



ACHIEVE LONGER LIFESPAN FOR YOUR CLADDING THROUGH DESIGN







MATERIAL SELECTION FOR **OTHER** COMPONENTS IS ALSO **CRUCIAL**



EVEN IF CLADDING **CAN LAST** LONG, FAILURE COULD BE **DUE TO** INCOMPATIBLE MATERIAL

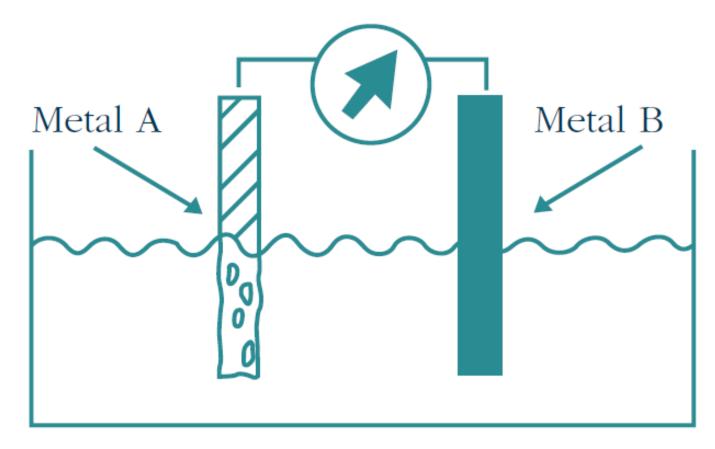


LEAKAGE COULD COME THROUGH THE **WEAKEST POINT** OF THE CLADDING **SYSTEM**



LET'S LOOK INTO THE DETAILS TO **LEARN HOW** TO GET THE SMALL THINGS RIGHT!

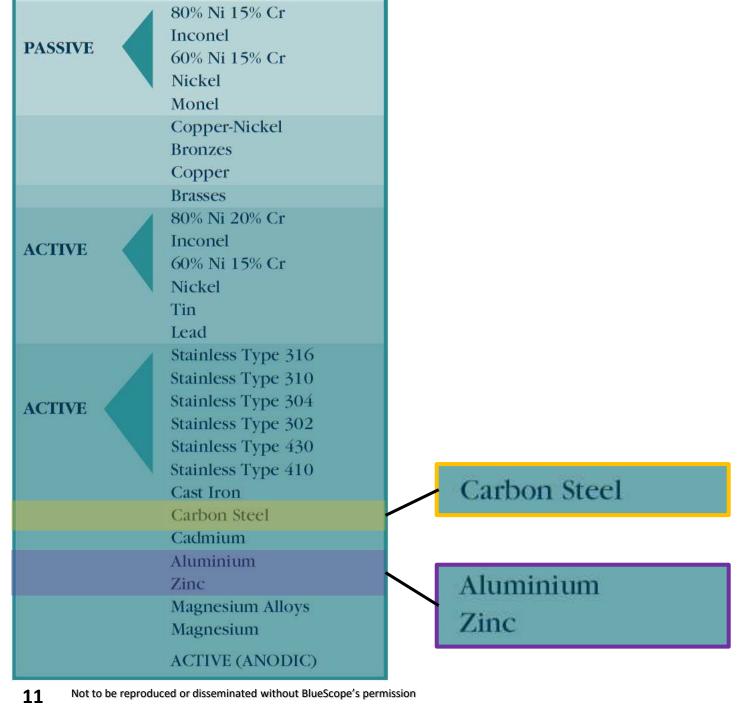
Galvanic Current



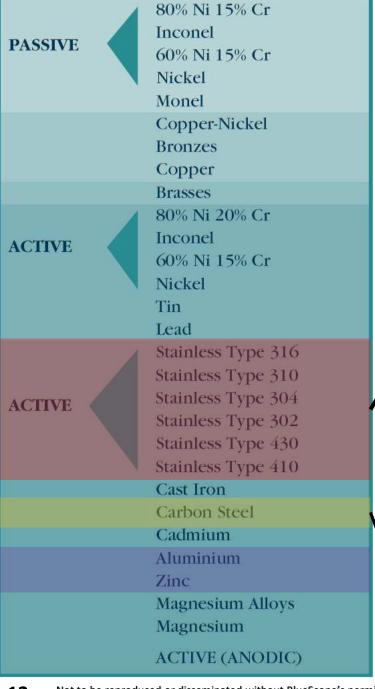
MOSTLY WORKS ON THE PRINCIPLE GALVANIC REACTION

NOBLE (CATHODIC) NOBLE (CATHODIC) Gold Platinum Titanium Graphite Silver Stainless Type 316 Stainless Type 310 Stainless Type 304 PASSIVE Stainless Type 302 Stainless Type 430 Stainless Type 410 80% Ni 15% Cr Inconel PASSIVE 60% Ni 15% Cr Nickel Monel Copper-Nickel **Bronzes** Copper Brasses 80% Ni 20% Cr Inconel ACTIVE 60% Ni 15% Cr Nickel Tin Lead Stainless Type 316 Stainless Type 310 Stainless Type 304 ACTIVE Stainless Type 302 Stainless Type 430 Stainless Type 410 Cast Iron Carbon Steel Cadmium Aluminium Zinc ACTIVE (ANODIC) Magnesium Alloys Magnesium ACTIVE (ANODIC)

GALVANIC SERIES



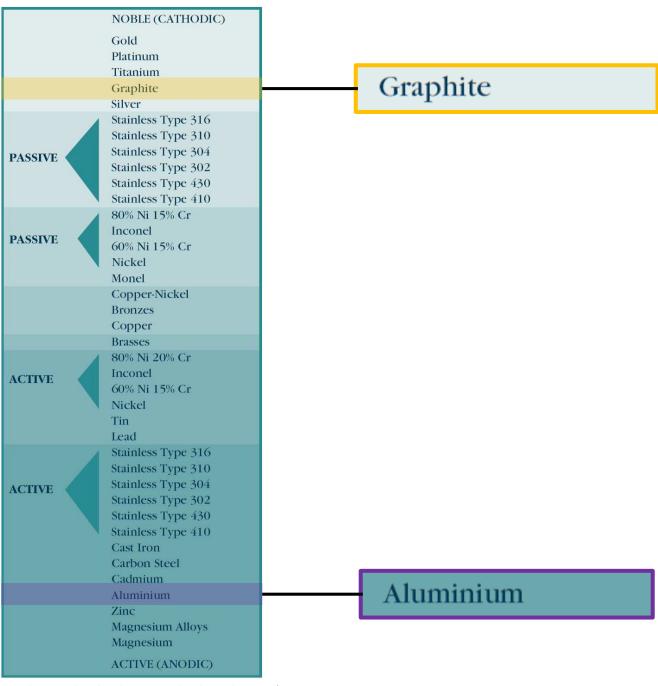
ZINC / ALUMINIUM MORE ACTIVE THAN STEEL



Bronzes Copper Brasses 80% Ni 20% Cr Inconel 60% Ni 15% Cr Nickel Tin Lead Stainless Type 316 Stainless Type 310 Stainless Type 304 Stainless Type 302 Stainless Type 430 Stainless Type 410

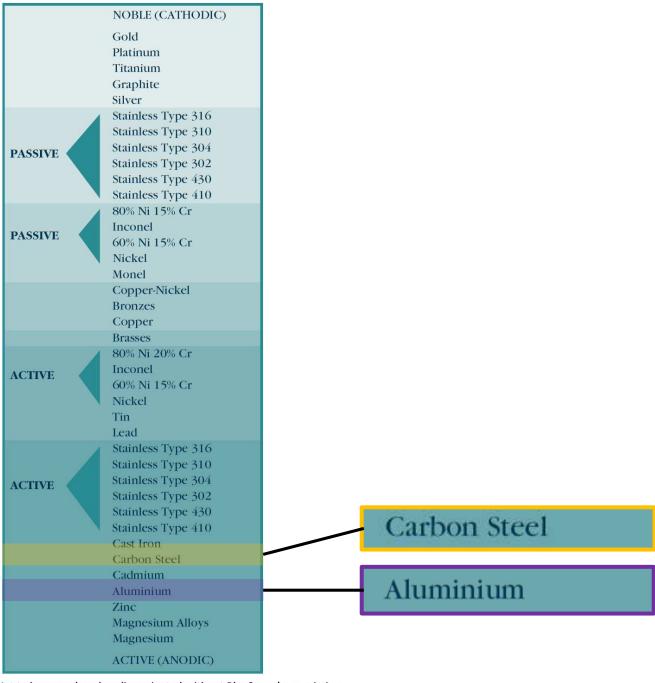
Carbon Steel

COPPER / BRASS / STAINLESS STEEL LESS **ACTIVE THAN** STEEL



FURTHER APART IN GALVANIC SERIES

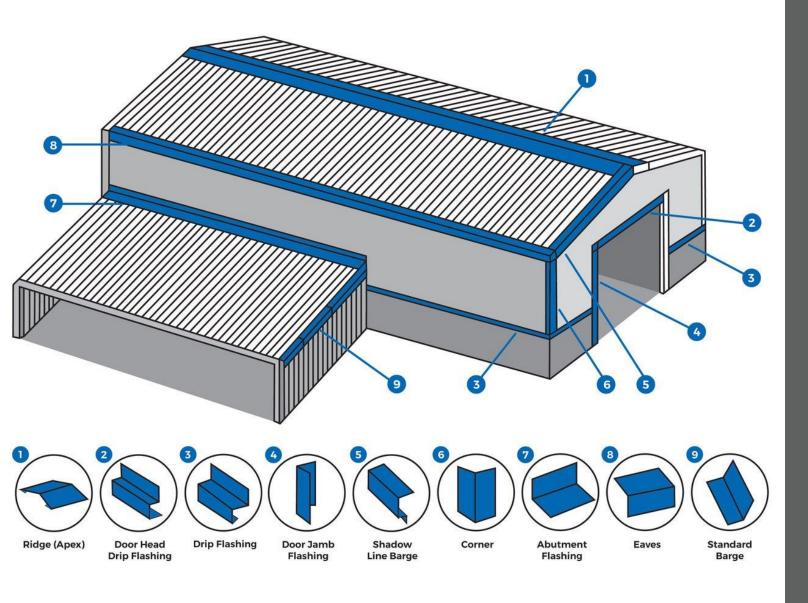
FASTER GALVANIC REACTION



CLOSER APART IN GALVANIC SERIES

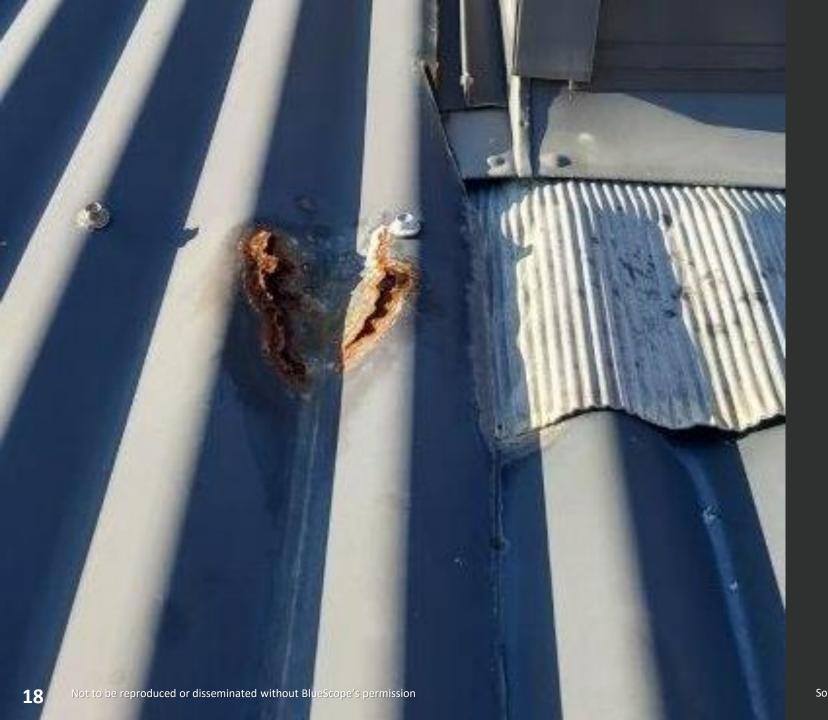
SLOWER GALVANIC REACTION





DIFFERENT TYPES OF FLASHING AND CAPPING





LEAD FLASHING

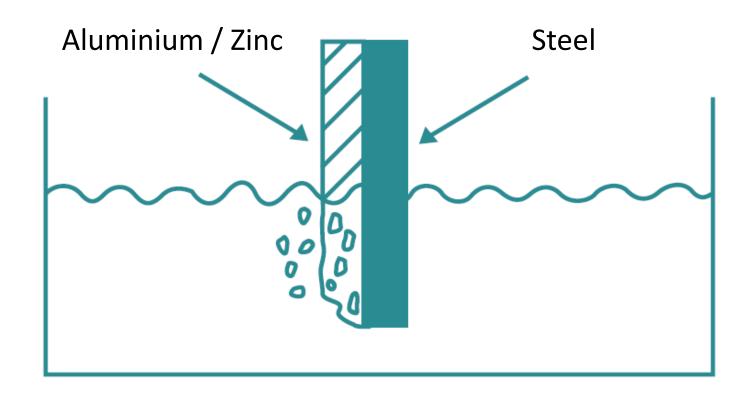


COATED STEEL FLASHINGS AND CAPPINGS

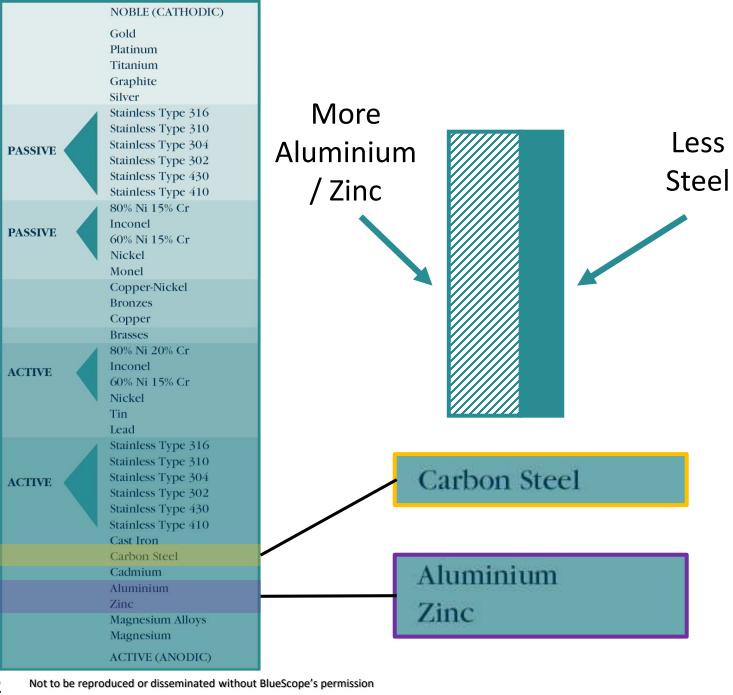


RUST FROM CORRODED STEEL WILL SPREAD ONTO THE ADJACENT SURFACE

GALVANIZED STEEL



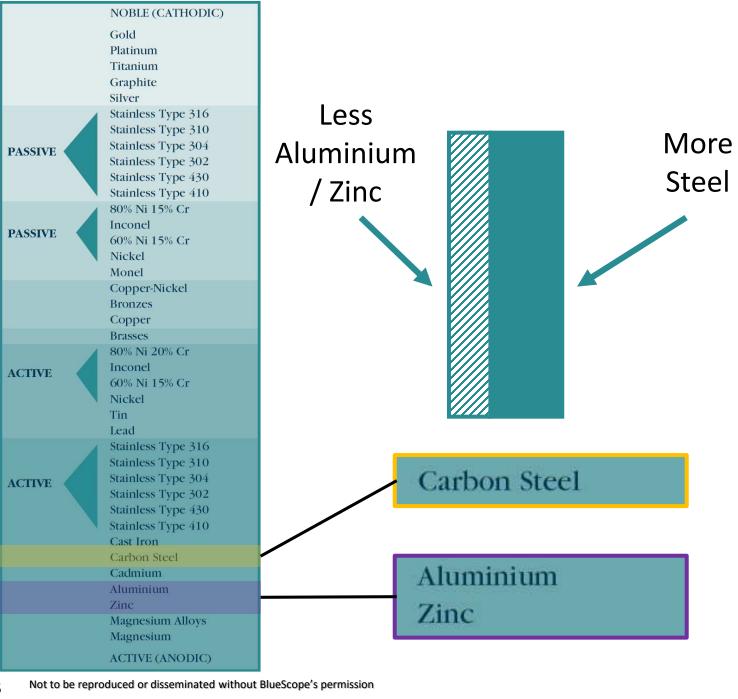
LOOK BACK TO GALVANIC REACTION



INCREASED ANODIC METAL

3

INCREASED PROTECTION



INCREASED CATHODIC METAL

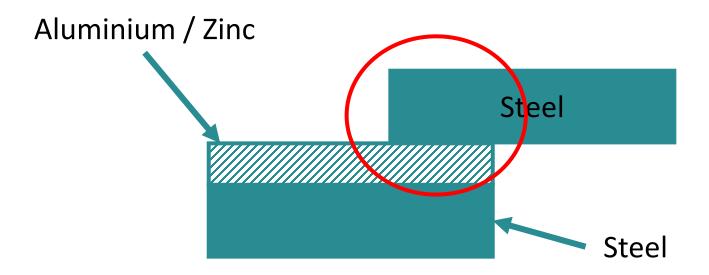
3

DECREASED PROTECTION

Steel



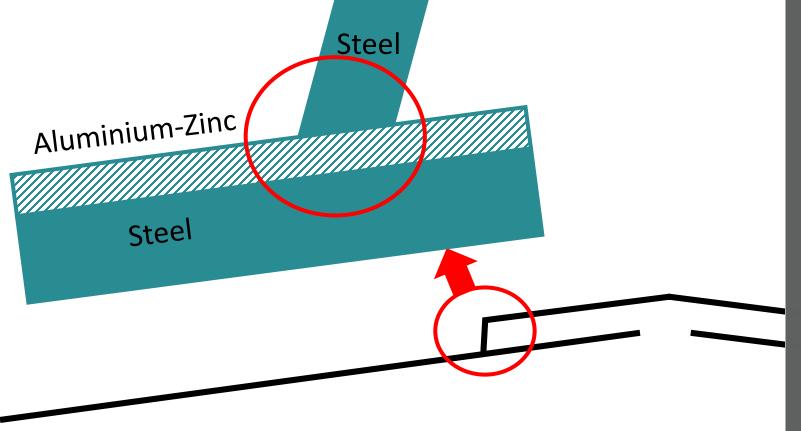
SIMILAR WITH THE SCENARIO OF HAVING **SWARF** PARTICLES ON THE EXTERNAL SURFACE



THE AREA OF CONTACT WILL HAVE DECREASED PROTECTION

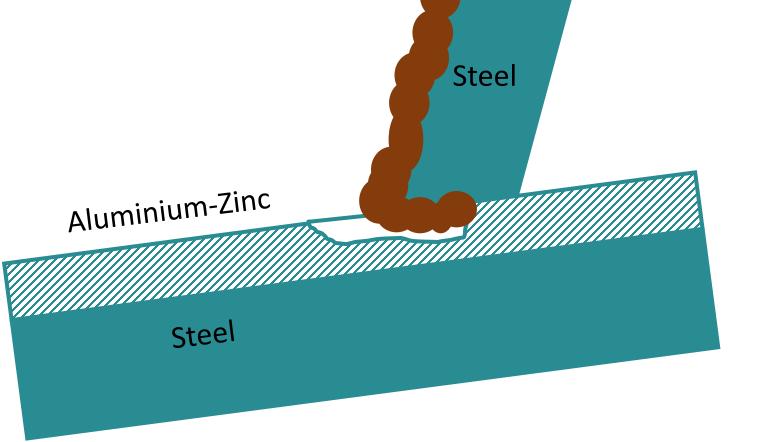
Rusted flashing contact with coating Not to be reproduced or disseminated without BlueScope's permission

CLOSER LOOK AT THE CONTACT AREA



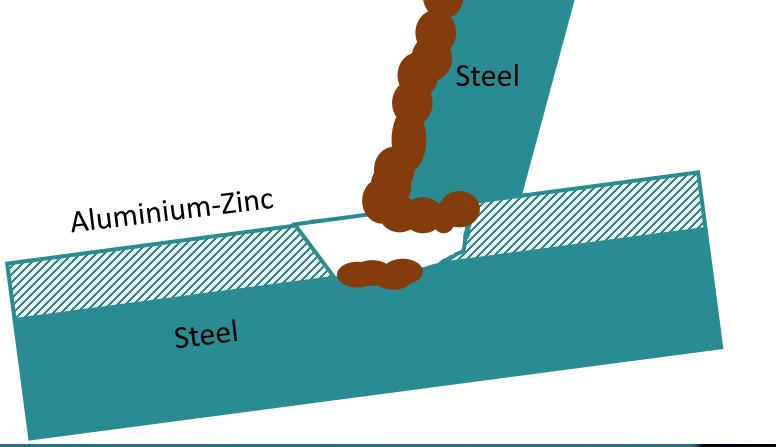


MOST VULNERABLE AREA AT CONTACT POINT



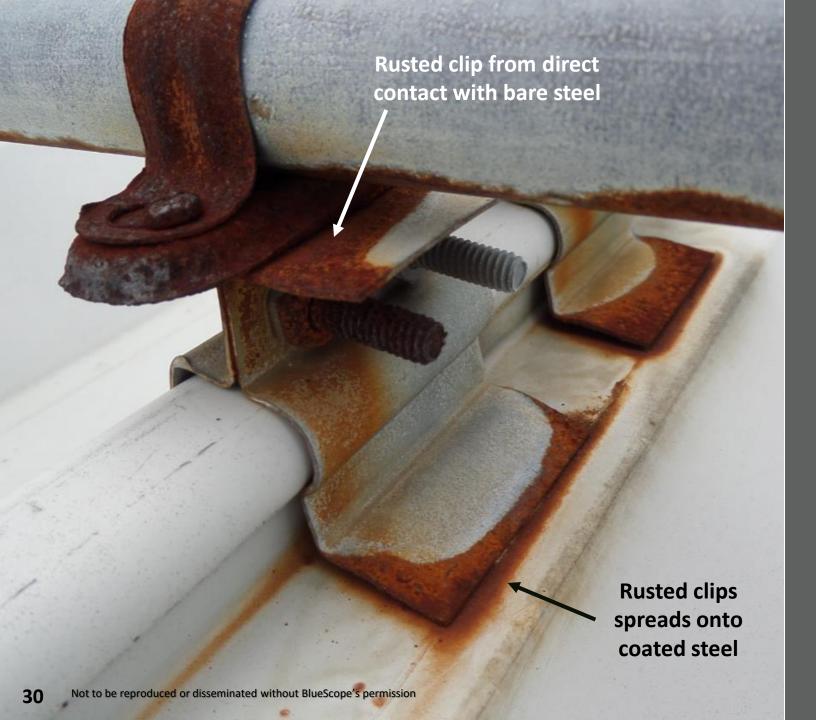


MOST **VULNERABLE AREA AT** CONTACT **POINT**





LEADING TO LOCALIZED CORROSION



OTHER EXAMPLE OF CORROSION **DUE TO** DIRECT CONTACT







2 FASTENERS



NON-PERFORMING **FASTENERS**



RUST CAN SPREAD ONTO THE STEEL CLADDING

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 application.	1	

DIFFERENT TYPES OF COATED FASTENERS

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
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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 application.	1	

CLASS 3 -MINIMUM REQUIREMENT FOR FASTENER FOR EXTERNAL CLADDING

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
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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 application.	1	

CLASS 4 – FASTENERS IN SEVERE MARINE ENVIRONMENT





COMMONLY SEEN INCONSISTENT FASTENER PERFORMANCE



COMMONLY SEEN NOT SUITABLE FASTENERS

Australian Standard

Self-drilling screws for the building and construction industries

Part 2: Corrosion resistance requirements

1 SCOPE

This Standard specifies the requirements for corrosion resistance of self-drilling screws used in the building and construction industries.

TABLE 1 CLASSIFICATION AND DESIGNATION OF CORROSION RESISTANCE

Corrosion resistance class	Atmosphere of intended use		
1	General use in internal application.		
2	General use in other than external applications but where significant levels of condensation occurs.		
3	External use in mild, moderate industrial or marine environments. Corrosivity categories C2 and C3 classified in accordance with ISO 9223.		
4	External use in severe marine environment. Corrosivity category C4 classified in accordance with ISO 9223.		

NOTE: The specification for self-drilling screws suitable for use in specific corrosive atmospheres are subject to agreement between manufacturer and consumer.

IDENTIFY THE TYPE OF **FASTENERS FROM** BEGINNING (AS 3566)

Australian Standard

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CLASS 1 & 2 ARE FOR INTERNAL BUILDING USAGE

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NOTE: The specification for self-drilling screws suitable for use in specific corrosive atmospheres are subject to agreement between manufacturer and consumer.

CLASS 3 & 4 ARE FOR EXTERNAL BUILDING USAGE

TABLE 2
REQUIREMENTS FOR ZINC AND TIN-ZINC COATED FASTENERS

Corrosion resistant class	Minimum porosity rating of mechanically plated coatings (see Clause 7)	Coating type	Coating composition (by mass)	Minimum local metallic coating thickness µm	
1		Electro plated zinc	98 percent zinc	4	AS
2		Electro plated zinc	98 percent zinc	12	AS
2	6	Mechanically plated zinc	98 percent zinc	17	AS
2	6	Mechanically plated zinc-tin	20-30 percent tin balance zinc	12	AS
3	-	Electro plated zinc	98 percent zinc	30	AS B,
3	-	Hot-dip galvanized	98 percent zinc	30	AS B,
3	8	Mechanically plated zinc	98 percent zinc	40	AS B,
3	8	Mechanically plated zinc-tin	20-30 percent tin balance zinc	25	AS B,
.4	_	Hot-dip galvanized	98 percent zinc	50	AS B,
4	8	Mechanically plated zinc-tin	25-30 percent tin balance zinc	45	AS B,

TYPICAL CLASS 3 & 4 COATING COMPOSITION & THICKNESS

Coating Type

Electro plated zinc

Hot-dip galvanized

Mechanically plated zinc

Mechanically plated zinc-tin



Coating Composition

98% zinc

20 – 30% tin with balance zinc

25 – 30% tin with balance zinc



Coating Thickness

 $25 - 50 \mu m$

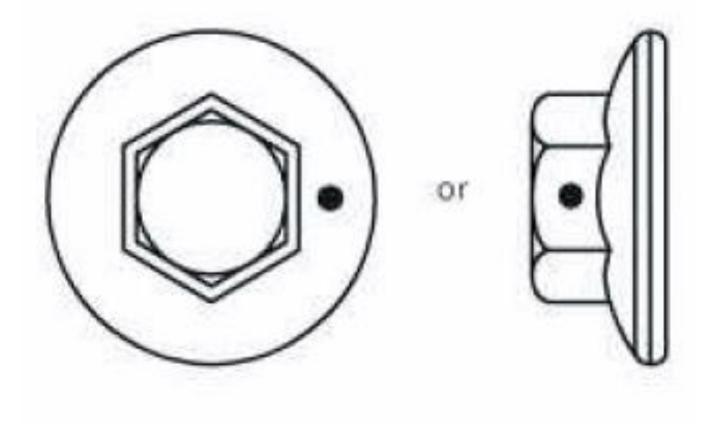


Type of Passivation

Type A − D

TYPICAL CLASS 3 & 4 COATING COMPOSITION & THICKNESS

AS 3566.2-2002



(a) Hexagon washer head

LOCALIZED METALLIC COATING THICKNESS

Source: AS 3566.2 - 2002

AS 3566.2-2002

5.3 Class 3

The exposed portion of the heads of Class 3 corrosion resistant screws shall comply with one of the following requirements:

(a) Accelerated testing

Class 3 corrosion resistant self-drilling screws prepared in accordance with Appendix A shall comply with the following requirements as appropriate:

(i) When tested in a neutral salt spray in accordance with AS 2331.3.1 for 1000 h red rust shall not be present over more than 5 percent of the significant areas of the screws and there shall be no blistering of the coating.

:

- (b) Outdoor exposure testing When Class 3 corrosion resistant self-drilling screws are tested at an outdoor test site in accordance with Appendix B there shall be no red rust present on the significant surfaces of 95 percent of the fasteners tested i.e., 95 of the 100 screws in the test panel.
- (c) Zinc and zinc-tin coated screws The metallic coating of zinc and zinc-tin coated Class 3 corrosion resistant screws shall be in accordance with Table 2. The local thickness of the metallic coating shall be determined in accordance with AS 2331.1.3 or AS 2331.1.4 and the minimum local coating thickness shall be determined from three local thickness measurements made on the reference surface shown in Figure 1.

The remaining portions of the screws shall comply with the requirements given in Clause 5.2 Item (a)(i) or Item (b). Where compliance with Item (b) is claimed, the reference area for the measurement of local thickness of the coating shall be the unthreaded shank.

TYPICAL TESTS FOR CLASS 3 FASTENERS

AS 3566.2-2002

5.4 Class 4

The exposed portion of the heads of Class 4 corrosion resistant screws shall comply with one of the following requirements:

- (a) Outdoor exposure testing When Class 4 corrosion resistant self-drilling screws are tested at an outdoor test site in accordance with Appendix B there shall be no red rust present on the significant surfaces of 95 percent of the fasteners tested, i.e. 95 of the 100 screws in the test panel.
- (b) Zinc and zinc-tin coated screws The metallic coating of zinc and zinc-tin coated Class 4 corrosion resistant screws shall be in accordance with Table 2. The local thickness of the metallic coating shall be determined in accordance with AS 2331.1.3 or AS 2331.1.4 and the minimum local coating thickness shall be determined from three local thickness measurements made of the reference surface shown in Figure 1.

Where a non-metallic coating is applied over a zinc or a zinc-tin coating the zinc or the zinc-tin coating shall be in accordance with Table 2, otherwise the requirements given in Item (a) above apply.

TYPICAL TESTS FOR CLASS 4 FASTENERS

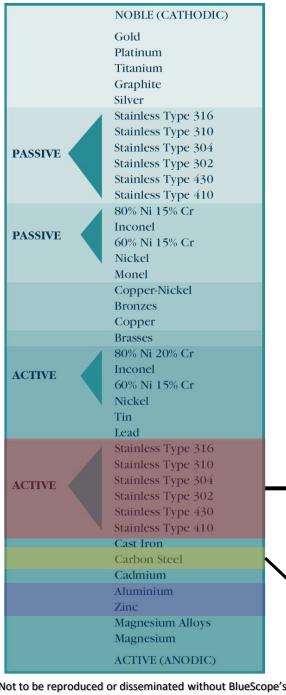
Source: AS 3566.2 - 2002

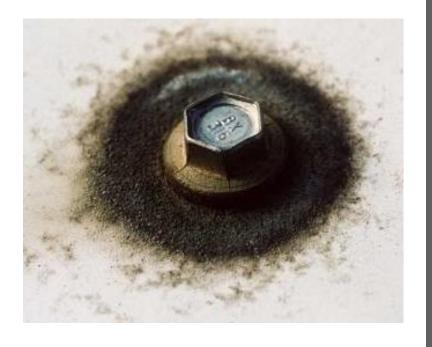
Source: BlueScope

IF THE RUSTED **FASTENERS STARTED** SPREADING TO CLADDING, IT MIGHT BE TOO LATE



CORROSION OCCURS EVEN AFTER RUSTED FASTENER IS OVERPAINTED





Stainless Type 316 Stainless Type 310 Stainless Type 304 Stainless Type 302 Stainless Type 430 Stainless Type 410

Carbon Steel

STAINLESS STEEL FASTENER IS NOT COMPATIBLE WITH STEEL



WILL CAUSE RING CORROSION EFFECT



THERE'S STILL A WAY TO USE STAINLESS STEEL FASTENER



SLEEVES TO PREVENT DIRECT CONTACT



SLEEVES TO PREVENT DIRECT CONTACT



TOO MUCH HASSLE FOR YOU? CHOOSE CONCEALED FIXED / STANDING SEAM **PROFILES**





(3) LIGHTNING CONDUCTOR

DID YOU KNOW THAT?

K.L. HAS THE 5TH HIGHEST NUMBER OF LIGHTNING STRIKES IN THE WORLD

Source: http://www.myhealth.gov.my/en/lightning-safety/

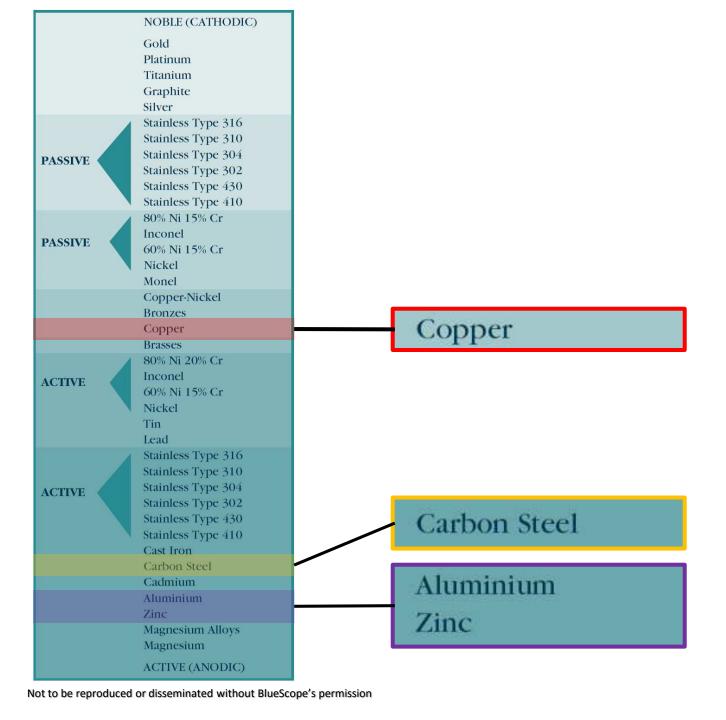


Air termination network Rolling sphere ra LPZ OA Direct flash, full lightning current, full magnetic field SPD 0_B/1 No direct flash, partial LPZ OB lightning or induced 0g/1 No direct flash, current, damped partial lightning magnetic field or induced current, No direct flash. full magnetic field induced currents. further damped magnetic field SPD 0_B/1 LPZ 3 Down conductor network LPZ OB SPD 0_R/1 Equipotential bonding by means of SPD Earth termination network Not to be reproduced or disseminated without BlueScope's permission

FORM PART OF THE **EXTERNAL** LIGHTNING **PROTECTION** SYSTEM (LPS)



COPPER – TYPICAL LIGHTNING CONDUCTOR MATERIAL



COPPER IS MORE CATHODIC THAN STEEL / ALUMINIUM / ZINC



COPPER CAUSES STEEL TO CORRODE FASTER



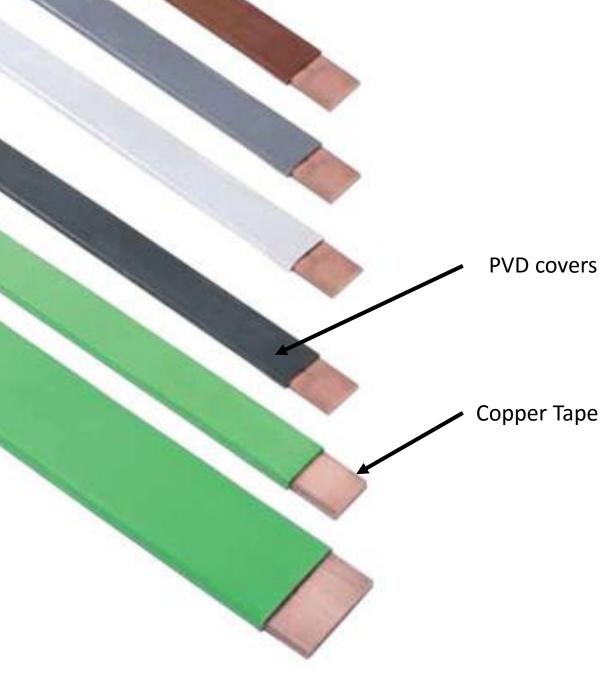
EVEN WITHOUT DIRECT CONTACT



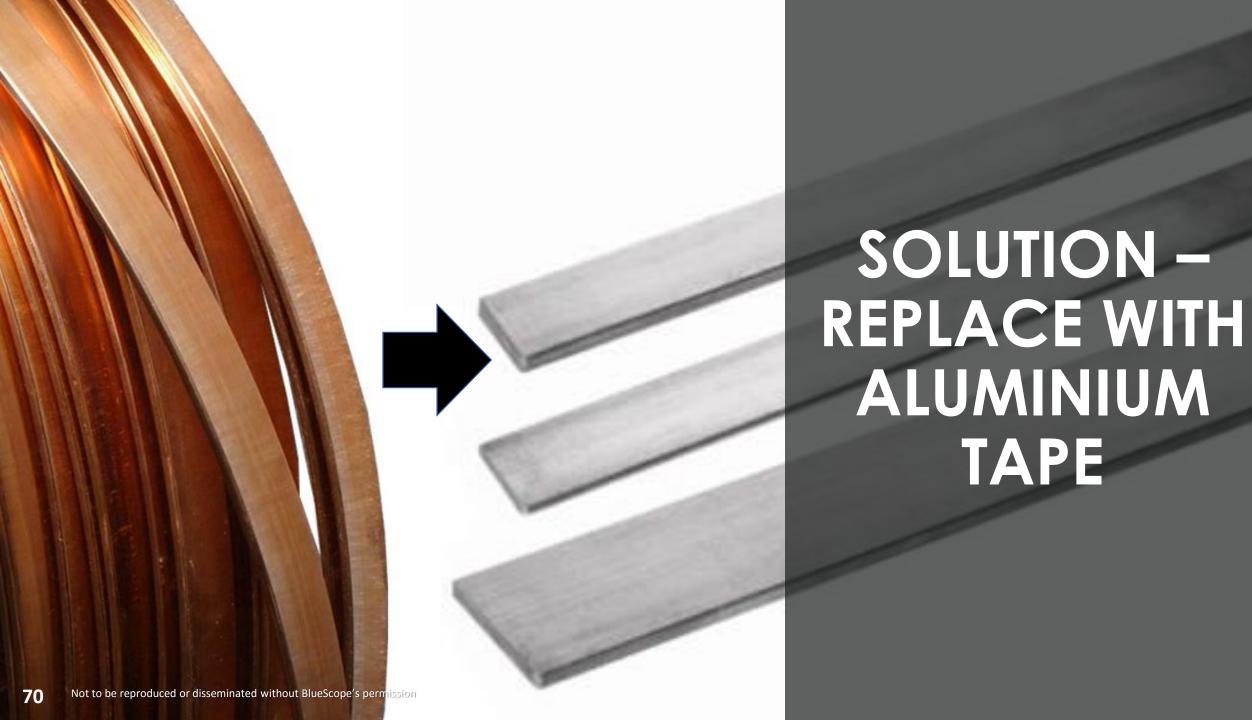


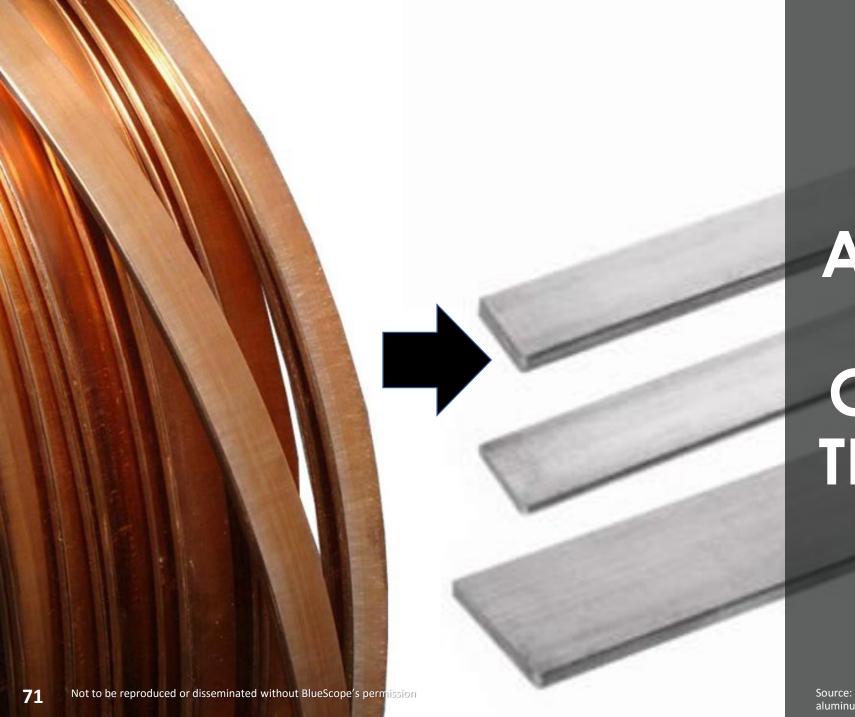
IMAGINE YOU **HAVE TO** REPLACE YOUR ROOF **DUE TO** LIGHTNING ARRESTOR



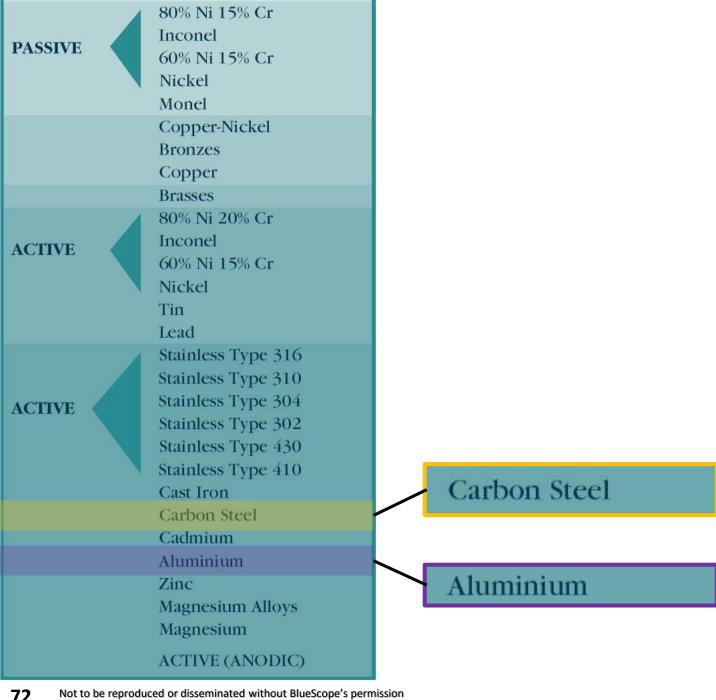


SOLUTION – PVC COVERED COPPER TAPE





ALUMINIUM IS 39% LESS CONDUCTIVE THAN COPPER



ALUMINIUM IS MORE ACTIVE THAN STEEL

EN 62305-3:2006

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Table 6 – Material, configuration and minimum cross-sectional area of air-termination conductors, air-termination rods and down-conductors

Material	Configuration	Minimum cross- sectional area	Comments ¹⁰⁾
		mm²	
Copper	Solid tape	50 8)	2 mm min. thickness
	Solid round 7)	50 8)	8 mm diameter
	Stranded	50 ⁸)	1,7 mm min. diameter of each strand
	Solid round 3), 4)	200 8)	16 mm diameter
Tin plated copper 1)	Solid tape	50 ⁸)	2 mm min. thickness
	Solid round 7)	50 ⁸)	8 mm diameter
	Stranded	50 ⁸)	1,7 mm min. diameter of each strand
Aluminium	Solid tape	70	3 mm min. thickness
	Solid round	50 ⁸)	8 mm diameter
	Stranded	50 8)	1,7 mm min. diameter of each strand
Aluminium alloy	Solid tape	50 ⁸)	2,5 mm min. thickness
	Solid round	50	8 mm diameter
	Stranded	50 ⁸)	1,7 mm min. diameter of each strand
	Solid round 3)	200 8)	16 mm diameter

ALUMINIUM CAN BE USED AS LIGHTNING CONDUCTOR



SECTION G: ROOFING WORKS

No. Dokumen : JKR 20800-0183-14

No. Keluaran : 01

No. Pindaan : 00 Tarikh : 29 Januari 2014

Muka Surat : G/4

6.1.7 Lightning conductors

Aluminium lightning conductor is recommended for use on steel roof

system.

x AREA (mm²)

EN 62305-3:2006

Ensure to meet minimum cross-sectional area requirement

Material	Configuration	Minimum cross- sectional area mm ²	Comments ¹⁰⁾
Aluminium	Solid tape	70	3 mm min. thickness
	Solid round	50 8)	8 mm diameter
	Stranded	50 8)	1,7 mm min. diameter of each strand
Aluminium alloy	Solid tape	50 ⁸)	2,5 mm min. thickness
	Solid round	50	8 mm diameter
	Stranded	50 ⁸)	1,7 mm min. diameter of each strand
	Solid round 3)	200 ⁸⁾	16 mm diameter

LIGHTNING CONDUCTOR SPECIFIED BY JKR



ALUMINIUM WILL NOT ACCELERATE STEEL CORROSION

Source: BlueScope





TO SEALANT ROOF OPENINGS



ORTO SEAL LAPPING WITH TRANSLUCENT SHEETS



SOME **SEALANTS** RELEASE OIL SUBSTANCES, CAUSES WATERMARKS



BECOME BRITTLE OVER TIME





SEALANT SHOULD NOT CONTAIN ACIDS



NEUTRAL CURE SEALANT

Source: BlueScope



PROPER METHOD OF APPLICATION



POTENTIALLY STAINING THE WHOLE **EXTERNAL** CLADDING Not to be reproduced or disseminated without BlueScope's permission Source: BlueScope





Aluminium Clamp Not to be reproduced or disseminated without BlueScope's permission

COMPATIBLE METAL IN CONTACT

Isolation layer Not to be reproduced or disseminated without BlueScope's permission

SEPARATE FROM DIRECT CONTACT USING AN ISOLATION LAYER



IT'S OK FOR STAINLESS STEEL BOLT TO BE USED, AS LONG AS IT'S NOTIN DIRECT CONTACT



SOLAR WATER HEATER



RECOMMEND STAINLESS STEEL WATER PIPE



WATER RUN-OFF FROM COPPER CAN LEAD TO CLADDING CORROSION





2. FASTENERS **RECOMMENDS AT LEAST CLASS 3 FOR EXTERNAL CLADDING APPLICATION** Not to be reproduced or disseminated without BlueScope's permission











Colerbond VERMOE TrueCore Zincolume



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BlueScope Malaysia



NS BlueScope Malaysia