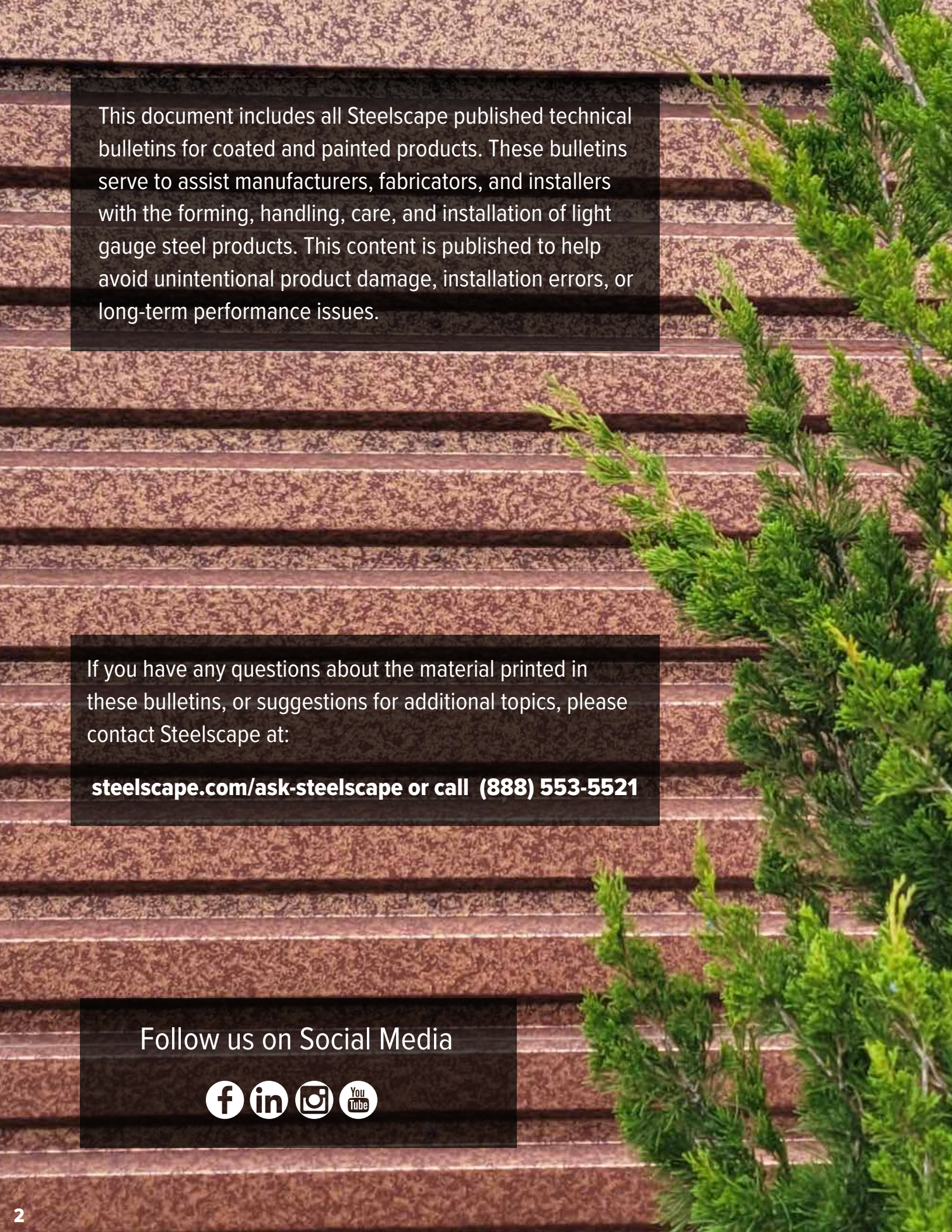
TECHNICAL BULLETINS

steelscape®



This document includes all Steelscape published technical bulletins for coated and painted products. These bulletins serve to assist manufacturers, fabricators, and installers with the forming, handling, care, and installation of light gauge steel products. This content is published to help avoid unintentional product damage, installation errors, or long-term performance issues.

If you have any questions about the material printed in these bulletins, or suggestions for additional topics, please contact Steelscape at:

steelscape.com/ask-steelscape or call (888) 553-5521

Follow us on Social Media

TABLE OF CONTENTS

ZINCALUME® TECHNICAL BULLETINS

ZINCALUME® Technical Bulletins.....5-33

Bulletin ZB1 General Guide to Good Practice in the Use of ZINCALUME Steel for Roofing & Siding Products..... 5-8

Bulletin ZB2 Flashing Materials for Bare & Pre-Painted ZINCALUME Steel 9-10

Bulletin ZB3 Fastener Selection for ZINCALUME Steel Roof & Siding Products 11-13

Bulletin ZB4 Swarf Staining of ZINCALUME Steel Roof & Siding Products 14-15

Bulletin ZB5 Sealants for ZINCALUME Steel 16

Bulletin ZB6 Cut Edge Protection of ZINCALUME Steel 17

Bulletin ZB7 Guidelines for Welding ZINCALUME Steel 18-19

Bulletin ZB8 Unsuitable Applications for ZINCALUME Steel 20-21

Bulletin ZB9 Guidelines to the Effective Use of ZINCALUME Plus Steel 22-24

Bulletin ZB10 Preventing Transportation & Storage Corrosion of ZINCALUME Steel 25-27

Bulletin ZB11 Field Maintenance, Field Painting & Touch-Up Painting of ZINCALUME Steel Roofing and Siding..... 28-30

Bulletin ZB12 Guidelines for the Installation of Photovoltaic Panels with ZINCALUME Steel 31-32

Bulletin ZB13 HI Islands: Exceptions to Standard Limited Warranty, Cleaning & Panel Design Recommendations..... 33-34

Bulletin ZB14 Hail Damage to ZINCALUME Steel Products 35

TRUZINC® TECHNICAL BULLETINS

Bulletin TB1 Guidelines for Effective Use of TruZinc® Plus Steel 36-38

PRE-PAINT TECHNICAL BULLETINS

Pre-Paint Technical Bulletins 39-45

Bulletin PPB1 Batch Sensitive Products.....39-41

Bulletin PPB2 Pressure Mottling 41-42

Bulletin PPB3 Wet Stack Storage 43-45

Bulletin PPB4 Natural Matte® Installation 46

CONTINUED ON NEXT PAGE...

GENERAL TECHNICAL BULLETINS

General Technical Bulletins 47-59

Bulletin GB1 Dissimilar Metals/Galvanic Corrosion 47-48

Bulletin GB2 Metal & Light Reflectivity 49-52

Bulletin GB3 Peel Coat Guidelines & Best Practices 53-54

Bulletin GB4 Fluting Vs. Non-Fluting Steel 55-56

Bulletin GB5 Cleaning Coil Coatings 57

Bulletin GB6 ZINCALUME VS TruZinc® 58-59

REGULATORY TECHNICAL BULLETINS

Regulatory Technical Bulletins 60-67

Bulletin RB1 Overview and Summary Table 60

Bulletin RB2 Buy American Act 61

Bulletin RB3 Surface Transportation Assistance Act (STAA), Buy American & Other State Content Requirements 62

Bulletin RB4 American Recovery & Reinvestment Act (ARRA) 63

Bulletin RB5 Site Extraction & Manufacture 64

Bulletin RB6 Restriction of Hazardous Substances (RoHS) 65

Bulletin RB7 ASTM International Standards 66

Bulletin RB8 Safety Data Sheets 67

RETURN TO TABLE OF CONTENTS

ZB1 - General Guide to Good Practice in the Use of ZINCALUME® Steel for Roofing & Siding Products

Introduction:

Panels fabricated from ZINCALUME Steel will provide many years of trouble free service when properly designed, installed and maintained. The key to obtaining all of the benefits of the corrosion resistant coatings applied to steel used in roofing, siding and rainwater items lies in correct material selection, good handling and installation practice, and sensible maintenance.

Few roofing or siding products are replaced because of an overall breakdown or general corrosion. Replacement is generally due to isolated component failure which could have been avoided by following a few simple rules. This Technical Bulletin sets out the general principles to follow. Attention to the following factors should ensure satisfactory performance and good service life. Manufacturers' specific recommendations about their particular products should be followed.

Correct Selection of Materials:

The correct selection of roofing and siding materials is the first step to ensuring a building's long life. The range of products manufactured by Steelscape is designed to provide good performance under normal environments from benign rural areas to corrosive industrial or salt-laden coastal atmospheres. Correct selection is a matter of choosing the right product for its intended use.

A roofing installation in a coastal environment has a completely different demand upon it than one in a benign rural location. Our experienced sales and technical personnel should be consulted if there is any doubt as to the correct metallic coated or painted product for a specific structure. This is especially true for the special requirements of severe coastal and industrial as well as animal confinement environments.

Design for Durability:

There are many factors that should be considered in the design phase of any building to ensure the maximum trouble free service life. The following factors are some of the primary considerations.

Minimum Roof Pitch:

The pitch must be designated/designed so that standing water conditions are not created. Water or condensate must freely drain from the roof panels. Where a roof includes several slopes, a valley gutter or other device should be installed to ensure adequate drainage. Specified minimum pitch will vary according to the depth of the roof profile and the means of fastening. Many standing seam roofing systems with deep profiles (i.e. panel seams ranging from 2-3 inches), fastened with concealed clips which do not penetrate the steel weathering membrane, may be installed down to a minimum slope.

Regardless of roof pitch, the cut ends of panels should be burr down, or designed with a rolled or hemmed edge to prevent moisture from being held at the edge.

A properly installed standing seam roofing system will allow the roof to drain effectively without "flooding" the laps. The concealed clips ensure the drainage part of the panel membrane is not breached by fastening holes through which water may leak. Perimeter detailing and flashing is also an important component of such a system.

A roof fixed to its minimum pitch must observe all of the criteria for correct installation. Supports must be carefully aligned to avoid creating low spots in the roof where ponding will occur, leading ultimately to reduced service life.

Correct Support Spacing:

Correct spacing of supports is important. Not only do the purlins, battens, etc., support the weight of the roof and the weight of the roofer during installation, they must be strong enough to prevent the sheets of decking from blowing away in high winds.

Continued on next page...

Support spacing near the eaves and the ridge is usually less than the intermediate spacings. This allows the roof to handle the increased lift and forces created by wind turbulence. The supports hold the roof down and they must themselves be restrained. It is possible for a roof to be blown off with the purlins or pieces of poor quality lumber battens attached to the sheets.

Steel Thickness - Base Metal:

To protect steel sheet from the corrosive effects of the elements, a layer of metallic aluminum/zinc alloy is applied to the steel base in the hot dip process. To enhance this protection as well as provide an attractive appearance, a pre-painted finish is also an option. These protective finishes are the major determinants of long service life and lasting good looks. The structural strength of the roofing or siding profile is derived entirely from the steel base and the profile of the particular steel panel.

An important consideration in the spanning capacity of a steel profile is its base metal thickness, which is used to determine support spacings. The total thickness of pre-painted steel sheet (the base metal steel plus an aluminum/zinc hot dipped coating, plus pre-painted finish) is, at best, a very imprecise indicator of the base metal thickness which provides the strength of the roof sheeting.

The ability of the roof sheeting to span recommended distances without severe deflection, to support the installer, and to resist tearing away from fixing clips or screws largely depends on the base metal strength.

Always ensure that the base metal thickness specified is according to recommendations. Most metal panel manufacturers provide load tables to assist in the selection of an appropriate profile for spanning conditions.

Fume Extractors & Vents:

Corrosive dust and particles can be released through roof vents and discharged onto the roof surface. The immediate area of the roof adjacent to the vent is at increased risk of corrosion. The following design guidelines should be considered to avoid problems.

- Locate vents on the corner of the windward side of the building.
- Install filter elements to trap hazardous material.
- Specify pre-painted product or apply a protective coating to the affected area of the roof.
- Maintain coal or oil fired boilers or incinerators so they do not discharge sulfur compounds over the roof surface.
- Avoid condensate from copper tubing.

Foot Traffic:

Repeated foot traffic and the dragging of maintenance or cleaning equipment over the roof surface may damage the roof which will reduce its life expectancy. Catwalks and platforms should be designed and installed where necessary.

Roof Structures:

Equipment such as air conditioning units are often secured to uncoated steel channels. Uncoated steel used on a ZINCALUME Steel roof should be cleaned, primed and given a suitable finish coating. If left unprotected the rust may bleed onto the ZINCALUME Steel panels and stain the surface. For guidelines on the installation of photovoltaic panels see **Technical Bulletin ZB12 "Guidelines for the Use of Photovoltaic Panels with ZINCALUME Steel"**.

Site Storage Before Erection:

Where possible do not leave uncovered coils or stacks of sheets lying in the open. Install finished material as quickly as possible. Store materials indoors and away from openings to the outside. On arrival at site, ensure the steel sheets are dry. If wet, open the pack immediately, separate the sheets and allow them to dry.

If it is absolutely necessary to store ZINCALUME Steel outdoors please follow the following guidelines:

- Erect simple scaffolding around the material and cover it with a waterproof sheet or tarp. Ensure space is allowed between the cover and the material to allow air to circulate.
- Store material off the ground and on an incline so that if rain should penetrate the covering, water will drain away.
- Use only dry, untreated lumber spacers for block stacking.
- The storage site should be inspected regularly to ensure moisture has not penetrated the stack. If moisture has infiltrated between panels they should be separated and dried immediately. ZINCALUME Steel must not come in contact with wet cement or concrete. If contact occurs remove immediately.

Continued on next page...

For additional information on storage corrosion see **Technical Bulletin ZB10 "Preventing Transportation and Storage Corrosion of ZINCALUME Steel"**.

Installation Guidelines

Allowance for Expansion:

All roofing and cladding will expand and contract with changes in temperature. Fastening/Fastener attachment systems used must accommodate the expansion to avoid problems of "canning", ponding or roof noise. Expansion tables are usually available from the panel manufacturer.

Handling:

Handle panels carefully. Do not drag or slide sheets over other products or rough surfaces. Equipment and materials placed on to the roof should be clean and care taken to prevent damage to the surface.

Long panels are best lifted with the aid of a lifting boom. Flat, rubber soled footwear should be worn when walking on a roof. Shoes should be cleaned before going up on the roof.

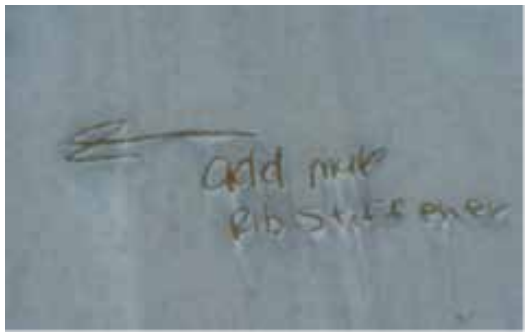
Bare ZINCALUME Steel is prone to fingerprinting and hand printing. ZINCALUME Plus Steel, which has a clear acrylic resin applied, is recommended for unpainted applications. The clear resin prevents finger and handprints and aids in forming. If bare ZINCALUME Steel is utilized, clean gloves should be worn when handling.

Laying:

Pierced sheets should be installed with overlaps away from the weather. End laps in profiled metal roofing should be avoided where possible. The end lap of ZINCALUME Steel and painted profiles should be sealed with a double bead of sealant.

Marking, Cutting and Drilling:

Black lead pencils should never be used for marking ZINCALUME Steel products as the carbon in the pencil will promote corrosion which will etch the surface leaving a permanent mark. Use any other color pencil but black. Cut and drill pre-painted steel with care to avoid marking the high-quality surface. Use a hand shear or nibbler instead of a friction blade to avoid damaging the ZINCALUME Steel or paint coating. Remove all debris and metal filings as soon as possible; see **Technical Bulletin ZB4 "Swarf Staining on ZINCALUME Steel Roof & Siding Products"**.



Example of graphite pencil corrosion

Fasteners - Placement, Size, Type, Life Expectancy & Compatibility:

The security of a roof is no better than its fasteners. Correct choice and placement ensures fasteners are placed in effective positions. The use of nails is not advised for roofing and siding profiles. Screw type fasteners with washers are recommended and have been proven to have 2 to 3 times the holding power of nails. Care should be taken not to underdrive, or overdrive screws. Large washers are necessary when hurricane conditions apply to the location. This prevents screws being pulled through sheeting under high lift forces.

Fasteners used for external fixing of roofing and siding products must be compatible with ZINCALUME Steel and have a life expectancy comparable with the ZINCALUME Steel panel.

Our recommendations on type and compatibility of fasteners are published in **Technical Bulletin ZB3 "Fastener Selection for ZINCALUME Steel Roof & Siding Products"**.

There are some fasteners on the market with only minimal corrosion protection. These will quickly rust and present an unsightly appearance. Fasteners made of some alloy materials are highly corrosion resistant in their own right but a galvanic couple may occur when they are in contact with ZINCALUME Steel. This may cause an increased rate of corrosion of the steel around the fasteners. Screw manufacturers/suppliers should be consulted to ensure correct usage.

Clean Up:

After erection has been completed the roof panels and gutters should be swept to remove dirt and debris such as unused fasteners, metal filings, pop rivet stems, and pieces of flashing. The shank of a fastener left lying on a roof will rust very quickly and will run down onto the panel causing an unsightly stain. The process of cutting roof and wall sheeting to size with discs, or drilling to fix with fasteners, can create debris which is unsightly and can create localized corrosion and shorten the service life.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Technical Bulletin ZB4 "Swarf Staining on ZINCALUME Steel Roof & Siding Products" covers this in greater detail.

Mud and dirt tracked onto the roof panels, and greasy hand and footprints, can be removed by washing with a cleaner consisting of 1/3 cup mild detergent in one gallon of water applied with a mop or soft broom.

The roof should then be thoroughly rinsed with water. High pressure spray applications and strong alkaline detergents should not be used. If washing with a detergent solution is found to be inadequate, solvents such as mineral spirits can be used to remove more stubborn stains.

More aggressive and highly volatile solvents such as acetone or toluene should be avoided for safety reasons, as well as their incompatibility with many paint systems used on building panels. The compatibility of any solvent on paint should be tested or known prior to its use. Tri-sodium phosphate (TSP) cleaners should not be used.

Compatability of Accessories (Including Flashing & Sealants):

There are basic facts regarding compatibility of metal products that are usually predictable and well documented. These have been summarized into a few simple rules for roof installers in **Technical Bulletin ZB2 "Flashing Materials for Bare & Pre-Painted ZINCALUME Steel"** which covers this topic in much more detail. The mix of incompatible metals or materials with dissimilar service life is poor practice and will significantly affect service life. Correct choice of sealants to suit materials and location is important. Sealants containing amine or acidic acid should never be used. High quality sealants, such as neutral cure silicones, provide good performance in most applications. They may cost a little extra but are a good investment. Recommendations on sealant selection are covered in **Technical Bulletin ZB5 "Sealants for ZINCALUME Steel."**

RETURN TO TABLE OF CONTENTS

ZB2 - Flashing Materials for Bare & Pre-Painted ZINCALUME®

Introduction:

The preferred flashing material for ZINCALUME Steel is either bare or painted ZINCALUME Steel. The following guidelines have been provided to assist in the informed use of other materials where necessary.

Compatibility

Galvanic Corrosion:

Due to a phenomenon known as galvanic or bimetallic corrosion, some commonly used metals can cause accelerated corrosion when used with ZINCALUME Steel zinc/aluminum alloy coated and pre-painted sheet. The field of corrosion study has defined an "activity" scale shown in Table 1 which shows zinc and aluminum more active than copper, lead or stainless steel. The farther apart on the scale, the more dissimilar and the stronger the potential for reaction between the metals. When a galvanic "couple" is formed by electrical contact the more active metal will sacrifice itself (or dissolve) to protect the less active component of the couple. This phenomenon is amplified when the dissimilar metals are in a corrosive environment. See Steelscape's **Technical Bulletin GB1 "Dissimilar Metals/Galvanic Corrosion"** for additional information.

ZINCALUME Steel will experience accelerated corrosion when in contact with copper (including copper treated lumber) or lead. Leeching from copper will result in especially high levels of corrosion. The protective oxide film which naturally forms on aluminum surfaces is broken down by copper or lead in localized areas. Pitting corrosion ensues which is a highly accelerated form of attack. Zinc coatings are not generally subject to pitting when in contact with the same materials.

Rainwater Runoff:

The galvanic scale in Table 1 is also important when considering runoff from one material to another. If any two of these materials are in damp contact or a runoff situation, the metal higher on the table will sacrifice itself to protect the lower. A simple guideline to follow is to remember that water can flow downhill but not uphill. Zinc to copper is acceptable but copper to zinc is not.

Table 1: Galvanic Series of Metallic Activity

More Active Metals

More Noble Metals

- Zinc
- ZINCALUME Steel
- Aluminum
- Steel
- LEAD
- Copper
- Stainless Steel

Catchment (Caution When Combining Different Roofing Systems):

Care should be taken when combining products on a roof system. If products are combined incorrectly severe localized corrosion may occur as a result of "inert catchment."

The zinc coating on galvanized steel products develops a protective surface film as a result of natural weathering. This provides the longevity of performance which is typically known of galvanized products. When flowing over galvanized roofing rainwater dissolves small amounts of minerals and salts from the zinc surface. These minerals and salts promote and maintain the protective film and enhance the corrosion resistance of other galvanized steel products such as gutters and valleys.

When rainwater flows over or is collected from roofing materials which do not promote this protective film (inert materials) accelerated corrosion of unpainted galvanized steel roofs and gutters can occur. Examples of inert materials include ZINCALUME Steel, pre-painted steel, acrylic, glazed tiles, aluminum, fiberglass and PVC.

- Unpainted galvanized steel must not be used for roofing or rainwater goods (including valleys and gutters) to collect water runoff from ZINCALUME Steel or any other inert material.

- ZINCALUME Steel and painted ZINCALUME Steel can be used to collect water from galvanized or any inert catchment material. ZINCALUME Steel gutters will typically give a longer service life than traditional galvanized steel.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Standing Water:

New applications for standing seam metal roofing have required roof slopes be minimized to as low as 1/4:12.

An area of a roof can be almost flat depending on the particular building. These conditions can create areas where water can collect and remain for extended periods of time with possibility of accelerated corrosion. Where an unfavorable galvanic couple exists, the presence of standing water for prolonged periods will allow the corrosion reaction to continue for a longer time than it normally would. In cases where an adverse couple does not exist, enough water can complete the necessary electrical contact and corrosion will proceed as long as the water maintains the circuit.

The appearance of roofing panels can suffer even when all materials within a water ponding area are compatible. Aluminum-coated steel panels are not as resistant to standing water as ZINCALUME Steel. When the aluminum-coated panel begins to rust, the standing water can disperse and deposit rust particles on an adjacent ZINCALUME Steel sheet panel, resulting in an unsightly stain.

Compatibility of Commonly Used Flashing Materials

Copper:

Copper is incompatible with both bare and pre-painted ZINCALUME Steel, either in contact with or where water can flow from it, such as is often experienced with hot water system overflows. Painting the outside of the copper pipe is recommended. ZINCALUME Steel must not come in either direct contact with, or water runoff from copper treated lumber. Hot water discharge pipes should be extended beyond the roof, preferably to ground. Every effort must be made to prevent the overflow of water from copper pipes onto the roof and gutter material.

Lead:

Lead is the only metal generally considered to be compatible with zinc-coated steel but not with bare or pre-painted ZINCALUME Steel. ZINCALUME Steel, in contact with or receiving run-off water from lead is prone to corrosion. In the event of roof retrofit where lead already exists and its re-use is desirable, the ZINCALUME Steel must be insulated from the lead by a suitable barrier. This can be achieved by painting the underside of the lead or preferably both surfaces to ensure complete electrical separation. Plastic film can also be used provided it is robust enough and will not tear, e.g., polyethylene damp course placed between the lead and ZINCALUME Steel sheet (with paint on top), is a better alternative.

Lead in the water run-off should be avoided by painting the top surface of the lead flashing. The lead supplier should be contacted for advice as to a suitable finish coat barrier system and the ongoing maintenance requirements. Applying two or three coats of water-based acrylic is generally suitable but any painting must be maintained so it will not break down and expose any of the lead surfaces.

Galvanized Steel:

Galvanized flashing materials and accessories may be used with bare and pre-painted ZINCALUME Steel. However, galvanized products may have a shorter life span and thus eventually makes them impractical in the long term. Conditions detailed above with unpainted galvanized subject to water runoff from ZINCALUME Steel panels should be avoided.

Aluminum Coated Type II:

Flashings fabricated from this material may be used although inferior resistance of aluminum coated steel to standing water and cut edge corrosion may result in rust staining of adjacent bare and pre-painted ZINCALUME Steel.

Graphite:

All materials containing graphite should not be used with or adjacent to ZINCALUME Steel. This includes washers and also graphite from pencils used to mark ZINCALUME Steel components.

Stainless Steel:

300 Series grades are suitable, 400 series grades with > 1.0 mil. zinc or cadmium coating may be used. Other grades should be avoided.

For more information regarding stainless steel fasteners see **Technical Bulletin ZB3 "Fastener Selection for ZINCALUME Steel Roof and Siding Products".**

RETURN TO TABLE OF CONTENTS

ZB3 - Fastener Selection for ZINCALUME® Steel Roofing & Siding Products

Introduction:

Roofing, siding and accessory products manufactured from ZINCALUME Steel will give long, trouble-free service when exposed to the atmosphere in environments ranging from benign to severe in terms of corrosive effect. The selection of the appropriate form of fastener is a task, however, which should not be solely influenced by cost. Fastener costs are minimal relative to the overall cost of a project and there is little benefit gained through the use of inferior fasteners.

Guidines for Appropriate Fasteners:

The expected service life of the fastener should meet or exceed that of the ZINCALUME Steel components used in the construction. The severity of environmental conditions and the corrosion resistance of the fastener should be considered.

The fastener must be compatible with the ZINCALUME Steel components. When a more active metal is placed in direct electrical contact with another less active material the more active component will sacrifice itself to prevent the other from corroding.

This is known as dissimilar metal contact or galvanic corrosion and can be extremely aggressive under certain conditions. Galvanic corrosion can be much faster in corrosive environments such as acid rain due to the increased conductivity of the electrolyte or rainwater. **For this reason lead, copper and copper containing alloys (such as Monel) should not be used in conjunction with ZINCALUME Steel.** Stainless steel should not be used in severe environments as the ZINCALUME Steel alloy coating can corrode sacrificially. Refer to Table 3 to ensure the fastener of your choice is compatible and has sufficient durability.

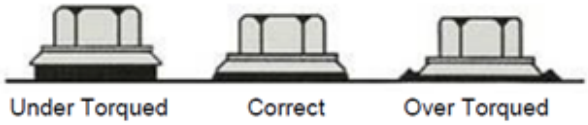
Careful consideration should be given not only to the expected performance of the head of the fastener, but the shank as well. This applies particularly if the shank of the fastener could be subject to the effects of aggressive substances, such as acid or chemical fumes or to prolonged humidity and condensation for example, within the confines of a building.

Please reference **Technical Bulletin ZB2 "Flashing Materials for Bare & Pre-Painted ZINCALUME Steel" and the Technical Bulletin GB1 "Dissimilar Metals/Galvanic Corrosion"** for additional information on galvanic corrosion.

Fastener size, strength and correct fastening pattern are critical and are recommended by the panel manufacturer.

Guidines for Installation of Fasteners:

Do not overdrive screws or drive at an angle. This can result in the washer piercing the steel panel or no longer mating with the area around the hole. The ZINCALUME Steel coating will protect the damaged area for some time; however, rust may prematurely occur depending on how much steel is exposed and on the local environment. Overdriving a fastener can also cause a depression in the panel which can collect water and create localized ponding. Driving tools equipped with depth sensing nose pieces and suitable RPM speeds can assist in avoiding these problems. Impact type tools should not be used.



Over driven fastener resulting in premature corrosion of the ZINCALUME panel.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Washers - The rubber washer component of self-drilling screws must be manufactured from materials compatible with the roofing material. Washers containing significant levels of conductive carbon black fillers should not be used with ZINCALUME Steel products. The use of carbon or graphite washers may lead to galvanic corrosion, especially in corrosive atmospheres. Black neoprene rubber is not recommended in any environment as they contain carbon pigmentation which can also cause galvanic corrosion. Neoprene rubber other than black is acceptable.

TABLE 1 Fastener Performance Rating

A	Provides Excellent Long-term Durability and Compatibility
B	Provides Good Long-term Durability and Compatibility
C	Provides Acceptable Durability and Compatibility
NR	Not Recommended

TABLE 2 Guide to Atmospheric Exposure Conditions & Distance from Corrosive Source

Atmosphere	Typical Exterior Atmosphere	Marine	Industrial
Benign	Outer Urban, Semi Rural, Rural	More than 3/4 Mile	More than 1/2 Mile
Moderate	No Obvious Marine/Indust. Influence	1/2 Mile - 3/4 Mile	1/3 Mile - 1/2 Mile
Severe/Very	Surf, Indust. Pollution & Fumes	Up to 1/2 Mile	Up to 1/3 Mile

Note: Marine as a corrosive source is characterized by salt laden, moist air. Industrial as a corrosive source is characterized by fallout, acid laden air. Some commercial or agricultural applications may create internal environments in which the buildup of pollutants, fumes or humidity is a potential source of corrosion. Fastener selection in such cases should be made after careful evaluation of building design, nature of corrosive source.

TABLE 3 Fastener Guidelines for use with ZINCALUME Steel

Fastener Type and External Atmosphere	Benign	Moderate	Severe - Very Severe (Coastal/Industrial)
300 Series Stainless (self-drill screws not available in this alloy)	A	A	Not Recommended in very severe environments - the ZINCALUME Steel coating around fastener head may corrode sacrificially.
Zinc/Aluminum Alloy Cast Head (ZAC)	A	A	A
Solid Plastic/Nylon Molded Head	A	A	A
Aluminum	A	A	A
Electroplated Zinc/Mechanically Coated Zinc (5.0 mil min.)	B	C	NR
Baked-On Organic Polymer Barrier Coat Over 5.0 Mil Plated Zinc Coating	A	A	B
400 Series Stainless Steel (1.0 mil Zinc coating)	A	A	C
Lead Head Nails and Washers	NR	NR	NR

1. Internal atmosphere should also be considered.
2. Subject to breakdown due to U.V. and heat; may fade at a different rate than pre-painted steel panel.
Note: Push or crimped-on caps can allow moisture to collect beneath them, causing corrosion of the head.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Stainless steel fastener used in close proximity to salt water. Galvanic corrosion is occurring underneath the paint and radiating out from the stainless fastener. The loss of metallic coating underneath is causing the paint to lift and bubble.

When the paint is removed, extensive corrosion is apparent, including red rust from the base steel.

RETURN TO TABLE OF CONTENTS

ZB4 - Swarf Staining on ZINCALUME Steel Roof & Siding Products

Introduction:

Swarf refers to steel debris created from cutting or piercing operations when using friction saws, abrasive discs, drills etc., on steel roofing and siding products. This debris in addition to other discarded steel objects such as rivet shanks, nails, screws and nuts, which may come in contact with coated products (i.e. pre-painted steel, ZINCALUME Steel) are the subject of this bulletin.

Swarf particles, if left on the surface, will corrode and cause rust stains which will detract from the finished appearance of a project. These stains are often mistaken for early deterioration of the roofing or siding itself.

Fresh swarf stains are typically small red-brown colored areas with a central dark spot (remnants of the steel particle). The surface will feel rough, and the particle may be dislodged with a fingernail. An older swarf stain will have a smooth, red-brown stain, the original steel particle having corroded away. Prevention of such staining is the responsibility of the installer and it is strongly suggested that the recommendations contained in this bulletin be followed.

Metal debris will come in contact with coated steel sheet products in three ways:

- Loose particles left after cutting, drilling and riveting operations.
- Hot metal filings from disc cutting or drilling operations which may adhere to the finished surface.
- Loose particles which may be ground in underfoot or become embedded in the surface film of pre-painted products under pressure from adjacent equipment or materials.

Prevention

Cutting:

Use of a cold cutting saw with an appropriate tungsten blade is the best way to cut sheets on site. This method generates larger, cooler particles than abrasive discs.

Where possible, cutting should be minimized by using factory supplied cut-to-length sheets. Sheets cut on site should, where practical, be cut on the ground, with the exterior color finish of pre-painted sheet facing down. Care should be taken to ensure hot filings do not come into contact with nearby pre-paint steel sheets. Do not cut over the top of other coated products, where debris may fall onto other sheets. Where cutting must be carried out near sheets already installed, the area around the cut must be covered and the stream of hot particles directed away from completed work. Field cut edges should be concealed under ridge caps or gable flashings whenever possible.

Drilling:

The area around the hole should be covered to shield the product from hot metal filings. Avoid pre-drilling fastener holes while panels are stacked or bundled. If pre-drilling is necessary carefully clean each panel immediately.

Installation:

Smooth soled shoes should be worn when working on a roof; avoid the ribbed type which will carry metal filings and other objects.

Clean Up:

Metal debris/filings should be swept or hosed from the job progressively and certainly at the end of each day. This action will remove loose particles.

Maximum care should be taken when attempting to detach filings which have become stuck; this can be done, but no action which is likely to remove paint or metal coatings should be attempted. Any damage to these coatings will lead to reduced life of the material.

When sweeping or hosing into a gutter, clean out the gutter before leaving the job to prevent premature corrosion. On completion of the job give a final wash or sweep down. For critical applications, inspection of the job should be made after two weeks when rain or condensation will have caused any remaining filings or debris to rust and will highlight affected areas.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Note: Many staining problems arise not from installers, but from other contractors working in the vicinity. Architects and builders need to be aware of this possibility and warn contractors accordingly.

Effect on Performance:

The effect of staining itself on Steelscape prefinished products is generally aesthetic and may not be detrimental to the performance of the product. The product life will be severely affected where attached metal particles have penetrated the pre-painted film and are in contact with the protective metallic coating, although this only occurs in severe cases. This is because on pre-painted surfaces red oxides of iron are normally inert substances and do not attack the finish; the stain is merely absorbed by the finish. Red oxides of iron are insoluble in water and the stain will take considerable time to weather away.

On metallic coatings, concentrated corrosion can occur over a small area as the zinc in the coating sacrifices itself to prevent oxidation of both the debris and, if allowed to continue, exposed areas of the steel base.

Repair of ZINCALUME Steel Sheet:

Brush the surface with a stiff bristle (not metallic wire) brush to dislodge particles which must then be completely removed. Wire brushing will mar the appearance of the sheet if brushing is not followed by painting. If the coating is severely damaged by corrosion, the area should be painted. Please contact Steelscape to discuss the correct coating to repair the damaged area.

Repair of Pre-Painted Sheet

Mild Staining:

A household cream cleanser, used according to directions, will remove most mild staining from metal debris (one cup of mild, common detergent which contain less than 0.5% phosphate, dissolved in warm water are usually effective). Avoid the use of aggressive cleaners such as TSP.

Severe Staining:

- Clean the surface by washing with a non-ionic industrial or household detergent and water in proportions as recommended by the detergent manufacturer. Wash well with clean water.
- Remove the corrosion product by using a stiff nylon brush and washing off completely. More heavily affected areas may need a light rub with a Scotch-Brite guard pad (not steel wool).
- Abrasive papers should only be used if repainting is to be carried out. Great care must be taken not to cause damage to the paint film.
- Hose down the affected area completely after treatment.
- This treatment will normally leave only very mild stains.

Very Severe or Extensive Staining:

In these cases, if aesthetics is important, either replacement or field painting may be the most appropriate option. Field applied paints will weather faster than factory applied, therefore the entire visible area should be repainted.

Note: The above repair actions will not fully restore the product to its original state. It is critical to ensure that swarf is avoided.

Heavy swarf staining on pre-painted ZINCALUME.

Moderate swarf staining on ZINCALUME Plus.

RETURN TO TABLE OF CONTENTS

ZB5 - Sealants for ZINCALUME® Steel

Introduction:

This bulletin provides background information relating to sealants and their application when used in conjunction with the range of exterior ZINCALUME Steel products produced by Steelscape. The sealant industry in the US produces a wide variety of building sealants which together embrace a multitude of end user applications and an even greater range of specific conditions.

Sealant Selection:

The decision on which sealant is the most effective for ZINCALUME Steel products in a specific application should be based on several performance characteristics.

Neutral cure silicone rubber sealants will typically meet the performance characteristics outlined above for most applications. Other generic types of sealant such as polyurethane and butyl elastomers are readily available in tape, hot melt and cartridge forms. Once again the performance of these systems should be evaluated with your sealant supplier based on service condition and performance characteristics. The use of sealants means fastening, whether by integral forming or by individual fasteners is necessary where metal to metal joining is involved. For more information on fasteners and **ZINCALUME Steel, please refer to Technical Bulletin ZB3, "Fastener Selection for ZINCALUME Steel Roof & Siding Products."**

Physical Property of Sealant	Performance Characteristic
Adhesion	Good adhesion to bare and pre-painted ZINCALUME Steel, without pre-priming except in extreme service conditions.
Flexibility	No cracking or loss of adhesion during required bending at specified service temps.
Weatherability	No cracking, chalking, bleeding or loss of rubber characteristics after exposure to the damaging effects of ultra-violet rays (sunlight) and humidity.
Water Resistance	Adhesion to metal surface will not deteriorate after immersion in water.
Chemical Resistance	Good resistance to water, ozone, water vapor, and other chemicals that may be exposed to the sealant in service.
*Non Corrosive**	Will not deteriorate, darken, etch or salt deposit bare or pre-painted ZINCALUME steel.
Staining	No contact or migratory staining of the bare or pre-painted ZINCALUME steel surface.
Non Sagging	Will retain original shape within the joint at specified service temperatures w/o sagging.
Paintability	Over paintable if required.

***Note:** Sealants containing acetic acid or amines should not be used on ZINCALUME Steel; wet conditions during early stages of sealant cure can liberate by-products potentially corrosive towards protective coatings. These often smell of vinegar or ammonia.

RETURN TO TABLE OF CONTENTS

ZB6 - Cut Edge Protection for ZINCALUME® Steel

Introduction:

The single aspect most frequently vexing prospective users of zinc-coated and zinc/aluminum alloy-coated steel sheet is cut edge performance. It is an established fact the sacrificial protection afforded to the steel at cut edges will delay corrosion while there is zinc or zinc/aluminum alloy left in the vicinity of the edges. Almost every metal coated steel product has cut edges and when piercing occurs within the area of the sheet a further "cut" edge is generated.

Prime examples of such products are roofing, guttering and spouting. These items are first slit-to-width then cut-to-length. Holes are often pierced to accommodate fasteners; however corrosion in these areas has never constituted a problem. Regardless of the environment, when more metallic coating is present, the steel has more protection both on flat unmarked surfaces and at cut edges.

Measure of Protection:

Zinc/aluminum alloy hot dip metallic coated steel sheet is produced by passing continuous steel strip through a bath of molten metal. As the strip emerges from the bath the thickness of the coating is precisely adjusted according to the coating class required. The coating class is a designation describing the coating type and amount of coating applied.

The coating type is generally described by the capital letter of the chemical symbols of the metals in the coating. The amount of coating is indicated by the minimum "coating mass" measured by the triple spot test specified in ASTM A792/ A792M–06.

The severity of the intended application should dictate the coating class specified. Heavier coating thicknesses should be used in more severe environments.

Two Way Protection:

The zinc/aluminum alloy metallic coating performs in two ways:

- The aluminum acts as a barrier when the steel base is completely enclosed by the coating. Protection is afforded by the corrosion resistance of the coating itself.

- As a sacrificial coating at edges when the barrier is broken by slitting, shearing, piercing or scratching. The barrier effect is universally recognized. However, it is the sacrificial protection this bulletin addresses.

Protection if Automatic:

Complete coating of steel sheet products is not practical, economical or generally necessary. It is normal practice and has been since zinc-coated sheet has been produced, to have slit, sheared, drilled or sawn edges.

In service, galvanic action causes zinc compounds to automatically build up at cut edges and scratches by an electrolytic reaction when water or moisture is present. These slow the rate at which the surrounding coating is consumed around damaged areas. This effect is sometimes referred to as the "self-healing" property of coatings containing zinc.

Comparison of Zinc/Aluminum Coatings:

It is natural with the widespread use of ZINCALUME Steel sheet in traditional zinc-coated building applications, the question of comparative cut edge performance should be raised. Unpainted ZINCALUME Steel will perform in a very similar manner to zinc-coated sheet in the relatively thin range of thickness associated with roofing, wall cladding, gutters and down-pipes.

This has been tested by removing coating of similar thickness from ZINCALUME Steel and galvanized sheet down to the steel base, using scribe marks ranging from .016" to .16" in width. When exposed to the atmosphere, the differences in the samples are slight, particularly at the thinner scribe marks.

Example: Coating Class AZ50
AZ = Aluminum/Zinc
50 = Minimum of .50oz./ft^2, the total on both sides.

RETURN TO TABLE OF CONTENTS

ZB7 - Guidelines for Welding ZINCALUME® Steel

Introduction:

ZINCALUME Steel can be readily welded using resistance and arc welding techniques. Utilizing conventional welding techniques along with the guidelines given below, ZINCALUME Steel can be as easily welded as other coated sheet products. In general, the Al/Zn coating is soft and conductive compared to uncoated sheet steel and, therefore, requires higher welding currents, welding times and electrode forces for resistance welding. The parameters used for successfully welding ZINCALUME Steel sheet are very similar to those for galvanized sheet.

Spot Welding:

The optimum tip geometry which provides the longest electrode tip life when spot welding ZINCALUME Steel sheet is the truncated cone with either a 90° or 120° included angle. Pointed, domed or radius electrodes should be used only where necessary for reasons of access or alignment.

Testing has shown that a dispersion-strengthened copper alloy electrode will provide superior electrode life and welding characteristics when compared to RWMA Class 2 Cu-Cr or Cu-Zr alloys. Typical spot welding schedules for ZINCALUME Steel sheet are given below.

Electrode maintenance is also important in spot welding coated sheet steels. The parameters given above will cause gradual deformation of the contact surfaces as well as the coating alloying with the electrode material. These factors require the electrodes be redressed more frequently than is the case with uncoated steel. The electrode tips should be redressed periodically, but the time between re-dressings depends on the sheet thickness and conditions of use. Additional factors influencing electrode life are proper tip alignment and sufficient water cooling (minimum 2 gal/min) to the electrode.

The peel test, which is commonly used as a measure of nugget size and weld soundness, can be used to test the quality of spot welds on ZINCALUME Steel sheet. Test specifications vary among manufacturers, but in general, two coupons are welded together and then peeled apart. Under proper welding conditions, failure should occur around the weld, not through the weld. The nugget diameter should approximate the diameter of the electrodes.

Seam Welding:

The conditions for seam welding ZINCALUME Steel sheet are similar to those for galvanized steel in that higher currents and closer control of welding schedules are required than for uncoated sheet steel. Intermittent current feed is preferred over continuous current and 0.5-inch radius faced electrodes can be used for all sheet thicknesses if desired.

Schedules for seam welding ZINCALUME Steel sheet are suggested in the table above. As with the spot welding schedules, the conditions below may need alteration depending on the job.

Seam welding wheels should be RWMA Class 2 copper alloy. Knurled wheels are preferred because the knurled drive rollers continuously remove pick-up from the sheet coating and maintain a constant face width, thus eliminating the need for redressing. The electrode wheels in the weld area should be flushed with water during welding to provide adequate cooling.

Material Thickness (in.)	Welding Current (amperes)	Electrode Force (lb)	Welding Time, Cycles (1/60 second)	Electrode Face Diameter (in.)
0.028	11,300	400	12	0.187
0.036	12,500	500	14	0.250
0.040	12,800	500	14	0.250
0.053	13,000	550	14	0.250
0.065	13,400	650	18	0.250

Actual requirements will vary depending on the job conditions.

Continued on next page...

Material Thickness (in.)	Electrode Face Type	Electrode Thickness (in.)	Electrode Force (lb.)	Welding Current (amperes)	Weld Time Cycles Heat	Weld Time Cycles Cool	Welding Speeds (in./min)
0.017	1/2" Radius	3/8	700	14,500	2	2	60
0.022	1/2" Radius	3/8	850	16,000	3	2	60
0.034	1/4" Flat	1/2	1,000	21,500	4	2	60
0.049	1/4" Flat	1/2	1,100	22,000	4	2	60
	1/4" Flat	1/2	1,100	23,000	4	1	90
0.083	5/16" Flat	5/8	1,600	27,000	10	6	30

High/Low-Frequency Welding:

ZINCALUME Steel has been fabricated into products such as tubing using both high-frequency and low frequency welding techniques. Standard procedures similar to those employed for galvanized or aluminum coated steels are used. Since the coating may smear at sheared or slit edges, it may be necessary to scrape the sheet edges prior to welding.

Arc Welding:

Gas tungsten-arc (TIG) welding of ZINCALUME Steel is not recommended because, as with galvanized sheet steel, fumes generated during welding tend to contaminate the tungsten electrode and cause instability of the arc. Shielded metal-arc welding is best accomplished using E60XX electrodes, such as E6010, E6011 or E6012. A whipping technique is often used to burn off the coating ahead of the puddle. For gas metal-arc (MIG) welding, a mild steel wire should be used with Ar/1% 02 or Ar/CO2 shielding gas. Gas containing Ar provides a more stable arc resulting in better bead appearance and significantly less weld spatter. When a backup plate is used, the plate should be grooved under the weld to provide better penetration and venting of fumes from the underside of the weld.

Fuming:

In arc welding, the total weight of evolved fumes per unit weld area for ZINCALUME Steel sheet is 25 percent of the amount for galvanized. The ratio of the amount of zinc oxide released from ZINCALUME Steel is only 20 percent of the amount released from galvanized sheet. The decreased fuming of ZINCALUME Steel represents a reduced fume hazard to welders, but the extent of fuming is still sufficient to require the use of fume hoods and/or forced exhaust systems. Fuming during resistance welding is very slight and special exhaust systems should not be needed.

Corrosion Resistance of Welds:

As is the case with other coated sheet steels, spot and seam welding may remove the coating from ZINCALUME Steel sheet exposing the base steel. These areas may be too large to be galvanically protected by the adjacent coating and should be covered with metal-sprayed zinc or aluminum, zinc-rich paint or organic coating. Covering the weld area of arc welds is especially important because the damage to the coating is even more severe.

RETURN TO TABLE OF CONTENTS

ZB8 - Unsuitable Applications for ZINCALUME® Steel

Introduction:

ZINCALUME Steel has proven to exhibit superior corrosion resistance in a diverse range of environments including those in rural, industrial, marine and severe marine regions of the country. Atmospheric corrosion testing for more than 30 years has clearly shown that ZINCALUME Steel has at least 2-4 times the life span of galvanized G90 in these environments. However, with even the most revolutionary materials there are specific end user applications into which ZINCALUME Steel should not be placed without careful consideration as to the ultimate performance.

These applications, and issues to be considered within these applications, are summarized in this Technical Bulletin to assist in the correct selection of materials.

Animal Confinement:

Structures erected to house the intensive farming activities of pigs, cattle, turkeys and chickens can present problems for ZINCALUME Steel. This form of animal confinement can result in the creation of animal waste and waste decomposition by-products which can be extremely aggressive towards ZINCALUME Steel, creating significant corrosion problems.

Waste decomposition gases such as methane, hydrogen sulfate and ammonia can combine with water vapor to form a highly corrosive compound which condenses on the bottom side of the steel roof panel, resulting in an extremely corrosive attack. Direct contact with animal wastes should be avoided regardless of the type of material employed in the construction of the building. Good panel insulation, ventilation and frequent waste removal will assist in maintaining the longevity of such a structure; however we recommend the following guidelines:

- ZINCALUME Steel (bare or painted) should not be used for cattle, pig or poultry confinement due to the risk of the corrosive process outlined above. Heavy zinc coated galvanized or aluminum products should be used for these applications.

- ZINCALUME Steel will perform favorably in the majority of other agricultural applications. Such structures include storage sheds, silos, grain bins and other utility farm buildings.

Concrete:

ZINCALUME Steel is not suitable for use with wet concrete mixtures (including mortar or stucco). It is not recommended for use in framework and floor deck applications. The aluminum in the ZINCALUME Steel coating will react with the wet concrete leaving the coating porous and prone to corrosion. Adhesion between the concrete and ZINCALUME Steel is poor and the concrete itself can expand and lose strength. Small splashes of concrete onto ZINCALUME Steel are damaging, and should be removed when wet.

Pre-Painted ZINCALUME panel in contact with wet concrete on the left displaying premature edge corrosion, no contact on the right.

Culverts:

ZINCALUME Steel is not recommended for applications involving burial in the earth or soil. Soils vary widely in moisture content, acidity or alkalinity. Objects buried in the soil can be subject to bacterial activity and oxygen levels can be highly variable. ZINCALUME Steel is more sensitive to low oxygen levels and lack of passivity than galvanized products, hence heavy coating mass galvanized would be the recommended product under these conditions.

Miscellaneous Sources of Aggressive Substances:

The following specific applications should also be treated with caution. Contact Steelscape to seek advice on the correct material to use in these instances.

- Some chemical, food processing and acid pickling plants where chemicals, acids and alkalis are present such that when combined with water vapor and dew point effect.

Continued on next page...

RETURN TO TABLE OF CONTENTS

- Direct contact with or runoff from green lumber or chemically treated lumber containing copper. A white paper on ZINCALUME Steel contact with pressure-treated wood is available upon request. Where copper/chrome/arsenate treated lumber is specified it must be well dried after treatment and insulated from the roof.
- Copper containing mildew inhibitors, such as copper oxychlorate, should not come in contact with ZINCALUME Steel. Rinse immediately if contact occurs.
- Dirt, leaves and build-up of organic matter.
- Avoid direct contact with the ground/soil, foundations or sills.
- Food or beverage container or contact should be avoided. The surface treatments used in ZINCALUME Steel can become soluble when in contact with food acids.
- Sustained or frequent temperatures in excess of 390°F should be avoided with ZINCALUME Plus Steel (acrylic coated).

Copper treated shingles above bare ZINCALUME roof panels, the water runoff resulted in black oxidation.

RETURN TO TABLE OF CONTENTS

ZB9 - Guidelines to Effective Use of ZINCALUME® Plus Steel

Introduction:

The standard ZINCALUME Plus Steel coating is a specially formulated water-based resin film, which is factory applied over the ZINCALUME Steel surface. In the cured state the coating is colorless, odorless and imparts a satin finish to the surface of the product. It aids in the roll forming process often eliminating the need for lubricants and also prevents fingerprinting.

The clear resin film is applied wet, using state-of-the-art roll coaters installed between the chromate application station and the delivery section. The roll coaters are similar in design and operation to those used on a coil coating line. The film is cured using computer controlled ovens. This ensures that optimum coating properties are achieved prior to rewinding and shipping.

The resin film has excellent adhesion to the substrate with very good impact resistance and flexibility. When it is used without post painting, the natural weathering process will gradually erode the clear coating from the surface over a period of 12-18 months, without powdering, peeling or cracking. No significant changes in surface appearance will be evident.

In addition to the standard ZINCALUME Plus coating, we also offer a resin film designed specifically for end-use applications that involve adhesives such as plywood sandwich panels and foam insulation. A Steelscape Sales Representative can help to determine which resin film is right for any specific end-use application.

Field Painting Guidelines

Wet Painting:

Both ZINCALUME Steel and ZINCALUME Plus Steel are readily over painted provided paint manufacturer's recommendations are followed and appropriate consideration is given to environmental conditions, end use, location and product application. Traditionally ZINCALUME Steel requires the surface to be painted also be washed with a suitable solvent to remove traces of residual roll forming lubricant, and suitable metal primer be applied before the application of a decorative topcoat.

ZINCALUME Plus Steel removes the requirement to use solvent to clean up surfaces. A simple detergent wash is satisfactory, and eliminates the need to prime the surface. Solvents or harsh chemical cleaners should not be used. ZINCALUME Plus Steel can be readily over-painted with a high quality water based acrylic topcoat without priming, provided a lubricant has not been used in the forming process and the surface is clean and dry.

Solvent based finish coat systems may be used, however, these must be applied after the material has been primed with a water based, solvent resistant primer. If the material is correctly primed a number of coats may be applied. Surface preparation and priming must be in accordance with the paint manufacturer's instructions.

Additional cleaning recommendations and field painting guidelines can be found in **Technical Bulletin ZB11 "Field Maintenance, Field Painting and Touch-Up Painting of ZINCALUME Steel Roof and Siding."**

Powder Coating:

ZINCALUME Plus Steel is suitable for direct powder coating, provided the surface to be coated is clean and powders requiring a peak metal temperature in excess of 390°F are not used. It is recommended a brief water wash serve as the only pretreatment step, rather than another form of solvent-based cleaning solution.

Roll Forming Characteristics:

Lubricants are rarely required during the roll forming of ZINCALUME Plus Steel because the clear resin film acts as a solid lubricant. The need for additional lubricant must be determined, however, on a case by case basis. Variables to be considered include roll former design, (number of stands and severity of each incremental shape change) speed, surface condition of rolls and general machine maintenance.

Most common roof and sidewall trapezoidal shapes do not require additional lubrication if the roll former is well maintained and correctly set up. Very severe profiles may require a small amount of spot lubricant at the heaviest worked points.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Benefits of using ZINCALUME Plus Steel:

- **No Pickup** - The reduction or absence of pickup during forming due to the resin film means the reduction or elimination of time-consuming cleanup.
- **Increased Tool Life** - Reduced pickup combined with the lubricating benefits of the resin film will contribute to improved tool life in manufacturing and roll forming applications.
- **Scheduling Flexibility** - ZINCALUME Plus Steel can typically be roll formed interchangeably with pre-painted feed avoiding the need for intermediate roll cleaning. This provides greater scheduling flexibility.
- **Removal of Hazardous Work Place Chemicals** - Hazardous substances such as kerosene and other lubricants can be removed from the work environment improving occupational health and safety practices.
- **Less Slippery** - The resin film is less slippery than a lubricated steel surface particularly with the absence of residual lubricant left over from roll forming. This will make the product safer to walk on while installing, particularly in wet conditions.
- **Improved Final Appearance** - Residual lubricants can often create a patchy visual appearance as the result of uneven drying off of the lubricant. This problem can usually be avoided with ZINCALUME Plus Steel.

Resistance to Marking:

ZINCALUME Plus Steel resists marking and stains occurring during manufacturing, handling or fixing. The coating acts as a surface sealant, protecting the metal surface from hand and boot prints. **CAUTION** - during transportation of coil, sheets or formed panels, galling or abrasion of the resin coating can occur when one resin surface vibrates, or rubs, excessively against another resin surface. It will present as black marks, which are often mistaken for black rust, but it is not rust. Galling of the resin surface is strictly aesthetic in nature; the long-term performance of the product is unaffected.

Transit abrasion on formed panels.

West Stack Storage Resistance:

The resin coating has an increased resistance to wet stack storage stain, but is not a guarantee to prevent it from occurring. Such stains appear black, and are caused when the material is packaged and subjected to moisture ingress between production and final use. The coating acts as a barrier coat, preventing any chemical action from occurring. Recommended storage should still be followed as outlined in **Technical Bulletin ZB1 "General Guide to Good Practice in the Use of ZINCALUME Steel for Roof & Siding Products" and Technical Bulletin ZB10 "Preventing Transportation and Storage Corrosion of ZINCALUME Steel".**

Installation of ZINCALUME Plus Steel

Flashings:

The recommendations for flashing ZINCALUME Plus Steel are the same as for ZINCALUME Steel. Copper and lead are incompatible with ZINCALUME Steel and neither of these metals should be used in contact with ZINCALUME Plus Steel. For further information refer to **Technical Bulletin ZB2 "Flashing Materials for Bare & Pre- painted ZINCALUME Steel."**

Sealants:

Tests show common neutral cure silicon sealants will adhere to the resin film. The adhesion properties of the resin film are the same as ZINCALUME Steel. Refer to **Technical Bulletin ZB5 for "Sealants for ZINCALUME Steel" for additional information.**

Fasteners:

Recommended fasteners for ZINCALUME Plus Steel are the same as for ZINCALUME Steel. Refer to **Technical Bulletin ZB3 for further information on "Fastener Selection for ZINCALUME Steel Roof & Siding Products".**

Slitting ZINCALUME Plus Steel:

Where friction drag pads are used to maintain processing tension during slitting/recoiling, pickup of the resin can occur. Some chromate is present in this pickup, as it is with most ZINCALUME Steel, therefore, the following guidelines are recommended:

- Use minimal frictional forces on pads.
- Set minimum pad width 6" to minimize frictional forces if drag pads are used.
- Encourage use of an appropriate respiratory device for personnel working in close proximity (4-6 Feet) if dust is produced by the drag pad.

Continued on next page...

- Remove pickup from drag device and adjacent areas using appropriately designed apparatus.
- Dispose of drag pads in accordance with environmental or local regulations.

Welding:

Spot, seam or gas metal arc welding can be carried out successfully on ZINCALUME Plus Steel. Fume generation may be slightly higher than ZINCALUME Steel without the coating. All welding should be carried out in well-ventilated areas.

General Corrosion Characteristics:

The ZINCALUME Plus coating does not improve the general corrosion characteristics of ZINCALUME Steel. As discussed in the introduction the coating degrades when exposed to ultra violet light. The resin film will not negatively impact the superior corrosion performance of ZINCALUME Steel.

Product Mixing:

ZINCALUME Steel and ZINCALUME Plus Steel should not be mixed in adjacent areas on the same building. The different surface finishes, both in the new and weathered conditions, will result in a contrasting appearance which may be objectionable.

Visual Reflectivity:

ZINCALUME Plus Steel is no more reflective than ZINCALUME Steel.

Eletrical Conductivity:

The resin film applied to ZINCALUME Plus Steel can potentially cause an insulating effect between panels in electrical appliance applications. The insulating effect would normally be overcome with welding or mechanical fastening of components. Manufacturers should be advised to ensure products are adequately grounded.

RETURN TO TABLE OF CONTENTS

ZB10 - Preventing Transportation and Storage Corrosion on ZINCALUME® Steel

Introduction:

ZINCALUME Steel is a proven product exhibiting superior long-term corrosion resistance in a multitude of atmospheric environments. However, as with any steel product, there are precautions which must be observed during receiving, handling, processing, shipping, storage and assembly of ZINCALUME Steel products. If no precautions are taken, oxidation (i.e. black rust) can occur. This technical bulletin briefly describes the various sources of oxidation affecting the typical ZINCALUME Steel end user. This technical bulletin also provides guidelines to prevent the occurrence of oxidation and how to potentially remove an oxidation stain if it occurs.

Sources of Oxide Formation on ZINCALUME Steel:

Oxide stains can occur on either coils or tightly bundled sheets of ZINCALUME Steel. Although oxidation of the metallic coating is usually superficial and confined to the extreme upper layer of the coating, it is aesthetically displeasing and can quickly become more severe if the cause of the stain is not removed. In the most severe instances, there can be a weight loss of metallic coating and a potential reduction of service life. When the cause of an oxidation stain is removed or (in the case of a formed panel) when affected panels are assembled at the job site, the oxidation stain will not worsen.

The basic cause of an oxide stain on ZINCALUME Steel is water or moisture interacting with the metallic coating in an oxygen-deficient environment. Under normal service conditions, ZINCALUME Steel has excellent durability because of a protective oxide formed when the coating comes into contact with air. However, when moisture is in contact with the strip, and the strip is tightly stacked or wrapped into a coil, there is no exposure to air allowing the barrier oxide layer to form. As a result, accelerated corrosion is initiated. Oxide stain can occur in this type of oxygen-deficient environment in less than 48 hours.

Condensation:

Oxidation can occur due to condensation when cold steel is moved from out of doors into a warmer building. The moisture in the air of the warmer building can condense on the colder steel surface. The presence of condensation-type oxide is typically identified as a dark gray oxidation condition which subsequently becomes darker. It is distributed on the material in a generalized pattern (rather than localized). A condensation-type oxide pattern occurs inward from both edges of the strip and is shallow in penetration from the edges.

Steel products must not be exposed to combinations of temperature and humidity which can result in condensation. Steel products should not be allowed to vary by more than 20°F from their surrounding environment. If an incoming shipment of ZINCALUME Steel appears to exceed 20°F difference from the storage environment, the product should be allowed to warm slowly in a cooler indoor area free from cold air drafts. All material storage areas must be properly ventilated with adequate circulation of air. Circulation of air, however, should not be defined as allowing doors to remain open where moist air from the outside can enter the building and increase the probability of condensation.

Condensation can also occur on tightly bundled stacks of sheets or panels of ZINCALUME Steel. In its very early stages, it may appear as a white stain similar to the white oxide that can form on galvanized steel. Even pre-painted and roll formed ZINCALUME Steel sheet is not immune to this type of oxidation.

Wet Storage:

Oxidation can occur due to transport or storage of the steel in a wet environment. Oxidation frequently occurs when the material comes in direct contact with water during transportation to the end user facility or job site.

In such a situation, the material will have evidence of water penetration by capillary action, from the side wall of the coil or the edge of a sheet (in the case of formed sheets). The oxide penetrates deeper into the metallic coating and becomes more difficult to remove than a condensation type condition. Oxide occurs as a more localized pattern than general across the entire surface. Oxidation also will occur within stacks of tightly bundled sheets when the stack comes into direct contact with water while the sheets are bundled at the end user facility or job site. In its very early stages, it can appear as a somewhat removable, white stain, similar to the oxidation stain that can form on galvanized steel. Even pre-painted ZINCALUME Steel is not immune to wet storage oxidation.

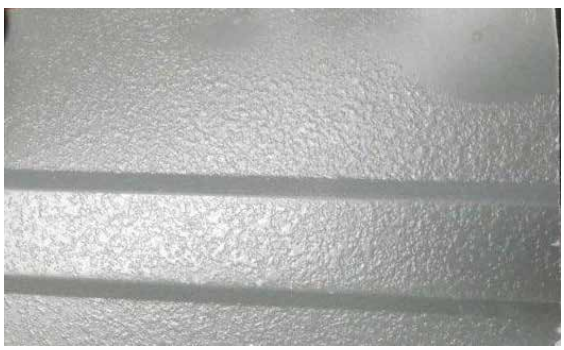
Continued on next page...

RETURN TO TABLE OF CONTENTS

Other sources of oxidation could evolve during processing of the ZINCALUME Steel itself. Inadequately cured surface treatments or water-based remnants of forming lubricants allowed to remain on the surface during storage will provide entrapped moisture for oxide formation. The net effect would be a dark oxidation stain (rust) with a linear and blotchy pattern not necessarily associated with the edges.

Light corrosion on stacked flatsheets.

Heavy oxidation between coil wraps.



Storage corrosion under the paint on formed, nested panels.

Prevention of Oxide Formation on ZINCALUME Steel:

The Steelscape ZINCALUME Steel production process incorporates surface passivation, resin coating and oiling capabilities to minimize the potential of oxide formation on the finished product during transportation and storage. Steelscape recommends, depending on what treatment an order has received, coils should be properly stored no longer than the periods listed below.

Product Ordered	Max. Storage Period after Ship Date
ZINCALUME Steel - Oiled/No Chem.-treat	3 months
ZINCALUME Steel - Chem.-treat/Dry	4 months
ZINCALUME Steel - Chem.-treat/Oil	6 months
ZINCALUME Plus Steel	6 months

Responsibility of the Steel Fabricator:

To prevent the occurrence of an oxidation stain, the following precautions should be practiced by a fabricator.

- Order ZINCALUME Steel product with an optimum combination of surface treatment, oil and coil packaging.
- Verify any transit carriers adhere to shipping instructions and provide optimum protection to the steel coils during transit to the fabrication plant.
- Inspect ZINCALUME Steel coils for moisture upon arrival and stock ZINCALUME Steel coils indoors in a clean, dry area away from any sources of chemical pollution.
- Establish defined coil receiving inspection procedures which establish carrier responsibility.
- Document transit-related water damage on the manifest. Photos or video must be taken of any questionable condition.

Documentation should include the following elements:

- Weather conditions at time of delivery.
- Tarp or protective equipment conditions/exceptions.
- Equipment conditions/exceptions.
- Coil conditions, (i.e., wet, package damage, etc.).

Continued on next page...

- **Notify Steelscape as quickly as possible when oxidation of the surface is confirmed.**
- Store ZINCALUME Steel product at an even temperature above the dew point with adequate air circulation to prevent condensation problems.
- Remove plastic or paper packaging upon arrival, if the storage area is heated and dry. If the material is wet, the sheets should be wiped dry. Wet coils should be scheduled into production as soon as possible.
- Inspect the storage site regularly to ensure standing moisture has not penetrated the ZINCALUME Steel coils.
- Stack the product on wood or metal skids so that the coils are not in contact with the ground and elevate one end of each bundle to allow any moisture to run off rather than puddle on the top of the bundle or between nested panels.
- Ensure ZINCALUME Steel roll formed sheets are paper-wrapped when the sheets are not scheduled for erection on the day of delivery.
- Avoid using plastic material for covering. Non-breathing materials should not be used to shroud bundles because they tend to trap moisture.
- Verify transit carriers adhere to shipping instructions and provide optimum protection to the steel sheets during transit to the job site.

Note: *To correctly wrap a bundle of ZINCALUME Steel sheets, the bottom paper sheet is put in place first and the top laps are covered smoothly with the top covering sheet with the folds underneath the bundle. If folded improperly, the laps on top can create a catch for water and actually encourage accumulation of water in transit.*

Responsibilities of the Erector at Job Site:

To prevent the occurrence of an oxidation stain, the following precautions should be practiced by an Erector at a job site:

- Inspect bundles on arrival at the building site and note on the delivery receipt any exceptions such as damage, corrosion or wet material.
- Store the bundles on racks at least one foot above ground level. Do not use uncured lumber.
- Use under-roof storage when possible. If the bundles must be stored in the open on bare ground, a plastic ground cover should be used under the bundles to minimize condensation on the sheets from moisture in the soil.
- Elevate one end of the bundle to allow moisture to run off rather than puddle on the top of the bundle or between nested panels. Water resistant paper will not keep out puddled moisture beyond its rated moisture vapor transmission time.

Removal of Oxide Stains on ZINCALUME Steel:

The oxide stain (black rust) that forms on ZINCALUME Steel sheet is primarily a hydrated aluminum oxide and can be very difficult to remove if progressed beyond the initial stages. In mild cases the oxide may be removed by using a solvent, such as mineral spirits, applied to a cloth. Mineral spirits would also be used to remove an oxide stain from pre-painted ZINCALUME Steel without damaging the paint. A mild, nonabrasive household cleanser may also be successful in removing the stain from a panel.

In more severe cases, industrial solvents may be used. However, as more aggressive chemicals are used to remove the stain, there is an increased possibility for damage to the coating itself. Harsh alkaline cleaning solutions should never be used. High pressure sprays should be avoided. Steel wool should never be used to remove an oxide stain from ZINCALUME Steel since it is too abrasive and it will leave embedded iron files causing a cosmetically displeasing red rust condition.

In all cases of oxide stain, removal of the stain will affect the appearance of the metallic coating under and near to the stain. The area near the stain will usually appear duller after the stain is removed.

RETURN TO TABLE OF CONTENTS

ZB11 - Field Maintenance, Field Painting and Touch-Up Painting of ZINCALUME® Steel Roof and Siding

Introduction:

Minimum maintenance of ZINCALUME Steel, whether bare or pre-painted, is required. Both are highly durable and simple maintenance by regular washing with clean water will enhance the service life of the product and maintain the appearance.

"Unwashed areas" are areas on a building that are sheltered from general rainfall and are therefore not naturally washed. Condensation can be absorbed by the dust and dirt that build up in these areas, leading to an increase in the time that the material is in contact with sufficient moisture to initiate corrosion. The associated affect is exacerbated in the vicinity of a salt marine influence, where the build-up includes marine salts and/or other pollutants. Regular cleaning of ZINCALUME Steel products in unwashed areas is required. Examples include, but are not limited to, fascia, wall cladding under eaves, garage doors, and the underside of eave gutters, carports and patios.

Washing should be done every six months as a minimum. More frequent washing may be necessary in coastal areas or where high levels of industrial fallout/pollution occurs.

Cleaning:

While factory-applied finishes for metal building panels are so durable that they will last many years longer than ordinary paints, it is desirable to clean them thoroughly on a routine basis whenever the finish is not washed by rain. Cleaning will generally restore the appearance of these buildings and render repainting unnecessary. An occasional light cleaning will also help maintain an aesthetically pleasing appearance.

In cases where regular maintenance using fresh water does not remove all dirt from the surface of the product the following procedure should be used:

- Wash the surface with a mild solution of pure soap or non-abrasive dish washing detergent in warm water. Washing should be conducted with a sponge, soft cloth or soft bristle nylon brush (no abrasive scourers, steel wood, etc). Care should be taken not to scuff the surface of the product.

Note: *The use of detergents containing greater than 0.5% phosphate is not recommended for use in general cleaning of building panels.* ***NEVER BLEND CLEANERS AND BLEACH.***

- As an alternative one cup of household ammonia dissolved into five gallons of water (room temperature) could also be used.
- Using either solution, work from the top to the bottom of the panels, gently removing dirt and debris. A low pressure spray washer may aid in removing dirt deposits. Solvent-containing cleaners, such as Fantastic®, are effective and can be used without concern.
- If mildew or other fungal growth is a problem and cannot be removed, a mix of household bleach, one gallon to five gallons water, together with one cup of mild soap (Ivory® is recommended), can be used.
- The surface should be thoroughly rinsed with freshwater immediately after cleaning to remove traces of any detergent or cleaner.

Additional Maintenance:

The long term performance of ZINCALUME Steel can at times be impacted by the durability of the accessories which are in contact with the product. For example, the deterioration of the fasteners used can result in sacrificial corrosion of the product in the areas immediately adjacent to the fasteners. It is a good practice to:

- Ensure that fasteners used comply with **Technical Bulletin ZB3 "Fastener Selection for ZINCALUME Steel Roof and Siding Products".**
- Regularly inspect the fasteners and consider replacing any showing evidence of red rusting.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Field Painting:

Pre-painted ZINCALUME Steel and ZINCALUME Plus Steel are both coated with factory applied, oven cured coatings. While both are intended to be installed as is and will have long term durability and performance, there may be instances when field painting over the factory finish is required. The guidelines presented here are also applicable to bare ZINCALUME Steel. The following should be considered:

- Air drying paints have different weathering characteristics to pre-painted ZINCALUME Steel and are typically not as durable. Areas field painted with air dry paints to match adjacent factory applied areas may weather different over time and therefore vary in appearance.
- The color and gloss of air dry paints may not exactly match that of the factory applied paint.
- Field painting over the factory applied finish voids any originally issued paint warranties.

Surface Preparation:

It is normal practice to ensure that any surface to be painted is in a suitable condition for painting. The most appropriate preparation is dependent on the age and condition of the surface. Any dirt, debris or mildew must be removed; follow the cleaning guidelines outlined above in this bulletin. Rinse the surface thoroughly as residual cleaners or detergent left on the surface could result in poor adhesion of the field applied coating.

Bare ZINCALUME Steel product should be cleaned with solvent to remove any rolling oils or lubricants. Rinse thoroughly and allowed to dry completely.

Minor scratches which have not left the metal substrate exposed can be lightly sanded or buffed to create a smoother surface. Care must be taken to avoid exposing the substrate.

To prevent rust from forming on exposed metal, sand the general area lightly and use a high-quality primer to protect the exposed metal from corrosion. Allow sufficient time (normally 24 hours) for the primer to dry before applying the topcoat. If either red or white rust is evident, remove as much rust as possible with a wire brush, and then sand lightly to remove all rust. Wipe the exposed area with mineral spirits before priming.

Field Paint Types:

The most suitable field paint type is generally water-based acrylic. However, in more corrosive salt marine locations, or for severely rusted material, it may be necessary to choose a paint system that has enhanced corrosion resistance such as a zinc-rich primer.

Due to ongoing improvements in paint technologies, at any given time there are numerous potentially suitable paint products available. It is therefore recommended that a reputable paint supplier or contractor be consulted to determine the most appropriate paint system for your particular applications and environment.

- Read manufacturer's instructions and observe them explicitly. Thorough mixing is essential.
- It is not advisable to use different brands of primers and finishing coats in conjunction with one another. Do not over paint water-based paints with oil or organic solvent-type paints.
- At all times, avoid excessive paint film thickness such as may occur in the valleys of formed roofing panels.
- When extensive areas are to be covered, spray painting can lower cost while giving acceptable results. The paints used, however, must be formulated for this purpose.
- Work safely. Wear proper safety equipment; ensure good ventilation in paint handling; avoid unnecessary contamination of the skin.

Touch-Up Paint:

Scratches and very minor damage may occur during handling and installation of painted roofing and walling. In these instances, it may be desirable to use touch-up paint to repair the blemishes. Keep in mind touchup paints are quick fixes and when used properly will result in satisfactory appearance. Misuse or over-use can result in spoiling the overall appearance.

Small scratches that do not penetrate through the metallic coating of the ZINCALUME Steel and are not noticeable from 6ft. should be left alone as the metallic coating will protect against corrosion.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Surface Preparation:

Edges of deep scratches should be lightly sanded or "feathered" with 400 grit sandpaper. If a scratch extends through the paint and the protective metal layer exposing raw steel, it should be treated with a zinc rich or similar primer before touch-up application. If feathering and/or priming are not necessary, areas to be touched-up should at least be wiped with mineral spirits to remove dirt, wax or other contaminants before colored touch-up is applied.

Paint Application:

The recommended paint type for touch-ups is an acrylic silicone paint which can be found at local paint stores. Many panel fabricators have touch-up paint available in their standard colors as well.

Special attention should be paid to the manufacturer's instructions, including direct skin or eye contact, ventilation and potential flammability. Aerosol or spray applications are not recommended for blemish or scratch repairs. The best tool for this type of repair is a good quality, 1/4 in. artist brush or a pen tip type applicator; only the narrow edge of the applicator should actually contact the scratch or blemish. Use touch-up paint sparingly and only to cover up those areas where paint has been removed. Excessive use of touch-up paint will result in a blotchy, uneven, appearance (see picture).

Excessive use of touch-up paint that has faded faster than factory applied coating.

RETURN TO TABLE OF CONTENTS

ZB12 - Guidelines to Installation of Photovoltaic Panels on ZINCALUME® Steel

Introduction:

When installing photovoltaic (PV or solar) panels to roofing made from ZINCALUME Steel the following installation and maintenance practices will assist in maintaining the water tightness and durability of the roof. This technical bulletin relates to the installation of framed PV/solar panels mounted above ZINCALUME Steel roofing.

Installation Considerations

Clearance Between the Panels and the Roof

PV/solar panels installed on a ZINCALUME Steel roof shield the roof from the sun and prevent beneficial washing from rainfall. Areas on the roof directly beneath the panels are considered to be unwashed and may be subject to accelerated corrosion due the accumulation of dirt, salt and other airborne contaminants which may retain moisture for extended periods due to condensation or high humidity. The provision of adequate clearance between PV/solar panels and roofing will help to:

- Facilitate self-cleaning and limit the build-up of leaves and other debris.
- Provide sufficient access for the cleaning, inspection and maintenance of the roofing material, including removal of any accumulated contaminants, and fasteners beneath the panels.
- Allow air flow to quickly dry areas beneath the PV/solar panels. This may also be beneficial to the performance of the PV/solar panels as electrical output is usually temperature dependent.

Compatibility of Materials with Roofing Made from ZINCALUME Steel

Dissimilar metals, such as stainless steel, lead, brass, copper and copper containing alloys should not be used in direct contact, or contact that could create an electrical connection, with roofing made from ZINCALUME Steel. This also includes conductive seals, washers and gaskets. Refer to **Technical Bulletin ZB2 "Flashing Materials for Bare and Pre-Painted ZINCALUME Steel" and Technical Bulletin ZB3 "Fastener Selection for ZINCALUME Steel Roof and Siding Products"** for additional information on dissimilar metals and galvanic corrosion.

Avoid PV/solar panels, or any introduced flashings, which utilize materials such as copper and lead as these materials have the potential to create water run-off onto roofing made from ZINCALUME Steel resulting in galvanic corrosion.
Ensure any sealant in contact with ZINCALUME Steel is "neutral cure" silicone.

Timber used in direct contact with roofing made from ZINCALUME Steel that has the potential to become damp can result in accelerated corrosion of the roofing. Furthermore, treated lumber has the potential to leach and drip corrosive substances onto the roof. Use of lumber on the top surface of the roof should be avoided.

Avoiding Potential Damage to the Roof

Foot traffic can dent, scuff, or scratch the ZINCALUME Steel roof.

Dents may need to be rectified to avoid water ponding, which is more likely on low pitch roofs. Ponded water exposes ZINCALUME Steel to an extended period of wetness which may increase the potential for corrosion or water ingress.

Scuffing is typically an aesthetic issue that is unlikely to have any detrimental effect on the performance of roofing made with ZINCALUME Steel.

Maintaining Water Tightness of the Existing Roof

The installation of PV/solar panels should allow for free drainage of moisture from all surfaces. Avoid ponding water.

Any penetrations through the roof should be placed in such a manner so as to minimize the risk of water ingress. Penetrations through the roofing should be properly sealed using appropriate flashings, sleeves and/or sealants. Non-penetrating attachment clamps are recommended if the design allows.

Avoid valley fixing or valley holes for electrical cables.

PV/solar panel fasteners and brackets should be installed away from sheet side laps as they may distort the profile and interfere with the specifically designed anti-capillary laps, leading to water ingress.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Rainwater Collection
If rainwater is collected from the roof, check with the PV/solar panel supplier to ensure it does not adversely affect water quality.

Fasteners and Brackets:
Fasteners and brackets used in the installation of PV/solar panels should have a service life comparable to the expected performance of the ZINCALUME Steel. This includes the replacement of any corroded roofing fasteners that will be located beneath the new PV/solar panels.

Swarf:
During installation swarf should be removed daily. Refer to **Technical Bulletin ZB4 "Swarf Staining on ZINCALUME Steel Roof and Siding Products"** for additional information.

Electrical Cables:
Electrical cables should not sit directly on the roof panels as this may lead to the accumulation of dirt, salt and other contaminants. Cables should be affixed to the PV/solar panel support structure.

Grounding:
Ensure appropriate grounding of the PV/solar system. Stray currents to the roof made with ZINCALUME Steel may accelerate corrosion.

Maintenance:
Unwashed areas have an increased risk of corrosion compared to washed areas, regular cleaning is recommended. Generally, unwashed areas should be cleaned with fresh, potable water, at least every 3 months for coastal or industrial areas, and at least every 6 months in other applications. This may coincide with periodic PV/solar panel cleaning. Maintenance should also include an inspection of the roofing fasteners, as well as the surface condition of the ZINCALUME Steel. For further guidance on maintenance refer for **Technical Bulletin ZB11 "Field Maintenance, Field Painting and Touch-Up Painting of ZINCALUME Steel Roof and Siding"**.

RETURN TO TABLE OF CONTENTS

ZB13 - Hawaiian Islands: Exceptions to Standard Limited Warranty, Cleaning & Panel Design Recommendations

Introduction:

The volcanic activity on the big island of Hawaii is a unique but well understood natural feature. Two of the primary emissions from the vents located at Kilauea are hydrogen sulfide and sulfur dioxide. These particulates often result in the well known island haze called VOG. These two components when mixed with water droplets in the surrounding air can result in the formation of sulfuric acid which can become acid rain. Acid has long been known to cause corrosion on ZINCALUME steel, both painted and bare, but historically the levels of sulfur on the island of Hawaii has been such that routine rainfall provided enough cleaning of roof panels to prevent any type of premature corrosion.

Unfortunately, the situation at the Kilauea summit has changed dramatically over recent years and even months. The opening of a vent at the Halema`uma`u crater in December 2007 resulted in much higher levels of sulfur dioxide being released into the environment; an estimated 750-2,000 tons/day. In May 2018 numerous new fissures opened along the Eastern Rift generating large, continuous lava flows as well as significant volumes of corrosive gases and ash. Due to the increased corrosiveness on Hawaii, Steelscape is undertaking a large scale exposure study to determine the best substrate, paint and panel design to minimize pre-mature corrosion. Until the results of this study are available, the following limited warranty exceptions and recommendations have been developed.

Limited Warranty Guidelines and Exceptions

Big Island of Hawaii:

For orders accepted after December 1, 2010, the below ZINCALUME steel limited warranty durations and distances will be in effect. All the standard and current ZINCALUME steel limited warranty conditions and provisions will apply.

Distance from Halema'uma'u and/or Pu'u O'o Vents*	Limited Warranty Duration
0 – 30 miles	Site Exception Review Required
>30 miles	Standard 25 years

*Halema'uma'u Vent 19°24"24.19'N 155°17'01.02"W
Pu'u O'o Vent 19°23'21.47"N 155°06'20.51" W

Other Hawaiian Islands:

The other Hawaiian Islands will be subject to the current standard ZINCALUME steel limited warranty.
An exception to our limited warranty should be requested for any sites, Hawaiian or otherwise, located within one mile of the ocean as this zone is defined as aggressive marine. Failure to submit a limited warranty request for aggressive marine locations may result in a voided warranty.

Recommended Cleaning Practices

Big Island:

Roof panels should be washed down with fresh water for a period of time sufficient to remove any debris, dirt or pooled water from the surface. Fresh water for the purposes of this technical bulletin is defined as potable, or drinkable with a 6-9pH. It is especially important that no dirt or debris be left at the drip edges of the roof panels. No cleaning solutions are necessary and panels should not be scrubbed. Recommended cleaning frequency is below.

During periods of active eruptions cleaning should be more frequent. Ash and debris should not be allowed to accumulate on panel surfaces for long periods.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Distance from Halema'uma'u and/or Pu'u O'o Vents*	Recommended Cleaning Frequency
0 – 10 miles	Monthly
11 – 20 miles	Every Two Months
21 – 30 miles	Every Four Months
>30 miles	Every Six months

*Halema'uma'u Vent 19°24"24.19'N 155°17'01.02"W
Pu'u O'o Vent 19°23'21.47"N 155°06'20.51" W

Panel Design

Panel Design and Effect on Corrosion:

Our field inspections conducted to date indicate that panel design may play a significant role in the rate of corrosion due to acid rainfall and VOG from the volcano. Panels with an exposed cut edge and corrugated profile tend to hold small amounts of water and debris at the very edge due to capillary action. Over time this concentration of acidic water and particulate matter begins to corrode the paint and eventually the substrate.

Profiles with a hemmed drip edge allow water and debris to flow off the panel, thus providing better long-term corrosion performance.

Silt accumulation on a panel without a drip edge. Blistering of the paint is an early sign of corrosion.

RETURN TO TABLE OF CONTENTS

ZB14 - Hail Damage to ZINCALUME® Steel Products

Introduction:

Hail storms can range from light to severe and hail stones vary from small to quite large. Bare and pre-painted roof panels fabricated from ZINCALUME Steel tend to have very good resistance to hail, but damage can still occur. Generally speaking, the panels will remain structurally sound even though indentations could occur along with loss of paint.

Indentations:

Indentations from hail stones usually don't affect the life of the roof. However, areas of concern may arise from:

- Low pitched roofs with significant hail indentations within the pans leading to ponding and dirt accumulation which may promote corrosion.
- Roofs with sheet overlaps that have been significantly deformed, the anti-capillary effect could be lost and water could be drawn into the lap resulting in corrosion.

In the event of ponding or damage to overlaps, the affected sheets should be replaced as soon as practicable.

Paint Damage:

Loss of paint due to hail stone impacts will be an aesthetic issue only and will have no appreciable effect on the corrosion performance of the product.

However, if any one impact area is missing paint that can be seen with the naked eye from 3ft distance, or if there are many spots of missing paint the paint integrity could be compromised and the original paint warranty void.

Depending on the severity of paint damage, affected sheets may have to be replaced. Please contact your Steelscape representative to determine continued paint warranty coverage.

RETURN TO TABLE OF CONTENTS

TB1 - Guidelines for Effective Use of TruZinc® Plus Steel

1.0 Properties of TruZinc Plus Steel:

The TruZinc Plus Steel coating is a specially formulated water-based resin-chrome film, which is factory applied over a bare TruZinc Steel surface. In the cured state, the coating is colorless and odorless.

The resin film has excellent adhesion to the substrate with very good impact resistance, flexibility, roll formability, storage stain corrosion resistance (far superior to conventional passivation), and anti-fingerprinting properties. When it is used without post painting, the natural weathering process will typically not affect the surface appearance for at least 12 months.

1.0.1 Factory Production of TruZinc Plus Steel.

The clear resin film is applied wet, using state-of-the art roll coaters. The roll coaters are similar in design and operation to those used on a coil coating line. The film is cured using computer-controlled ovens. This ensures that optimum coating properties are achieved prior to rewinding and shipping.

1.1 Field Painting Guidelines

1.1.1 Wet Painting:

TruZinc Plus Steel can typically be painted, provided paint manufacturers recommendations are followed and appropriate consideration is given to environmental conditions, end use, location and product application. Given the wide variety of available paint systems and applications, testing for specific compatibility is highly recommended. Traditionally, TruZinc Steel requires the surface to be painted also be washed with a suitable solvent to remove traces of residual roll forming lubricant, and suitable metal primer is applied before the application of a decorative topcoat.

TruZinc Plus Steel removes the requirement to use solvent to clean up surfaces. A simple detergent wash is satisfactory, and generally eliminates the need to prime the surface. TruZinc Plus Steel can typically be over-painted with a high-quality water based acrylic topcoat without priming, provided a lubricant has not been used in the forming process and the surface is clean and dry. Again, given the wide variety of available paint systems and applications, testing for specific compatibility is highly recommended.

Solvent based finish coat systems may be used; however, these must be applied after the material has been primed with a compatible water based, solvent resistant primer. If the material is correctly primed a number of coats may be applied. Surface preparation and priming must be in accordance with the paint manufacturer's instructions.

1.1.2 Powder Coating.

TruZinc Plus Steel is suitable for direct powder coating, provided the surface to be coated is clean and powders requiring a peak metal temperature in excess of 390°F are not used. It is recommended that a brief water wash serve as the only pretreatment step, rather than another form of solvent-based cleaning solution. Please contact our Sales Department to discuss a program to trial TruZinc Plus Steel for these applications.

1.2 Roll Forming Characteristics.

Lubricants are rarely required during the roll forming of TruZinc Plus Steel because the clear resin film acts as a solid lubricant. The need for additional lubricant must be determined, however, on a case-by-case basis. Variables that should be considered include roll former design, (number of stands and severity of each incremental shape change) speed, surface condition of rolls and general machine maintenance. Most common roof and sidewall trapezoidal shapes do not require additional lubrication if the roll former is well maintained and correctly set up. Very severe profiles may require a small amount of spot lubricant at the heaviest worked points.

The Benefits of Using TruZinc Plus Steel Include:

- No Pickup - The reduction or absence of pickup during forming due to the resin film means the reduction or elimination of time-consuming cleanup.

- Increased Tool Life - Reduced pickup combined with the lubricating benefits of the resin film will contribute to improved tool life in manufacturing and roll forming applications.

Continued on next page...

- Scheduling Flexibility - TruZinc Plus Steel can typically be roll formed interchangeably with pre-painted feed, avoiding the need for intermediate roll cleaning. This provides greater scheduling flexibility.

- Removal of Hazardous Work Place Chemicals - Hazardous substances such as kerosene and other lubricants can be removed from the work environment, improving occupational health and safety practices.

- Less Slippery - The resin film is less slippery than a lubricated steel surface particularly with the absence of residual lubricant left over from roll forming. This will make the product safer to walk on while installing, particularly in wet conditions.

- Improved Final Appearance - Residual lubricants can often create a patchy visual appearance as the result of uneven drying off of the lubricant. This problem can usually be avoided with TruZinc Plus Steel.

1.3 Resistance to Marking:

TruZinc Plus Steel resists marking and stains occurring during manufacturing, handling or fixing. The coating acts as a surface sealant, increasing protection of the metal surface from hand and boot marking.

1.4 Wet Stack Storage Stain Resistance:

Resin coating provides an increased resistance to wet stack storage stain but is not guaranteed to prevent it from occurring. Such stains appear white, gray or black, and are caused when the material is packaged and subjected to moisture ingress between production and final use. The coating acts as a barrier coat, minimizing aesthetic degradation. Recommended storage should still be followed.

1.5 Installation of TruZinc Plus Steel

1.5.1 Flashings:

The recommendations for flashing TruZinc Plus Steel are the same as for TruZinc Steel. Using TruZinc Plus Steel or TruZinc Steel in areas subject to water runoff from ZINCALUME, Pre-painted ZINCALUME, Pre-Painted TruZinc Steel or aluminum coated steel should be avoided. TruZinc Plus Steel and TruZinc Steel are not subject to pitting corrosion when used alongside lead or copper components. Similar to other metallic building materials, TruZinc Plus Steel and TruZinc Steel should not be used in direct contact with green, wet or chemically treated wood products.

1.5.2 Fasteners:

Recommended fasteners for TruZinc Plus Steel are the same as for TruZinc Steel. Fasteners and flashings should be selected to avoid galvanic corrosion, for additional information please see **Technical Bulletin GB1 "Dissimilar Metals/Galvanic Corrosion".**

1.5.3 Sealants:

Experience shows that TruZinc Plus Steel is compatible with polyurethane, PVC, and polypropylene, and therefore would likely be compatible with common neutral cure silicone sealants. The adhesion properties of the resin film should be similar to TruZinc Steel.

1.6 Slitting TruZinc Plus Steel:

Where friction drag pads are used to maintain processing tension during slitting/recoiling, pickup of chrome passivant can occur. Some chromate is present in this pickup, as it is with most TruZinc Steel, therefore, the following guidelines are recommended:

1. Use minimal frictional forces on pads.
2. Set minimum pad width 6" to minimize frictional forces if drag pads are used.
3. Encourage use of an appropriate respiratory device for personnel working in close proximity (4-6 Feet) if dust is produced by the drag pad.
4. Remove pickup from drag device and adjacent areas using appropriately designed apparatus.
5. Dispose of drag pads in accordance with environmental or local regulations.

1.7 Welding:

Spot, seam or gas metal arc welding can be carried out successfully on TruZinc Plus Steel with typical resin coating weights. Fume generation may be slightly higher than TruZinc Steel without the coating. All welding should be carried out in well-ventilated areas.

1.8 High Temperatures:

The maximum recommended continuous service temperature is 390°F. Service temperatures exceeding 390°F will be detrimental to the coating. Applications requiring operating temperatures up to the 500°F safe limit for TruZinc Steel should be specified without the resin film.

Continued on next page...

1.9 General Corrosion Characteristics:

The TruZinc Plus coating does not improve the general corrosion characteristics of TruZinc Steel except as described in section 1.0. The resin coating has been tested to 1000 hours of UV exposure with no effect on appearance.

1.10 Product Mixing:

TruZinc Steel and TruZinc Plus Steel should not be mixed in adjacent areas on the same building. The different surface finishes, both in the new and weathered conditions, will result in a contrasting appearance, which may be objectionable.

1.11 Visual Reflectivity:

TruZinc Plus Steel reflectivity is similar to standard TruZinc Steel.

1.12 Electrical Conductivity:

The resin film applied to TruZinc Steel can potentially cause an insulating effect between panels in electrical appliance applications. The insulating effect would normally be overcome with welding or mechanical fastening of components. Manufacturers should be advised to ensure products are adequately grounded.

RETURN TO TABLE OF CONTENTS

PPB1 - Do Not Mix Paint & Mill Applied Coating Systems (Batch Sensitive)

1.0 Introduction:

Due to the chemical and physical variability within certain paint systems and slight process equipment changes from one production run to another, there are some products whose appearance may not be the same from order to order. This technical bulletin describes those items Steelscape does not guarantee as reproducible and guidelines for avoiding mixed orders on jobsites.

1.1 Metallic/Mica Paints:

The metallic/mica family of paints is inherently variable in appearance due to not only the physical shape of the pigment particles but also their behavior during the application process. The individual pigment particles are flat in nature allowing for light to reflect off of them at various angles. They are also typically larger in size than non-metallic pigments. The specific orientation of these pigment particles affects how the final paint system appears visually to the human eye.

The exact size and orientation of these pigment particles cannot be completely controlled during the paint manufacturing process, thus each paint batch of metallic/mica paint, even though the same color may have a slight visual difference.

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. Steelscape does not accept responsibility for material appearance when the architectural design requires panels to be offset (i.e. perpendicular) from adjoining panels, resulting in visual differential in color and or reflectivity.

It is important that the end user does not rotate panels in the cases of symmetrical roll form patterns to avoid obvious color and light differential within the structure. The use of directional arrow branding on the bottom side of metallic material is highly recommended.

1.2 Printcoat Paint Systems (including Steelscape Prints®):

Printcoat paint systems consist of a base coat of color and then a pattern of a different color over the top, which allows two colors to be visible on the finished product. Order to order variability in this process originates from several sources.

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 resulting in slightly different pattern appearances.

1.3 Vintage® and Eternal Collection™:

The Vintage and Eternal Collection coatings are inherently variable in appearance due to the coatings’ composition and application process. The make-up of these specialized coatings, while guaranteed within an approved color range, cannot be completely controlled during the paint manufacturing process. In addition, these coatings are semi-transparent and final appearance is influenced by the substrate surface, which can also vary between batches. As such, each coating batch may have a slight visual difference.

Continued on next page...

These slight visual variations from one production run to another can occur even if the same batch of the coating is used. This phenomenon is also responsible for the slight color shift observed when viewing a coated panel in the coil rolling direction versus perpendicular to coil rolling direction "flop".

Steelscape does not accept responsibility for material appearance when the architectural design requires panels to be offset (i.e. perpendicular) from adjoining panels, resulting in visual differential in color and or reflectivity.

1.4 Rawhide, Natural Matte® & Textured Paint Systems:

The chemistry and ingredients that create the textured appearance can vary between paint batches. In addition, the look and density of the textured surface is influenced by slight changes in the application process and film thickness. For these reasons care should be taken not to mix batches of Rawhide, Natural Matte or other textured paint systems.

1.5 Visual Only Paint Colors:

The color of some paint systems cannot be measured electronically due to pigmentation or gloss. These are often very bright, saturated colors or very high gloss paint systems. Metallics, micas and other special effect pigments would also be included in this category. When a color cannot be measured electronically against a standard it is assessed visually by a person using a color light booth. This human factor along with the nature of the paint formulation can result in batch to batch color variation and batches should not be mixed on jobsites.

1.6 ReziBond®, ZINCALUME® Plus, TruZinc®Plus, & Other Mill Applied Resins & Coatings:

Resins and coating systems applied on the metallic coating mill have inherent batch to batch variability for several reasons. The application process on the mill has limitations that can result in a wider range of coating weights and film thicknesses as compared to a paint line, this in turn can result in color and flow variation between production batches. Mill applied systems are not color controlled. The majority of mill applied coatings and resins are either transparent or semi-transparent, and are therefore influenced by the appearance of the underlying metallic coated substrate, which can also vary between batches.

2.0 Guidelines for Avoiding Mixed Orders on Jobs:

Inventory and order size are critical for ensuring that mixed batches of variable painted and/or coated product do not get used at a jobsite. If the paint system or specialized coating is a standard or stock item, order large quantities at a time; this will allow for fewer batches in inventory and reduce the risk of mixed orders on a job.

If the item is a custom color or print requiring established minimum linear feet, order slightly more linear feet than the job requires. This will allow any damaged or defective material to be replaced from the same production run.

If it is absolutely necessary to use more than one order of a metallic/mica, printcoat or specialized coating on a job compare the different available batches carefully; some batches may be a better match than others.

Also, using different batches on trim, accessories or on separated portions of a building may not be visually objectionable.

If a project cannot be completed without ordering additional material, it is imperative that Steelscape be notified of the situation and told which previous order needs to be matched. Although Steelscape will not guarantee a match on metallics/micas, print-coats or specialized coatings, every effort will be made to duplicate the desired color as closely as possible.

Steelscape strongly recommends the use of branding, directional arrows on metallic, micas, Vintage, Eternal Collection and TruzGuard coated coils.

RETURN TO TABLE OF CONTENTS

PPB2 - Pressure Mottling

Pressure Mottling:

As defined by the National Coil Coaters Association, "Pressure Mottle" is 'an uneven pattern, often seen as glossy spots, which is usually caused by pressure within a painted coil.

The cause of mottling is from direct pressure within the coil where the gloss controlling components of a paint system are suppressed or "flattened". The act of this "flattening" will result in the reflectivity or gloss to be randomly suppressed. Visually this will result in a "blotchy" appearance on the painted surface where areas of the paint appear dull, versus shiny.

The pressure used in recoiling material after painting as well as the types of components used to suppress the natural gloss of the pigmentation within the paint system will vary, resulting in the occasional "mottling" of the finished product. The gloss suppressing components are typically pressed down within the surface of the paint. Due to this pressure the gloss components are flattened and in essence blanket the natural reflectivity of the pigments underneath.

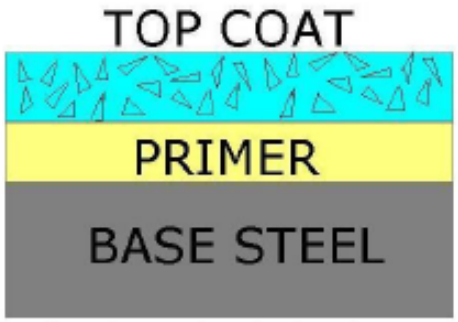


Figure 1

Sample crossview showing gloss components in normal suspension

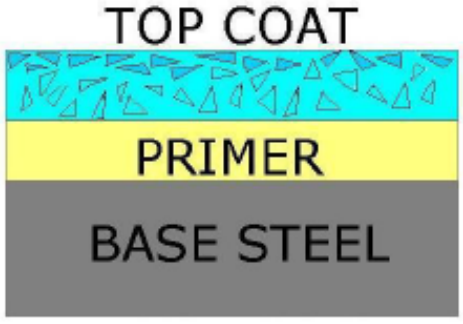


Figure 2

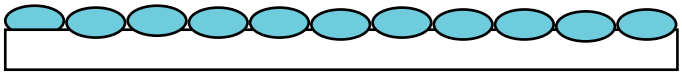
Sample crossview showing "suppressed" gloss components

As seen in the diagrams above, the gloss components in Figure 1 are under normal suspension within the topcoat and the direction is random throughout. But when excessive pressure is applied to the painted surface in conjunction with higher recoiling temperatures, the gloss components are suppressed or flattened within the topcoat as seen in Figure 2. Only the components closest to the surface are affected and this results in the variance in gloss across the strip.

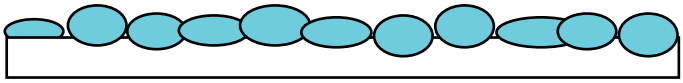
The greater the difference in gloss between the backer coat and top coat the more pronounced the mottling. This is due to the surface roughness differences at a micro level between low gloss and high gloss paints. The "suppression" of the gloss components is more exaggerated than if the both surfaces have the same surface structure.

Medium/High Gloss Paint Surface:

The surface is relatively smooth and even which results in a medium or high gloss appearance.



The surface is rough and bumpy which results in a low gloss appearance.



After being subjected to tension within the coil the low gloss surface is deformed resulting in mottle.

When the material is formed and installed, the exposure to the heat of the sun will make these components "spring" back to their original positions within the topcoat, giving the even appearance and uniform gloss across the strip.

Continued on next page...

Pressure mottling within coil wraps before exposure to heat. A linear appearance in the rolling direction is typical.

Pressure mottling (bottom) and after application of heat (top).

The greater the difference in gloss between the backer coat and top coat the more pronounced the mottling. This is due to the surface roughness differences at a micro level between low gloss and high gloss paints. The “suppression” of the gloss components is more exaggerated than if the both surfaces have the same surface structure.

RETURN TO TABLE OF CONTENTS

PPB3 - Wet Stack Storage

Overview:

This document is intended to provide guidance for the prevention of storage corrosion of bare and pre-painted building panels and accessory items.

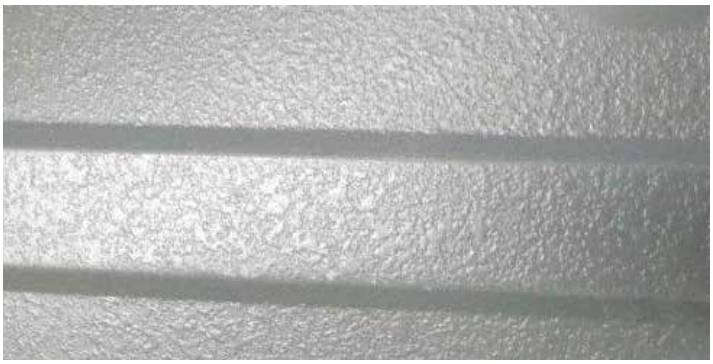
Introduction:

Building panels when properly installed, offer a long service life and under normal service conditions provide excellent corrosion resistance. However, building panels are subject to premature corrosion failures prior to installation if they are not handled and stored properly on the job site.

Excessive storage periods, or poor storage conditions, often result in water intrusion into panel bundles. Prolonged exposure of bundled panels to wet conditions can cause paint blistering and substrate corrosion. Wet Stack Corrosion can manifest itself in as little as 2-4 weeks.

Proper storage of panels must be considered as improper storage can result in costly consequences including material reordering and job site delay. This bulletin depicts wet stack storage issues and prevention methods for pre-painted metal.

This issue can also arise on bare and resin coated metal, and the storage considerations published in this bulletin also apply to these products.



Close up image of severe "Wet Stack Corrosion". Note smooth, normal surface in upper right corner.

Wet stack corrosion can also occur in coils. Coils should be stored to minimize exposure to moisture, large temperature swings, and used in a timely manner. Wet stack corrosion will nullify all warranties on the applied paint as well as any substrate warranty. Refer to suppliers terms of sale or claims policy for more information.

Note that when scratched, the primer has been compromised as well as the presence of Zinc Oxide (white rust).

Environmental and Service Conditions:

When water or water vapor is present along the sides of a panel bundle, it may penetrate between the panels by capillary action, leading to corrosion. Improper precautions during transport can also lead to water accumulation between the panels. Ambient humidity and temperature cycles will also promote water intrusion into stored panel bundles through condensation. Finally, rain and snow are other potential sources of water that can cause storage corrosion of pre-painted panels.

Two other important factors contribute to the corrosion of stored pre-painted panels; temperature, and exposure time.

Storage corrosion can be prevented by:

- Reducing site storage time
- Decreasing water contact
- Moderating temperature extremes

Other environmental factors may accelerate storage corrosion. This includes the presence of aggressive soluble chemicals such as sulfur and chlorine compounds often found in polluted atmospheres, road salt contaminants, and marine environments.

Continued on next page...

For additional information on ZINCALUME oxidation see **Technical Bulletin ZTB10 "Preventing Transportation and Storage Corrosion"** and for more details on TruZinc Steel corrosion see Galv Info Note 3.2

Job Site Storage:

Proper storage limits the collection of water from rain, snow, and condensation on the panel surfaces. Under roof storage is always preferred. However, prolonged storage will increase the likelihood of storage corrosion for both finished panels and pre-painted coil.

If panel bundles must be stored outdoors, several precautions must be taken to prevent storage corrosion. The panel bundles should be stored in a level area out of the way of other construction activities to minimize the number of bundle movements required at the job site.

If the bundles are stored on the ground, a plastic ground cover must be put down under the bundle to minimize condensation of water from the ground onto the panels. The bundles must then be raised off the plastic ground cover to avoid contact with water puddles and to allow for air circulation around the bundle to promote drying of condensed water.

Wet, uncured, or pretreated lumber should not come into contact with the panel bundles. The panels must be stored on an angle to promote drainage of water off the bundle. Sufficient support must be provided to the raised and angled bundles to avoid excessive bowing, which may result in low spots that could hold water.

Improper Storage - Insufficient support in the center of long panels allow "Bowing" or "Sagging" that traps water in the center of the panel length.

The bundle must be completely sheltered with a loose-fitting waterproof tarp to protect the bundle from rain or snow moisture while allowing for air circulation and drying of condensed water. A loose-fitting tarp also shadows the bundle from direct sunlight and will moderate temperature extremes.

It is important not to snugly cover panels with a tarp when on the ground. Tightly covered panels can create a humidity chamber that can accelerate corrosion. Tightly covering pre-painted panels restrict airflow and trap moisture in the ground under the tarp.

Improper Storage - By snugly fitting a tarp directly on the ground.

This method traps moisture underneath. After just 3 months covered in the manner above, the panel bundle is opened to reveal that moisture has made its way into the layers of sheets.

Outside Storage Best Practice:

The National Coil Coaters Association (NCCA) developed a best-practice storage method for pre-painted, bundled panels. This bulletin can be found at CLICK HERE FOR LINK to NCCA BULLETIN

Continued on next page...

The following steps outline the methodology recommended by the NCCA.

Step 1 – Preparing the Bundle:

The pre-painted bundle should be placed on a tarp to prevent ground moisture from being a factor. The bundle should then be placed on top in a sloping position. This allows any moisture that may already be present to gravitate out.

Bundle placed in a sloping position to gravitate moisture out.

Step 2 – Placing Spacers:

Place dunnage or material scraps of dimensional lumber on the bundle's cover sheet or tarp. This is to keep the top tarp from resting directly on the panels. This will increase air flow and will allow moisture to escape. Rolling the edges of the bottom tarp up and cutting a hole in the lowest area of the bottom tarp will allow water to escape.

Scrap material used to keep tarp from resting directly on bundle.

Tarp edges rolled up and hole cut in lowest area of tarp to allow water to escape.

Step 3 – Tarp Placement:

Roll the top tarp over the stack allowing enough tarp to stretch out at least 12 inches from any edge of the panel stack.

Tarp rolled over stack with a minimum of 12" overlap on all sides.

Step 4 – Securing the Tarp:

While using stakes and elastic straps, pull the top tarp tight enough to keep the edge off the ground, creating air flow under the bundle.

Tarp secured to ground tightly with elastic stakes, allowing for airflow under the bundle.

Additional Guidance:

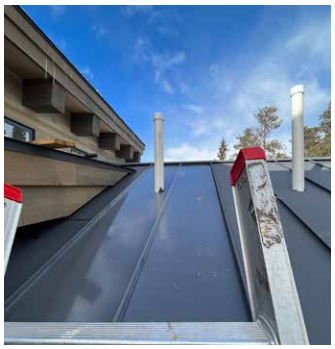
The condition of the tarps and paper wrapping of stored bundles should be inspected daily for damage, puddles, or snow accumulation. Damage to packaging or tarps must be repaired and snow or water accumulation must be removed. If water is present in the panel bundles, the panels must be separated and wiped dry with a clean, soft cloth and stacked with a space between each panel, so that air circulation can complete the drying process.

RETURN TO TABLE OF CONTENTS

PPB4 - Natural Matte® Installation

Finish Overview:

The Natural Matte® is an ultra-low gloss silicon-modified polyester (SMP) paint system. This unique finish features a micro-wrinkle texture that dissipates light and achieves unprecedented low levels of gloss and sheen. Natural Matte offers good resistance to damage, but due to its unique texture, hard-forming or abrasion may visibly mar the painted surface. Natural Matte requires additional care during handling and installation, and the application of a specialty protective film.



Installation and Handling:

Apply the appropriate strippable film to the exposed metal surface. Strippable film should remain on the metal surface during transportation, manufacture, and installation.

Handle the product with care to avoid damage or marring. Avoid dragging the exposed painted surface across other surfaces. Always handle the painted surface with clean, dry, cut-resistant gloves.

Avoid carrying unsecured stacks or bundles of sheets or panels, as this may result in metal-to-metal abrasion.

Ensure coils, sheets, or formed panels are secured and packaged appropriately during transportation.

Avoid walking on the painted surface where possible. Minimize foot traffic by establishing walkways and traffic lanes on the roof surface. Ensure that those walking on the roof area use clean, non-marking, soft-soled footwear.

Avoid cutting or trimming roof panels directly over the painted metal roof surface. Small metal filings may get lodged in footwear or trapped on the painted surface leading to unintentional scratching.

Check machine settings and clearances to ensure they are within factory spec to avoid excessive machine marring.

Be aware of the sharp metal edges of trim pieces and the potential for metal-to-metal abrasion during installation. Tips to avoid damage include ensuring the trim is supported appropriately during fastening.

Use appropriate metal-specific snips, shears, and drill bits, to ensure accurate trimming and fastener penetration.

Minimize field storage of Natural Matte and store material in a dry, well-ventilated area and away from traffic.

Strippable Film:

The recommended film for Natural Matte is Pregis 21UV71C or Novacel 9138.

Other strippable films may fail to provide sufficient adhesion to the textured finish resulting in adhesion issues during product handling, transport, or installation.

The strippable film should not remain on the painted metal surface for more than 60 days.

Extreme environmental conditions, such as severe temperature changes or extreme heat or cold, may impact strippable film adhesion.

Removing Dirt and Minor Scuffs:

Clean dirt marks and minor scuffs with warm water and a lint free cloth.

Due to the unique texture of the factory-applied finish, touch-up paint will not replicate Natural Matte and should be used sparingly and not relied upon in highly visible areas.

Contact:

For inquiries or assistance identifying a suitable provider of strippable film, please contact us at (888) 553-5521, or submit a request via Ask Steelscape.

RETURN TO TABLE OF CONTENTS

GB1 - Dissimilar Metals/Galvanic Corrosion

Introduction:

Steelscape's steel-based products, painted and bare, feature a metallic-coating that provides long-lasting resistance from corrosion. This coating is applied during the steel production process prior to the application of paint. Metallic-coatings consist of either zinc (sold as TruZinc® or galvanized) or a specialty mix of aluminum and zinc (sold as ZINCALUME®). Care must be taken during the design and installation phase of metallic-coated products to avoid the unintentional creation of galvanic corrosion. This rapid form of corrosion is induced when metals of varying types (dissimilar metals) are installed in direct contact with one another in a **corrosive environment**.

Galvanic Corrosion:

Galvanic or bi-metallic corrosion is a reaction in which one metal will sacrifice itself (or dissolve) to protect the different, less active metal, leading to visible corrosion. Galvanic corrosion occurs between dissimilar metals in certain corrosive environments and typically requires three criteria in which to occur:

1. Two or more dissimilar metals,
2. Metal to metal contact, and
3. Both metals to reside in the same conducting solution/ corrosive environment, i.e. salt air or water.

Metals can be viewed as active or noble based on their position on the galvanic scale, simplified in Table 1 below. The further apart these metals are on this scale, the greater the potential for a reaction between the metals. In addition to the dissimilarity of the metals, the severity of the environment will influence the potential for galvanic corrosion. Common factors influencing environmental severity can include direct proximity to salt water or chemical spray, the frequency of breaking surf (which generates airborne salt-laden particulates), and how frequently the surface is rinsed by rainfall.

MORE ACTIVE METALS (ANODE)
Zinc
ZINCALUME Steel
Aluminum
Steel
Lead
Copper
Stainless Steel
LESS ACTIVE OR NOBLE METALS (CATHODE)

Table 1: Galvanic Series of Metallic Activity

In Application:

Installations featuring galvanic corrosion are commonly attributed to improper fastener and accessory selection. This includes the use of stainless steel and copper products in direct contact with metallic-coated metal roofing and siding profiles.

Stainless-Steel Hardware (Clips, Fasteners, etc):

Galvanic corrosion can be caused by stainless-steel fasteners, rivets, light fixtures, window frames and other accessories recessed in metallic-coated panels in corrosive environments. Initially this may appear as the apparent bubbling of the painted metal roof or siding surface around the stainless-steel fixture. Often falsely identified as a paint failure, this bubbling is the steel underneath corroding, resulting in the loss of paint adhesion.

Paint bubbling radiating out from stainless steel fastener on roof 300ft from ocean.

When the paint is removed corrosion down to base steel is clearly visible.

Most stainless-steel hardware, such as clips and fasteners, are not intended to be used with ZINCALUME coated steel profiles in **corrosive environments**. In these environments stainless steel components should be used in conjunction with profiles fabricated out of aluminum.

Continued on next page...

Copper and Copper Treated Lumber:

Metallic coated steel will experience accelerated corrosion when it is in contact with copper, this includes copper treated lumber. Leaching of copper from treated materials, such as through water run-off from rainfall or condensation, can result in corrosion without direct metal to metal contact. In these instances, the protective oxide film which naturally forms on aluminum-zinc coatings is broken down by copper in localized areas. Pitting corrosion ensues which is a highly accelerated form of attack. Zinc coatings are not generally subject to pitting but will demonstrate the effects of galvanic corrosion when installed in direct contact with copper.

Steelscape recommends avoiding the use of copper where galvanic corrosion may be a concern. If the use of copper cannot be avoided, Steelscape recommends that insulated copper or a protective coating over the copper be used to prevent exposure. Any electrical terminals that utilize exposed copper should also be sealed with shrink tape or similar method. This includes but is not limited to, grounding wire for Photo Voltaic Arrays, Lightning Protection, and Pipe Penetrations.

Galvanized Steel and ZINCALUME® Coated Steel:

Unpainted galvanized steel must not be used for roofing or rainwater goods (including valleys and gutters) to collect water runoff from ZINCALUME Steel or other more noble metals. ZINCALUME Steel and painted ZINCALUME Steel can be used to collect water from galvanized catchment material. Irrespective of galvanic corrosion considerations, ZINCALUME Steel panels & gutters will typically give a longer service life than traditional galvanized steel. Neither product should be used as catchment material for roofs featuring more noble metals such as aluminum or copper.

For more information on fastener selection and incompatible materials with ZINCALUME, see the **Technical Bulletin ZB2 "Flashing Materials for Bare & Pre-Painted ZINCALUME Steel" and ZB3 "Fastener Selection for ZINCALUME Steel Roof & Siding Products".**

Warranty Implications & Remedy:

Product deterioration or corrosion created by the improper installation of dissimilar metals will void any warranty supplied by Steelscape. This includes paint and metallic-coating warranties.

If galvanic corrosion is identified, this issue must be rectified as promptly as possible due to the rapid rate at which it can spread. Remedies may include the replacement of the panels impacted by corrosion and the substitution or relocation of the associated dissimilar metals. For more information on the identification or rectification of galvanic corrosion, **please contact Steelscape**.

RETURN TO TABLE OF CONTENTS

GB2 - Metal & Light Reflectivity

Technical Overview:

Key Light Considerations – Not just color and contrast (lightness/darkness) but also the type of light reflection (specular or diffuse).

Light Reflectance Value (LRV) – The measurement of the total reflection of visible light, used to assess how light or dark a color will appear relative to black or white extremes.

Gloss and Sheen – The assessment of the concentrated reflection of visible light (seen as shine) from a specific viewing angle, influenced by surface texture, chemistry, and other factors.

Solar Reflectance/Reflectivity Value – Measures the reflection of visible and non-visible light (total solar spectrum) and used to determine how much heat will be reflected from a surface (which contributes to structure cooling costs).

Improving Metals Integration – New technology including textured and disruptive paints can be used to achieve a variety of light and dark colors while offering significantly lower visible shine.

Metal is a durable roof solution which affords unmatched design flexibility. However, traditional metal finishes may not be suitable for all applications. Homeowners associations, planning ordinances, and other building provisions may seek to restrict the selection of coated metal finishes due to their traditional interaction with light.

No one wants a building that does not suit its environment or a surface that may create an unwanted distraction for others. To avoid this issue, many designers, homeowner's associations, and review bodies comparatively evaluate colors and end-products to facilitate the selection of an appropriate exterior material.

As explored in this article, this evaluation must include more than one single metric. Often planning bodies rely exclusively on the term Light Reflectance Value or LRV to determine the suitability of colors and products for an environment. In this document we outline the concept of LRV in building design, in addition to other key metrics to consider including gloss and sheen.

In this article we also review the importance of understanding the efficiency of a finish at reflecting heat, often a biproduct of color selection. Using the combination of these metrics and being aware of the finish enhancement options available will help ensure that designers and building owners select the right color and finish for their next project.

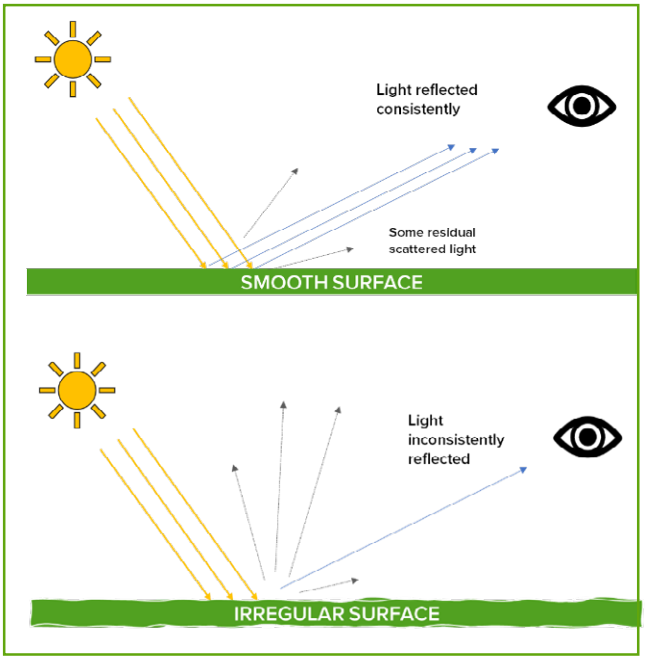
More than Just Color:

The way light interacts with a surface is beyond just the color. Several attributes impact light reflection including chemical composition, translucency, cleanliness, and most importantly surface texture.

Why?:

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.



Continued on next page...

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.

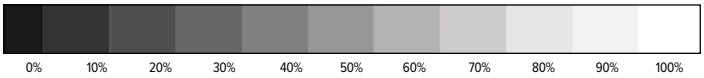
> ***Example of Concentrated v Diffuse Light:*** *A rich standard painted black metal color will appear black and full of color when viewed from 90 degrees, however in direct sunlight and when viewed from a side angle may appear lighter and provide a noticeable shine or reflection of light. This is because it is a specular reflective surface. By comparison a light gray asphalt shingle will generally appear the same irrespective of the lighting angle, this is because it is a diffuse reflective surface.*

So, what are some of the common metrics used to assess light reflection for building products and how will it impact my project?

Light Reflectance Value Light v Dark:

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.

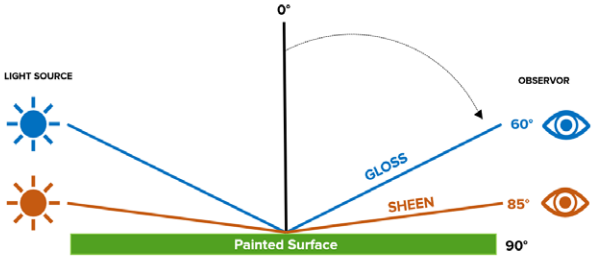


LRV is best used to assess how light or dark a color will appear.

Gloss and Sheen – Concentrated Light:

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 light striking a surface at a specific 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.



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.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Solar Reflectance Value (SRV) Efficiency not Vibrancy:

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 while 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, particularly when many modern exterior paints use highly reflective cool pigment technology.

Solar Reflectance Index (SRI) – Assessing Efficiency of Your Roof:

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, while 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. Several quality tests are performed on each production batch of painted metal to guarantee this consistency.

Reviewing the Data - Sample Metal Colors

Color Name	Parchment	Forest Green	Dark Bronze	Black
LRV	40	9	8	5
Gloss	11	10	11	21
Sheen	12	13	13	25
SRV	51	30	32	30
SRI	58	29	32	29

LRV:

Notice how the LRV value is directly related to the contrast of the color relative to black or white, but offers little to differentiate the inherent surface shine in metal.

Gloss and Sheen:

Note how gloss and sheen are independent of the LRV, with three of the colors presenting very similar readings. Of note, the black has a low LRV but the highest gloss and sheen.

Continued on next page...

RETURN TO TABLE OF CONTENTS

Solar Reflectance:

As these are cool colors, note how the Solar Reflectance of Forest Green, Dark Bronze and Black are almost the same. However even with the use of cool pigments, very light colors such as Parchment, will always offer superior solar reflectivity and this is apparent in the significantly higher SRV and SRI values for this color.

This Makes Sense –"But I want full color, metal, and limited visible light reflection.":

Modern paint technology has advanced to offer low reflective finish options to building designers and users. These include adding flatteners to the paint, textured paint systems, and micro-wrinkle paints (microscopic texturing) to produce diffuse light interactions.

Flatteners can be added to common paint systems (a custom paint specification) to reduce gloss and sheen and are the most traditional method to reduce the visually reflective properties of painted metal. Flattener particles impart roughness/texture that scatters light. These particles come in different particle size and shapes to achieve certain light and texture characteristics. However, this process can usually only reduce the gloss and sheen so far before negatively affecting viscosity, the stability of the solution or 'washing out' the perceived depth of the color.

Textured paint achieved through chemical reaction, such as Steelscape's Rawhide, offers a similar visual effect but utilizes a different approach. This is achieved through the paint's chemistry which causes the paint to crease during the curing process (heat controlled drying process), creating a texture like stucco or sandpaper. As this is done in a controlled environment on large-scale metal paint lines, this can be done consistently while still ensuring the product offers the same durability as traditional standard paints. The texture created by this process helps create a more diffuse light interaction with the surface.

A step further is advanced technology termed micro-wrinkle or disruptive paints (such as Steelscape's Natural Matte®). These paints are chemically developed to create texture at a microscopic level, similar to natural elements such as wood or stone. Even though the texture variance is microscopic, it offers greater surface variance overall, creating a more diffuse light interaction. The result is a richly colored painted metal with industry leading light diffusing properties.

Natural Matte Comparison

Color Name	Natural Matte® Carbon	Standard Black
LRV	5	5
Gloss	0.9	21
Sheen	3.8	25
SRV	26	30
SRI	25	29

These two colors are similar yet their interaction with light is completely different, and this is captured in the data. See how the LRV of these colors is identical, yet the gloss and sheen is completely different due to the paint technology. Despite its advanced texture, Natural Matte uses the same paint backbone as standard paints, including the use of cool pigments. This enables the Natural Matte product to offer SRV and SRI values similar to the standard black.

Natural Matte is listed with the Cool Roof Rating Council (CRRC)

CRRC
COOL ROOF RATING COUNCIL ®
MEMBER

RETURN TO TABLE OF CONTENTS

GB3 - Peel Coat Guidelines & Best Practices

Introduction:

This bulletin details proper jobsite storage, removal and clean-up of panels and flashings supplied with protective peel coat film.

Job Site Storage:

Stored panels and flashings should be protected from exposure to moisture, sunlight and precipitation. It is recommended to store panels and flashings indoors for the utmost protection. If outdoor storage is the only means, it is recommended to store panels and flashings elevated under a waterproof tarp and tilted in such a way to not entrap moisture and facilitate drainage. Exposure to UV light and weather elements can result in excessive adhesion to the surface. The film can also degrade to the point it can no longer be peeled off.

Material with peel coat applied should not be stored for longer than 30 (thirty) days.

Removal of Peel Coat:

Protective films should be removed gradually beginning at one end peeling back at a 180°degree angle with a smooth even motion. Do not quickly jerk the protective film. Inspect for any adhesive residue once the peel coat is removed. If residue remains on the surface, follow the below cleaning guidelines.

DO NOT remove peel coat in freezing conditions. The recommended temperature range for film removal is between 40°F (16°C) and 90°F(32°C).

DO NOT remove peel coat if panels are wet. Panels and flashings should be moved indoors and allowed to dry before removing the protective film.

Using sunlight to warm or dry the panels and flashings could result in UV degradation of the peel coat. Heat lamps or dryers can be used to warm up or dry off panels.

Peel coat should be removed from installed panels and flashings within 24 (twenty-four) hours.

Removal of Stubborn Peel Coat & Residue:

There are several options available that may aid in removing stubborn peel coat and/or leftover residue.

- Citrus-based hand cleaners (non-abrasive)
- Goo Gone Pro-Power Adhesive Remover
- PPG DuraPrep® Prep 400 Overspray & Graffiti Remover (For use on Dura Tech™ 5000 paint systems only)
- Water applied with portable steam cleaner

As a general rule the peel coat will be resistant to the absorption of the Goo Gone Pro-Cleaner, Citrus-based cleaner and DuraPrep Prep 400 cleaners.

- Remove as much of the film or residue as possible.
- Panels and flashings must be completely dry before applying cleaners. With the dry substrate out of direct sunlight, saturate the film backing with the selected cleaner. Keep the film saturated with repeated applications until the film swells and softens. The remover needs to wick under the edges of the film which can be aided by gently agitating the film edge with a soft bristle brush.

Once the film has softened, lift and remove with fingernail or by means of scraping with a soft, non-abrasive scraper, being careful not to scratch or damage the panel surface. It is common for only the area of film near the edge to be removed; it may take repeated cycles to remove all the film or residue. For leftover residue, saturating then wiping with a soft cloth may be sufficient.

- When peel coat or residue is completely removed, a general-purpose surface cleaner may be used with a soft cloth to remove any light haze or residue that remains. Please reference **Technical Bulletin #13 "Cleaning Coil Coatings for Approved Painted Surface Cleaners"**.

Continued on next page...

- A portable steam cleaner can also be used to swell and soften the film for easier removal.

Cleaners should always be tested on a small area first. Carefully read and follow the manufacturer's precautions and directions. The information provided in this technical bulletin is for general knowledge only; it is not to be considered an exact method for removal of peel coat or adhesive residue.

Care should be taken to avoid cleaners from contacting siding, windows, doors and vegetation. Follow all local environmental guidelines for proper disposal of cleaning agents.

RETURN TO TABLE OF CONTENTS

GB4 - Fluting Vs. Non-Fluting Steel

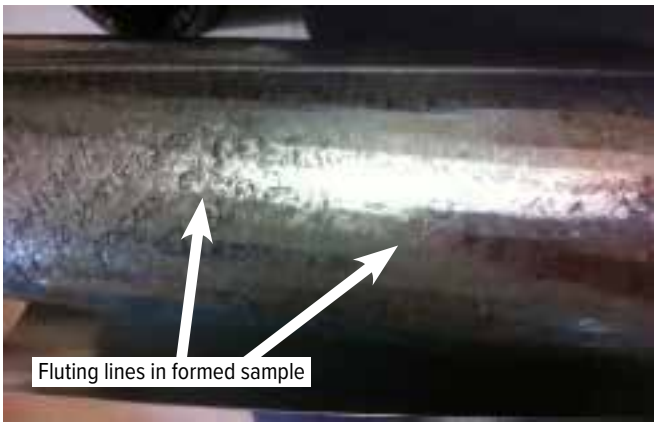
Introduction:

Due to the chemical and physical variability within certain paint systems and slight process equipment changes from one production run to another, there are some products whose appearance may not be the same from order to order. This technical bulletin describes those items Steelscape does not guarantee as reproducible and guidelines for avoiding mixed orders on jobsites.

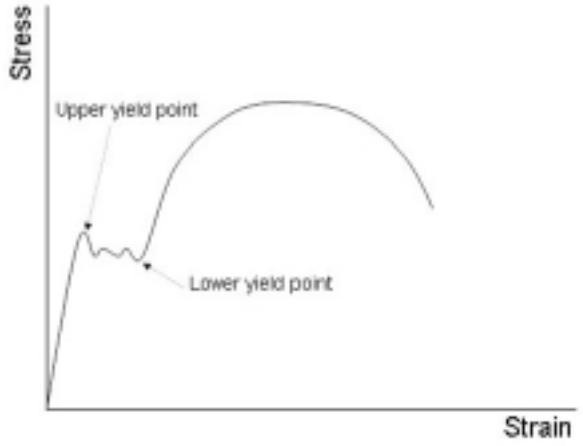
Definition:

Fluting can be defined as follows:

Visible line markings that run perpendicular to the forming direction and sometimes appear on the surface of flat rolled low carbon steel products during forming of cylindrical parts.



Fluting is a naturally occurring characteristic of annealed low-carbon steel and is influenced by the steel chemistry, cold-reduction practices and annealing cycles. It is associated with material that has an upper and lower yield point, or yield point elongation (YPE) and may also be referred to as Luder Lines, stretcher strain, or discontinuous/non-uniform yielding.



Product that does not exhibit these lines when formed is usually called non-fluting and is likely related to tension-leveling and/or temper passing practices after annealing.

Controlling Fluting During Coil Production:

Fluting can be eliminated or minimized depending on steel chemistry and processing equipment capability. Production lines with high load temper rolling or stretcher/tension leveling capabilities can produce a non-fluting material. However, the elimination of fluting is often only temporary, and will re-appear as the steel ages.

Steelscape has the ability to skin pass product on both the TruZinc® and ZINCALUME® lines. If the skin pass mill is used the resulting product will be non-fluting for a period of time. All paint line feed coils are skin passed for surface smoothness, but the paint line process accelerates the aging of the steel and therefore fluting may return. For this reason, Steelscape CANNOT guarantee non-fluting on painted product. The only remedy available at Steelscape is to tension level the painted product after painting. However, like using the skin pass mill, the non-fluting characteristic is temporary.

Continued on next page...

RETURN TO TABLE OF CONTENTS

How to Order Fluting/Non-Fluting Product:

While skin passing of non-painted, bare material is not standard, it can be requested if non-fluting is required. There are several end uses that automatically trigger this process. It is important when non-fluting material is required for bare product that it be included on the purchase order and, where applicable, one of the end uses below be designated:

- HVAC
- Cornerbead—Bullnose
- Cornerbead
- Piping-Spiral
- Piping-Chimney
- Piping-Furnace
- Track-Garage Door
- Flashing-Bird stop (curved)
- Rainwater Goods
- Ductwork-Die stamped

As already mentioned, Steelscape cannot guarantee non-fluting on painted product without the additional tension leveling or extension process, which is only offered on the slitter at the Rancho Cucamonga, CA location. If painted, non-fluting material is required, the requirement MUST be included on the purchase order and reviewed with both the Steelscape Sales Representative and Technical Department. Additional processing charges may be incurred.

Bare product ordered as non-fluting or painted product subsequently tension leveled for non-fluting should be formed into final parts within 90 days of receipt.

RETURN TO TABLE OF CONTENTS

GB5 - Cleaning Coil Coatings

Description:

Coil Coatings present a relatively non-adherent, inert surface to airborne soil. If needed, a variety of methods for removal of surface deposits is available. However, note these precautions:

- **Do not use wire brushes, steel wool, sandpaper, abrasives, or other similar cleaning tools which will mechanically abrade the coating surface.**

- **Some of the cleaning agents listed below should be tested in an inconspicuous area before use on a large scale. Always test a small area first.**

- **Misuse or abuse of any of the cleaning agents or methods described will result in a voiding of the warranty.**

Hot or Cold Detergent Solutions:

A 5% solution in water of commonly used commercial and industrial detergents will not have any deleterious effect on a Coil surface. These solutions should be followed by an adequate rinse of water. Use cloth, sponges, or a soft bristle brush for application. Cleaning should be done on the shaded side of the building or, ideally, on a mild, cloudy day.

Solvents:

Most organic solvents are flammable and/or toxic and must be handled accordingly. Keep away from open flames, sparks, and electric motors. Use adequate ventilation, protective clothing, and goggles. Remove non-water-soluble deposits (tar, grease, oil paint, graffiti, etc.) from Coil surfaces using these solvents with caution:

Alcohols

- Denatured alcohol (ethanol)
- Isopropyl (rubbing) alcohol
- Methanol (wood alcohol)

Petroleum Solvents

- VM&P naphtha
- Mineral spirits
- Turpentine (wood or gum spirits)

Aromatic Solvents

- Xylol (xylene)
- Toluol (toluene)

(These solvents should be used with caution on coil surfaces. Limit contact to five minutes. Test a small area first.)

Ketones, Esters, Lacquer Thinner Methyl ethyl ketone (MEK)

- Methyl isobutyl ketone (MIBK)
- Ethyl acetate (nail polish remover)
- Lacquer thinner

(These solvents should be used with great caution on a Coil surface. Limit contact to one minute. Test a small area first. Panel manufacturer and coating supplier are not responsible for damage from unrestricted use of these.)

- Acetone/Paint Remover

Do not use acetone or paint remover on Coil surfaces.

Chemical Solutions:

- Sodium hypochlorite solution (laundry bleach, Clorox)
- Hydrochloric acid (muriatic acid)
- Oxalic acid
- Acetic acid (vinegar)

Hydrochloric acid (10% muriatic acid), diluted with ten volumes of water, may assist in removing rust or alkali mortar stains from Coil & Extrusion surfaces. Limit contact to five minutes. **Caution**: Acid solutions are corrosive and toxic. Flush all surfaces with water after use. Oxalic acid solutions or acetic acid (vinegar) may be used for the same purpose. Flush with water after use. Laundry bleach may assist in removing certain stains.

Mildew Removal:

Remove mildew with a basic solution of the following:

- 1/3 cup detergent (Tide, for example)
- 2/3 cup trisodium phosphate (Soilex, for example)
- 1 quart sodium hypochloride, 5% solution (Clorox, for example) **Rinse with clear water immediately.*

Excess Sealant Removal:

Precautions should be taken to prevent sealants from getting on painted surface. Sealants may be difficult to remove. If any gets on a Coil surface, remove promptly with a solvent such as alcohol or a naphtha type. Caution: It may be possible for solvents to extract materials from sealants which could stain the painted surface or could prove harmful to sealants; therefore, these possible effects must be considered. Test small area first.

RETURN TO TABLE OF CONTENTS

GB6 - ZINCALUME® VS TruZinc

Description:

Corrosion, also known as oxidization 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:

Key Differences:

The two common types of metallic coating are galvanized and ZINCALUME® (also known as Galvalume®). Galvanized coatings consist of zinc, whereas ZINCALUME consists of both aluminum and zinc.

As a protective element, zinc provides a sacrificial barrier for the steel underneath - this ensures the coating will corrode preferentially to the base steel. Aluminum by comparison, provides an inherent protective barrier which prevents the spread of corrosion. As a result, ZINCALUME combines the benefit of preferential corrosion, while slowing its spread. This provides better overall long-term performance and superior cut edge and edge creep corrosion resistance performance. 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.

Manufacturing Process:

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.

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.

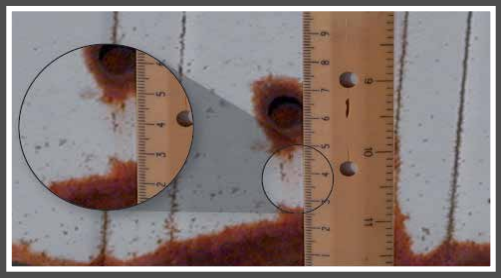
The most common ZINCALUME coating weight is AZ50 (or in some cases AZ55). AZ50 refers to 0.50 ounces of aluminum-zinc coating per square foot. AZ50 forms the most appropriate coating weight for a diverse range of building applications. Due to the difference in the performance between galvanized and ZINCALUME, the numerical terminology does not represent an equivalency (AZ50 is not the same as G50). A thicker coating weight is not required to increase performance like for galvanized.

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.

Case Study 1:
Barrier Protection in Action

Corrosion comparison of a drip edge at 20 years of service life. Both products are painted and located in an acid rain environment in Pennsylvania. Note how the ZINCALUME product has slowed the spread of corrosion.

ZINCALUME

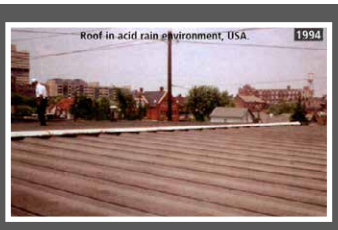


Galvanized

^Reference: ZAC Association , ZINCALUME – Build Once, Roof Once, pg 2

RETURN TO TABLE OF CONTENTS

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	Up to 60 years
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 system (25-50+)	Bare: 60+ years Painted: Dependent on paint system (can be 60+)
Recommended Coating	G90	AZ50
Typical Applications	Steel decking, agricultural, metal buildings, residential roofing, commercial roofing and siding	Residential roofing, metal building, commercial roofing and siding
More Info	galvanizeit.org	galvalume.com



Case Study 2
Service Life

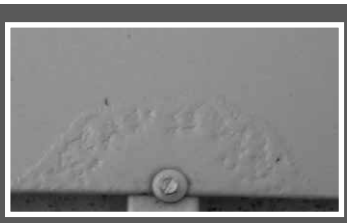
One of the first ZINCALUME applications at 20 & 30 years service life. Application is a low slope, bare, standing seam roof. Corrosion observed is on non-ZINCALUME accessories.

Source: ZAC Association

Recommendations:

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. There are some environments in which ZINCALUME is not suitable including highly alkaline environments, such as those in direct contact with wet cement or when buried in soil, and animal confinement settings.

To avoid premature corrosion, both coatings are not suitable for roof slopes below ¼ : 12 due to the potential for standing water. Designers should also ensure these products are not in direct contact with dissimilar metals in corrosive environments, for example, direct contact with stainless steel or copper in a coastal setting.



Case Study 3
Dissimilar Metals

A stainless-steel fastener installed in a ZINCALUME panel in a coastal home, creating rapid galvanic corrosion. Note how it initially appears as a paint failure, but it is from corrosion underneath.

Source: Steelscape Internal

RETURN TO TABLE OF CONTENTS

RB1 - Overview and Summary Table

Description:

Steelscape is committed to partnering with its customers and providing comprehensive product information to meet end user needs. To help its customers, Steelscape has published this technical bulletin to address regulatory requirements commonly asked by customers and the design community.

It is important to note that if you place an order with Steelscape that needs to meet a specific building requirement, Steelscape must know about the requirement at the time of quote and order entry. Without prior notice of the requirement, Steelscape cannot guarantee the product you receive will meet the regulatory requirement for your project.

For more information or other regulations not addressed in this bulletin, please contact Steelscape's Technical Service Department or your Steelscape Account Manager.

Summary Table of Regulations:

The table below provides a simple overview of the regulations covered in this document. Please refer to the different regulation sections of this document for further detail.

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 specified 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 specified 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 specified 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 documentation library on the Steelscape website.	Prepared for each product type

RETURN TO TABLE OF CONTENTS

RB2 - Buy American Act (BAA)

Introduction:

The Buy American Act (BAA) requires the United States government to prefer U.S.-made products in its purchases. Other pieces of Federal legislation extend similar requirements to third-party purchases that utilize Federal funds, such as highway and transit programs.

In certain government procurements, the requirement purchase may be waived if the domestic product is more expensive than an identical foreign-sourced product by a certain percentage. It may also be waived if the product is not available domestically in sufficient quantity or quality, or if doing so is in the public interest.

Definitions and Differentiation:

The Buy American Act is not to be confused with the similarly named Buy America Act, which came into effect in 1983. The latter, a provision of the Surface Transportation Assistance Act of 1982, applies only to mass-transit-related procurements valued over $100,000 and funded at least in part by federal grants.

Executive Order 13881:

Federal Acquisition Regulation (FAR) rule changes outlined in Executive Order 13881, dated 25 January 2021, require that the domestic content of steel and iron products be 95% of total raw material costs. This reflects a change in the approach to BAA provisions in which the amended focus is on raw materials and where the steel is melted and cast. Under this strict approach, domestic processing and transformation does not change the “foreign” composition of finished steel products.

Steelscape Compliance:

Steelscape’s various metallic-coated and pre-painted products are manufactured in the United States and have historically complied with the act. However, the revisions outlined in Executive Order 13881 require raw material that is melted and cast in the US. Consequently, Steelscape’s standard material does not comply with the Executive Order. Domestically poured material in compliance with the Executive Order can be obtained upon request, subject to additional lead time. The requirement for domestically poured material must be identified at time of order entry.

Customer letters outlining this compliance, commonly used as part of project submission packages, can be obtained upon request by contacting Steelscape at (888) 553-5521 or at productinfo@steelscape.com.

RETURN TO TABLE OF CONTENTS

RB3 - Surface Transportation Assistance Act (STAA), Buy American & Other State Content Regulations

Introduction:

The Surface Transportation Assistance Act (STAA) of 1982 provides a comprehensive transportation funding and policy act of the United States Federal Government. The Surface Transportation Assistance Act covers those federal funds distributed to the states by the Federal Highway Administration and the Federal Transit Administration for highway and mass transit (rail) projects. The Buy American provisions within the STAA are more stringent then the BAA.

Steelscape Compliance:

Standard products do not qualify. Steelscape can provide qualifying material upon request.

Steelscape may be able to purchase domestic hot band to satisfy the STAA requirements if the customer notifies Steelscape at the time of order entry.

State Buy American and Made in the USA Provisions:

Many states have their own Buy American or Made in the USA provisions. These requirements tend to vary significantly depending on the state and/or enforcing party. Steelscape frequently works with customers to assist them to achieve state based regulatory requirements.

State based requirements need to be reviewed on a case-by-case basis in order to determine if Steelscape's standard products qualify or if domestically sourced hot band is required. Please contact Steelscape's Technical Service Department or your Steelscape Account Manager for assistance with state based regulations.

Customer letters outlining compliance, commonly used as part of project submission packages, can be found in the Documentation Library within the Resource Center on the Steelscape website.

RETURN TO TABLE OF CONTENTS

RB4 - American Reinvestment & Recovery Act (ARRA)

Introduction:

American Reinvestment and Recovery Act (ARRA) applies to construction projects that use ARRA funds. ARRA funded projects must use construction materials that are manufactured in the United States. On August 30, 2010, the government issued final guidelines on the interpretation of these guidelines for steel. The guidelines now make clear that construction materials manufactured in the United States predominantly or wholly from foreign steel do not conform to the restrictions imposed by the Buy American requirements under the ARRA. This new ruling was effective October 1, 2010, and applied to solicitations for bids issued and contracts awarded on or after October 1st.

Steelscape Compliance:

Based on this ruling effective October 1st, 2010, Steelscape's standard products do not qualify for ARRA funded projects. This may not apply if the total project cost exceeds $7.8 million.

Steelscape may be able to purchase domestic hot band to satisfy ARRA requirements if the customer notifies us at the time of order entry.

Customer letters outlining compliance, commonly used as part of project submission packages, can be found in the Documentation Library within the Resource Center on the Steelscape website.

RETURN TO TABLE OF CONTENTS

RB5 - Site of Extraction & Manufacture

Introduction:

Building codes and building accreditation criteria often require the identification of the point of extraction and manufacture of the building materials used. Steelscape manufacturers its products in the US, however it sources material through a global supply chain resulting in extraction points across multiple countries outside of the US.

Site of Manufacture:

Steelscape proudly manufactures its products in the US. This includes metallic coating and painting. Steelscape manufactures all galvanized substrate, also known by the trade name TruZinc®, at our Kalama, Washington facility. Steelscape manufactures all Galvalume® substrate, also known by our trade name ZINCALUME®, at our Rancho Cucamonga, California facility. Both facilities have painting capabilities.

Site of Extraction:

The majority of the input materials used in Steelscape's standard products, exceeding 99% by weight, are supplied from foreign sources utilizing global extraction sites. Steelscape manufactures its products from hot band coil, in which the extraction point of the iron ore and other base components vary. Iron ore in Steelscape steel is likely from Australian, Asian, American, and other sources. Although Steelscape can source domestic hot band coil, there are no sources of iron ore extraction within the Western US region or close to Steelscape production facilities. As a result, Steelscape is confident that any material sold, was extracted more than 500 miles from any point of manufacture.

Customer letters outlining points of extraction and manufacture, commonly used as part of project submission packages, can be found in the Documentation Library within the Resource Center on the Steelscape website.

RETURN TO TABLE OF CONTENTS

RB6 - Restriction of Hazardous Substance (RoHS)

Introduction:

RoHS is a European developed directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE). RoHS restricts the usage of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers. An updated version of this directive, RoHS 2, was released in 2011. Compared to RoHS 1, the RoHS 2 directive not only expands the scope of products covered, but also imposed new obligations on EEE manufacturers to prepare EU declaration of conformity and affix CE markings on finished products.

The RoHS directive applies to a range of equipment including, IT telecommunications, consumer, lighting (including light bulbs) and electronic equipment. It also includes toys, leisure, and sports equipment, medical devices, monitoring and control instruments, automatic dispensers and semiconductor devices.

Compliance is the responsibility of the company that puts the product on the market, as defined in the Directive, components and sub-assemblies are not responsible for product compliance. RoHS applies to products sold in the EU whether made within the EU or imported (including the US).

Steelscape Compliance:

Steelscape certifies compliance with RoHS Directive 2002/95/EC of January 27, 2003, 2005/618/EC of August 18, 2005, and RoHS2 amending directive of January 3, 2013 that its TruZinc® and ZINCALUME® coated steel coils, when supplied as dry, no chemical treatment/passivation, do not contain the below listed materials or substances in excess of the allowed thresholds.

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.

Material/Substance	Threshold Level*	Yes	No	Notes, Exceptions, etc.
Cadmium (Cd)	0.01%		√	
Hexavalent Chromium (Cr+6)	0.1%		√	
Lead (Pb)	0.1%		√	Exceptions: 1) Lead in glass of electronic components. 2) Lead in high melting temperature type solders (i.e. lead based solder alloys containing 85% by weight or more lead) 3) Lead in electronic ceramic parts.
Mercury (Hg)	0.1%		√	
Polybrominated Biphenyls (PBBs)	0.1%		√	
Polybrominated Diphenylethers (PBDEs)	0.1%		√	

*Threshold Level, maximum concentration by weight in homogenous materials

Products requiring no chemical treatment or passivation must be specified at the time of order entry. Please note that standard PLUS resins are not RoHS compliant. RoHS compliant resins are available by special order and must be specified at order entry.

Customer letters outlining compliance, commonly used as part of project submission packages, can be found in the Documentation Library within the Resource Center on the Steelscape website.

RETURN TO TABLE OF CONTENTS

RB7 - ASTM International Standards

Introduction:

ASTM is a not-for-profit organization which provides a forum for producers, users, consumers, and interest groups (representatives of government and academia) to meet on common ground and write standards for materials, products, systems and services.

ASTM standards are developed and used voluntarily. Standards become legally binding only when a government body references them in regulations, or when they are cited in a contract. Any item that is produced and marked as conforming to an ASTM standard must meet all applicable requirements of that standard.

ASTM standards are used comprehensively by individuals, companies and agencies. Purchasers and sellers incorporate standards into contracts and architects and designers use them in plans. Government agencies commonly refer to these standards in building codes, regulations and laws; and many other groups refer to these standards for guidance.

Steelscape Compliance:

Steelscape products are manufactured in accordance with the two relevant codes for metallic coating. The most recent versions of the respective ASTM standards include:

- For ZINCALUME® products, ASTM Standards A792
- For TruZinc® products, ASTM standard A653

Both of the above listed ASTM standards reference ASTM A924 and ASTM A568, which represent general requirements for steel production and cold rolled substrate requirements.

Customer letters outlining compliance, commonly used as part of project submission packages, can be found in the Documentation Library within the Resource Center on the Steelscape website.

RETURN TO TABLE OF CONTENTS

RB8 - Safety Data Sheets (SDS)

Introduction:

A Safety Data Sheet (SDS) is an important component of product stewardship and workplace safety. It is intended to provide workers and emergency personnel with procedures for handling or working with the specified substance in a safe manner, and includes information such as physical data (melting point, boiling point, flash point, etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill-handling procedures.

SDSs may include instructions for the safe use and potential hazards associated with a particular material or product. An SDS is not primarily intended for use by the general consumer, focusing instead on the hazards of working with the material in an occupational setting. It is important to use an SDS specific to the product supplier, as the hazards of a product may vary between manufacturers.

Using an SDS:

Steelscape customers often require SDSs for their own use or as part of project submission requirements and Steelscape openly provides SDSs to meet these needs. However, it should be noted that for many green building programs, such as LEED or Living Building Challenge, the submission of an SDS alone does not provide sufficient information to meet these programs requirements. Steelscape has other reporting documentation specific to these programs. Please refer to the separate Suitability Technical Bulletin for further information on how Steelscape can provide the appropriate reporting documentation to meet green building requirements.

Steelscape Compliance:

Steelscape has a range of SDSs that can be downloaded from the Documentation Library within the Resource Center on the Steelscape website. These include:

- TruZinc® Steel
- TruZinc® PLUS Steel
- ZINCALUME® Steel
- ZINCALUME PLUS Steel
- Pre-Painted TruZinc®
- Pre-Painted ZINCALUME
- Painted Aluminum
- Vintage®
- Rezibond®
- Eternal Collection™
- TruzGuard™

Steelscape has a separate SDS for each product. If you cannot find the product specific SDS that you are looking for, please contact Steelscape's Technical Service Department or your Steelscape Account Manager for assistance.

steelscape®

For more product information or samples:

888-553-5521

steelscape.com

productinfo@steelscape.com