



The Steelscape Green Book

The Definitive Resource for Pre-Painted and Coated
Steelscape Metal Products

Contents

Document Overview 3

An Introduction to Steelscape 3

- Steelscape Overview - 3
- What is Pre-Painted Metal and Coil Coating? - 4
- Links for More Information - 4
- Common Terms when Selecting a Pre-Painted or Coated Metal Product - 5
- Common Questions about Steelscape Products - 6-7

Metallic Coating 8

- Metallic Coating Overview - 8
- The Differences between TruZinc® (Galvanized) and ZINCALUME® - 8
- Variants and Specification - 9
- Restrictions and Considerations - 10
- Links for More Information - 10
- Common Metallic Coating Terms - 11
- Common Metallic Coating Questions - 12

Painted Products 13

- Pre-painted Introduction - 13
- An Overview of Steelscape's Coil Coating Capabilities - 13
- Paint Overview - 14
- Layers Applied to Metal - 14-15
- Common paint systems produced by Steelscape - 16
- Cool Pigments - 17
- Common Pre-painted Metal Enhancement Options - 17
- Color Options - 18
- Quality Control - 18-19
- Pre-Painted Finish Warranties - 20
- Batch and Direction Sensitivity - 21
- Common Painted Terms - 21-22
- Common Painted Questions - 22-23

Technical Finish Topics 24

- Light and Reflection Considerations - 24
- Installation, Storage, and Forming Considerations - 25-27

Steelscape and Sustainability 28

- Recycled Content Overview - 28
- LEED - 28-29
- Living Building Challenge and Red List Free - 29
- Life Cycle Assessments (LCA), Environmental Product Declarations (EPD) & Health Product Declarations (HPD) - 29
- Cool Roof Rating Council - 30
- RoHS - 30
- Sustainability and Regulatory Links For More Information - 30

Document Overview

Thank you for downloading the Steelscape Technical Green Book. This e-book serves to comprehensively address several key topics related to coil-coated and pre-painted metal, the long-lasting material extensively used by metal building product manufacturers. This guide provides an overview of key topics, answers common questions, and provides links and resources for those using Steelscape products.

This comprehensive resource is organized based on common technical topics and presented in a singular, easy to navigate document. This document serves as a one stop resource for all direct purchasers, designers, installers, and users of Steelscape products.

Be sure to check the Steelscape website for the latest updates to this evolving document. If there are topics you would like added to this guide or explored in further detail, please let us know using the Ask Steelscape form on the Steelscape website.

An Introduction to Steelscape

Steelscape Overview

Steelscape is a manufacturer of high-quality coated metal. We produce bare and painted metal in the form of sheet steel which is used by building product manufacturers to form into common construction items including metal roofing, metal siding, insulated metal panels, metal decking, and metal buildings.

Steelscape's in-house production capabilities include pickling, cold rolling, metallic-coating and painting. Pickling includes a series of acid baths to ensure the proper surface for coating. Cold Rolling reduces the thickness of steel to precise tolerances for exacting customer requirements. Metallic coating applies a protective barrier to the steel to resist from the effects of corrosion, and painting provides the final aesthetic look and long-term resistance to the elements. For more information on what these processes entail, visit the What We Do section of the Steelscape website. Explore our standard offer for more information.

Steelscape offers two distinct metallic coating options, TruZinc® (known as hot dipped galvanized) and ZINCALUME® (Also known by the trade name Galvalume®). In this guide we will explore these coatings and their differences in detail. Steelscape offers painting capabilities for steel and aluminum in an endless array of colors and finishes. Steelscape coats metal with a range of paint systems for all purposes and offers its own range of premium finish options.

Steelscape also offers the value-add services of embossing, slitting, and cut to length. Embossing imparts a physical pattern into the steel in the form of a non-directional stucco pattern. Slitting and cut-to length offer the flexibility to customers to slit wide strips of metal into narrower variants that better suit their product needs or into flat sheet format for specialty press and stamp-based fabrication.

Our Products are produced in Kalama, Washington and Rancho Cucamonga, California.

As a large-scale metal coater and painter, Steelscape products are not sold direct to the public. Steelscape produces steel coils – tightly wound strips of metal that are then shipped to product manufacturers to form into finished products. End users such as building owners, product specifiers and designers seeking to use genuine Steelscape steel will need to inquire with their desired product manufacturer if they purchase genuine Steelscape products. For more information on how to find manufacturers who use genuine Steelscape steel in your area, reach out via Ask Steelscape.

What is Pre-Painted Metal and Coil Coating?

Coil coating is the process Steelscape undertakes to produce painted products for its customers. The term pre-painted metal arises from the fact the metal is painted before it is formed into finished products such as metal building panels. The term coil coating arises from the process in which flat metal is wound up into a coil to provide a long, continuous feed to streamline manufacturing operations. The bare coil is unwound, painted, then rewound into coil format in one fast, continuous process, one coil after another.

Coil coating (or pre-painting) offers several benefits to post-painting or field painting, including:

- **Consistency** - As it is applied in a continuous, automated and controlled process the paint is applied in a highly consistent fashion, delivering a consistent quality product.
- **Quality** - When produced by a reputable coater, each coil must undergo several ASTM standard test procedures to ensure it is fit for purpose and of a high quality. In many cases, field painting is only tested by visual inspection.
- **A tighter bond** - As the environment in which the paint is applied is controlled, the metal is properly cleaned and cured with high heat, the paint forms a tight bond to the base metal. This contributes to pre-painted metals' having an extended life span which can exceed 50 years in many applications, extending beyond the original warranty period.
- **A robust, flexible finish** - This excellent adhesion to the substrate combined with superior flexibility of the paint enables it to be post-formed (why it's called pre-painted). These finishes can be roll formed, stamped or manually bent into a multitude of building products without cracking or peeling, demonstrating how robust this finish is.
- **Efficient inventory for end users** - As it is formed after painting, this is also a win for end product manufacturers as they don't need to inventory finished products. Rather, they can produce and store painted metal in the far more efficient coil format in which 5-10,000lbs of material takes up around 5x5 sq ft of floor space.
- **More efficient use of paint** - With a controlled environment, precise application, and tightly bonded adhesion, less paint is needed to achieve a robust finish, improving paint efficiency and lowering the end price for product users.
- **Environmentally friendly** - The process is a closed loop system which means that the curing ovens capture and burn harmful Volatile Organic Compounds (VOCs) as a source of fuel.

Pre-painted metal does have its limitations. Due to the production process it is optimized to run in large quantities and relatively thin metal thicknesses. As a result, it can be costly to produce small scale runs or certain metal types. Not all finished products lend themselves to be produced from pre-painted metal due to the pressures and techniques applied during the forming process. For these alternate metal applications spray or powder coating may be a more appropriate solution.

Links for More Information

Detailed production information and ordering requirements - [Steelscape Single Bill Service Offer Manual](#)

National Coil Coating Association website - [NCCA](#)

Steelscape's main documentation repository - [Document Library](#)

Steelscape online courses about pre-painted metal - [AEC Daily](#)

Common Terms when Selecting a Pre-Painted or Coated Metal Product

Substrate

Substrate refers to the base metal used in a coated or painted metal product, for Steelscape this includes steel and aluminum. The most common material for metal roofing and siding products is steel, due to its mix of performance, longevity, and price. Aluminum is a popular alternative in certain applications for its corrosion resistance properties. However, aluminum is more expensive and malleable, and may not offer the product performance attributes of comparable steel products.

Substrates are available in different specifications related to the grade of the base metal. Grade refers to the metallurgy of the metal and its yield strength. Yield strength refers to the stress point at which the metal will permanently deform based on the application of pressure. Different applications may require different steel grades based on the stresses they encounter once installed. The grade selected by customers often represents the optimization of performance needs and formability. The metals relative strength can make the metal stiffer and stronger per unit of coverage but this may make it difficult to readily form into finished products such as metal roof and siding panels. Grade is often denoted as a number, such as 'Grade 50'. The number in the terminology denotes the minimum yield strength, i.e. the permanent deformation point presented in 1,000 pounds per square inch format, i.e. Grade 50 represents that beyond 50,000 pounds per square inch of pressure the metal will permanently deform. The grade is typically not specified by the designer or end user but is specified by the product manufacturer based on the markets they serve and the performance attributes they seek to achieve. For the majority of light gauge metal exterior building products, metal grade will not be a selectable option by end users and often unlikely to appear in product literature.

Thickness or Gauge

Metal thickness directly influences product performance, weight, and cost. It is often represented in inches or as a gauge number (ga). Gauge refers to a thickness tolerance range - the smaller the nominal gauge, the thicker the material. Thicker metal typically means greater strength but also a higher price. Metal is inherently strong relative to its weight. As additional strength is imparted when metal is formed into common shapes such as roof panels, pre-painted metal thicknesses are typically very thin. Metal thickness are often standardized among end-use applications or product groups to avoid overuse and unnecessary cost. For steel, the thickness range 0.0142" - 0.0202" (termed 29ga) is common in agricultural and light-commercial applications. Similarly, 0.0182" - 0.0247" (26ga) and 0.0236" - 0.0316" (24ga) is common for residential roofing applications. For commercial applications 0.0236" - 0.0316" (24ga) and 0.0296" - 0.0376" (22ga) are common for both roofing and siding applications. For additional guidance on translating inches in thickness to gauge, see ASTM-AISI Thickness Tolerance Range table. For aluminum, 0.032" (20ga) or 0.040" (18ga) are the common thicknesses for light gauge building product applications including metal roofing and siding.

Coating Weight

This refers to the amount of metallic coating applied to steel to act as the primary protective barrier from corrosion. See the Metallic Coating section of this document for more detail. In summary, the two key types of protection are galvanizing (a zinc coating, Steelscape's tradename is TruZinc®) or Galvalume® (a formulated aluminum-zinc mix, Steelscape's tradename is ZINCALUME®). Galvalume offers longer protection in most environments and carries a corrosion warranty. Coating weight refers to the amount of coating applied. Some products may carry a thicker coating weight for improved corrosion protection. See the separate section for more detail on common coating thicknesses and what the terminology represents.

Paint System

This refers to the combination of finish layers added to the metal to create color, vibrancy, and a protective barrier from elements such as UV damage. For metal, paint systems typically involve a primer and a topcoat. Different paint system chemistries are available to provide end users different characteristics such as affordability or performance. There are three common paint systems that Steelscape coat for the building products market - polyester, silicon modified polyester (SMP), and polyvinylidene difluoride (PVDF). Each system varies by performance, cost, longevity, and warranty coverage. For more information on paint systems, see the separate paint section within this document.

Common Questions about Steelscape Products

Are Steelscape's products manufactured in the US?

Steelscape manufactures coated steel products in the US in our Kalama, Washington and Rancho Cucamonga, California facilities. The unprocessed steel used in our products is produced, extracted, and sourced from a variety of locations including domestic and international sources. Due to the complexity of our supply chain, for projects requiring domestically sourced and extracted input steel, Steelscape must be notified of these requirements prior to order entry.

Are Steelscape products produced in accordance with ASTM standards?

Yes, Steelscape products are produced in accordance with a range of ASTM standards. This is one of several independent measures that identify manufacturing standards adhered to by Steelscape, including:

- ASTM A568/A568M Steel Sheet, Carbon, High-Strength, Low-Alloy, Hot Rolled and Cold Rolled
- ASTM A924/A924M Steel Sheet, Metallic Coated by the Hot Dip Process
- ASTM A653/A653M Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated by the Hot Dip Process
- ASTM A792/A792M Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process

How do I buy Steelscape products?

Steelscape sells to metal distributors and metal product manufacturers. Steelscape does not sell direct to end users such as homeowners. To identify product manufacturers in your area that use genuine Steelscape steel, please contact us via Ask Steelscape.

Do Steelscape products comply with common construction regulatory programs?

Steelscape products comply with several federal and state mandates for construction materials. A summary of these are provided below.

Program	Status	Notes
Buy American Act (BAA)	Previously qualified. However due to changes outlined in Executive Order 13881 dated 25 January 2021, Steelscape's standard material does not comply	For compliance, domestic hot band must be identified at time of order entry
Surface Transportation Assistance Act (STAA)	Standard products do not qualify. Steelscape can provide qualifying material upon request.	STAA domestic hot band must be notified at the time of order entry
State by State Buy American provisions / Made in USA provisions	Varies. Potential compliance	Reviewed on a case-by-case basis. Contact Technical Service Department or your Steelscape Account Manager
American Reinvestment and Recovery Act (ARRA)	-Effective October 1st 2010, standard products do not qualify -Steelscape can provide qualifying ARRA material upon request	ARRA domestic hot band must be notified at the time of order entry
Site of Manufacture and Extraction	-Site of Manufacture: Kalama, WA or Rancho Cucamonga, CA -Site of extraction varies, but from multiple countries	No site of iron ore extraction within 500 miles of Western Steel Mills
RoHS	All TruZinc® or ZINCALUME® coils ordered as dry, no chemical treatment/passivation, or with a RoHS compliant chemical treatment/passivation are RoHS and RoHS 2 compliant	Products or resins requiring no-chemical treatment or passivation must be specified at the time of order entry
ASTM	-ZINCALUME® products - ASTM A792 -TruZinc® products - ASTM A653	
Safety Data Sheets (SDS)	Multiple available. Can be downloaded from document library on the Steelscape website	Prepared for each product type

Figure 1 - Steelscape compliance with several regulatory requirements

Can I use Steelscape products for green building programs?

Yes, Steelscape products can contribute to several green building programs including LEED and Living Building Challenge, submit a question via Ask Steelscape to learn more.

I need to submit documents to a general contractor, or as part of a bid covering elements of my material supply. Can Steelscape help?

Steelscape offers a suite of customer letters for different applications. Some of them can be found on the document library, for other customer letter needs please reach out via the Ask Steelscape form.

I am seeking a specific product rating or performance data such as Class A Fire, Wind Uplift results, Miami Dade County Approval, or third-party test results such as those published by UL, IAPMO or ICC. Can Steelscape help?

These types of tests are related to the performance of formed, finished products. As Steelscape does not produce formed products, but rather the coated metal from which they are based, these performance assessments are the responsibility of finished product manufacturers. Upon request, Steelscape can provide the details of manufacturers in your area that use genuine Steelscape steel and publish product performance data. For assistance in the identification of these manufacturers, please reach out via the Ask Steelscape functionality.

I need a Safety Data Sheet (SDS) on Steelscape's products, where can I find them?

Steelscape's public SDSs can be found in the Document Library.

Homeowner Associations (HOAs) or Planning Departments restrict the use of metal roofing and siding in my neighborhood. Can Steelscape help me inform and educate these authorities to permit the use of metal?

An advantage of Steelscape's range of innovative designs and finishes is that they can improve the integration of metal into a wide variety of environments. Natural finishes such as Vintage provide highly versatile finishes that improve environmental integration through their less saturated hue and dynamic color. Other finishes such as Rustic Rawhide or Classic Brushed, can provide the appearance of aged metal for cohesive building design and a softer aged color. Additionally, Steelscape's innovative textured and ultra-low gloss finishes can significantly reduce the glare and sheen that is a common reason for the restricted use of metal. For more information on product finishes that may suit your neighborhood or for additional technical resources designed to educate and inform planning authorities and associations, please contact Steelscape via Ask Steelscape.

How long does the painted metal used in my roof or wall last? Do I need to replace metal once the warranty ends?

A painted metal product such as a roof or wall panel is designed to last for decades once properly installed. Products can last for 50-60 years and well beyond before being replaced. Ultimately, the lifespan of a painted metal roof or wall product will be based on its installed environment, atmospheric conditions, and the frequency of periodic cleaning. In most situations, the degradation of other elements of the building, or changing design and color preferences will result in product replacement prior to the metal surface failing.

The warranty period is designed to provide peace of mind for homeowners and to provide protection from variances to quality standards. The warranty should not be viewed as the indicative lifespan of the product, in the same way that product warranties for vehicles or consumer products are not indicative of their intended service life span.

Metallic Coating

Metallic Coating Overview

Corrosion, also known as oxidation or rust, weakens steel and can contribute to product failure. Metals, including zinc and aluminum can be applied as a coating to provide a protective barrier against corrosion. Steelscape applies this coating in a continuous coil coating process in which the material is cleaned, the coating applied, cooled, and finished for consistency and fitness for purpose.

The metallic coating is applied to the bare steel before it is painted. In most instances, the metallic coating is applied by passing the steel through a molten pot of the coating, after which it is cooled and treated to create a tightly bonded, consistent finish. This process is performed in accordance with ASTM standards A924, A653 and A792.

The two common types of metallic coating are galvanized (Steelscape's TruZinc®), and ZINCALUME® (also known as Galvalume®). Galvanized coatings consist of 100% zinc, whereas ZINCALUME consists of both aluminum and zinc. ZINCALUME (or Galvalume) is produced under license and refers to a specific, scientifically optimized mix of 55% Aluminum and 45% Zinc.

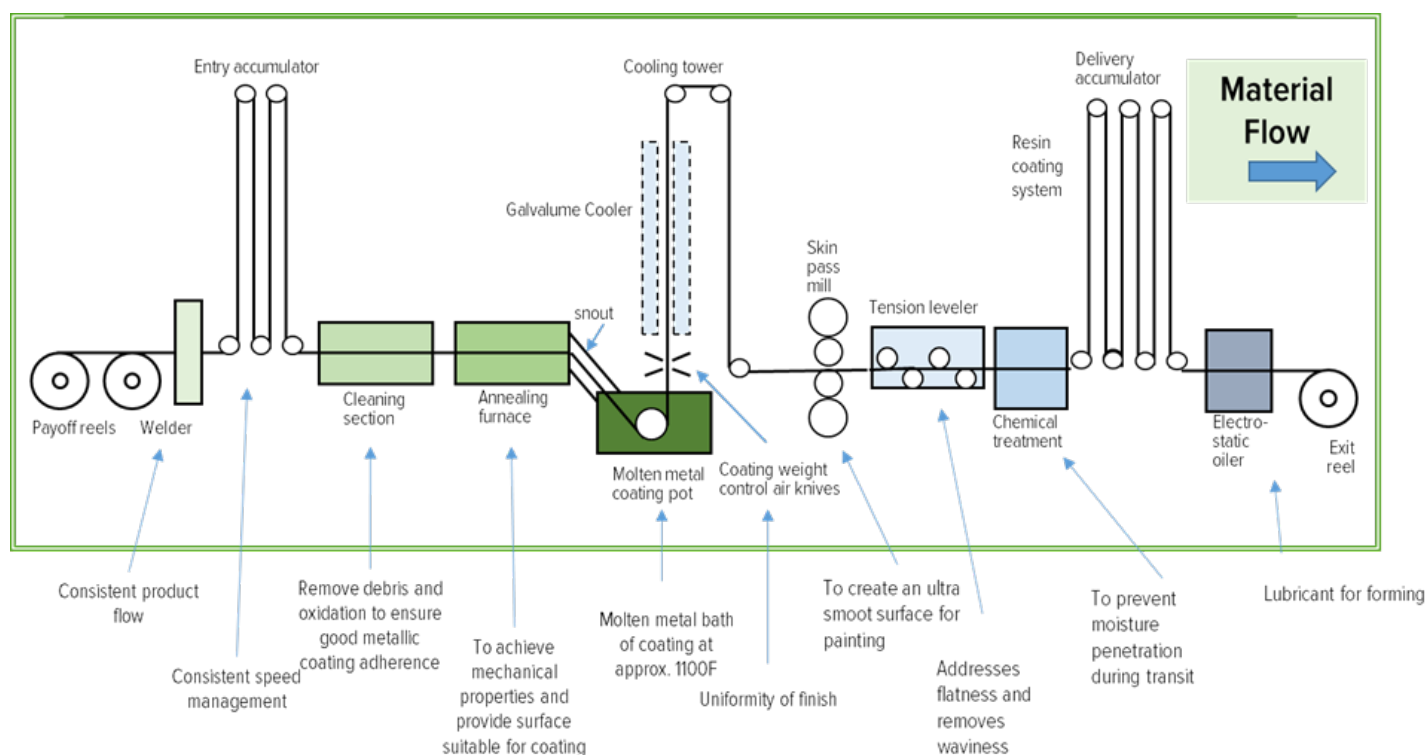


Figure 2 - A diagram of Steelscape's Metallic Coating Line (MCL)

The Differences between TruZinc® (Galvanized) and ZINCALUME®

As a protective element, zinc provides a sacrificial barrier for the steel underneath - this ensures the coating will corrode preferentially to the base steel. While Zinc is a very effective barrier against corrosion, underpinning its extensive use, the zinc protective layer will eventually be consumed over time. This consumption timeframe will be dictated by how corrosive the installed environment is. Aluminum by comparison, provides an inherent protective barrier which prevents the spread of corrosion.

ZINCALUME combines the benefit of preferential corrosion, while slowing its spread. This provides better overall long-term performance and superior protection at exposed edges of the metal sheet, such as factory cut panel ends. Extensive field testing has proven that ZINCALUME can outlast galvanized material several times, with the latest tests estimating a 60-year service life in unpainted applications. ZINCALUME and licensed Galvalume products will typically carry a corrosion warranty. This warranty is independent of any additional finish warranty provided by the paint system.

Variants and Specification

Metallic coating specification will vary based on type (galvanized or ZINCALUME), and by thickness, called coating weight. The thickness of the metallic coating will impact the longevity of the corrosion resistance. For galvanized material, the most common thicknesses are G60 and G90. The number denotes the coating of zinc per square foot. For example G60 reflects 0.60 ounces and G90 reflects 0.90 ounces per square foot. For galvanized material, 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.

The most common ZINCALUME coating weight is AZ50 (or in some cases AZ55). AZ50 refers to 0.50 ounces of aluminum zinc coating per square foot. AZ50 forms the most appropriate coating weight for a diverse range of building applications. Due to the difference in the performance between galvanized and ZINCALUME, the numerical terminology does not represent an equivalency (AZ50 is not the same as G50). Due to the length of the zinc columns in the aluminum-zinc coating, a thinner AZ35 coating can create pathways for corrosion. As a result, AZ35 coatings cannot carry the ZINCALUME trade name and will not carry a corrosion warranty.

ZINCALUME offers superior corrosion resistance in most applications. However, when used in conjunction with a premium paint system (such as a PVDF system), both coatings will provide long-lasting corrosion protection in most environments. Some specialty applications, such as those within proximity of airborne chemicals or salt spray, may require alternative coating thicknesses. Thicker coating weights can impact other factors such as formability (ability to be formed into a panel) and cost. In these situations, specifiers should consult their preferred product manufacturer before selecting a coating or submit an inquiry via Ask Steelscape.

Attribute Summary	Galvanized	ZINCALUME®
Overview	100% Zinc	45% Zinc and 55% Aluminum
In Use	150+ years	Since 1972
Visual Appearance	No to light spangle	Light spangle
Corrosion Protective Properties	Sacrificial - Protects the steel underneath but will be consumed until structural integrity is lost	Sacrificial and barrier - In addition to sacrificial protection, barrier protection will slow the spread.
Corrosion Resistance	Good bare, very good when painted with a premium paint system (fluorocarbon or PVDF) Initial observable corrosion is often less (<10 years)	Excellent bare and painted Improved edge creep protection & improved protection at cut edges (i.e. exposed edge of panel) providing greater long-term protection
Corrosion Warranty	No warranty	Manufacturer dependent.
Price	Comparable	
Availability	Can be produced in common gauges for metal roof and wall building applications including 29ga, 26ga, 24ga, and 22ga	
Lifespan	Heavily dependent on installed environment, however:	
	Bare: 25-50 years Painted: Dependent on Paint systems (25-50+)	Bare: 60+ years Painted: Dependent on Paint systems (can be 60+)
Recommended Coating	G90	AZ50
Typical Applications	Steel decking, architectural, metal buildings, residential roofing, commercial roofing and siding	Residential roofing, commercial roofing and siding
More Info	galvanizeit.org	galvalume.org

Figure 3 - A comparison of key attributes TruZinc (Galvanized) v ZINCALUME (Galvalume)

Restrictions and Considerations

Metallic coated metals such as ZINCALUME (Galvalume) and TruZinc (Galvanized), offer excellent corrosion resistance but are not suitable for all environments. ZINCALUME is not suitable for extreme environments with high acidity. These include animal confinement settings, when buried in soil, or when in direct contact with wet cement. The urea and ammonia secreted from animal waste and the acidity of soil or wet cement are considered severe corrosive agents to the aluminum-zinc alloy in the metallic coating and will create rapid corrosion.

In coastal applications, Steelscape recommends the use of ZINCALUME over TruZinc due to its superior corrosion protection properties. However, some coastal settings may not be suitable for either TruZinc or ZINCALUME. Key considerations include the proximity to the ocean, the presence of breaking surf (which can intensify the salt present in the air) and the frequency of rain fall (which can rinse the metal surface). As each environment is unique, users considering metal installations in marine environments should contact Steelscape or their preferred metal panel manufacturer first.

Designers should also ensure that metallic coated products are not in direct contact with dissimilar metals in corrosive environments. Dissimilar metals and subsequent galvanic corrosion are significant concerns impacting fastener and accessory selection. Galvanic corrosion occurs where one metal will sacrifice itself for another metal, creating rapid, visible corrosion. The likelihood of this occurring is driven by how dissimilar the metals are, if there is metal to metal contact and if they are installed in a conducive corrosive environment. The most common display of galvanic corrosion is where a fastener such as a rivet, or an accessory such as a lighting fixture, is made of a different metal such as stainless steel or copper and recessed in metallic coated steel in a severe marine setting.

Other factors which may cause premature corrosion include the runoff of water in which metals or chemicals are present. This includes HVAC condenser output or run off directly from treated lumber. Standing or pooled water that is present for extended periods of time can also lead to premature corrosion.

Steelscape publishes a comprehensive suite of technical bulletins on ZINCALUME and TruZinc including installation and environmental considerations. If you have concerns around the environment of the proposed location of your metal product installation, please reach out to Steelscape using the Ask Steelscape functionality.

Metallic Coating Links for More Information

ZINCALUME Detailed Technical Bulletins for Installing and Designing – [Technical Bulletin](#)

TruZinc Detailed Technical Bulletins for Installing and Designing – [Technical Bulletin](#)

Available by Request

Customer Letter TruZinc Steel meets ASTM 653

Customer Letter ZINCALUME Steel meets ASTM 792

Customer Letter ZINCALUME in Animal Confinement

Customer Letter Zinc in Rainwater Runoff from ZINCALUME® Plus Roofs

Customer letter REACH compliance ZINCALUME

Customer Letter Conflict Minerals Compliance

Common Metallic Coating Terms

AZ35 - An aluminum zinc coating with a weight of 0.35 ounces of aluminum zinc coating per square foot. This is a thinner coating than recommended which means it will not offer the corrosion resistance of an AZ50+ coating. As this is a sub-optimized coating weight that is susceptible to a more rapid rate of corrosion, it will not carry the ZINCALUME/Galvalume trade name or associated warranty.

AZ50 - The most common coating weight for construction products using Galvalume or ZINCALUME. This reflects the preferable mix of protection, warranty coverage, formability, and cost. Denotes 0.50 ounces of aluminum zinc coating per square foot.

Coating Weight - The thickness of the metallic coating applied to the steel for corrosion resistance performance. The most common weights for metal roofs and walls are G90 for TruZinc/galvanized and AZ50 for ZINCALUME/Galvalume.

Corrosion - The reaction of iron and oxygen in steel to environmental elements such as moisture, creating a reddish-brown oxide, often known as rust. Rust is an ongoing process and over time and can consume the metal entirely, completely compromising the metal's structural integrity.

Corrosion Warranty - A guarantee that the substrate (base metal) will not rupture, fail structurally or perforate within an outlined period and within an environment with normal atmospheric corrosion. These warranties are subject to limitations which are outlined in the warranty terms and conditions.

G90 - The common coating weights for construction products using TruZinc/galvanized material. Denotes 0.90 ounces of the coating per square foot.

Galvanized - A metallic coating comprised of 100% Zinc. Steelscape's trade name for galvanized material is TruZinc.

Galvalume - A trade name for a metallic coating comprised of the specialty mix of 55% aluminum and 45% zinc. To license the Galvalume technology, manufacturers must manufacture products to a specific standard set by the Zinc Aluminum Coaters Association (ZAC). Steelscape is a proud member of this association.

Metallic Coating - A coating comprised of metal that is applied to the steel to provide protection from corrosion. Typically applied by passing the steel through a molten bath of the metal before cooling.

ZINCALUME® - A metallic coating consisting of 55% Aluminum and 45% Zinc that protects the base steel from corrosion. The combination of the two metals provides improved corrosion resistance and slows its spread leading to a longer service life in most applications and warranty for corrosion.

TruZinc® - Steelscape's trade name for its hot dipped galvanized material, a metallic coating consisting of 100% Zinc which acts as a barrier to prevent the base steel from corroding.

Common Metallic Coating Questions

What is the difference between ZINCALUME and TruZinc?

Both are metallic coatings, TruZinc is 100% Zinc where as ZINCALUME is a specialty mix of 55% aluminum and zinc to provide a longer service life in most applications.

What is the appropriate specification for my project?

The common variants for coated building products which use light gauge steel are G90 for TruZinc and AZ50 for ZINCALUME. Coating weights below these will not offer the same levels of corrosion protection. For some extreme environments, a higher coating weight may be desirable.

Is ZINCALUME comparable to Galvalume?

ZINCALUME is Steelscape's trade name for Galvalume and reflects our own specialty application process and commitment to quality. Steelscape is also a member of the ZAC association, the governing body of Galvalume® licensing ensuring that Steelscape processes also meet the industry standards required to use the Galvalume name.

Is TruZinc available with a warranty?

TruZinc is not available with a corrosion warranty. However, when painted is available with the standard finish warranties available of Steelscape's painted products.

Should I consider saving money with an AZ35 coating?

No. Steelscape strongly discourages a coating weight below AZ50 as long-term industry testing has proven that this coating weight is too thin for effective protection from corrosion.

Is ZINCALUME/Galvalume a time-tested product like galvanized?

Yes. Zincalume has been in service since the early 1970s and many of the first installs still remain in service. Today the service life of ZINCALUME is 60+ years.

What is edge creep and how is ZINCALUME better?

Edge creep is the spread of corrosion from the exposed, cut edges of metal. As ZINCALUME offers both sacrificial and protective properties, it slows the spread of corrosion from these points compared to traditional galvanized materials.

Does AZ55 mean 55% aluminum?

No. ASTM standard A792 outlines the specific ratio of aluminum to zinc (55%). The number in the coating weight refers to the amount of actual metallic coating applied (55 ounces per sq ft for AZ55).

What kind of roofs can metallic coated material be used for?

For a variety of steep and low slope roofs, however to avoid corrosion caused by pooled water, they are not suitable for applications where the pitch of the roof (rise over run) is less than ¼:12 (If the roof changes below ¼ of an inch in height every foot in length).

I am a designer/homeowner, do I need to research or specify the metallic coating weight for my project?

In most applications, the metallic coating weight will be pre-selected by the product manufacturer based on the intended application of their products. For most building products this will be the standard specification of G60 or G90 for TruZinc and AZ50 for ZINCALUME.

Steelscape recommends speaking directly to your preferred panel manufacturer about the coating weights they use for their products and if it will meet the needs of your project. Custom metallic coating weights are subject to upcharges and minimum quantities. In most applications where additional corrosion protection is required, modified paint systems (such as high build primers and marine paint systems) are used rather than modifying the metallic coating.

Painted Products

Pre-Painted Introduction

Pre-Painting or coil coating reflects the method of applying paint to metal before end product fabrication. The paint is applied in a continuous, automated process, enabling high consistency and tight quality control. Prior to being painted the metal is first cleaned (using a chemical mix) before primer coatings are applied using rollers. The paint is then applied using coater heads. Once applied, the paint is baked on to create adhesion using curing ovens before being recoiled.

Coil coated metal is typically produced at speeds of 100 feet per minute (fpm) and up—some lines can coat metal at up to 700 fpm. The curing (baking) process takes only 15-30 seconds. Accumulators in the coating line regulate the speed the strip of material goes through the coater heads, ensuring effective quality control. An overview of a coil coating line is provided in Figure 4 below.

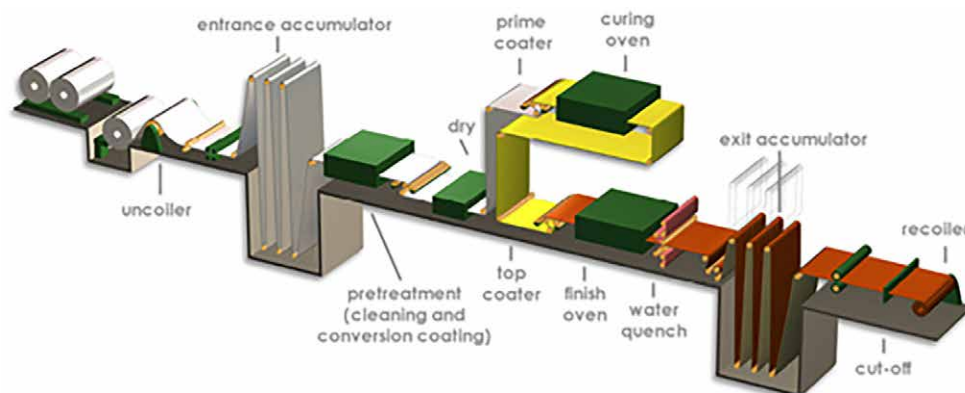


Figure 4 - A coil coating line

An Overview of Steelscape's Coil Coating Capabilities

The advantages of this process as highlighted earlier include a highly consistent, durable finish, an economical and efficient use of paint, and an environmentally friendly solution in which harmful VOCs are burned in curing ovens, eliminating their release into the air. The output of this process is a continuous strip of material, often up to 1000s of feet in length.

There are disadvantages to be aware of. Notably, while the coil coating process is rapid once running, it can require significant set-up time, depending on the properties of the paint system specified. The overall process is based on efficiencies of scale, which in turn results in minimum order requirements which can restrict order size flexibility. Many metal building products have defined and prescriptive color charts that are far narrower than those offered for interior paints. It also means architectural metal product manufacturers may charge premiums and extend lead times for custom colors.

Steelscape's products cater to specific product categories within the light-gauge metal construction market. That is metal construction products, generally less than four feet in width, and produced in a continual feed process or through hand fabrication methods.

End products produced with this material include:

- Roll formed metal roofing and siding products including standing seam roofing, metal flush and wall panels, metal lap siding, agricultural panels, and corrugated profiles.
- Stamped metal products including metal roof tiles.
- Insulated metal panel products.
- Gutter, trim, garage door and other home metal exterior accessory pieces.
- Structural steel decking used in commercial applications.
- Interior and exterior insulated walk in cooler panels.

Paint Overview

Paint consists of three primary components: resins, pigments, and solvents. Resins are the binder in the paint; they provide the coating's physical and chemical attributes and determine how effectively the paint will adhere to a surface, flex and form, and weather with time. The resin chemistry is also the paint type; polyester, silicone polyester, acrylic, epoxy, PVDF, etc. The primary role of pigments is to impart color, but they also contribute to energy efficiency, corrosion resistance and UV protection. Solvents dissolve the resin and pigment components into a consistency suitable for application. Additives may be added to the paint to fine tune or improve performance characteristics. The typical composition of paint by weight is provided in Figure 5 below.

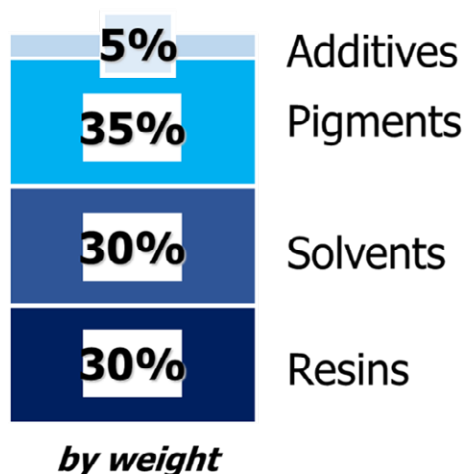


Figure 5 - Paint composition by weight

Each of the three main components of paint can be modified based on the specific end use and aesthetic objectives. This modification process must take into consideration the application process to ensure the right adhesion, formability, color, and gloss is created. Other considerations include end use requirements, cost, and desired warranty coverage. Many attributes of a paint are trade-offs and paint mixes are balanced to achieve certain characteristics.

Layers Applied to Metal

A coating system for pre-painted metal is comprised of multiple layers. Depending on the paint system or finish required, some layers such as a clear coat or primer may not be necessary.

- **Backers** provide the base color, some protection, and a base for adhesives. Backers are typically white or neutral colors as in most installations they will not be visible.
- **Metallic coatings** provide corrosion resistance as discussed in detail in the Metallic Coating section of this document.
- **Pre-treatments** clean the metal and improve paint adhesion attributes.
- Primers prepare the substrate for painting by providing 'bite' for adhesion and directly support topcoat color and flexibility. Primers also provide corrosion resistance.
- **Topcoats** offer protection from the outside elements, color, and aesthetic appearance, in addition to durability, and weatherability. Note: In some applications the topcoat can be painted on both sides of the metal instead of a backer. This may be a desirable coating option for building products where the underside is exposed such as metal buildings or eaves.
- **Clear coats** are an optional layer and can be added for perceived depth, to enhance gloss, graffiti resistance, and can provide a final protection layer.

A summary of these layers are provided in Figure 6 on next page.

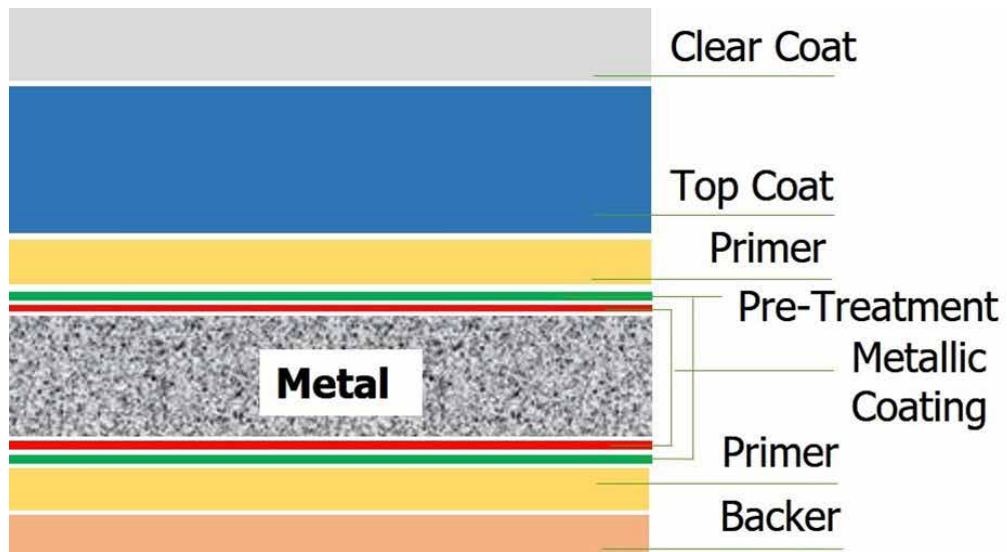


Figure 6 - Cross section of pre-painted metal

Common Paint Systems Coil-Coated By Steelscape

For building products there are three common paint systems, Polyester, Silicon Modified Polyester (SMP), and Polyvinylidene Fluoride (PVDF) also known as Fluorocarbon or the trade names Kynar or Hylar. The key element to understand is that there are different benefits and tradeoffs for each system, rather than a singular best system for all applications. In terms of performance the three paint systems range from good (Polyester) to better (SMP), to best (PVDF), however this performance comes at a cost premium that may not be justified for all applications and panel types.

Polyester paint systems are typically the most economical paint system and offer the lowest level of UV resistance when compared to SMP and PVDF systems. As a result, they usually offer the shortest product warranties. However, polyesters are very versatile and easy to form and can be modified to suit a wide range of performance, color and gloss options. Polyester paint systems are typically designed for cost conscious applications such as agricultural and light commercial applications. Out of the three systems, polyester paints have some of the greatest formulation versatility to reach performance or price objectives. Not all polyester paints are the same and caution must be taken when comparing different polyester systems.

SMP paint systems are more durable compared to standard polyesters. They are modified with a different resin structure to improve their UV resistance qualities. SMP paint systems provide better weatherability (resistance to moisture, sunlight, and temperature changes) and have a greater resistance to chalk and fading compared to polyester systems. Their balance of price and performance underpin their widespread use in residential roofing applications.

PVDF paint systems are known by several different names but they all use the same polymer and provide the most durable paint system. PVDF systems exhibit exceptional chemical, chalk, and fade resistance and can resist degradation when exposed to aggressive weather elements such as urban grime, air pollutants, salt, high temperatures and humidity. Their high formability means they can be used on a wide range of preformed shapes, which is why they are often specified for high-end architectural and high-profile commercial projects. However, this paint system does attract a price premium over SMP systems. Testing has shown that PVDF systems are most durable when it makes up 70% of the overall resin composition. Some low cost PVDF options are available in 50% PVDF formulations but long-term performance is shown to drop off. A summary of the three systems is provided in Figure 7.

Paint System	Polyester	SMP	PVDF
Performance	Good to better	Better	Best
Price Point	Cost effective	Moderate	Higher
Warranty	None to moderate	Long	Longest
Durability	Limited to good	Medium to high with improved weatherability	Highest
Application	Versatile, but typically low exposure applications such as agricultural and industrial buildings	Wide range of construction applications including residential and commercial	High-end, high-profile, architectural and commercial projects and industrial and marine environments
Other Attributes	Wide range of colors and gloss options	Wide range of colors and gloss options	Excellent chalk and fade resistance and chemical resistance
AAMA Specification	AAMA 2603 AAMA 621	AAMA 2604 AAMA 621	AAMA 2605 AAMA 621

Figure 7 - A comparison of the three different paint system types

Cool Pigments

‘Cool’ coatings utilize infrared (IR) reflective pigments that have been altered chemically and physically to reflect IR wavelengths whilst still absorbing the same visible light.

Solar radiation reaches the earth’s surface in three distinct wavelengths: UV, IR, and visible. Near infrared (NIR) radiation is responsible for heat build-up within a structure. The purpose of IR reflective or cool pigments is to minimize heat build-up and reduce cooling costs. Most dark pigments readily absorb IR radiation and get hotter than lighter pigments; but when cool pigments are used, a dark color can offer ‘cool’ reflective properties.

Cool colors are assessed using two measures which are combined into one singular index to aid in color comparison and the energy efficiency properties of color. Solar reflectance (SR) is the amount of solar radiation reflected off a surface. Emissivity is the amount of heat a surface can dissipate away from itself. The solar reflectance index (SRI) is the consolidated value calculated from solar reflectance and emissivity with factors such as air flow considered.

The Cool Roof Rating Council (CRRC) verifies the emissivity, SR, and SRI values of painted roofing products and publishes their initial SRI value and aged (3 year) SRI value. A key advantage of metal, unlike other roofing materials, is that its SRI value does not deteriorate with time—it can remain unchanged for 20 years or more.

Any type of paint system, not just a high-end PVDF, can be modified to be a ‘cool’ color. Today most SMP and PVDF systems will use cool pigment technology as standard. Colors with these cool pigments will generally be identified on a manufacturer’s color card with ‘cool’ terminology.

Common Pre-Painted Metal Enhancement Options

- *Mica and metallic pigments* - These pigments have light catching or sparkling attributes for enhanced color. These often come at a price premium and are batch sensitive and direction sensitive. When the paint is applied during the coil coating process, the final directional orientation of these pigments cannot be controlled. This results in slight visual variations from one production run to another, even if the same batch of paint is used. This phenomenon is also responsible for the slight color shift observed when viewing a metallic/mica painted panel in the coil rolling direction versus perpendicular to coil rolling direction. While relatively indistinguishable in isolation, the difference is apparent when installing different color batches directly next to one another. To avoid this, always source sufficient material at one point in time from a single supplier and ensure the metal fabricator and installer are aware of this product constraint.
- *Clear coats* - An optional layer that can be applied over the top color coat to provide another layer of protection and UV and fade resistance. Clear coats can also be used to add a barrier against graffiti.
- *Extreme environment paint system modifications* - Pre-painted metal systems can be modified to offer enhanced durability for specific environmental applications. For example, coastal environments or industrial environments with higher levels of air pollutants. Product options include high-build primers or additional paint layers that provide an extra barrier of protection. Not only are these systems more durable, they may enable the creation of a warrantable finish despite the environmental extremes.
- *Textured paint systems* - Paints can be modified through chemistry or by adding particulates to create a textured or wrinkle effect.
- *Patterns* - Patterns can be printed on to the metal to recreate designs such as wood, stone, aged metal and rust.
- *Low gloss enhancement* - A common attribute of metal is its smooth surface and moderate levels of gloss compared to natural elements. Gloss can be reduced in these systems through paint chemistry change or by adding particulates. However, often low levels of gloss come at a tradeoff to other performance attributes including a greater susceptibility to scratching and marring.

Independently verified cool colors can be found in the [Rated Products Directory of the Cool Roofing Rating Council’s website](#).

Color Options

The advantage of metal is that it can be coated in an almost endless array of colors. However, to improve the efficient management of material and to reduce the cost to end users, most Steelscape customers have a defined range of colors which can be identified on their respective color card. Steelscape also offers its own range of premium colors and finishes exclusive to Steelscape. These unique finishes offer enhanced visual appeal compared to standard finishes in turn providing greater design flexibility.

Steelscape can produce custom colors for specific applications, these are subject to order minimums and extended lead times. For custom color inquiries, please reach out to Steelscape using the Ask Steelscape form.

Quality Control

Pre-painted metal undergoes a series of tests to ensure the product is suitable for application in the field and to verify there will be no failures during product forming or throughout the warranted product lifespan. An overview of the key tests undertaken are summarized in Figure 8.

Test	Attribute	Test Method	ASTM Standard	Standard Overview
1	Color	L, A, B Color Value Measurement	ASTM D2244	Standard practice for calculation of color tolerances and color differences for instrumentally measured color coordinates.
2	Dry Film Thickness	Tooke - DJH Electronic Gauges	ASTM D5796	Standard test method for measurement of dry film thickness of thin-film coil-coated systems by destructive means using a boring device.
3	Solvent Resistance/ Cure	M.E.K. Rub Test	ASTM D5402	Standard practice for assessing the solvent resistance of organic coatings using solvent rubs.
4	Film Hardness	Pencil Hardness Test	ASTM D3363	Standard test method for film hardness by pencil test.
5	Gloss	Gloss Meter	ASTM D523	Standard test method for specular gloss.
6	Flexibility	T-Bend Test	ASTM D4145	Standard test method for coating flexibility of prepainted sheet.
7	Adhesion	Impact Test	ASTM D2794	Standard test method for resistance of organic coatings to the effects of rapid deformation (impact).
		Cross Hatch Adhesion Tape Test	ASTM D3359	Standard test methods for measuring adhesion by tape test.
8	Corrosion Resistance	Salt Spray Test	ASTM B117	Standard practice for operating salt spray (fog) apparatus
		(Evaluating Blistering)	ASTM D714	Standard test method for evaluating degree of blistering paints
9	Water Resistance	Humidity Test	ASTM D2247	Standard practice for testing water resistance of coatings in 100% relative humidity.
10	Light Degradation Resistance	QUV Test	ASTM G154	Standard practice for operating fluorescent ultraviolet (UV) lamp apparatus for exposure of nonmetallic materials.
			ASTM D4587	Standard practice for operating fluorescent ultraviolet (UV) condensation exposures of paint and related coatings.
Other	Weathering Tests	Multi-Element Testing	ASTM D5894	Standard practice for cyclic salt fog/UV exposure of painted metal
			ASTM D822	Standard practice for filtered openflame carbon-arc exposures of paint and related coatings
			ASTM G152	Standard practice for operating open-flame carbon-arc light apparatus for exposure of nonmetallic materials

Figure 8 - A summary of key quality control tests used to assess the suitability of pre-painted metal

Some of the tests are performed on the paint line for each production run while others are performed as part of the research and development of the paint itself. Key tests performed on the line by Steelscape include:

- The T bend test simulates forming and assesses flexibility of the substrate and paint. During this test, a bend is formed in the test sample and inspected for any cracking. Adhesion is also checked by attempting to pull the paint off the bent section.
- The reverse impact test is a stress test that is performed to determine if any paint adhesion is lost through a direct impact from the underside of the material. Like the T bend test, this simulates final forming.
- The color of the pre-painted metal is verified relative to a visual check and the Lab scale on a color computer. Color and gloss are checked for consistency across the strip and relative to the order specification.
- Film or paint thickness is measured to ensure the product is suitable for the end-use application and will perform to warranty expectations.

Pre-Painted Finish Warranties

Warranties form an important part of the purchase decision when selecting an exterior building material. For typical exterior metal applications such as metal roofing and siding projects, three distinct warranties can be offered; finish warranties, roof or wall product performance warranties, and installer warranties that cover workmanship. The finish warranty is typically offered by either paint vendor or Steelscape. Steelscape does not provide warranties for panel performance such as wind performance, or workmanship warranties such as water-tightness.

Building owners must ensure they are aware of the coverage of each individual warranty to avoid coverage gaps in the event of a claim. For example, some products may offer a headline '30 year' warranty, but this coverage may only reflect the adhesion of the paint rather than its resistance to fade from sunlight.

What warranties does Steelscape offer?

For most standard colors, such as solid hues and mica colors, Steelscape passes through paint supplier warranties, such as those offered by PPG or Sherwin Williams. Most solid colors warranties will be passed through from these paint suppliers, rather than offered directly by Steelscape. Direct Steelscape warranties are offered for our specialty branded products, including printed designs (such as Rustic Rawhide®) and specialty resins (such as Vintage®).

Finish warranties typically warrant against three different forms of excessive deterioration. They are excessive chalking, color fade, and delamination of the topcoat or primer, often called film integrity.

- **Chalking** is caused by the degradation of the resin system of the painted surface, mainly due to UV rays. As the resin breaks down, resin particles along with imbedded pigment particles lose adhesion and take on a white appearance. The physical similarity of these particles to chalk underpins the term 'chalking'. The amount of chalking that is identified as excessive is determined based on an ASTM developed 0-10 scale. 10 represents no chalking to the product.
- **Fading** is caused when UV rays and substances in the environment attack the pigments in the paint and cause their color to change. Color change is assessed based on its variance to the base state when new. Color change is measured by delta E (also known as NBS Units), which is a numerical value that represents total color change from a base. A warranty will outline acceptable units of delta E variance over the warranted lifespan of the product. For reference, a human eye can detect a change in color between 0.5 and 1 delta E units.
- **Delamination** is the loss of paint adhesion to the metal or between the primer and the topcoat, also known as film integrity loss. It can be visually apparent in several forms including bubbling, peeling, checking, chipping, cracking, or complete loss of the topcoat. Warranty coverage will ensure that the surface retains a consistent finish without the presence of any signs of delamination for the warranty period.

Coverage against these three items, and the length of this coverage, will vary significantly by the paint solution offered. The three common paint systems, from good to best, are polyester, silicon modified polyester (SMP) and polyvinylidene fluoride (PVDF). Economical polyester systems will generally only cover against paint delamination whereas high-end polyester systems may have warranties that cover color, chalk and film integrity. By comparison, most PVDF systems will offer warranties for chalking, color fade, and film integrity.

Warranty coverage will also vary by the installed environment and proximity to factors that may prematurely age the finish. This environmental variation will be outlined in the finish warranty. A sample of a finish warranty table is provided in Figure 10 below.

Type of Environment Installation	Film Integrity (Years)	Color Fade (Years) $\Delta \leq 5.0$	Chalking Rating (Years) ≥ 8 Rating
Residential, Commercial & School - Buildings for habitation, distribution centers, hotels, shopping malls, office buildings, assembly factories and schools located in rural or residential areas.	40	40	40
Industrial - Steel mills, power generating stations, oil fields, oil refineries, ore mines, chemical plants, paper mills or other unusual environmental exposure.	10	No Warranty	7
Severe Marine - Less than 1,000 feet from coastline. Requires min 0.7 mils thick film primer over steel, not required over aluminum.	15	15	15
Severe Marine - Less than 1,000 feet from coastline. EXTENDED LIMITED WARRANTY REQUIRES: min 0.7 mils thick film primer and clear coat.	20	20	20

Figure 10 - Sample PVDF warranty coverage table

Batch and Direction Sensitivity

When selecting a color, an important element to consider is if it is batch or direction sensitive. Failure to properly manage these colors can lead to solution imperfections that may detract from the installed visual appearance of a structure.

Most solid metal colors do not exhibit batch or direction color sensitivity. Common colors are solid hues such as whites, browns, greens, and blues found on manufacturer standard color cards. Batch and direction sensitive products are primarily associated with premium or specialty products including micas or metallics, translucent resins and printed designs. Designers and specifiers may select these premium finishes for enhanced visual appeal, color depth, or design distinctiveness.

Batch or direction sensitivity can occur for several reasons, including pigment design, paint system composition, or the production process. Pigments that are batch sensitive, such as micas are irregular sized and can ‘fall’ within the paint at uncontrollable angles resulting in this variability. Production based variance arises from factors including:

- *Print Roll Speed* - The patterned roll used to create the print effect must be moving as close to the same speed at the coil strip during production. Although every measure is taken to align these two speeds there are slight differences from one production run to another which may result in slight pattern differences.
- *Paint Viscosity* - The viscosity of the paint being used for the print portion of the order will vary slightly from order to order and paint batch to paint batch. The viscosity of the paint on the print roll will affect the look of the final pattern; often resulting in a “lighter” or “heavier” pattern.
- *Print Roll Pressure* - In order for the pattern to transfer from the print roll to the coil strip pressure is applied between the two. The amount of pressure controls the amount of paint film applied to the strip as well as the look of the pattern. This pressure will fluctuate slightly between production runs.

Metal finishes are produced using narrow production tolerances and must pass color-specific acceptance tests. As a result, the degree of color variation between these sensitive colors is relatively minimal. However, when installed directly next to one another or when illuminated by bright light, the color variance becomes pronounced.

End users can overcome batch mixing by accurately estimating the amount of material required for the job. This may include holding surplus material for anticipated building additions or unforeseen trim pieces until the job is complete, ensuring the material (coil number) or batch number, is recorded when stored.

Common Painted Terms

Backer - The painted back side of a metal strip. Often painted a neutral or white color as this side is often unexposed once installed. Metal can be painted on both sides if required for applications where both sides of the metal will be exposed.

Batch Sensitivity - An attribute in the paint whereby there is slight variance in the finish from batch to batch created by pigment variability. This is common for some clear coat, print and mica products. While the difference is minimal, it can be noticeable when material from two different batches are installed directly next to one another which is why it is not recommended to mix material that is batch sensitive.

Clear Coat - An optional, clear finish layer applied over the top of the colored topcoat layer. Clear coats can provide added perceived depth or an additional protective barrier from UV damage or corrosion.

Cool Color - ‘Cool’ coatings utilize infrared (IR) reflective pigments that have been altered chemically and physically to reflect IR wavelengths whilst still absorbing the same visible light. This means they look like ordinary painted colors but reflect the heat from the sun, reducing building cooling costs.

Direction Sensitive - An attribute in the paint whereby there is slight variance in the finish in one direction compared to the other, this is created based on the way pigments with slight variability fall on the surface once painted.

Formability - An important consideration of paint, refers to how easily the painted surface can be bent and shaped without damaging the painted topcoat through effects such as delamination or cracking.

Graffiti Resistance - A protective barrier against the permanent effects of vandalism. For metal this refers to a clear coat layer that prevents aerosol and marker graffiti from permanently damaging the paint surface. Graffiti is removed by spraying the graffiti surface with a remover and wiping off.

Kynar/Hylar 5000 - A trade name for a PVDF formulation which contains 70% PVDF pigments.

Mica or Metallic Paints - Painted metal finishes that appear to have flakes or particles of metal in it which create a sparkling light catching effect.

Minimum Order Requirements - For Steelscape products, this typically denotes a specific minimum material length or weight minimum, presented as either linear ft or lbs.

Pigment - Pigment impart the color to paint. They are insoluble solid particles that are finely ground and dispersed in the resin. They can be either organic, derived from plants, or inorganic - metallic compounds or oxides that are further processed to provide color stability.

Polyester Paints - Polyesters are the entry-level paint system commonly used for metal roof and wall products. Polyesters are the most cost-effective paint solution. Compared to other paint systems polyester systems will offer the lowest resistance to UV light and subsequent paint fade and will typically offer the shortest product warranties.

Pre-Painted - The process in which metal is painted for building product applications such as metal roofs or walls. The metal is painted in a continuous strip and this process occurs before it is formed into its finished state.

Pre-Treatment - A layer added to the bare metal before it is painted, designed to clean the surface of the metal to promote a strong bond between paint and metal.

Primers - A layer added to the metal before the top coat which assist with the permanent adhesion of the top paint color, provide corrosion resistance, and impact the way color is achieved.

PVDF - A type of paint system short for polyvinylidene fluoride, the most durable paint system commonly available for building products. These products also commonly offer the most extensive finish warranties.

Resin - Resins are the binder within the paint. They provide the paints physical and chemical attributes and determine how effectively the paint will adhere to a surface.

Silicon Modified Polyester (SMP) - Also known as Enhanced Polyester reflects a more UV resistant version of a polyester paint system commonly used in residential metal roof and wall products. SMPs offer good exterior weatherability and improved resistance to chalk and fade.

Solvent - Dissolves the resin and pigment components of paint into a consistency suitable for application.

Common Painted Questions

How is paint applied to metal?

Paint can be applied to metal in several ways including air brushing, dipping, and roll coating. For most metal roof and wall products, the process of roll coating is used in a continuous process called coil coating to apply paint to metal. In this process a metal strip passes through multiple stages of a paint line in which the surface is cleaned, pre-treated to improve paint adhesion, paint layers are applied, and promptly baked in ovens to cure. The advantage of this process is that the paint system is applied in a controlled and autonomous environment enabling high batch to batch consistency.

At what rate is the paint applied to metal?

Coil coated metal is typically produced at speeds around 100 feet per minute (fpm) and up—some lines may produce up to 700 fpm. The curing (baking) process takes only 15-30 seconds.

How durable is painted metal?

Painted metal produced using the coil coating process is exceptionally durable with some paint systems warranted for up to 40 years and with lifespans in the field of even greater. Coil coating applies paint in a continuous, controlled environment enabling tight quality control and high batch to batch consistency. As this paint is applied prior to forming into a finished product it must be highly durable to withstand the forming process and extreme weather conditions such as hail and wind.

How thick is the paint Steelscape applies to metal?

As the paint used in pre-painted metal is produced in a highly controlled environment, paint can be applied in a highly efficient, consistent manner enabling long finish warranties. A typical metal roof paint system is 1.4 mils thick, which includes the backer and primer. By comparison other industrial coatings, such as those that are dipped or sprayed, are 2-5 mils thick. Sometimes additional layers of paint are added for highly corrosive environments to improve performance. For more information on paint see the Steelscape Learning Center.

Do painted metal roofs have a clear coat?

Many automotive applications of metal have a clear coat for additional color depth, but typically metal roof and wall products will not have a clear coat applied over the top. Clear coats can add to the expense of the finish and for most external metal construction applications are not required. In some instances, a clear coat is applied to improve protection from environmental factors or to add an additional layer of protection against color fade.

What does it mean if the paint is batch sensitive?

Some colors used in metal roofs and walls deploy unique pigments to achieve distinctive color properties. This includes paint with micas to achieve sparkling or light catching characteristics. Unlike standard colors, these pigments are irregularly shaped and can be more difficult to control in the production process, resulting in minor variation from batch to batch. Whilst the performance of the paint is unaffected and unobservable in isolation, this may lead to slight differences in color shades and a point of contrast once installed. This underpins why many manufacturers, including Steelscape, provide guidance on batch sensitive products to avoid batch mixing. These products can also be sensitive directionally, which means it is important that they are all installed in a singular direction. To address this these products are typically shipped with protective films with directional arrows.

Painted Products Links for More Information

Steelscape's innovative range of colors and finishes – [Virtual Color Palette](#)

Finish warranties and paint technical bulletins – [Document Library](#)

Cool Roof Rating Council (CRRC) Product Directory – [CRRC Product Directory](#)

Technical Finish Topics

This section serves to define and address common technical topics related to pre-painted metal. Additional resources on technical finish topics can be found in the Steelscape Document Library.

Light and Reflection Considerations

Surfaces can provide two distinct types of reflection, specular reflection (mirror like reflection) or diffuse reflection (the scattered reflection of light). Smooth surfaces reflect light in a consistent direction, intensifying the reflection and subsequent light observed. Irregular and varied surface textures do not reflect light in a consistent direction, creating the diffuse light reaction.

For specular reflective surfaces this concentrated reflection means that reflectivity will be nearly zero at all angles except at the appropriate reflected angle. By comparison for diffuse surfaces reflectivity will be uniform at all angles.

This underpins why some materials, irrespective of color, and when viewed from certain angles, will noticeably reflect light, such as metal, polished glass, or polished wood, creating a shine. By comparison, other materials, irrespective of color, such as shingles, clay, or aged wood, will offer a similar appearance at all lighting angles.

Light Reflectance Value

Light Reflectance Value, or LRV, measures the amount of visible or usable light that reflects from a surface. Of note, this measures the total amount of light reflected from the surface rather than the reflection of concentrated light at a specific viewing angle. LRV is expressed as a percentage from 0 to 100. Zero represents an absolute, all-absorbing black and 100% refers to a pure reflective white. This rating is best used to estimate how light or dark a color will appear. This value is often used to help designers and homeowners select hues within a color range and can be used for grouping and comparing colors, such as when creating complementary color palettes. LRV is typically calculated using a specially calibrated spectrophotometer.

For exterior applications, such as roof and siding surfaces, this alone may not be an accurate gauge of perceived light reflection. Specifically, sunlight falls at varied angles throughout the day, and may create a noticeable shine during certain hours. This is a combination of the specular reflection of light, the angle of the sun, the angle of the exterior building surface, and where the surface is being viewed from. LRV alone will not provide an accurate measure to assess the intensity of this concentrated reflected light.

Gloss and Sheen

Gloss and sheen both relate to the reflection of light but refer to the concentration of reflected light with the light source and measurement taken at a specific viewing angle. This measurement is used to assess the observable shine on certain surfaces.

Both gloss and sheen are measured based on striking a surface with a known quantity of light and observing the amount of light reflected at a specific viewing angle. Gloss is measured based on the reflection of the light source when observed at a 60-degree angle from the surface whereas sheen is observed at an 85-degree angle. The 85-degree angle is observed more in-line with the painted surface and can be a more accurate measurement for low gloss surfaces.

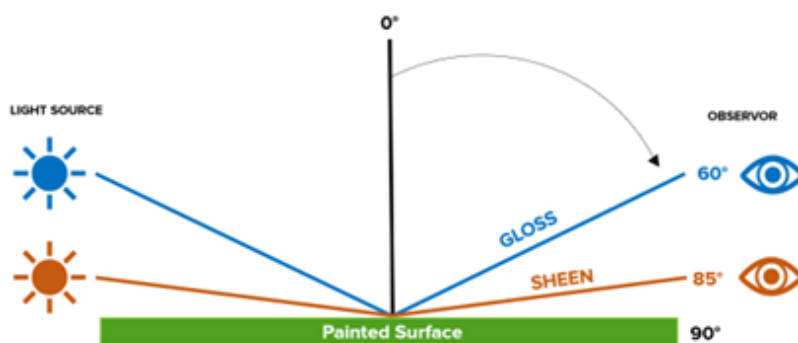


Figure 11 - The angles at which gloss, and sheen are observed

While correlated to color, other elements such as surface texture, surface chemistry, and cleanliness play a greater role in the impact of gloss and sheen. For example, a light covering of dust on the surface of your car will not drastically shift the color, however it will impact the intensity of light reflected.

Both gloss and sheen can be recorded using a consistent, scientific scale. Gloss Units (GUs) record the reflected light based on a 0-100 scale. The lower end (0 GUs) indicates a perfectly matte surface. The higher end (100 GUs) is based on a standard of polished black glass. It is possible for highly reflective surfaces such as a mirror to exceed 100 GUs. To perform this assessment accurately, gloss units can be recorded with a gloss meter with the testing process conducted in accordance with ASTM standard D523.

While this measure may not be as useful for grouping colors into a palette, this can be used to evaluate the intensity of reflected light from common viewing angles – often the concern with metal such as the way a roof plane may look to neighbors or pedestrians.

Solar Reflectance Value (SRV)

Solar radiation reaches the earth's surface in three distinct wavelengths: ultraviolet, infrared, and visible light. Near infrared (NIR) radiation is responsible for heat build-up within a structure. Most dark pigments readily absorb IR radiation and trap heat compared to lighter pigments. Solar Reflectance Value, or SRV, measures the amount of total solar radiation, visible and non-visible (infrared and ultraviolet) light that is reflected from a surface (sometimes called Total Solar Reflectance). SRV is expressed as a percentage from 1 to 100; the higher the number the more solar radiation that is reflected.

As with LRV, light colored objects often have a high SRV while dark colors are low. However, modern pigment technology has advanced and now includes the widespread use of 'cool' pigments. Cool pigment technology or 'Cool Colors' use infrared (IR) reflective pigments that have been altered chemically and physically to reflect IR wavelengths whilst still absorbing the same visible light. This means that traditional dark colors can offer solar reflectance values similar to lighter colors. While SRV is correlated to color, it should not be used to assess the visual impact of a color, particular when many modern exterior paints use highly reflective cool pigment technology.

Solar Reflectance Index (SRI)

The Solar Reflectance Index is a metric that incorporates Solar Reflectance Value and Thermal Emissivity to assess the impact of solar radiation on a surface and the transfer of heat to the structure. SRI includes both Solar Reflectance, the amount of solar radiation reflected off a surface, and Emissivity, the amount of heat a surface can dissipate away from itself. The Solar Reflectance Index (SRI) is the consolidated value calculated from solar reflectance and emissivity with factors such as air flow considered. All three of these elements relate to non-visible light.

SRI is a scale from 0 to 100. Materials that absorb and retain solar radiation have a lower number, whilst highly reflective materials have a higher number. Absorbed radiation results in heat trapped within a structure, increasing the energy required to cool the structure for occupants, reducing the overall energy efficiency of structure. This underpins why many modern building codes and green building programs mandate that roof surfaces have SRI values above certain minimum thresholds.

Some colors may denote the initial and aged Solar Reflectance Values. This is because some surfaces quickly lose their reflective properties due to UV degradation or the accumulation of grime. A key advantage of metal is that its aged solar reflectance remains comparable to its initial solar reflectance for many years. Additionally, metal is specifically engineered to ensure LRV, gloss, sheen and SRI values are controlled and highly consistent.

Installation, Storage, and Forming Considerations

Oil Canning

Oil canning is a visual phenomenon seen as waviness or distortion in the flat surfaces of installed pre-painted metal such as metal roofing and siding products. While oil canning is not a paint or metals failure, it can be a common issue with pre-painted light gauge metal. The wave pattern can range from barely visible to highly prevalent and can be created by a range of different factors. This includes, stresses in the base material, improper fastener pressure, misaligned panels, thermal expansion, and differential movement between the primary structure and the metal covering. In the majority of instances, improper panel manufacture or installation is the leading cause of oil canning rather than issues inherent in the base pre-painted metal.

The best approaches to reduce or avoid the effects of oil canning are to ensure metal is installed by a skilled professional and to select products which have features that break up large flat surfaces, such as the striations in standing seam roofing. Uneven bends, overtightened fasteners or a surface below the metal that is uneven, are common causes of installation-based oil canning.

Steelscape can apply processes in the production of pre-painted metal to help avoid the effects of oil canning once installed, however these are often selected by the product manufacturer not the end user. They include:

- Tension leveled material (tension levelling is an in-line process performed by the metallic coater to induce tension into the strip in excess of the yield strength to produce a flatter product with improved properties for subsequent forming)
- Embossed surfaces, in which a texture is imprinted into the surface to dissipates light in different directions.
- A lower gloss or textured coating such as Steelscape's Rawhide.
- Selecting a thicker material (oil canning is more prone on thinner flat material due to its ability to deform).

Swarf

Small metallic filings, also known as swarf, are created when metal roofing or siding products are pierced or cut with friction saws, abrasive discs, or drills, etc. If these tiny particles are left on a metal surface, they can corrode and cause rust stains, creating a permanent visual discoloration to the metal product. The appearance of the marks left by swarf is often mistaken for early deterioration of the roofing or siding; but, is in fact an installation issue not warranted by coating manufacturers. To avoid or reduce the impact of swarf, installers should:

- Use a power saw with a metal cutting blade cutting the metal sheets on the ground (to prevent swarf from coming into contact with installed panels).
- Cover the area around the work zone where the drilling or cutting takes place.
- Routinely cleaning and removing metal filings after performing work.
- Always sweep and clean the metal surface after installation and avoid doing major cutting and drilling activity directly over other metal pieces and avoid walking on metal surfaces prior to cleaning.

Dissimilar Metals

The use of other metals in direct contact with painted and coated products can create galvanic corrosion. Galvanic corrosion is an electrochemical effect where one metal corrodes in a different manner when in contact with another metal. Typically, moist air or chemical environments provide the conditions for this type of corrosion. The degree of 'dissimilarity' is affected by the metal type and the surrounding environment. In an inert environment there may be no galvanic corrosion but in one in proximity to the ocean, the galvanic corrosion could be severe. The further apart the two metals are in the galvanic series—a list of metals in order of their activity—the greater the potential for this type of corrosion.

The most common instances of premature corrosion created by dissimilar metals are when fasteners of a different metal type (such as stainless steel) are installed in direct contact with pre-painted material in a moist environment (such as a coastal setting). To learn more about Dissimilar Metals, read the Steelscape technical post on "Dissimilar Metals".

Premature Corrosion

Premature corrosion can be created by several different causes. Pooled water created by improper drainage, or trapped dirt and moisture due to foreign matter on the metal such as leaf or pine needle build up. Routine maintenance includes a documented wash of the metal surface can help to avoid premature corrosion and ensure the longevity of the coating. Roofs can be cleaned by power washing (ensure care is taken around panel seams and other flashings), or with 1/3 cup of Tide® detergent or other common detergent containing less than 0.5% phosphate dissolved in one gallon of water, followed by a clear water rinse immediately after.

Other sources of trapped moisture including wet insulation under a metal surface, untreated wood in direct contact with the metal or run off from AC condensers are also common causes of premature corrosion with pre-painted metal.

Wet Stack Issues

Premature corrosion can also be created if the metal is stored in a stack in a moist environment before it is installed. The oxidation of steel can occur when in direct contact with water or exposed to high humidity during storage. In such a situation, the material will have evidence of water penetration by capillary action, which presents as very fine blisters on painted product and white or black rust on unpainted material.

This oxidation, or wet stack corrosion, can occur both in unprocessed coil form or within stacks of tightly bundled sheets and finished panels. Wet stack issues are overcome by storing the metal products on racks at least one foot above ground level. Additional recommendations to prevent oxidation include reducing storage time, refrain from using wet, uncured or pretreated lumber for stacking, and store material inside or under roof areas when possible.

Explore Steelscape's broad range of technical bulletins and other technical product resources in the Steelscape Document Gallery

Steelscape and Sustainability

Steelscape's products cater to the needs of the light-gauge metal construction industry and these metal products contribute to sustainable building design. Not only is metal made of recycled input content, but it is 100% recyclable at end of life. Additionally, coated metal products are manufactured at high rates of speed on efficient lines and are highly durable, meaning they extend the scrap-replace cycle. The painted finishes used in these products also offers long lasting solar reflectance properties to reduce the buildup of heat in structures, improving building efficiency.

Steelscape products can be used in a range of construction applications to meet modern green building codes and requirements and these are outlined below. Steelscape understands the constantly changing nature of the green building environment and the vast amount of diversity at the local planning level. If you require further assistance in identifying the suitability of Steelscape products for a green building project, please reach out using the Ask Steelscape form.

Recycled Content Overview

The term 'Recycled content' refers to the proportion of products that are generated from postconsumer and/or pre-consumer material. 'Post-consumer' is material generated by households and businesses, such as tin cans and old car bodies. 'Pre-consumer' refers to materials recovered from the manufacturing process before it is sold to consumers, such as scrap from the car industry sold back to the steel industry. Reutilization of materials, such as scrap within the steelmaking process, is not considered pre-consumer material and thus not included in calculating recycled content.

In Steelscape's manufacturing process, the raw material from which we produce our products is hot band steel coil. Therefore, the recycled content of our steel products is directly related to the recycled content of the hot band steel coil we utilize. Steelscape can manufacture its products from two different types of hot band feed.

- **Standard Hot Band** - Currently, Steelscape's main hot band suppliers, which provide our standard hot band, use a basic oxygen furnace (BOF) process. Unless a customer specifies otherwise at time of order quote and order entry, this standard hot band is applied to all orders. As the amount of recycled content in BOF hot band steel varies by producer, the specific recycled content within our products utilizing standard hot band will vary.
- **High Recycled Content Hot Band** - Steelscape does have the ability to utilize a higher recycled content hot band steel upon request. This high-recycled content hot band steel may contain 50-75% recycled content in total. On average, the pre-consumer portion accounts for 20-35%, the post-consumer portion accounts for 30-40%, and the remaining portion represents reutilized materials. Steelscape products utilizing high-recycled content hot band may be available upon request and must be specified at the time of order quote and order entry.

LEED

The US Green Building Council manages a green building certification program called LEED. Short for Leadership in Energy and Environmental Design, LEED applies to a variety of building types and covers a broad range of elements relevant to building design including a framework for efficient and responsibly sourced building materials. The most current version is LEED v4.1, Metal building products, including products manufactured from Steelscape steel can generate multiple LEED credits.

Credits that can be generated directly from Steelscape sourced material include MRc3: Responsible Sourcing of Raw Materials (2 points) - Steelscape standard products are manufactured with post-consumer recycled content steel. LEED v4.1 allows a default value of 25% for post-consumer recycled steel. Steelscape manufactures products sourced from a Basic Oxygen Furnace (BOF) facility. While actual recycled content may be higher, the 25% default value allowed by LEED is used for LEED v4.1 reporting.

Upon request, Steelscape can purchase feed material made from high recycled steel that uses Electric Arc Furnace (EAF) production processes. EAF steel contains an average total recycled content of 50-70% (30-40% post-consumer and 20-35% pre-consumer). Longer lead-times and additional charges may apply and Steelscape must be notified in advance of purchase the need for this material

Notable Reference - This credit is based on material cost and recognizes the effect recycled content percentages have on a component-by-component cost basis (1/2 pre-consumer content + post-consumer content).

Ineligibility for extracted or recovered credit - Please note, that within the LEED guidelines, the term 'extracted or recovered' refers to the extraction of iron ore or the melting of recycling materials. Iron ore is mined around the globe and blended to produce specific grades of steel. Currently, there is no formal process to track the origin of iron ore transported and traded on global commodity markets. Moreover, there are currently no mining operations or steel recycling operations in Steelscape direct market (west of St Louis, Missouri) that can fulfill the products sourced (extracted, manufactured, and purchased) component of this credit.

Other LEED Credits -Most LEED credits are generated at the finished end-product level. This means that documentation for these credits is the responsibility of end-product manufacturers. However, Steelscape material can be used to contribute to these credits, including:

- MRc2: Building Life-Cycle Impact Reduction
- MRc2: Building Product Disclosure and Optimization
- MRc3: Building Product Disclosure and Optimization
- MRc5: Construction and Demolition Waste Management

For assistance identifying product partners of Steelscape that can contribute to LEED building credits, please reach out to Steelscape using the Ask Steelscape functionality.

Living Building Challenge and Red List Free

The Living Building challenge is a green building program developed by the International Living Future Institute. The core focus of this program is to develop regenerative buildings that better connect with nature and the community, are self-sufficient, and create a positive impact on the humans and environments they interact with.

The Living Building Challenge (LBC) 4.1 standard contains seven imperatives for developing and constructing non-harmful, and ultimately regenerative, buildings and homes. One of these imperatives is "Materials" which in turn contains the "Red List". Red List chemicals are defined by the LBC as worst in class materials prevalent in the building industry. The LBC requires declaration of Red List substances in concentrations of 100ppm or greater in a finished product.

Steelscape's metallic coated products, namely ZINCALUME®, TruZinc®, ZINCALUME® Plus and TruZinc® Plus products, comply with the Living Building Challenge Material Red List. The chemical composition of paint applied to Steelscape's metallic coated products varies by paint system and manufacturer. For painted product Red List inquiries please contact Steelscape via the Ask Steelscape form.

Some Living Building Challenge projects may require high-recycled content steel and Steelscape can obtain this material based upon customer request. High-recycled content products may contain unintentional trace amounts of Red List materials. However as per Declare Manufacturer's Guidance, Appendix B: Clarifications, this material is still in adherence to the standard, as Steelscape confirms that for its high recycled content material, no Red List ingredients are intentionally added.

Life Cycle Assessments (LCA), Environmental Product Declarations (EPD) and Health Product Declarations (HPD)

As part of some federal, state, or green building program regulations, manufacturers may be asked to provide information on the environmental impacts of their products. LCAs, EPDs, and HPDs enable this information to be presented in a consistent format improving the accessibility of data and ability of end users to compare the environmental impacts of the products they use. Each of these three documents serve a different purpose:

Life Cycle Assessment (LCA) – This document serves to provide an outline of the environmental impacts of a product or service throughout its entire lifecycle. These lifecycle stages include raw material extraction and reporting, transportation, manufacturing, use, and end of life disposal. The environmental impact includes elements such as harmful gasses and emissions, resource usage, and recyclability. Steelscape publishes an independently verified LCA that it updates every two years. This document is available by request. It is important to note that Steelscape products are typically formed into finished products such as roof and wall panels and Steelscape's LCA does not capture the environmental impact of these product transformations.

Environmental Product Declaration (EPD) – Developed based on the LCA, the EPD is a report that serves to articulate the information within the LCA in a transparent, comparable manner. EPD's are the most common format used by designers and product specifiers to evaluate the life cycle environmental impact of building products. The EPD outlines what a product is made of and how it impacts the environment across its entire life cycle. EPD's can be third party verified to ensure the data meets reporting thresholds and specific presentation formats. Verified EPDs can be used to earn products credits for LEED v4.1 and other green building rating programs. As Steelscape products are formed into finished products by direct customers, such as for metal roof and siding profiles, Steelscape does not publish an EPD. It is the responsibility of finished product manufacturers or product manufacturer industry associations to produce EPDs for their finished goods.

Health Product Declaration – Created by the Health Product Declaration® (HPD) Collaborative, a HPD refers to a standard specification for listing material ingredients and associated health information for building products. The purpose of the HPD is to improve the transparency of information available for building designers and specifiers and to improve the material health of the built environment. Similar to EPDs, HPDs are intended to be developed for finished products, and it is the responsibility of end product manufacturers to publish this information.

Cool Roof Rating Council

The Cool Roof Rating Council (CRRC) verifies the emissivity, solar reflectance, and Solar Reflectance Index (SRI) values of painted roofing products and publishes their initial SRI value and aged (3 year) SRI value. Several green building programs outline minimum SRI requirements for roofing areas. Many of these building programs, such as California's Title 24, outline that these SRI values must be verified by the Cool Roofing Rating Council. To research verified colors, use the CRRC Product Directory

Steelscape products are listed directly or indirectly. Directly listed products can be found by searching for "Steelscape" within the [Cool Roof Rating Council Product Directory](#). Indirect products will be listed by paint vendor or product manufacturer.

RoHS

RoHS is a European developed directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE). Steelscape's TruZinc® and ZINCALUME® coated steel coils, when supplied as dry, no-chemical treatment/passivation, do not contain the RoHS listed harmful materials or substances in excess of the allowed thresholds.

For more specific details on Steelscape's compliance with this directive, browse the downloads section the [Document Library](#).



Kalama, Washington

222 West Kalama River Road, Kalama, WA 98625-9420, USA

Rancho Cucamonga, California

11200 Arrow Route, Rancho Cucamonga, CA 91730-4805, USA

www.steelscape.com

888.553.5521

