to ensure they are comparable. Although polyester systems can be formulated to provide a moderate level of UV resistance, they commonly offer the shortest lifespans, with the majority of polyester products designed for cost conscious applications such as agricultural and light commercial buildings.

Silicone Modified Polyester or SMP for short is a more durable paint system compared to low end polyester paints. SMPs are modified with a different resin structure to improve the resistance to UV damage and subsequently offer greater durability to low end polyesters. Compared to standard polyesters there is less variability in range and quality, meaning it can be easier for end consumers to compare like-for-like products. Originally, the delineation between polyester and SMP paint systems was more discernable, however as technology improves, the differential between high-end polyester systems and SMP systems can be limited.

Fluorocarbon / PVDF / polyvinylidene fluoride also known as Kynar 500® or Hylar 5000® systems are a completely UV transparent paint system that offers superior durability. Fluorocarbons are known by several different names, including Kynar500® and Hylar5000®. Kynar 500® or Hylar 5000® broadly reflect a trade name for a PVDF product but also establish a minimum composition and quality standard for a PVDF finish. Long Term Arkema (owner of Kynar 500® brand) testing has shown that PVDF systems are most durable when it makes up 70% of the overall coating. Some low cost PVDF options are available in 50% PVDF formulations but long-term performance is shown to drop off. Applications above 70% do not coat well. As a result, only 70% versions may be sold under the Kynar 500® or Hylar® 5000 trade names.

A summary of the three paint systems is provided in the following table:

Paint System	Polyester	SMP	PVDF
Overall	Good to Better	Better	Best
Price Point	Cost effective	Moderate	Higher
Warranty	None to moderate	Long	Longest
Durability	Limited to good	Medium to High. Improved weatherability	Highest
Application	Versatile, but typically low exposure applications such as agricultural buildings, gutters and downspouts, industrial buildings	Wide range of construction applications including residential and commercial	High end architectural and commercial and high profile projects
Other attributes	Wide range of colors and gloss options	Wide range of colors and gloss options	Excellent chalk and fade resistance and chemical resistance

End users should always enquire with the product manufacturer as to the paint system offered. As demonstrated above, there are significant differences amongst the paint systems and even within the paint system families that can directly affect finish longevity and vibrancy of color.

Paint options

Whilst there are only three core paint systems, they can be optioned to alter the installed aesthetic appearance or improve protective attributes. A summary of the different paint options are listed in the table below:

Item	Beneficial Attributes
Metallic and Micas	Metallic or Mica pigments are added to the paint to create a sparkling or pearlescent, light catching effect for increased visual appeal. The individual pigment particles are flat in nature allowing for light to reflect off each particle at various angles. They are also typically larger in size than non-metallic pigments. The specific orientation of these pigment particles affects how the final paint system appears visually to the human eye. Common metallics include silver, bronze and copper colors. The exact size and orientation of these pigment particles cannot be completely controlled during the paint manufacturing process, thus each batch may have a slight visual difference. This means that metallic products cannot be mixed beyond batches. Furthermore it is important that the end user or installer does not rotate metallic coated panels to avoid color and light differences of the installed product. The use of directional arrow branding is highly recommended by Steelscape to product manufactures.
Other special effects	Paint systems can be optioned to include specialty pigments that create color changing effects from different viewing angles. These are typically based on the mixture of two mica pigments to create color shifting effect. The directional and batch to batch sensitivity of metallic colors identified above also applies to these pigments.
Graffiti resistance	This coating system includes a primer, the standard top coat, and a graffiti-resistant clear coat. The clear coating works as a barrier of protection over the color coat layer and prevents most graffiti material from gripping or shadowing the surface. If vandalized, a third party spray is applied directly on the surface and easily wipes off the graffiti without discoloring the base color.
Marine Systems / Industrial Systems	Paint systems can be modified to offer enhanced durability in highly corrosive environments. This includes coastal environments that have enhanced exposure to sea spray, or industrial environments that have greater exposure to airborne chemicals. For these applications the combination of a high-build primer and an additional clear coat provide enhanced corrosion protection and a warrantable product for certain environments. These high build systems are based on customer request with warranty provisions based specifically on the environment of the installed solution.

Specialty Finishes

Steelscape offers a range of design finishes and textures to expand the design flexibility for pre-painted steel. Due to the advanced paint application systems that Steelscape employs, the majority of the specialty prints and textures offered employ the same SMP and PVDF paint systems used for standard colors. This enables the expansion of curb appeal whilst retaining product longevity.

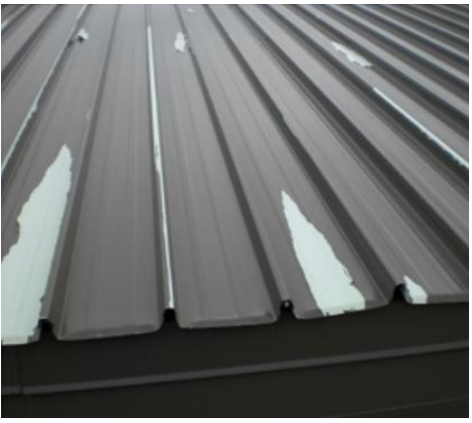
These paint systems consist of a base coat of color, with a pattern of a different color applied over the top, which allows multiple colors to be visible on the finished product. Steelscape Prints® such as Brushed Steel, Rustics and Naturals increase curb appeal by recreating stunning rustic and textured effects, but still carry the warranties of standard paint systems. Other products such as Rawhide, 'crinkle' the painted surface and can diffuse surface sheen to deliver a muted, textured finish. Overall, Steelscape products can be used to mimic copper, zinc, and rust whilst still offering complete product warranties. These specialty prints use existing paint system technology and as a result are available in a wide range of paint systems specific to end user and warranty requirements.

Steelscape also offers Vintage® and the Eternal Collection™ that are proprietary paints that are specifically formulated to provide a semi-transparent finish whilst providing similar protection and UV resistance as standard paints. Semi-transparent finishes produce a colored finish with added depth and provide a distinctive metallic luster. Other paint systems offered by Steelscape are designed for specific end use applications. This includes products such as TruzGuard®, which offers a durable, NSF International certified finish for food preparation environments.

Each of the specialty finishes highlighted above can have the same batch to batch sensitivities as metallic paint and as a result mixing batches or direction is not recommended. Ensuring appropriate order size to allow for install damage and scrap can help ensure a project avoids mixing different paint batches.

Paint Failure and Warranties

Paint warranties are typically offered for film integrity, color fading and chalking. These are the three most common modes of paint failure in coated steel. While these three failures are typically covered by the paint supplier warranty, improper application by a coater, can have a significant influence on long-term product performance. As a result, using the products of an experienced coater, such as Steelscape, which is a member of the National Coil Coater's Association, is always recommended.



Color fading is caused when substances in the environment and UV rays attack the pigment portion of the paint and cause the color to change. This occurs as the product ages. Whilst the methods used for assessing excessive color fade will vary by manufacturer, typically it is assessed based on its variance to the base state when new. The anticipated color fade and subsequently level of fade covered by warranty will dramatically vary based on the paint system selected. Some paint systems do not offer any guarantees against color fade. As highlighted above, PVDF systems will typically offer the best warranty against color fade. Check with your product manufacturer for complete details.

Film integrity warrants that the paint will maintain adhesion to the substrate (base metal). If a painted product fails to adhere it results in delamination and surface bubbling. Delamination is the loss of paint film adhesion to either the substrate or between primer and topcoat.

Chalking is caused by a degradation of the resin systems at the surface of the finish, due predominantly to ultraviolet (UV) rays. As the resin system breaks down, resin particles along with imbedded pigment particles lose adhesion and take on a white appearance, creating a chalky powdered surface. Due to both chalk and fade being directly associated with the impact of UV rays, some product manufacturers will consolidate the two into one warranty offering.

Overall pigment selection combined with proper resin formulation both affect fade and chalk. Superior paint systems employing different pigment properties (such as PVDF systems), combined with experienced coaters with stringent quality controls (such as Steelscape), will help prevent coating failure.

Cool Colors and Paint Options

'Cool' roof coatings were introduced to the U.S. steel coating market in 2001. They utilize special infrared reflective pigments that stay cooler than traditional pigmentation. Solar radiation reaches the earth's surface in three distinct wavelengths; UV (5%), Infra-Red (51%) and Visible (44%). The IR portion is responsible for the generation of heat on surfaces. Most visually dark pigments absorb IR radiation and thus get hotter compared to light colored pigments. Cool pigments have been altered chemically and physically to reflect IR wavelengths while still absorbing the same visible light, therefore their appearance is still able to recreate traditional darker colors.

Three terms are typically used for measuring and evaluating cool roofs; solar reflectance, emissivity and Solar Reflectance Index. Solar reflectance, expressed as a percentage or decimal, is the amount of solar radiation reflected off a surface. Emissivity (emittance) expresses as a percentage or decimal the amount of heat a surface can dissipate away from itself. The Solar Reflectance Index (SRI) is a consolidated value calculated from solar reflectance and emissivity with factors such as airflow included and is the easiest and simplest way to compare the energy efficiency properties of colors. Manufacturers will typically publish SRI values on their color card or product website. Other products outside of metal are rated as part of the cool roof rating council's activities. A significant differentiator of metal is the aged SRI performance. Unlike other substrates such as membrane roofs or asphalt shingles that degrade, impacting thermal efficiency, metal remains unchanged and in some instances can improve slightly over time, providing unchanged SRI efficiency for 20 years or greater. Despite this long-term performance benefit, the CRRC only publishes three year aged performance values, which for the majority of coated metal products are no different to their initial SRI values.

The Cool Roof Rating Council verifies emissivity and reflectivity of roofing products. This is typically undertaken by the roof and wall product manufacturer. The council's missions is to develop accurate and credible methods for evaluating and labeling the solar reflectance and thermal emittance properties of roofing products and to disseminate the information to all interested parties. More information can be found at https://coolroofs.org/. Overall the higher the SRI value the better the roof's ability to reject solar heat.

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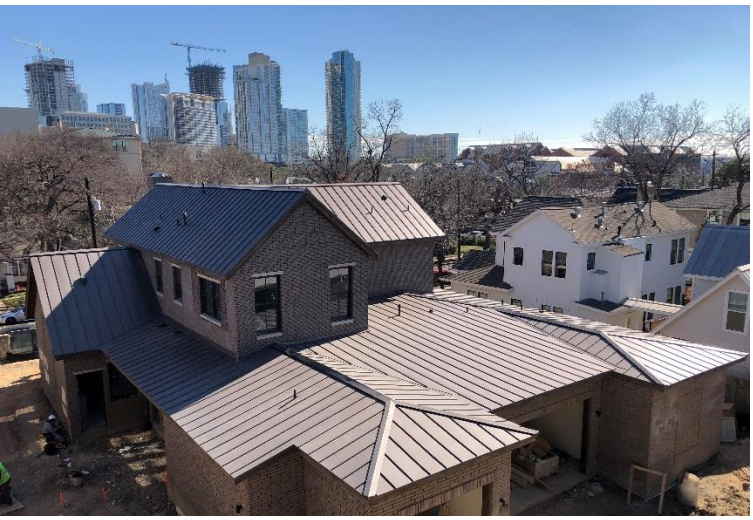
Summary

Thank you for taking the time to read through this introductory guide to pre-painted metal. As identified in this guide, pre-painted metal reflects a robust and cost effective solution for many applications. Pre-painted metal can provide aesthetic appeal and longevity for years to come in an environmentally responsible manner. It should be clear that not all pre-painted products are the same. Base metal characteristics, metallic coating, paint systems and other product options can all drastically alter the durability, formability and aged appearance of coated metal products.

This guide also identifies that despite the technical differences between paint systems and product options, product quality and longevity is heavily influenced by the manufacturing and installation process. Third party accredited coil coaters such as Steelscape, in addition to reputable product manufacturers and licensed contractors, all play an important role in the production and installation of a quality metal product.

For any additional questions or suggested improvements to this guide, please contact Steelscape at 888-285-7717 or send an email to info@steelscape.com.

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