Introduction of Coated Steel for Roofing / Wall Cladding Application

Jack Chum, Technical Marketing Manager – NS BlueScope Malaysia S/B

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20th May 2017

PAM Northern Chapter

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Corporate Information

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NS BlueScope Malaysia

Introduction

- Formerly known as BlueScope Steel Malaysia Sdn. Bhd.*
- Began coil coating operation since 1996 with Coil Painting Line (CPL) and followed by Metal Coating Line (MCL) in 1997 to supply coated steel for domestic market.





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* Part of NS BlueScope Coated Products since 28th March 2013, a 50-50 joint venture between BlueScope Steel Limited (BSL) 's building products in ASEAN and U.S. with Nippon Steel and Sumitomo Metal Corp (NSSMC)

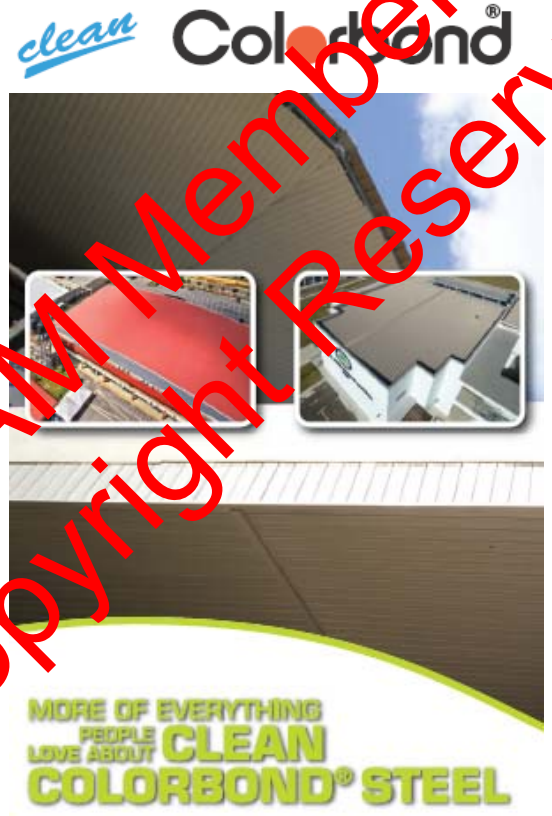
NS BlueScope Malaysia

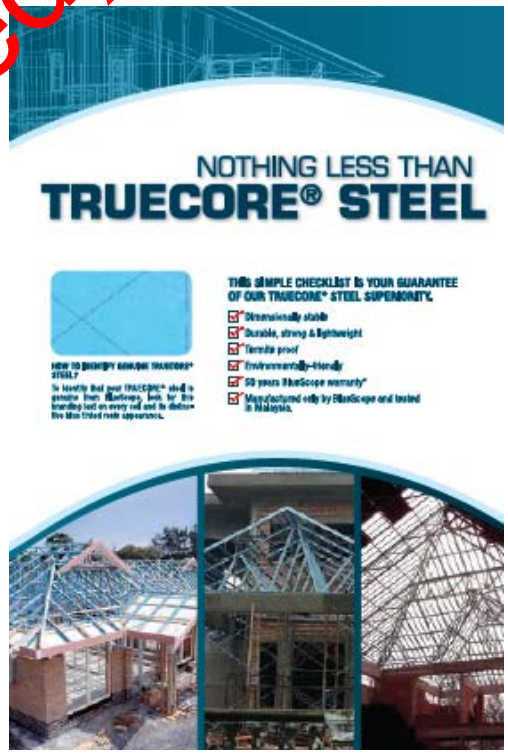
Corporate Product Brands

- The **only** local **manufacturer** of both ZINCALUME® and TRUECORE® aluminium / zinc alloy coated steel and **Clean** COLORBOND® pre-painted steel.



Zincalume®





TrueCore®

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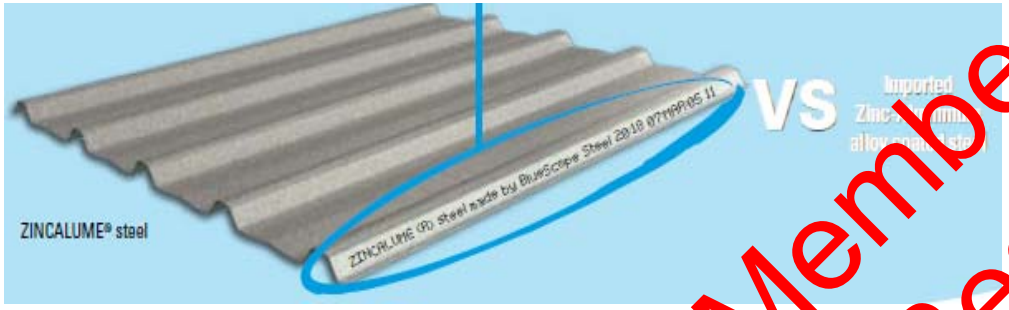
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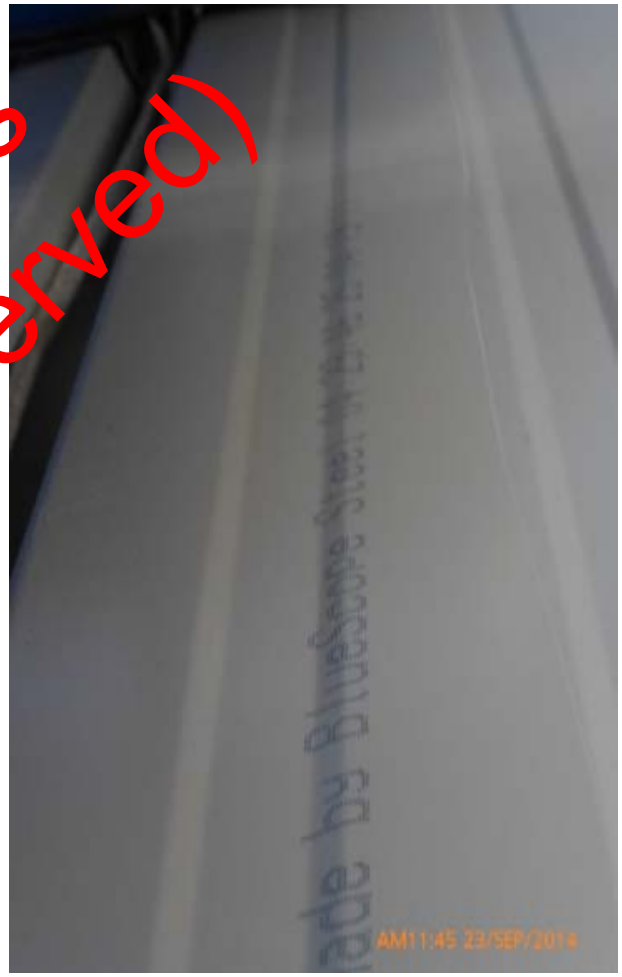
Product Identification and Traceability

For product identification and originality, please check the reverse side of the coil for the following branding text.

ZINCALUME (R) steel made by BlueScope 20:18 07:APR:13 11







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NS BlueScope Malaysia

Certification

- Accredited with ISO 9001 (Quality Management System) and ISO 14001 (Environmental Management System) since 2002.
- Products are certified to AS 1397 & MS 1196 (metallic coated steel); AS/NZS 2728 & MS 2383 (prepainted steel).
- Products are recognized for its green attributes by SIRIM Eco-Label, SGBP certification, listed in Green Pages Malaysia (GPM) for GBI credit guide, as well as MyHijau.
- Products comply to Act 520, certified by CIDB PPS.

SIRIM
CERTIFIED TO AS1397
Certication No: PB030301

SIRIM
CERTIFIED TO AS2728
Certication No: PB030302

SIRIM
ECO-LABEL











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BlueScope's Product Innovation and Technology (PIT)

Introduction

- Our research and development is supported by BlueScope's Product Innovation and Technology (PIT), a dedicated research team based in Port Kembla, Australia.







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- Over the past 50 years, PIT has made significant achievements in the adoption and refinement of technology in producing coated steel and the continuing improvement of coated steel's performance.



Introduction of Coated Steel

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Upstream Process

Steel Making / Hot Rolling / Cold Rolling



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1 Iron Making (Blast Furnace) → 2 Steel Making & Casting → 3 Hot Rolling (HRC) → 4 Cold Rolling (CRC)

Midstream Process

Continuous Hot Dip-Galvanizing / Coil Painting

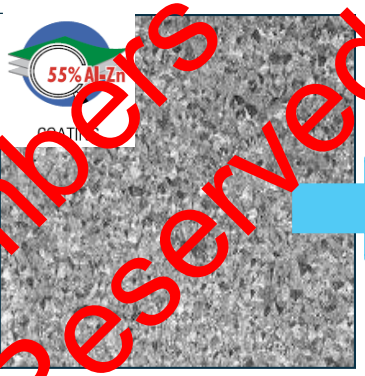
- Coated steel is a flat steel strip which went through a continuous coating process.



1. Cold Rolled Coils (CRC)



2. Continuous Hot Dip-Galvanizing





3. Metallic Coated Steel

If required pre-finished (paint)



4. Continuous Coil Painting



5. Pre-painted Steel

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Downstream Process

Roll Forming

- These coils will be delivered to roll-formers to **roll-formed** into various profiles (roofing / walling sheets) before supplied to project site:

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5. Pre-painted Steel



6. Roll-forming Process (Roof / Walling Profiles)





7. Roll-formed profiles supplied into Project

Introduction of Coated Steel

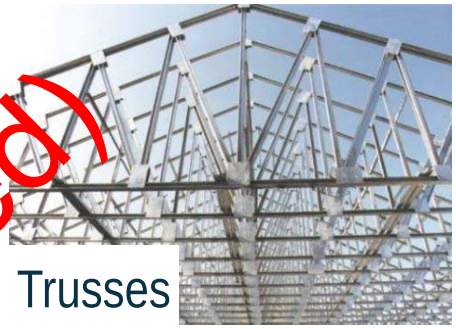
Product Application



Roofing



Walling



Trusses



Louvers



Rain Water Goods



Ceiling

Door Frame





Sandwich Panel



Shutter Doors

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Introduction of Coated Steel

Thickness



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BlueScope defined the finished coated thickness in pre-painted product as After Painted Thickness (APT) i.e. Base Metal Thickness (BMT) plus Metallic Coating Thickness and Nominal Paint Coating Thickness. Following is an example of 0.42mm and 0.48mm BMT Clean COLORBOND® steel:

	0.42mm BMT Clean COLORBOND® AZ150 steel	0.48mm BMT Clean COLORBOND® AZ150 steel
Base Metal Thickness, BMT (mm)	**0.42mm**	**0.48mm**
Metallic Coating Thickness , AS1397 (mm) – AZ150	0.05mm	0.05mm
Total Coating Thickness (TCT), AS1397 (mm)	**0.47mm**	**0.53mm**
Nominal DFT, AS/NZS 2728 (mm)	0.035mm	0.035mm
After Painted Thickness (APT), mm	**0.50mm***	**0.56mm***

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**Others manufacturer defined TCT as the finished coated thickness for pre-painted product but this is only applicable for metallic coated product (e.g. AS1397). There is no such terminology in pre-painted product (e.g. AS/NZS 2728).*

TABLE C2

COATING MASS (TOTAL BOTH SIDES, see Note 1), APPROXIMATE COATING THICKNESS (TOTAL BOTH SIDES, see Note 2) and MINIMUM COATING THICKNESS (ONE SIDE, see Note 3)

Coating type designation	Coating mass sum of both sides* g/m^2	Approximate coating thickness sum of both sides mm †	Minimum coating thickness, µm, on one surface ‡
Z100	130	0.02	6
Z200	220	0.03	11
Z275	290	0.04	15
Z350	370	0.05	20
Z450	470	0.07	25
Z600	650 ≤ 2.0 mm thick 680 >2.0 mm thick	0.09 0.10	34
AZ150	170	0.05	16
AZ200	220	0.06	22

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Introduction of Coated Steel

Thickness





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ZINCALUME® AZ150
0.42mm BMT + 0.05mm Alloy Thk.
= 0.47mm TCT

ZINCALUME® AZ150
0.48mm BMT + 0.05mm Alloy Thk.
= 0.53mm TCT

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Introduction of Coated Steel

Thickness

Q: Which give you the coated steel strength, BMT or TCT?



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- Avoid using Total Coating Thickness (TCT)
- It is important to specify thickness with Base Metal Thickness (BMT) since the roll-formed profile's strength is calculated using BMT.
- According to AS 1445 (corrugated profile) the minimum BMT of G550 steel grade for roofing sheet is 0.42mm BMT. The wall cladding is 0.35mm min.

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Coated Steel for Roofing / Wall Cladding

Coated Steel Used For Roofing / Wall Cladding

Type of Coated Steel



Metallic Coated Steel
(Bare Finished)

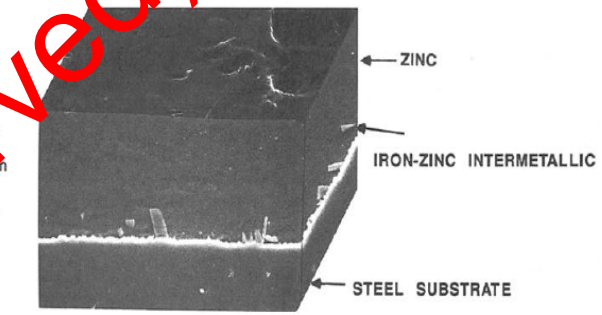


Coloured Steel
(Painted Finished)

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Metallic Coated Steel

Introduction

Metallic Coated Steel	AZ-Type (e.g. ZINCALUME®)	Z-Type (Galvanized)
Coating Composition	55% Aluminium, 43.5% Zinc, 1.5% Silicon 	~99.8% Zinc 
Appearance	Fine and consistent spangle size 	Large spangle size 
Standard	AS 1397; MS 1196	AS1397; MS 2384
Typical Coating Class	AZ150	Z120, Z150, Z180, Z220, Z275

Source: BlueScope Literatures and ASM Handbook, Volume 5: Surface Engineering – Continuous Hot Dip Coatings

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Outdoor Exposure Test Sites

Measuring Actual Product Performance (Corrosion Resistance)



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- Located less than 50m from breaking surf.
- Classified as an ISO 9223 C4 site.

Corrosion Performance

After 5 Years Exposure at Severe Marine (Bellambi Point, AS/NZS1580 457.1)



ZINCALUME® AZ150 – 150g/m^2



Galvanized Z275 – 275g/m^2



Galvanized Z180 – 180g/m^2

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Source: InterZAC08, Corrosion Performance of Low Coating Mass 55%Al-Zn Coated Steel in Australia and South East Asia

Corrosion Performance

After 12 Years Exposure at Severe Marine (Bellambi Point, AS/NZS1580 457.1)



ZINCALUME® Steel
(AZ150 – 150g/m^2)



Galvanized Steel
(Z275 – 275g/m^2)

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Source: BlueScope Literature

Metallic Coated Steel

Corrosion Protection

AZ-Type (e.g. ZINCALUME®)	Z-Type (Galvanized)
Sacrificial & Barrier Protection	Sacrificial Protection
	
Microscopic view of AZ-Type after weathering	Microscopic view of Z-Type after weathering
• Has superior barrier protection (**insoluble aluminium oxide layer**) with the aluminium-rich phases slowing corrosion. • The rust should stop when it comes in contact with aluminium alloy.	• Has better sacrificial protection in the early stages. • But **once the zinc is gone**, corrosion of the steel substrate proceeds i.e. **continue to corrode the entire sheet**

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Metallic Coated Steel

Corrosion Protection

Table 8 Lifetimes of hot dip zinc and zinc-alloy coatings

Environment	Years to first rust			
	Zn	Zn-1Al	Zn-7Al	Zn-55Al
Severe marine				
25 m from ocean, Kure Beach, NC	4	9	9	15
Moderate marine				
250 m from ocean, Kure Beach, NC	16	15	14	>25
Rural				
Saylorsburg, PA	14	14	14	>25
Industrial				
Bethlehem, PA	10	10	9	>25

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Source: ASM Handbook, Volume 5: Surface Engineering

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Metallic Coated Steel

Corrosion Protection – Cut Edges

- AZ-Type alloy coated sheet shown superior cut edge protection than galvanized sheet for narrow thickness (less than 1.5mm BMT)



Z-Type

ZA-Type

AZ-Type

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Source: ZAC Association

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Metallic Coated Steel

Case Studies #1







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After 10 years (severe marine environment)

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Metallic Coated Steel

Case Studies #2





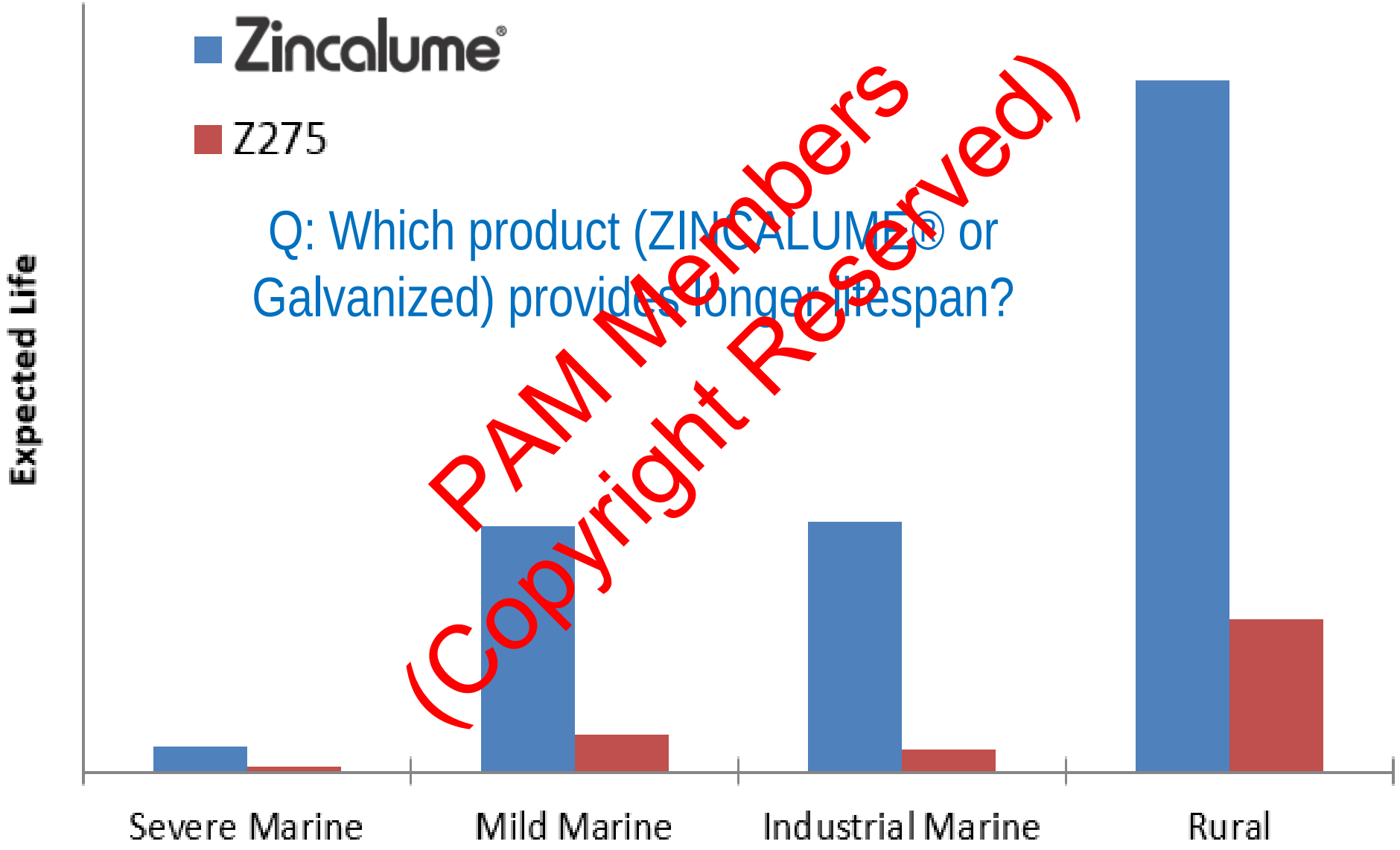
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No sign of corrosion or cut edges corrosion

After 30 years (light industrial environment)

Metallic Coated Steel

Expected Lifespan



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What's should be specified in Bill of Quantity (BQ)?

Metallic Coated Steel

- Specify product which has better corrosion resistance e.g. ZINCALUME® steel instead of galvanized steel.



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Zincalume®

Galvanized Steel
(Z275)

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Prepainted Steel

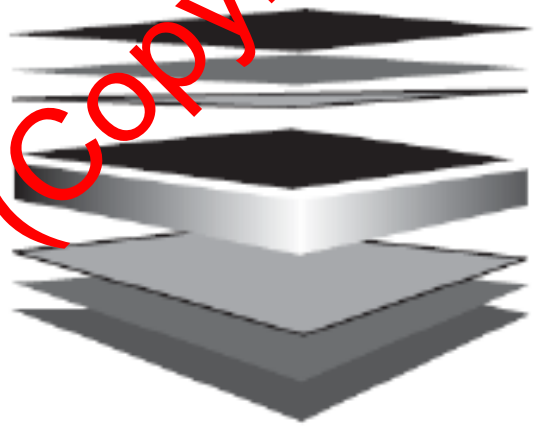
PRODUCT INFORMATION

clean Colorbond®

PREFERRED SUBSTRATE	ZINCALUME® G550S AZ150 steel (Aluminium/Zinc alloy-coated steel)
	ZINCALUME® G300S AZ150 steel (Aluminium/Zinc alloy-coated steel) (Refer Note 8)
PRETREATMENT	Corrosion resistant proprietary conversion coating
PRIMER COAT	Universal corrosion inhibitive primer. Nominal dry film thickness 5µm each side
FINISH COAT	Custom formulated super polyester paint system with high performance pigments. Nominal dry film thickness 20µm on the top or weather side. The finish coat can, if required, be applied to both sides to provide a double-sided product
BACKING COAT	Custom formulated Shadow Grey. Nominal dry film thickness 5µm
COLOUR	A range of standard colours is available. Other specifically required colours may be available on request.

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Finish Coat (Nominal 20µm) (Refer Note 4 & 5))
Universal Corrosion Inhibitive Primer (Nominal 5µm)
Conversion Coating

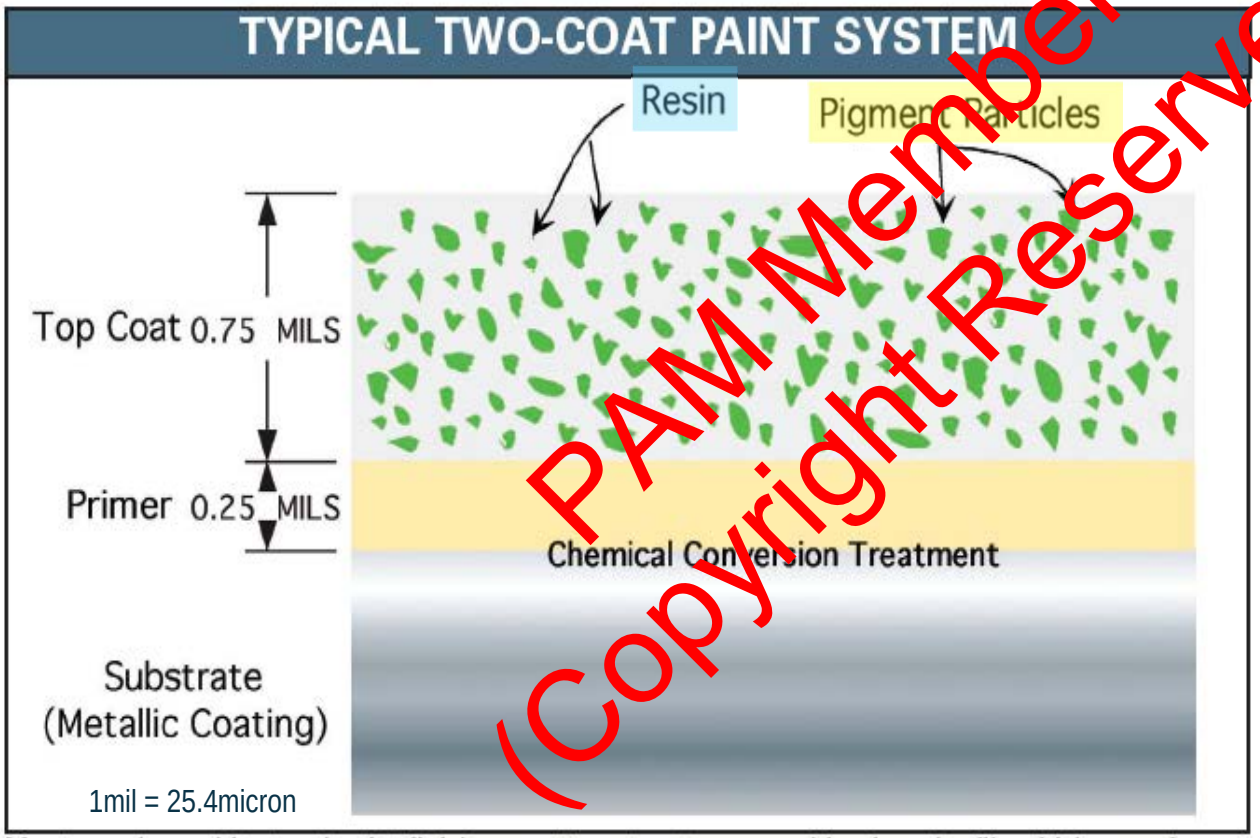
ZINCALUME® AZ150 Steel Substrate

Conversion Coating
Universal Corrosion Inhibitive Primer (Nominal 5µm)
Backing Coat (Shadow Grey, Nominal 5µm) (Refer Note 6)

Prepainted Steel

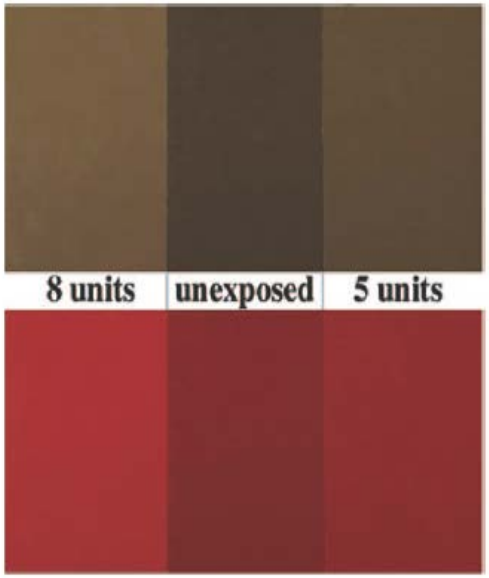
Introduction

- Resin : Forms most of the paint and holds (binds) additives and pigments
- Pigments : Can provide the colour, opacity to UV light, corrosion resistance etc.



Most popular architectural paint finishes are 2-coat systems, resulting in a dry film thickness of about 1.0 mil. *Courtesy of Metal Roof Advisory Group, Ltd.*

Fade is the loss of color calculated in Hunter ΔE units in accordance with ASTM D2244-02 procedures. One ΔE unit denotes the smallest degree of color change visible to the naked eye.



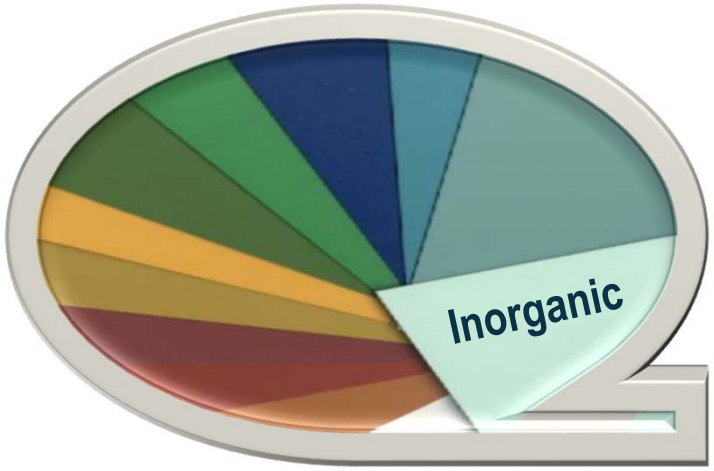
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Paint Formulation

Pigment







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Inorganic

- Synthetic or naturally occurring
- Dull colour range
- Good chemical resistance
- Excellent long term durability (UV resistance)
- The cost is higher than organic colorants
- Used in Clean COLORBOND® steel

Organic

- Synthetic
- Good colour range (bright colour)
- Show poorer durability (limited UV & heat resistance)
- Lower cost
- Not used in Clean COLORBOND® steel unless otherwise required to meet required colour shade.

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Paint Formulation

Pigment





Before Exposure

After Exposure

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After 5 years at Allunga, Australia

Paint Formulation

Resin

- Product attributes of different resin (paint system) used for pre-painted product:

Properties	Standard Polyester	SMP	Super Polyester (Clear COLORBOND®)	PVDF
Flexibility	Good	Fair	Good	Best
Resistance to chalking	Good	Good	Very Good	Best
Colour retention	Good	Very Good	Very Good	Best
Gloss retention	Good	Good	Very Good	Best
Dirt Resistance	Poor	Fair	Best	Best
Cut Edge Corrosion (ZINCALUME® substrate)	Best	Best	Best	Good

SMP: Silicone-modified polyester

PVDF: Fluorocarbon or Polyvinylidene Difluoride

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Paint Formulation

Polyester resin

- Product using Super Polyester paint showed better colour durability compare to standard product.

BlueScope, Kapar (Open Rack) ~ 10 years



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Paint Formulation

PVDF resin

- Typical paint system used for pre-painted product:

Properties	Standard Polyester	SMP	Super Polyester (Clear COLORBOND®)	PVDF
Flexibility	Good	Fair	Good	Best
Resistance to chalking	Good	Good	Very Good	Best
Colour retention	Good	Very Good	Very Good	Best
Gloss retention	Good	Good	Very Good	Best
Dirt Resistance	Poor	Fair	Best	Best
Cut Edge Corrosion (ZINCALUME® substrate)	Best	Best	Best	Good

SMP: Silicone-modified polyester

PVDF: Fluorocarbon or Polyvinylidene Difluoride

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Paint Formulation

PVDF resin

- Only 70/30 Polyvinylidene Difluoride (PVDF) / Acrylic blends* paint system provides supreme colour durability.

Proportion of pure PVDF phase in PVDF/acrylic blends, as a function of PVDF/acrylic weight ratio



Data from Ando et al, J. Polymer Sci. Part B, 32, 179-185, 199

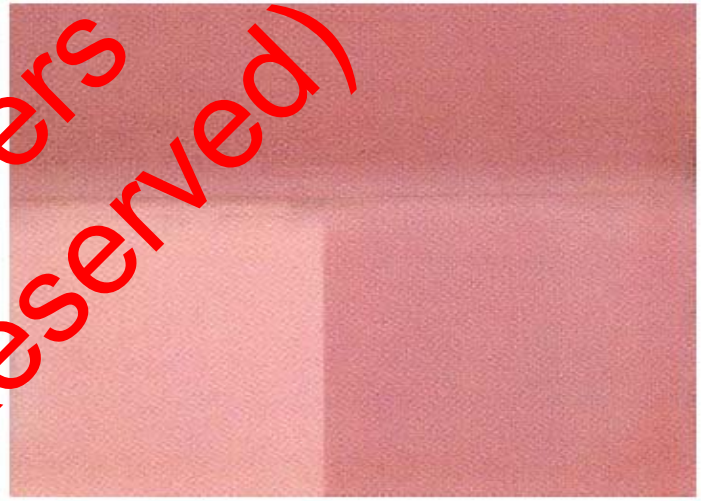


Figure 2: Red paint with no exposure (top) and full exposure (bottom), faded with chalk (bottom, left), faded with chalk washed off (bottom, right).

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PVDF:acrylic ratio	Original 60° gloss	60° Gloss after 20 years exposure	Percent gloss retention	Color change (delta E*)
90:10	42	23	55	5.5
70:30	50	26	53	4.0
50:50	65	23	35	5.2
0:100	81	<10	<10	8.0

*Source: Kurt Wood, Akira Tanaka, Min Zheng and Dana Garcia; 70%PVDF Coatings

Paint Formulation

PVDF resin

Severe UV Environment after 10 years at Rockhampton (AS/NZS1580 457.1)



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clean Colorbond® XPD

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Paint Formulation

Cut Edge Corrosion Resistance

- Typical paint system used for pre-painted product:

Properties	Standard Polyester	SMP	Super Polyester (Clear COLORBOND®)	PVDF
Flexibility	Good	Fair	Good	Best
Resistance to chalking	Good	Good	Very Good	Best
Colour retention	Good	Very Good	Very Good	Best
Gloss retention	Good	Good	Very Good	Best
Dirt Resistance	Poor	Fair	Best	Best
Cut Edge Corrosion (ZINCALUME® substrate)	Best	Best	Best	Good

SMP: Silicone-modified polyester

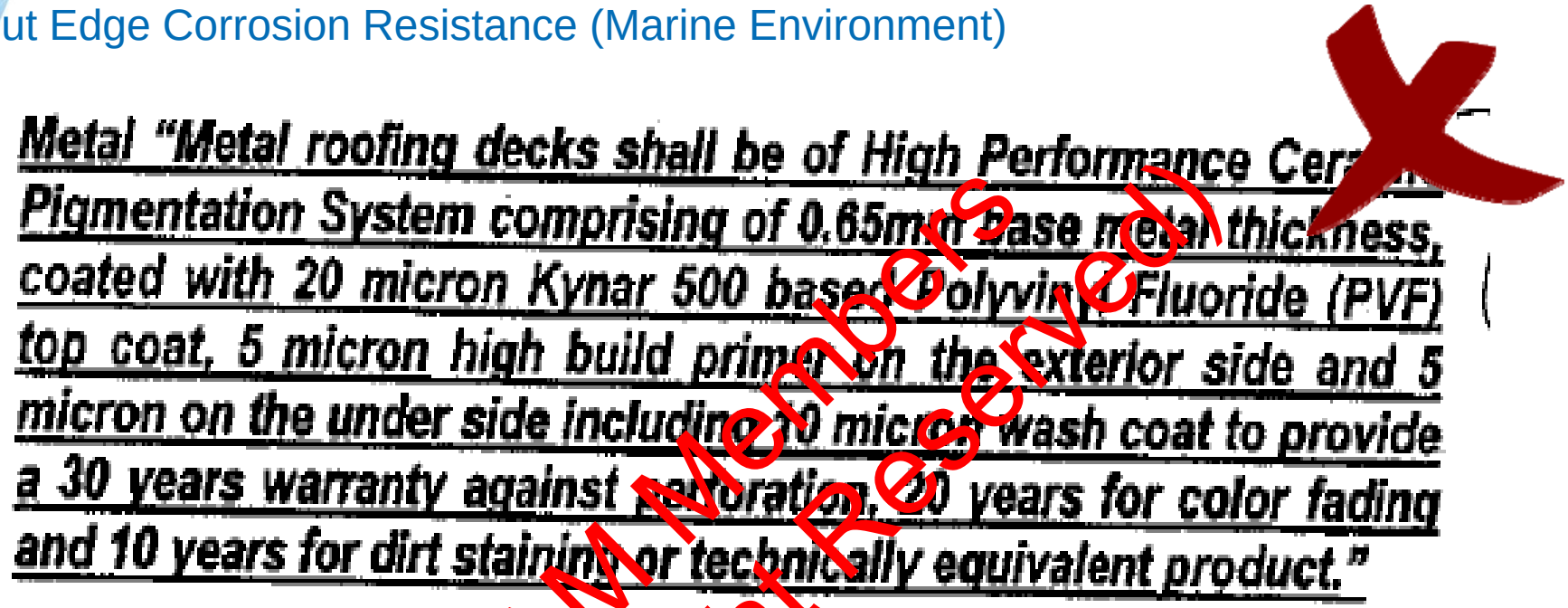
PVDF: Fluorocarbon or Polyvinylidene Difluoride

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Paint Formulation

Cut Edge Corrosion Resistance (Marine Environment)



Metal "Metal roofing decks shall be of High Performance Cer
Pigmentation System comprising of 0.65mm base metal thickness,
coated with 20 micron Kynar 500 based Polyvinyl Fluoride (PVF)
top coat, 5 micron high build prime on the exterior side and 5
micron on the under side including 10 micron wash coat to provide
a 30 years warranty against perforation, 20 years for color fading
and 10 years for dirt staining or technically equivalent product."

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- Using PVDF finish with metallic coated steel substrate (AZ-type or Z-type) will have high risk of undercutting corrosion due to impermeable characteristic of PVDF.
- We don't recommend using such coated steel if located less than 1km from marine environment or 2km from heavy industrial environment.

Paint Formulation

Cut Edge Corrosion Resistance (Marine Environment)

2.5 years old - severe marine (AZ150 + PVDF)

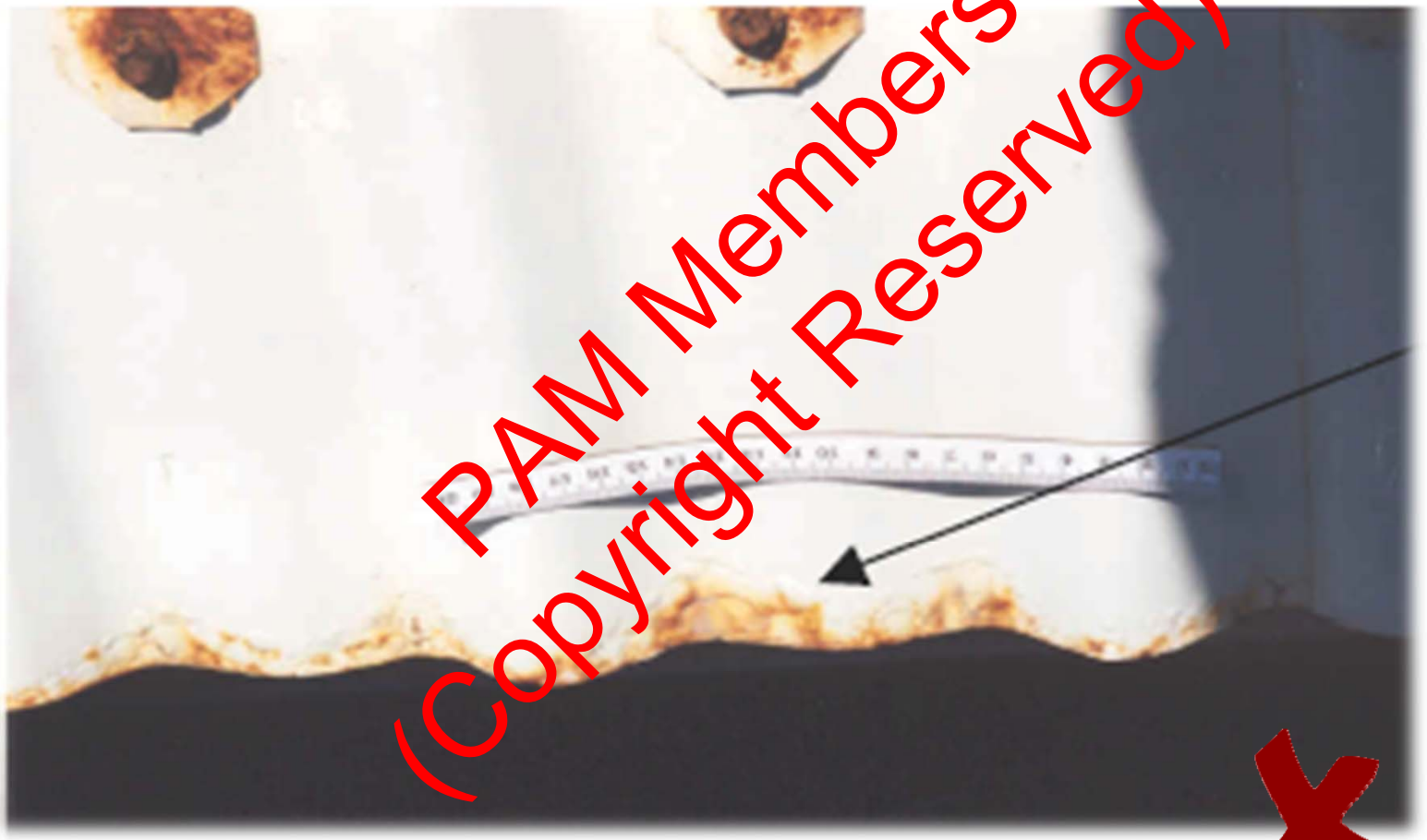


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Paint Formulation

Cut Edge Corrosion Resistance (Marine Environment)

4 years old – severe marine (Z275 + PVDF)



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Paint Formulation

Cut Edge Corrosion Resistance (Marine Environment)

- We are recommending pre-painted coated steel using polyester (e.g. Clean COLORBOND® ULTRA) instead PVDF finish for marine environment because polyester paint has better edge corrosion performance.



Labuan Jetty in Clean COLORBOND® ULTRA steel

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Prepainted Steel

Case Studies #1



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Labuan Jetty in Clean COLORBOND® ULTRA steel (After 10 years)

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Prepainted Steel

Case Studies #1



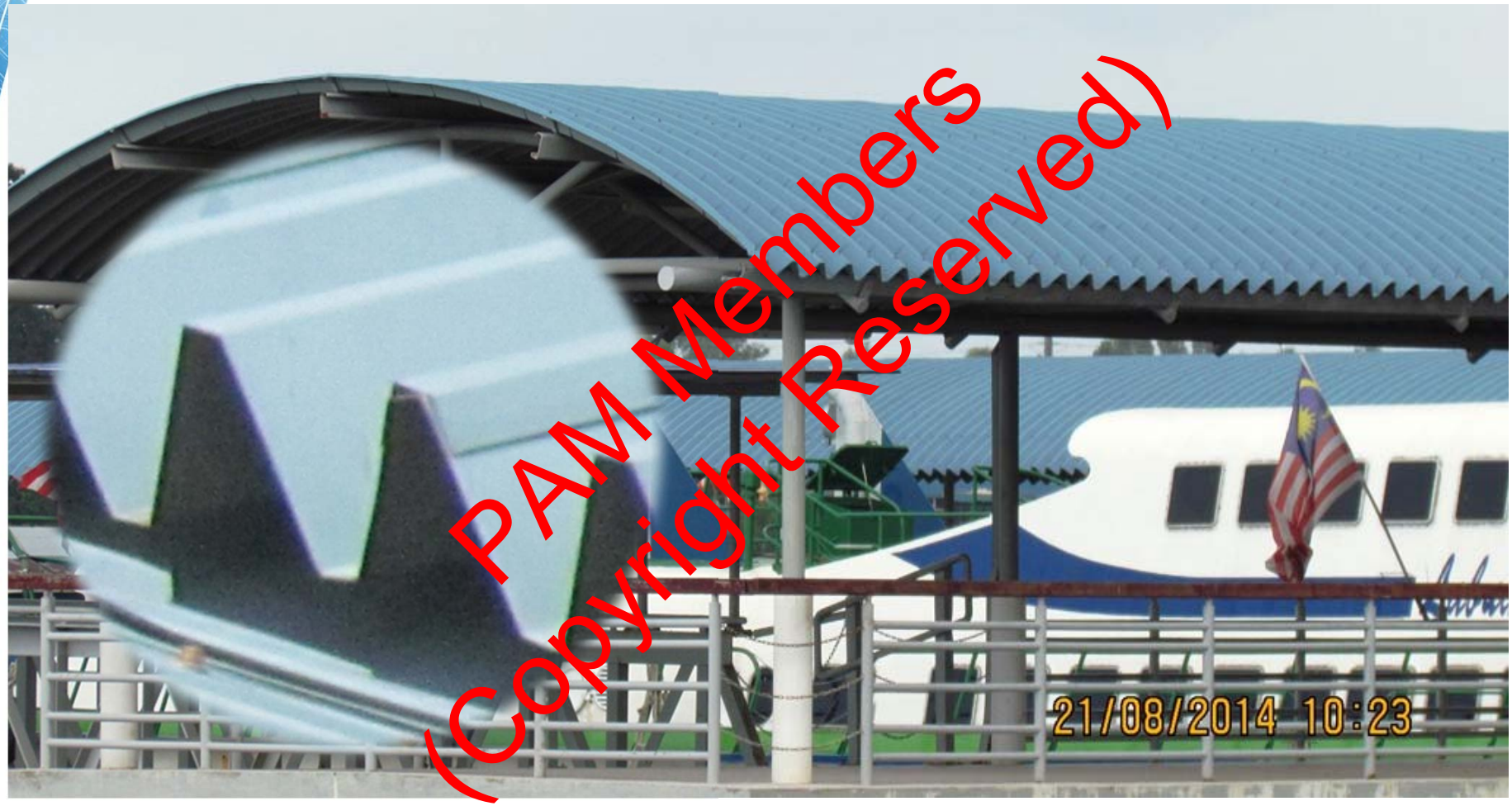
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Labuan Jetty in Clean COLORBOND® ULTRA steel (After 10 years)

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Prepainted Steel

Case Studies #1



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Labuan Jetty in Clean COLORBOND® ULTRA steel (After 10 years)

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Case Studies #2



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Prepainted Steel

Case Studies #2

Damai Beach Resort , Kuching (After 29 years)



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Paint Formulation

Dirt Resistance

- Typical paint system used for pre-painted product:

Properties	Standard Polyester	SMP	Super Polyester (Clear COLORBOND®)	PVDF
Flexibility	Good	Fair	Good	Best
Resistance to chalking	Good	Good	Very Good	Best
Colour retention	Good	Very Good	Very Good	Best
Gloss retention	Good	Good	Very Good	Best
Dirt Resistance	Poor	Fair	Best	Best
Cut Edge Corrosion (ZINCALUME® substrate)	Best	Best	Best	Good

SMP: Silicone-modified polyester

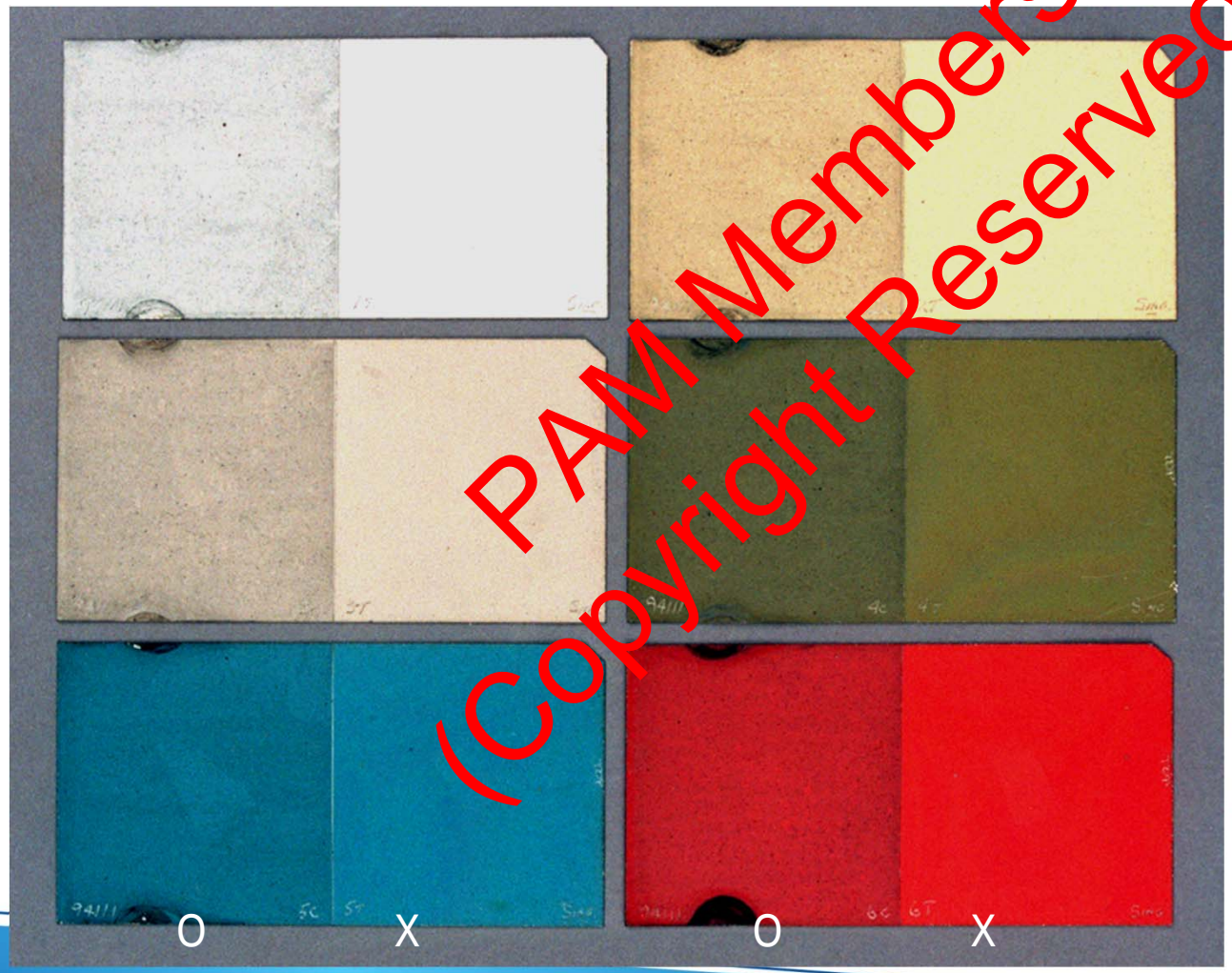
PVDF: Fluorocarbon or Polyvinylidene Difluoride

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Paint Formulation

Clean Technology

- Product using Clean Technology showed better dirt staining resistance compare to standard product.



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Dirt Staining Test
(S'pore) ~ 51 months

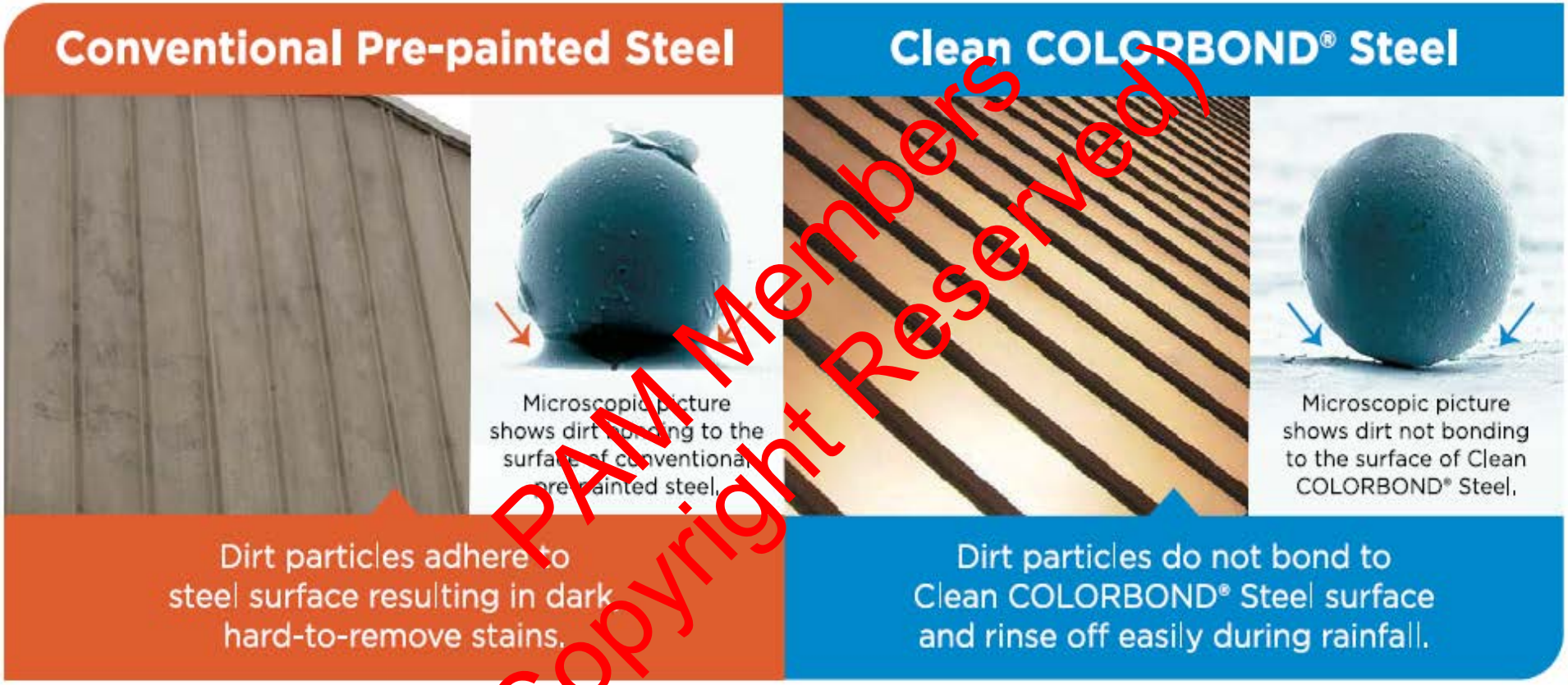
clean Colorbond®

X – Clean COLORBOND®
O – Without Clean Technology

BLUESCOPE

Paint Formulation

Clean Technology



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Prepainted Steel

Case Studies:

- Product claims to offer dirt staining resistance but fail to perform!

Competitor



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Source: BlueScope Report (Ref: CPA 424)

After 11 months at Singapore (Dirt Staining Test Site)

Prepainted Steel

Case Studies:

- Product claims to offer dirt staining resistance but fail to perform!

Competitor



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Source: BlueScope Report (Ref: CPA 425)

After 11 months at Singapore (Dirt Staining Test Site)



Green Building Index (GBI)

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Green Building Index (GBI)

Applicable GBI credits

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THE GREEN BUILDING PRODUCTS & SERVICES DIRECTORY

The Malaysia Green Building Confederation (MGBC) proudly presents GreenPagesMalaysia, the first and most trusted green building products and services directory for Malaysia's building industry.



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APPLICABLE GBI CREDITS	
NRNC	MR2, SM12*
RNC	MR2
INC	MR2, SM14*
NREB	MR2, SM6*
IEB	MR2, SM6*
INTERIORS	MR2

*Applicable for selected colours only.

- MR2: Recycled Content Materials
- SM6 / SM12 / SM14: Greenery & Roof*

BLUESCOPE

Green Building Index (GBI)

MR – Materials And Resources

MR
MATERIALS AND RESOURCES



PART 1 | NON-RESIDENTIAL | MATERIALS AND RESOURCES (MR)

MR1	MATERIALS REUSE AND SELECTION	2 POINTS
MR2	RECYCLED CONTENT MATERIALS	2 POINTS
MR3	REGIONAL MATERIALS	1 POINT
MR4	SUSTAINABLE TIMBER	1 POINT
MR5	STORAGE & COLLECTION OF RECYCLABLES	1 POINT
MR6	CONSTRUCTION WASTE MANAGEMENT	2 POINTS
MR7	REFRIGERANTS & CLEAN AGENTS	2 POINTS

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Green Building Index (GBI)

MR2 – Recycled Content Materials

INTENT

To encourage designers to specify the usage of recycled content materials in new buildings.

DESCRIPTION

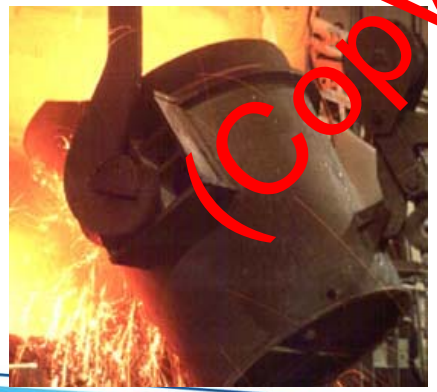
Increase demand for building products that incorporate recycled content materials in their production (Recycled content shall be defined in accordance with the ISO 14021 document).

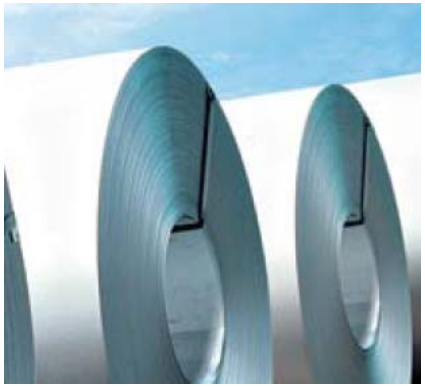
REQUIREMENTS

1 point: Where use of materials with recycled content is such that the sum of post-consumer recycled plus one-half of the pre-consumer content constitutes > 10% (based on cost) of the total value of the materials in the project, ***OR***

2 points: Where use of materials with recycled content is such that the sum of post-consumer recycled plus one-half of the pre-consumer content constitutes > 30% (based on cost) of the total value of the materials in the project.

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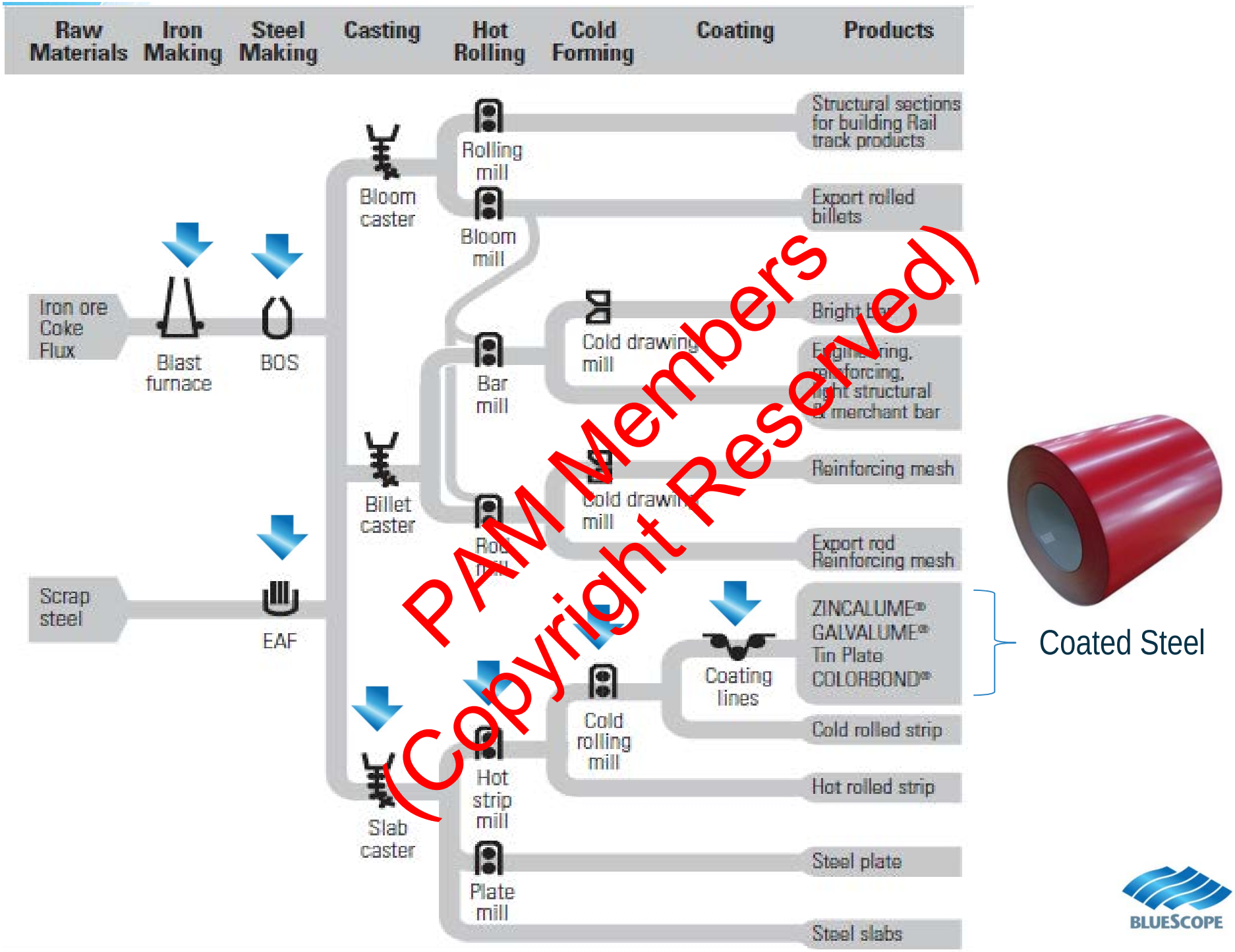
Steel life cycle

Source World Steel Association (worldsteel)



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*According to LEED-NC, there is a default post consumer recycle content value for steel of 25% which can be used regardless of documentation as steel is usually made from at least 25% post-consumer recycled steel.



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Our coated steel products are SIRIM Eco-Label (Criteria 032:2011) certified in compliance to stringent environmental requirements. Clean COLORBOND® steel is listed by Malaysia Green Building Confederation (MGBC)'s latest Green Pages Malaysia – Architectural Building Materials. Such information helps consultants to determine applicable Green Building Index (GBI) rating clauses associated with Clean COLORBOND® steel.

3.2 Environmental Requirements

3.2.1 Raw materials

SIRIM Eco-Label

a) The ferrous feedstock shall be derived from sponge iron or steel scrap substitutes, i.e DRI and/or HBI; and/or
b) The ferrous feedstock shall contain a minimum 88% steel scrap for EAF using steel mill; and/or
c) The ferrous feedstock shall contain a minimum 12% steel scrap for BOF using steel mill.
d) The steel scrap substitutes and recycled feedstock shall not contain radioactive materials and polychlorinated biphenyls.

Note: The limit values stated above are based on the average raw materials usage to produce a tonne of crude steel (Source: World Steel Association).

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BlueScope coated products are using cold-rolled steel which was manufactured from hot rolled steel via Basic Oxygen Furnace (BOF) steel making process. We are using various sources of cold-rolled steel which according to Steel Recycling Institute (www.recycle-steel.org) contains 19.8% post-consumer recycled content and 14.4% pre-consumer recycled content.

Nevertheless, there is a default post-consumer recycle content value for steel of 25% (according to LEED-NC guide), which can be used regardless of documentation as steel is usually made from at least 25% post-consumer recycled steel. In case where the steel recycled content is greater than 25%, documentation should be provided.

Green Building Index (GBI)

SM – Sustainable Site Planning & Management

SM
SUSTAINABLE SITE PLANNING & MANAGEMENT



PART 1 | NON-RESIDENTIAL | SUSTAINABLE SITE PLANNING & MANAGEMENT (SM)

SM1	SITE SELECTION	1 POINT
SM2	BROWNFIELD REDEVELOPMENT	1 POINT
SM3	DEVELOPMENT DENSITY & COMMUNITY CONNECTIVITY	2 POINTS
SM4	ENVIRONMENT MANAGEMENT	2 POINTS
SM5	EARTHWORKS - CONSTRUCTION ACTIVITY POLLUTION CONTROL	1 POINT
SM6	QLASSIC - QUALITY ASSESSMENT SYSTEM FOR BUILDING CONSTRUCTION WORK	1 POINT
SM7	WORKER'S AMENITIES	1 POINT
SM8	PUBLIC TRANSPORTATION ACCESS	1 POINT
SM9	GREEN VEHICLE PRIORITY	1 POINT
SM10	PARKING CAPACITY	1 POINT
SM11	STORMWATER DESIGN – QUANTITY & QUALITY CONTROL	1 POINT
SM12	GREENERY & ROOF	2 POINTS
SM13	BUILDING USER MANUAL	1 POINT

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INTENT

To reduce heat island (thermal gradient difference between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

DESCRIPTION

- Minimize impact on microclimate and human wildlife habitat.
- Reward for achieving any option. Roof application includes roofs over individual parking lots and roofs over parking structures.
- The use of greenery on rooftops can help alleviate urban heat island effects through shading and evaporative cooling. It also enhances aesthetics to the surrounding and provides a more pleasant working environment which is also discussed in Indoor Environment Quality.

REQUIREMENTS

Reduce heat island (thermal gradient difference between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat:

- **Roof Application:**
  (a) Use roofing material with a Solar Reflectance Index (SRI) equal to or greater than the value in the table below for a minimum of 75% of the roof surface, ***OR***
  (b) Install a vegetated roof for at least 50% of the roof area, ***OR***
  (c) Install high albedo and vegetated roof surfaces that, in combination, meet the following criteria:
    - (Area of SRI Roof / 0.75) + (Area of vegetated roof / 0.5) > Total Roof Area
    - Roof Type Slope SRI
    - Low-Sloped Roof < 2:12 78
    - Steep-Sloped Roof > 2:12 29

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Use material with high SRI (≥ 78) for low pitch (<9.5°)

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86
African White
84
Off White
71
Almond Beige
55
Beige
40
Autumn Red
32
Heritage Red
29
Hunter Red
30
Copperstone
70
Gull Grey
48
Armour Grey
Volcanic Grey
19
Cape Charcoal
49
Cold Blue
27
Lazuite Blue
Sunflower Gold
24
Gun Metal Grey
29
Torres Blue
46
Mist Green
41
Aquamarine
23
Caulfield Green
SOLAR REFLECTANCE INDEX (SRI)
ONLY COLOUR ON ACTUAL SAMPLE APPLIES
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Installation – Do’s / Don’ts

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The Do's and Don'ts

Impact To The Life Of Your Metal Roofing

i. Delivery & Handling

ii. Care & Storage Prior To Installation (TB-7)

iii. Cutting Sheet On Site (TB-5 / TB-13)

iv. Cleaning Up – Swarf Staining (TB-5)

v. Compatibility (TB-8 / CTB-9/ CTB-12)

vi. Fasteners (TB-16)

vii. Detergent & Cleaners (TB-4)

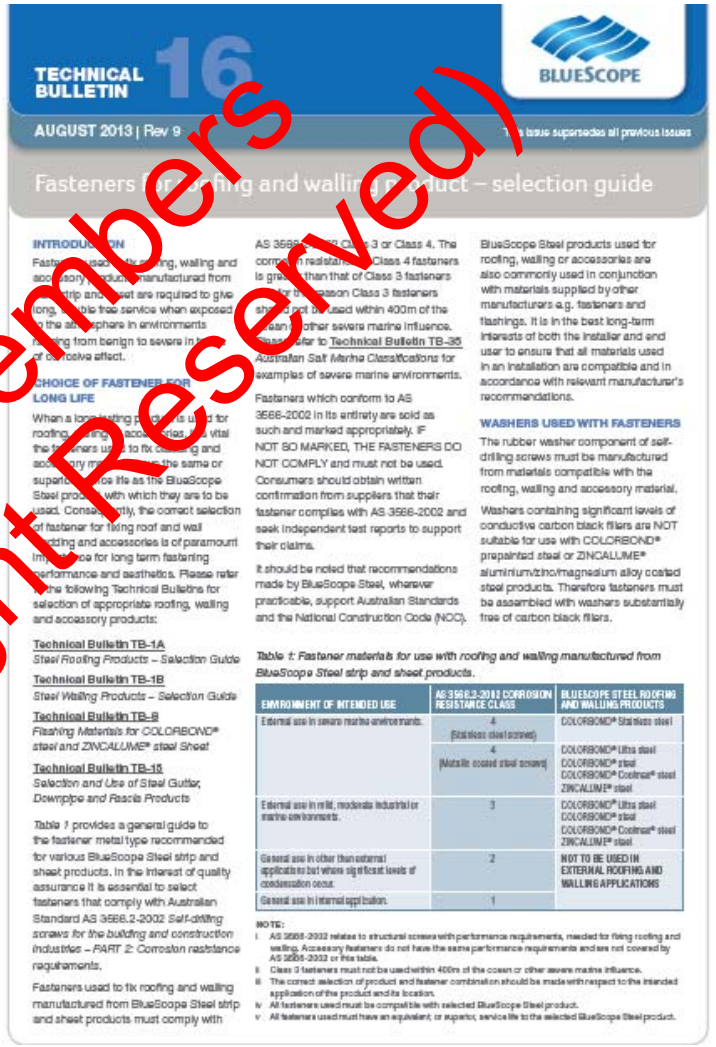
viii. Scratches, Cut Edges Corrosion & Touch-Up Paint (TB-10/TB-2)

ix. Water Ponding

x. Immersion (CTB–16)

xi. Contact with Mortar

xii. Sealants (TB-9)



TECHNICAL BULLETIN 16

BLUESCOPE

AUGUST 2013 | Rev 9

This issue supersedes all previous issues

Fasteners for roofing and walling product – selection guide

INTRODUCTION

Fasteners used for roofing, walling and accessory products manufactured from strip and sheet are required to give long, trouble free service when exposed to the atmosphere in environments ranging from benign to severe in terms of corrosive effect.

CHOICE OF FASTENER FOR LONG LIFE

When a long lasting product is used for roofing, walling, accessories, it is vital the fasteners used to fix cladding and accessory materials are the same or superior in service life as the BlueScope Steel product with which they are to be used. Consequently, the correct selection of fastener for fixing roof and wall cladding and accessories is of paramount importance for long term fastening performance and aesthetics. Please refer to the following Technical Bulletins for selection of appropriate roofing, walling and accessory products:

Technical Bulletin TB-1A
Steel Roofing Products – Selection Guide

Technical Bulletin TB-1B
Steel Walling Products – Selection Guide

Technical Bulletin TB-9
Flashing Materials for COLORBOND® steel and ZINCALUME® steel Sheet

Technical Bulletin TB-15
Selection and Use of Steel Gutter, Downpipe and Fascia Products

Table 1 provides a general guide to the fastener metal type recommended for various BlueScope Steel strip and sheet products. In the interest of quality assurance it is essential to select fasteners that comply with Australian Standard AS 3566.2-2002 *Self-drilling screws for the building and construction industries – PART 2: Corrosion resistance requirements.*

Fasteners used to fix roofing and walling manufactured from BlueScope Steel strip and sheet products must comply with AS 3566-2002 Class 3 or Class 4. The corrosion resistance of Class 4 fasteners is greater than that of Class 3 fasteners and for this reason Class 3 fasteners should not be used within 400m of the ocean or other severe marine influence. Please refer to **Technical Bulletin TB-36** *Australian Salt Marine Classifications* for examples of severe marine environments.

Fasteners which conform to AS 3566-2002 in its entirety are sold as such and marked appropriately. IF NOT SO MARKED, THE FASTENERS DO NOT COMPLY and must not be used. Consumers should obtain written confirmation from suppliers that their fastener complies with AS 3566-2002 and seek independent test reports to support their claims.

It should be noted that recommendations made by BlueScope Steel, wherever practicable, support Australian Standards and the National Construction Code (NCC).

BlueScope Steel products used for roofing, walling or accessories are also commonly used in conjunction with materials supplied by other manufacturers e.g. fasteners and flashings. It is in the best long-term interests of both the installer and end user to ensure that all materials used in an installation are compatible and in accordance with relevant manufacturer's recommendations.

WASHERS USED WITH FASTENERS

The rubber washer component of self-drilling screws must be manufactured from materials compatible with the roofing, walling and accessory material.

Washers containing significant levels of conductive carbon black fillers are NOT suitable for use with COLORBOND® prepainted steel or ZINCALUME® aluminium/zinc/magnesium alloy coated steel products. Therefore fasteners must be assembled with washers substantially free of carbon black fillers.

Table 1: Fastener materials for use with roofing and walling manufactured from BlueScope Steel strip and sheet products.

ENVIRONMENT OF INTENDED USE	AS 3566.2-2002 CORROSION RESISTANCE CLASS	BLUESCOPE STEEL ROOFING AND WALLING PRODUCTS
External use in severe marine environments.	4 (Stainless steel screws)	COLORBOND® Stainless steel
	4 (Metallic coated steel screws)	COLORBOND® Ultra steel COLORBOND® steel COLORBOND® Coolmax® steel ZINCALUME® steel
External use in mild, moderate industrial or marine environments.	3	COLORBOND® Ultra steel COLORBOND® steel COLORBOND® Coolmax® steel ZINCALUME® steel
General use in other than external applications but where significant levels of condensation occur.	2	NOT TO BE USED IN EXTERNAL ROOFING AND WALLING APPLICATIONS
General use in internal applications.	1	

NOTE:
i. AS 3566-2002 relates to structural screws with performance requirements, needed for fixing roofing and walling. Accessory fasteners do not have the same performance requirements and are not covered by AS 3566-2002 or this table.
ii. Class 3 fasteners must not be used within 400m of the ocean or other severe marine influence.
iii. The correct selection of product and fastener combination should be made with respect to the intended application of the product and its location.
iv. All fasteners used must be compatible with selected BlueScope Steel product.
v. All fasteners used must have an equivalent, or superior, service life to the selected BlueScope Steel product.

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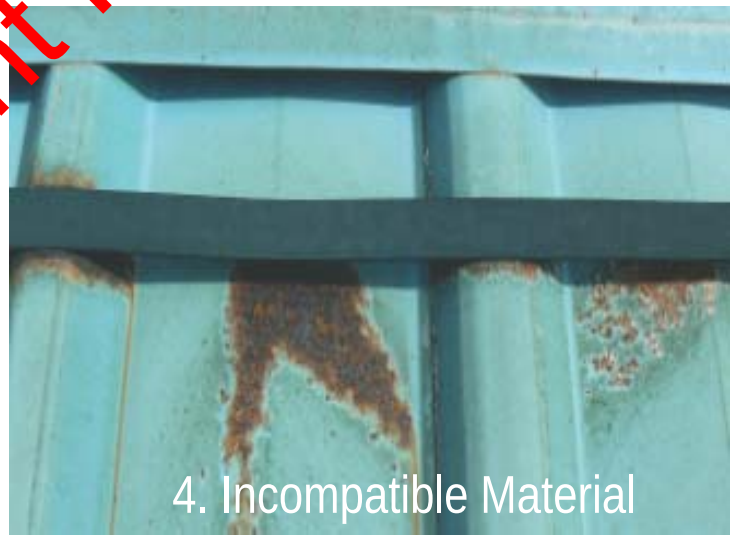
The Do’s and Don’ts

Impact To The Life Of Your Metal Roofing


1. Swarf Staining


3. Touch-up / Over-painting


2. Scratches


4. Incompatible Material

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1. Cutting Sheet On Site (TB-5 / TB-13)

- When cutting roof sheeting with power saw, care should be taken **to protect material from swarf**.
- Whenever possible, **cutting** should be done on ground and **not over coated materials**.







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1. Cleaning Up – Swarf Staining (TB-5)

A steel debris from cutting?

- Swarf are steel debris from cutting or discarded steel objects which corrode and cause rust stains (swarf staining). These stains often mistaken for early sign of corrosion.





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1. Cleaning Up – Swarf Staining (TB-5)

Only occurred on coated steel sheets?

- Swarf staining **can occurred on any type of material**.



Swarf staining on both skylight and roofing sheet



Polycarbonate skylight sheet



Coated steel sheet

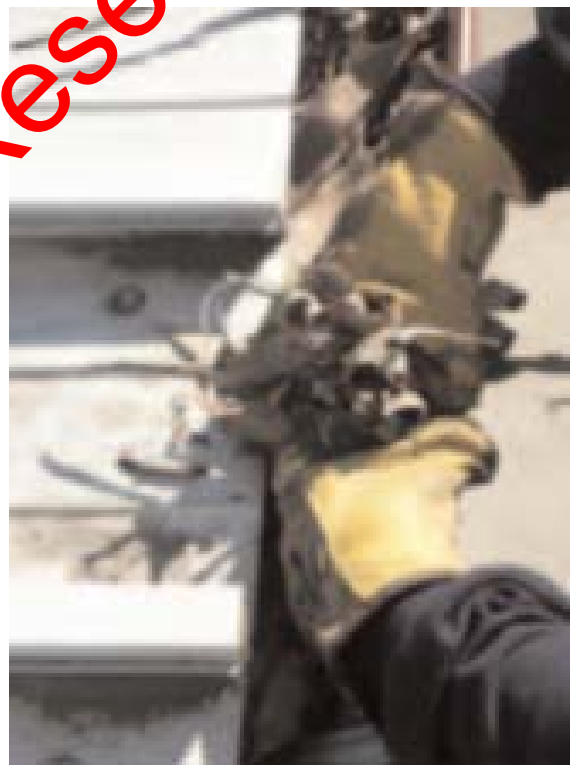
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1. Cleaning Up – Swarf Staining (TB-5)

How to prevent?

- In the event that swarf is produced, it should be removed before staining occur.
- Inspection of the job should be made after two weeks when the swarf started to rust.
- Prevention of swarf staining is the responsibility of the installer (roofer, steel works fabricator etc.) and trades working in the vicinity.





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1. Cleaning Up – Swarf Staining (TB-5)

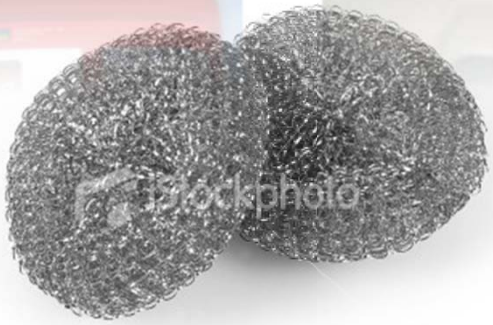
How to remove?

- Brush the affected area with **stiff bristle brush** / Scotch Brite Pad (DON'T USE STEELWOL) to **dislodge swarf particles**.
- Never use **abrasive** (e.g. sugar soap) or **solvent type cleaners** (turpentine, petrol, kerosene, paint thinners).









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1. Cleaning Up – Swarf Staining (TB-5)

How to remove?

- By washing with a mild household detergent and water. Then hose down with fresh water to remove detergent's residual.
- If the coating is severely damaged by swarf corrosion, the affected area should be replaced.



Before Cleaning



After Cleaning





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BLUESCOPE

1. Cleaning Up – Swarf Staining (TB-5)

Case Study:

- The photo of the roof before and after the cleaning process are illustrated as below:-



The appearance of the panels before the cleaning process.



The appearance of the roofing after the cleaning process.

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2. Incompatible Material (TB-8 / TB-16/ CTB-9/ CTB-12)

Compatibility of direct contact between metals or alloys

ROOF DRAINAGE SYSTEM COMPONENTS & ANY CLADDING MATERIAL	ACCESSORIES OR FASTENER OR (UPPER SURFACE)								
	ZINCALUME®	GALVANISED (ZINC COATED STEEL)	ZINC	COLORBOND®, COLORBOND® ULTRA, COLORBOND® METALLIC	COLORBOND® STAINLESS	STAINLESS STEEL	ALUMINIUM ALLOYS	COPPER & COPPER ALLOYS[1]	LEAD
ZINCALUME®	YES	YES	YES	YES	NO	NO	YES	NO	NO
GALVANISED (ZINC COATED STEEL)	YES	YES	YES	YES	NO	NO	YES	NO	NO
ZINC	YES	YES	YES	YES	NO	NO	YES	NO	NO
COLORBOND®, COLORBOND® ULTRA, COLORBOND® METALLIC	YES	YES	YES	YES	NO	NO	YES	NO	NO
COLORBOND® STAINLESS	NO	NO	NO	NO	YES	YES	NO	NO	NO
STAINLESS STEEL	NO	NO	NO	NO	YES	YES	NO	NO	NO
ALUMINIUM ALLOYS	YES	YES	YES	YES	NO[3]	NO[3]	YES	NO	NO
COPPER & COPPER ALLOYS[1]	NO	NO	NO	NO	NO	NO	NO	YES	NO
LEAD	NO	NO	NO	NO	NO	NO	NO	YES	YES

(1) MONEL - COPPER/NICKEL ALLOY
(2) FOR FURTHER GUIDENCE REFER TO AS/NZS 3500.3: 2003
(3) IN BENIGN ENVIRONMENTS, MIXING OF STAINLESS STEEL AND ALUMINIUM MAY BE ACCEPTABLE.

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2. Incompatible Material (TB-8 / TB-16/ CTB-9/ CTB-12)

Fastener Selection for Roofing / Walling

A) Stainless steel fastener causes bi-metallic corrosion reaction





B) Non AS3566 Class 3 or Class 4 fasteners showed early sign of corrosion attack







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2. Incompatible Material (TB-8 / TB-16/ CTB-9/ CTB-12)

Lightning Arrestor





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2. Incompatible Material (TB-8 / TB-16/ CTB-9/ CTB-12)

Case Study – Lightning Arrestor / Tape (After 4 years)



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2. Incompatible Material (TB-8 / TB-16/ CTB-9/ CTB-12)

Case Study – Lightning Arrestor / Tape (After 4 years)

Water-run off from copper tape (after 4 years)



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2. Incompatible Material (TB-8 / TB-16/ CTB-9/ CTB-12)

Case Study – Lightning Arrestor / Tape (After 10 years)

Contact with aluminium lightning arrestor / tape after 10years







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2. Incompatible Material (TB-8 / TB-16/ CTB-9/ CTB-12)

Flashing / Capping

- We recommend flashing / capping should be made from the same material as the cladding to achieve long lasting consistency.





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Installation Do's and Don'ts

Inspection Checklist

Has materials & location been inspected? (Yes / No): *If yes please complete and tick* ☒ *the following roof inspection checklist*

- ☐ Fasteners comply with AS3566 Class 3 or Class 4
- ☐ Fasteners are fastened properly to crest
- ☐ Roof is installed in accordance with manufacturer's installation manual / current published BlueScope guidelines
- ☐ Roof is cleaned of rubbish / swarf and other foreign materials
- ☐ Flashing, capping and associated components used are manufactured from compatible materials (Clean COLORBOND® steel, ZINCALUME® steel, zinc, or aluminium) or be coated or plated in accordance with current published BlueScope guidelines
- ☐ Lightning conductors material used is compatible with ZINCALUME® steel / Clean COLORBOND® steel / PrimaMaju™ steel
- ☐ Touch-up paint has not been used
- ☐ Neutral cure silicone sealants is used in accordance with current published BlueScope guidelines

Notes:

Is the surrounding environment and installation condition as per normal condition stipulated in the warranty T&C? (Yes / No)

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Roofing / Wall Cladding

Preventative Maintenance

- If the project site is located next to shoreline and may have strong wind. This means salt deposits or corrosive substance may stay at unwashed area.
- Potential risk of premature corrosion is unwashed area.
- Recommending regular maintenance e.g. hosing or washing with fresh clean water as per TB-4, 6 months intervals. Such practice is able to minimize corrosion effects at unwashed area.
- Compatible materials i.e. fasteners shall be AS3566 Class 4 if less than 400m from marine (not stainless steel) and using aluminium lightning arrestor











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Roofing / Wall Cladding

Preventative Maintenance - Impact of Washed versus Unwashed Area*

- Higher corrosion rate if corrosive particles (e.g. salt deposits) does not get washed off by rainfall when the coated steel is sheltered (unwashed area*)





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*Recommended regular & periodical wash down maintenance with fresh water or pressure clean (20MPa)

CREATE WITH
CONFIDENCE

- √ **LONG HERITAGE** in coated steel since 1965
- √ **WORLD CLASS MANUFACTURING EXCELLENCE** in producing coated steel
- √ **DEVELOPED AND PROVEN** with continuous product innovation for tropical climate performance
- √ **PEACE OF MIND SOLUTIONS** with genuine and reliable product warranty
- √ **RESPONSIVE LOCAL TECHNICAL SUPPORT** in giving top notch technical advices
- √ **PRODUCT STANDARD ACCREDITATION** by SIRIM i.e. metallic coated steel products certified with MS1196; pre-painted steel products certified with MS2322
- √ **GREEN PRODUCT ACCREDITATION** with SIRIM Eco Label (Criteria 1032)
- √ **COMPLIANCE TO ACT 520** with Peraturan Pembangunan Standard (PPS) by Construction Industry Development Board (CIDB)
- √ **EASY & AUTHENTICITY CHECK** by BlueScope's brand mark on the reverse side of the steel

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DESIGN FLEXIBILITY | COLOR CHOICE | HI-TECH PRODUCTION | DURABILITY/ SECURITY | THERMAL EFFICIENCY | RECYCLING | WARRANTY



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Question & Answer

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