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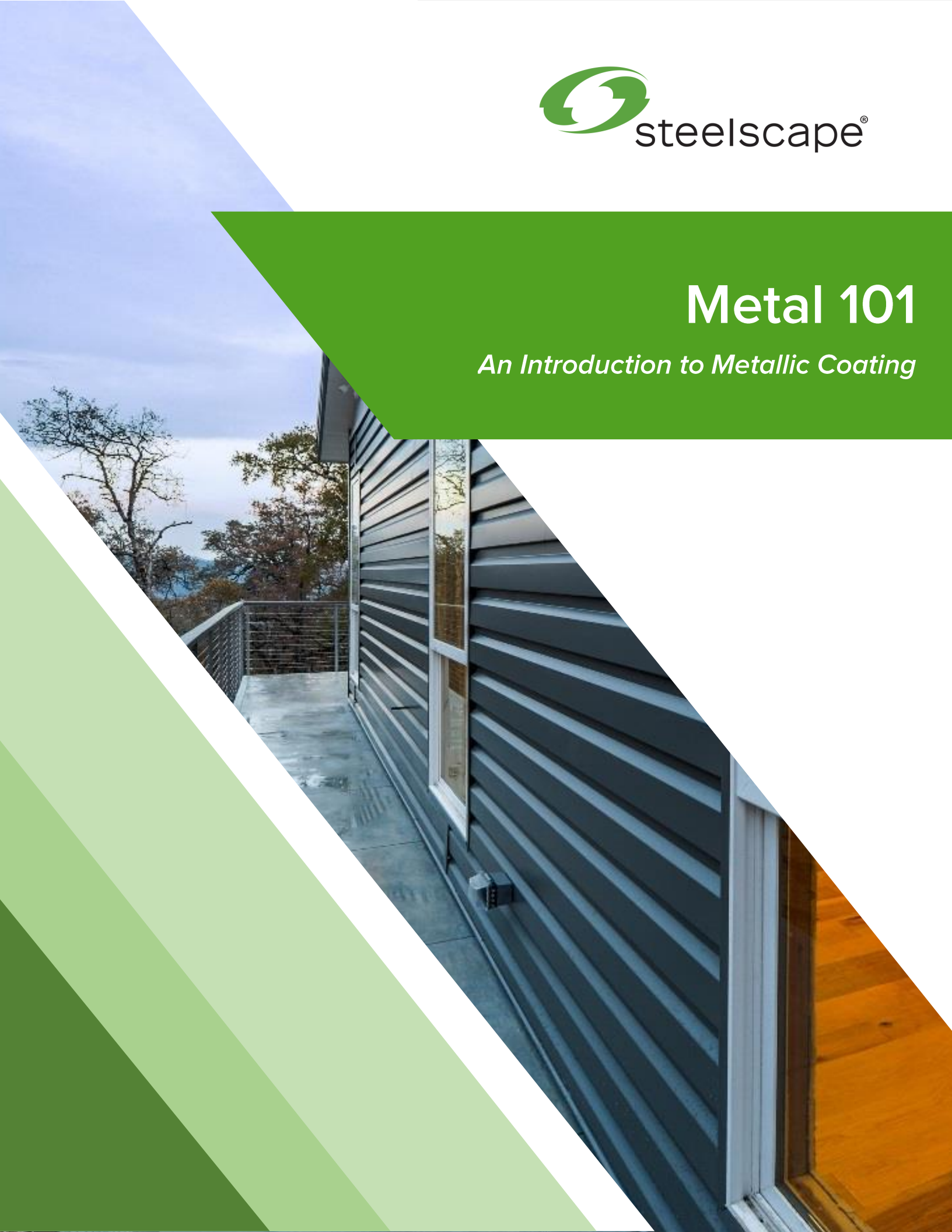
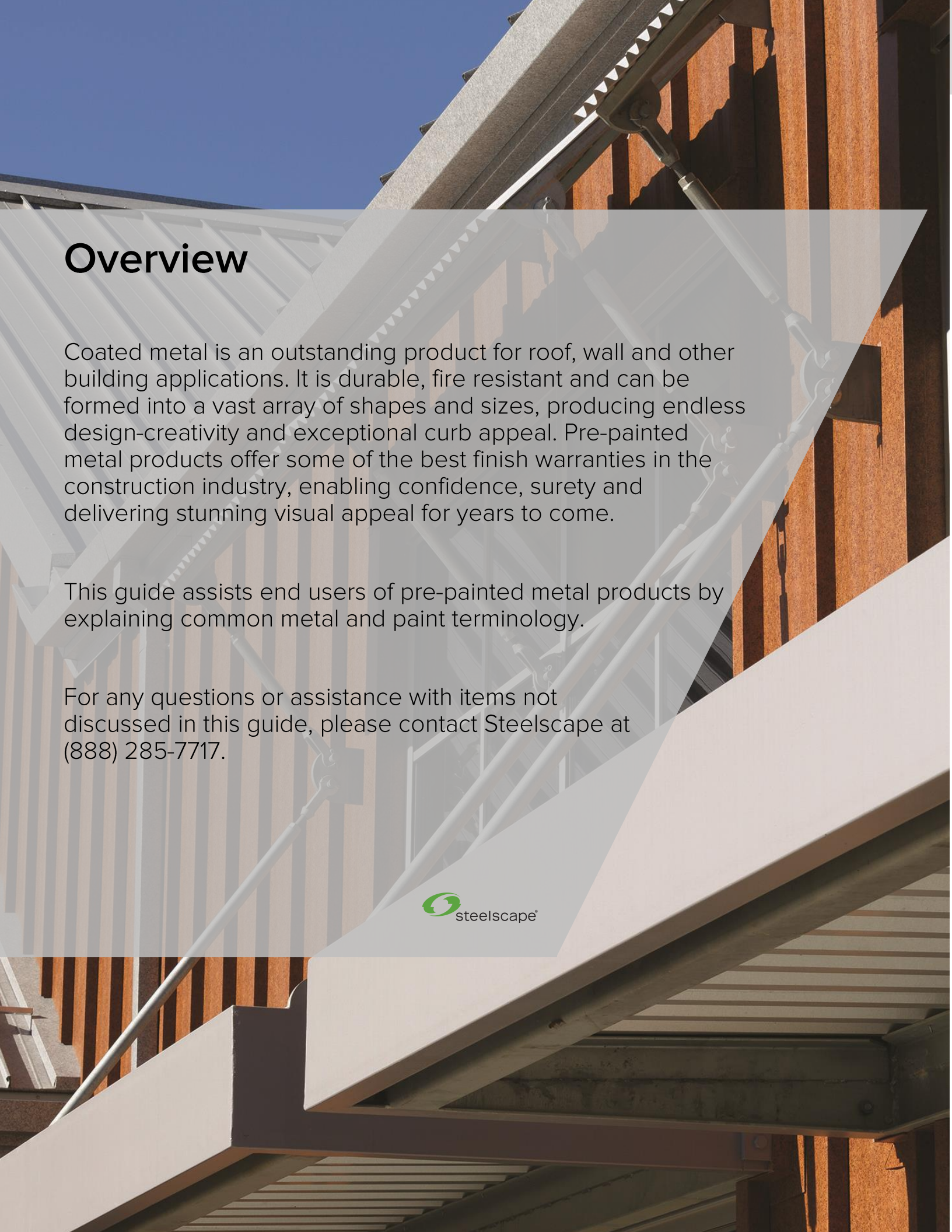
Metal 101

An Introduction to Metallic Coating





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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Introduction

So is all metal the same? The simple answer is no. There are a number of different product options that can be selected based on the application, the environment and other specific needs of end users. This guide is designed to provide an overview of metal properties that are important to understand when purchasing metal building products. For more detailed technical information not discussed in this guide, we encourage you to reach out to Steelscape's Technical Service Department for further information.

Metal is important, however the surface coating is the first line of defense, 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. For more detailed paint information on paint, please refer to the separate technical bulletin or reach out to Steelscape's Technical Service Department for further information.

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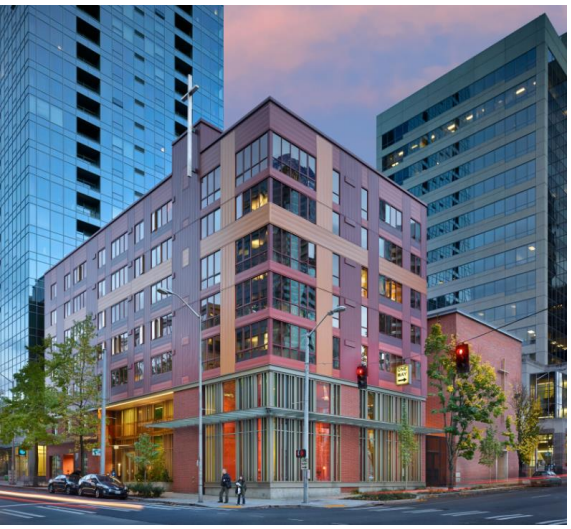
Metal

Steel and aluminum form the basis of most modern applications of metal in building product applications. These materials have superior strength, formability and offer strong cost competitiveness. Steelscape coats both of these products and provides these materials to users throughout the construction industry.

Most steel and aluminum products are end tested by product manufacturers for elements such as wind uplift performance, fire prevention and snow load performance and this performance can be used to assess product suitability. The attributes of the metal, namely product thickness or gauge as well as yield strength, will impact this performance.

A key benefit of metal in roofing and wall products is metal's low environmental footprint. High reflectivity and emissivity (ability to release heat) qualities enables steel to deflect heat which can reduce building cooling costs. Steel and aluminum are also 100% recyclable.

Both steel and aluminum offer long expected lifespans and low maintenance. The selection of aluminum over steel generally comes down to the environmental considerations of the installed application. Environmental considerations such as proximity to seawater, or fire and hurricane risk, material weight and the formed shape of the end product, all influence material selection.



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Pre-Painted Metal Material Choices

Steel - Finished steel products offer superior strength, great durability and strong cost competitiveness. Steel is harder and less malleable than aluminum, which in turn provides better structural performance across most strength based performance metrics. Steel is also more fire resistant when used without an underlayment. For comparable products, steel is less expensive and available in a wide variety of product types, making it a common product of choice. Modern metallic coating systems such as ZINCALUME® (Galvalume®) and TruZinc® (Hot Dipped Galvanized) enable excellent corrosion protection for product lifespans of over 50 years. Modern steel paint systems provide a wide array of paint and finish options to suit every design application

Aluminum – Aluminum offers superior edge corrosion resistance, which makes it a superior metal in coastal environments. Aluminum, despite offering a higher strength to weight ratio compared to steel, is softer and more malleable. This means it can be formed into more complex parts. The formability of aluminum is of less relevance in most roofing or siding applications as the majority of metal product manufacturers offer the same products in either metal type. By being a softer metal, it is also more susceptible to damage such as dents and does not 'spring back' like steel. This softness will also affect product performance including wind load and snow load performance. Aluminum is lighter per square foot of coverage compared to equivalent steel products and this will affect the weight of the installed product on the roof or wall. Despite being lighter, aluminum is typically more expensive compared to steel for similar building coverage.

Exotic metals such as zinc, copper and stainless steel can be used in construction applications. However, these are significantly more expensive than steel or aluminum and are typically not available in painted configurations.

Whilst metal is a proven, durable, product of choice, many building attributes such as total fire resistance, heat and snow retention, ventilation and water impenetrability, are directly influenced by the type of product used and the quality of the installation. Steelscape recommends that finished products should only be chosen from reputable manufacturers and installed by experienced professionals.

Attributes of Steel and Aluminum

Thickness

Steel thickness in end applications is typically expressed in terms of gauge (ga for short or sometimes gage). The higher the gauge, the lower the thickness of the steel. Due to the variability between mills, a gauge typically represents a range of material thickness (although on a very small scale of thousandths of an inch).

In most building product roof and wall configurations, steel is typically offered in 18-29ga ranges, which reflects Steelscape's core capabilities. The majority of commercial roof and wall applications are in 22 and 24ga for superior strength and durability or as dictated by building standard requirements. As most residential products are installed over a solid substrate, 26 and 24ga are the typical configurations. 29ga is used in some residential applications but is more broadly used in light commercial and agricultural applications due to its economical price point. The thickness of the metal is one of the key drivers of product price. An overview of steel gauges is provided below as per ASTM guidelines.

Gauge	Thickness (Inches)	Weight (lb / sq ft)	Typical End use
18,20 ga	0.0516 (18ga) 0.0396 (20ga)	2.071 (18ga) 1.581 (20ga)	Structural applications such as steel deck and purlins
22, 24ga	0.0336 (22ga) 0.0276 (24ga)	1.337 (22ga) 1.092 (24ga)	Commercial applications and high end residential or extreme weather applications
26ga	0.0217	0.851	Typical residential applications
29ga	0.0172	0.668	Economical residential, agricultural and light commercial applications such as barns, rain water goods

Aluminum is expressed in terms of thickness of an inch. Steelscape offers painted aluminum to customer requirements from 0.021 to 0.063 of an inch. This includes the thicknesses of 0.032, 0.040 and 0.050 commonly used in construction applications. Much like steel, aluminum thickness varies based on the end use application and requirements for product strength and performance. Often building requirements will dictate the selection of aluminum thickness, for example Miami Dade building code calls out for .040 and 0.050 aluminum material to meet minimum wind uplift performance requirements.

Strength or Steel Grade

Steel tensile or yield strength is sometimes a noted product attribute, particularly for commercial applications. This is expressed in terms of kilopound per square Inch (KSI) (such as 33, 40, 50 or 80ksi), and is commonly referred to as yield strength or simply steel grade. This refers to the amount of pressure the steel can withstand without permanent deformation. The higher the strength or grade, the more pressure that can be applied. Higher strength results in improved product performance, but also negatively impacts the ease at which the product can be formed into finished products. As a result, manufacturers will usually offer a relatively narrow range of grades or a singular grade for all products. For the majority of residential applications this grade is not a fundamental product property, as the product is usually installed over a solid substrate. However, for applications where the steel forms an integral part of the building structure, such as floor deck or structural roofing, higher-grade steel improves the performance of the installed product to meet building code requirements such as considerations for seismic events. Greater steel strength also enables building designers to span greater distances with fewer structural supports.

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Metallic Coating - Steel

Steel can be prone to corrosion, which can detract from the building design or lead to product failure. Metals including zinc and aluminum, can be applied as a metallic coating over steel to stop or reduce product corrosion through the creation of a protective barrier.

Metallic coatings act as the initial barrier to corrosion and sacrifice themselves to protect the base iron from oxidization. Zinc is a more active metal material than iron. This means that it oxidizes first, creating zinc oxide which forms a protective barrier. When zinc is combined with aluminum to form ZINCALUME® (Galvalume) the protective barrier is enhanced further.

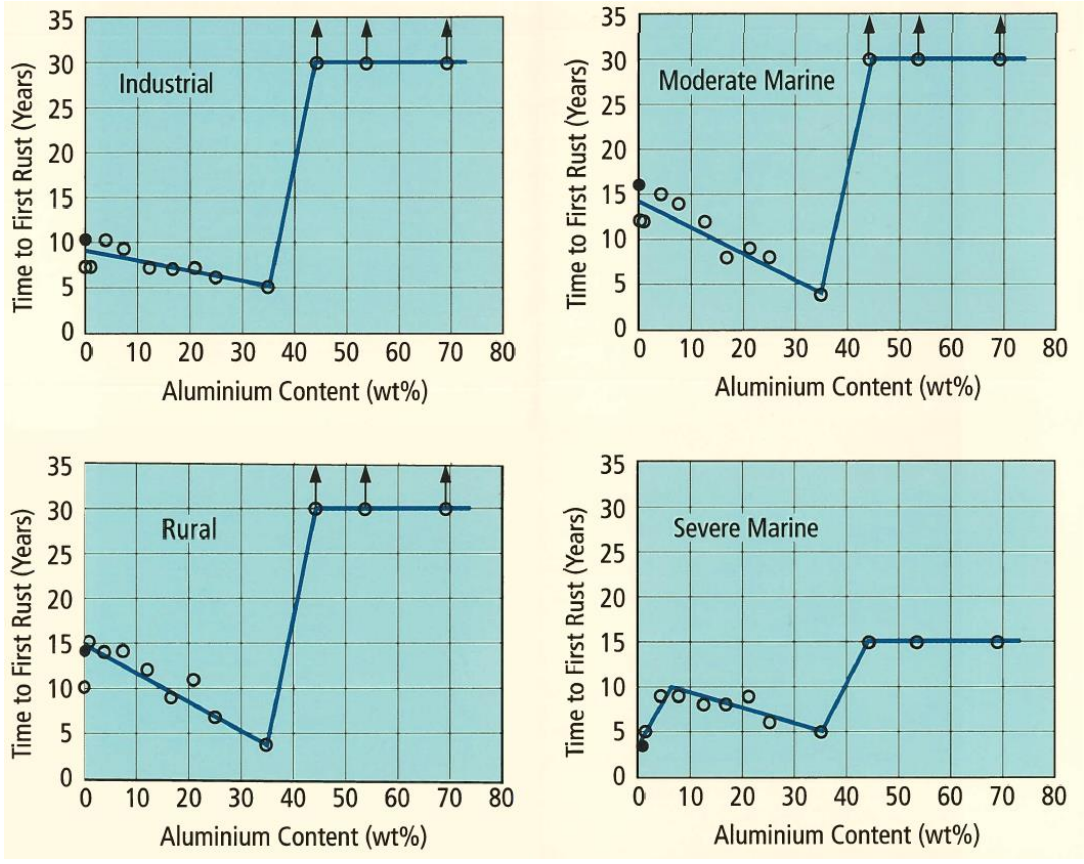
TruZinc® Steel (Hot Dipped Galvanized)

Galvanized steel is created by using an outer layer of zinc to protect an inner layer of steel from corrosion. This coating helps extends the life of a steel panel and slow the corrosion process. Galvanized Steel is the most common form of corrosive resistant steel roofing material. TruZinc® is the Steelscape trade name for Hot Dip Galvanized steel to provide end users with a guaranteed grade of galvanization specific to ASTM standards. As a protective element, Zinc provides a sacrificial barrier for the steel underneath.

From a technical perspective, the Galvanized metallic coating is typically expressed in terms of coating weight. The most prolific TruZinc® (Galvanized) coating for commercial and residential applications is G90, which denotes a coating of 0.90 ounces of zinc coating per square foot. Corrosion resistance is typically directly proportional to the amount of coating, in that a G90 product will be 1.5x more resistant compared to a G60 product. Environmental considerations drive the requirements for corrosion resistance – G90 coating weight forms the most appropriate coating weight to suit a variety of residential, commercial and agricultural applications.

ZINCALUME® (Galvalume®)

ZINCALUME® steel is also created through the hot dip process, but includes a combination of aluminum and zinc (55% Aluminum / 45% Zinc). Aluminum offers enhanced protection against corrosion in certain environments. The aluminum coating prevents the corrosion from spreading within the metal as aluminum is inert compared to Zinc, providing a protective barrier compared to a sacrificial barrier. ZINCALUME® (Galvalume®) has been evaluated in outdoor R&D tests for well over 50 years and has been proven to last at least twice as long as traditional galvanized material. Long term evaluations of aluminum-zinc metallic coated steel in harsh environments demonstrates the long term benefits of a metallic coating that includes both aluminum and zinc. Note in the chart below the significant difference in long-term performance once aluminum composition reaches 50%.



Source: ZAC Association

The most common ZINCALUME® coating weight for these applications is AZ50 (or in some cases AZ55). AZ50 refers to the coating weight of 0.50 ounces per square foot of the aluminum-zinc alloy coating. Again, AZ50 forms the most appropriate coating weight applicable to a diverse range of building application environments whilst delivering a finished product at a cost effective price point. Some economical products in the market utilize a coating weight of AZ35 which falls below the minimum requirements of a ZINCALUME® or Galvalume® certification.

Metallic Coating Summary

Metallic Coating	Composition	Typical Steelscape Coatings	Benefits
TruZinc® Trade name for galvanized	100% Zinc	G30 = 0.005” G40=0.007” G60=0.0010” G90=0.0015”	Strong resistance against corrosion
ZINCALUME® (trade name for Galvalume®)	55% Aluminum 45% Zinc	AZ50 = 0.0016” AZ55 = 0.0018”	Stronger resistance against corrosion particularly in harsh environments

Paints and finishes applied to this metallic coating can extend the lifespan of the metal and these are explored in the next section.

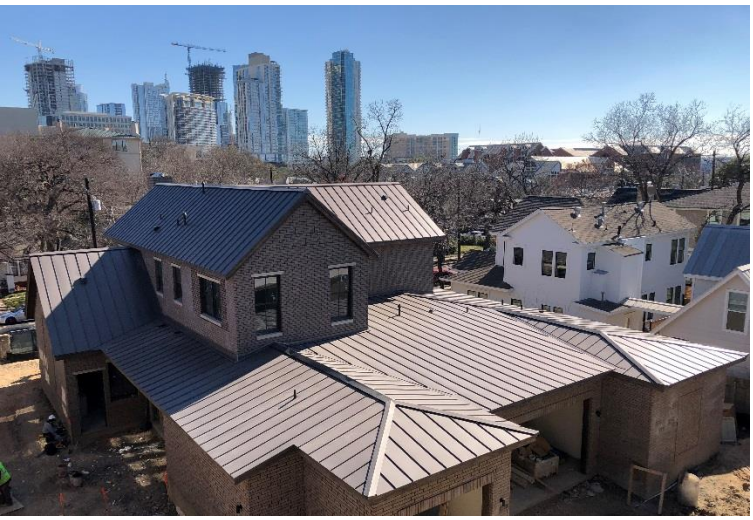
This metal overview is designed as an introduction to steel and aluminum properties. For more advanced technical information, please refer to our separate TruZinc ®, ZINCALUME® and other technical bulletins found in the technical resources section of the Steelscape website. Also for further information, please reach out to your Steelscape Technical Services Representative.

Summary

Thank you for taking the time to read through this introductory guide to metal. As identified in this guide, pre-painted metal reflects a robust and cost effective solution for many applications. 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 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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