

Guide to AS/NZS 2312.1:2014

A guide to the protection of steel against atmospheric corrosion



Guide to AS/NZS 2312.1:2014

About this guide

This guide is intended as supplementary document to AS/NZS 2312.1:2014 "Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings." This guide is produced by A&I Coatings.

The protection of steel

Steel is a widely used and very functional building material commonly used in the construction industry. Steel is very versatile, being easy to transport and erect and is easily recognisable in many of the world's largest buildings and structures. Along with being very versatile, steel is a leading contributor to sustainability as it can generally be reused or recycled at the end of a building lifespan.

A coating over steel is still the most straightforward and economic way to prevent corrosion. Coatings over steel serve two purposes: to protect the substrate from corrosion and to provide specifiers with the opportunity to select a range of colours and finishes to distinguish their structure.

The environment

The environment is the surrounding region in which elements of one or more corrosive agents are present.

Atmospheric Corrosivity Categories Based on AS/NZS 2312.1:2014

Category	Corrosivity	Description*
C1	Very Low	Environments in this category are most commonly found inside heated or air-conditioned buildings with clean atmospheres, such as most commercial buildings. They may also be found in semi-sheltered locations remote from marine or industrial influence and in unheated or non-air-conditioned buildings.
C2	Low	Dry, rural areas and other regions remote from the coast or sources of pollution, and most areas of Australia and New Zealand beyond at least 50 km from the sea. Can extend as close as one kilometre from seas that are sheltered. Typical areas occur in arid and rural inland regions, most inland cities and towns, and suburbs of cities on sheltered bays.
C3	Medium	Coastal areas with low salinity. Varies significantly with factors such as winds, topography, and vegetation. Extends beyond about 50 m from the shoreline to about one kilometre inland around sheltered seas. For less sheltered bays, this category extends from 100 m from the shoreline to about 3 to 6 km inland.
C4	High	Coastal areas with moderate salinity. Extends from about 50 m to several kilometres inland around moderately sheltered seas. For less sheltered bays, this category extends from about 100 m to several kilometres inland. Typical areas occur in coastal cities and towns such as Sydney, Brisbane, Perth, and Auckland.

* For full details on atmospheric corrosivity categories, refer to AS/NZS 2312.1:2014 section 2.0 and AS 4312.2019

Atmospheric Corrosivity Categories Based on AS/NZS 2312.1:2014

Category	Corrosivity	Description
C5-I	Very High - Industrial	This classification can be located within highly active industrial zones, where the surroundings could be acidic, registering a pH below 5. Instances of dampness and/or contamination typically associated with Category C4 may occasionally overlap with this classification.
C5-M	Very High - Marine	Coastal areas with high salinity. Extends up to about 50 m inland around unsheltered seas or within surf zones. For less sheltered bays, this category extends up to about 100 m inland. Typical areas occur near beachfront and near chemical plants.
CX	Extreme	This classification is frequently observed in areas adjacent to coastal surf beaches, characterized by substantial salt accumulation or harsh acidic industrial settings.
T	Inland Tropical	The coastal regions of northern Queensland, the Northern Territory, northwestern Western Australia, Papua New Guinea, and the Pacific Islands are included, except for areas affected by salinity. Corrosiveness in inland areas typically remains low, akin to Category C2, yet the environment's propensity to degrade organic coatings implies reduced durability compared to Category C2.

Coatings overview

1st Coat: Primer

The purpose of a zinc primer for steel is primarily to provide corrosion protection. Zinc primers are applied to steel surfaces as a first layer before subsequent coatings or as a standalone coating. Zinc is known for its ability to sacrificially protect steel from corrosion through a process called galvanic protection. When the steel surface is exposed to moisture or other corrosive elements, the zinc primer corrodes preferentially, protecting the underlying steel from rust and other forms of corrosion.

Additionally, zinc primers often provide excellent adhesion to steel surfaces, promoting better bonding with subsequent layers of paint or coatings, thereby enhancing the overall durability and longevity of the coating system. This makes them a common choice in various industries such as automotive, marine, construction, and industrial applications where steel structures are exposed to harsh environmental conditions.

2nd Coat: Intermediate/Barrier coat

Intermediate or barrier coats form the 2nd coat of a 3-coat system. The purpose of an intermediate coat is to provide additional protection and enhance the performance of the coating system. They are typically applied between a zinc primer and suitable UV resistant topcoat such as a Polyurethane. Intermediate/Barrier coats play a crucial role in enhancing corrosion protection, chemical resistance, and overall durability of the coating system. The specific requirements will depend on the environmental conditions, intended application and performance expectations for the steel structure.

3rd coat: Topcoat

Topcoats are necessary for steel to provide enhanced durability, aesthetic appeal, weather resistance, chemical resistance, easy maintenance, surface protection, and UV protection. They are a critical component of protective coating systems that help ensure the long-term performance and appearance of steel structures in various applications.

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Product selection guide for steel based on AS/NZS 2312.1:2014 Table 6.3

Coating System Details													Durability - Years to first maintenance (note 3)						
System	ISO 12944-5 Designation (note 1)	Surface Preparation	1st Coat			2nd Coat			3rd Coat			Total nom DFT µm	Atmospheric Corrosivity Category						
			Type	PRN	Nom DFT µm	Type	PRN	Nom DFT µm	Type	PRN	Nom DFT µm		C1 Very low	C2 Low	C3 Med	C4 High	C5-I Very High Industrial	C5-M Very High Marine	T Inland Tropical
ALKYD																			
ALK1		St 3/Sa 2	Vitrethane 445	C05	40	-		-	-	-	-	40	5+	0-5	-	-	-	-	-
ALK2		St 3/Sa 2	Vitrethane 445	C05	75	Vitrethane 406	C20	40²	-	-	-	115	10+	5-10	2-5	-	-	-	2-5
ALK3		St 3/Sa 2	Vitrethane 445	C05	40	Vitrethane 407	C20	40	Vitrethane 407	C20	40	120	15+	10-15	5-10	2-5	-	-	5-10
EPOXY - Very High Build (DFT: 250 to 500 µm per coat)																			
EVH1		Sa 2.5	Vitrezone 425	C13a	250	-		-	-	-	-	250	25+	15-25	10-15	5-10	2-5	2-5	5-10
EVH2	A1.26	Sa 2.5	Vitrezone 425	C13a	400	-		-	-	-	-	400	*	25+	15-25	10-15	5-10	5-10	10-15
EVH3		Sa 2.5	Vitrephos 560	C02	75	Vitrezone 425	C13a	400	-	-	-	475	*	25+	15-25	10-15	5-10	5-10	10-15

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			Type	PRN	Nom DFT µm	Type	PRN	Nom DFT µm	Type	PRN	Nom DFT µm		Cl Very low	C2 Low	C3 Med	C4 High	C5-I Very High Industrial	C5-M Very High Marine	T Inland Tropical
EPOXY - Very High Build (DFT: 250 to 500 µm per coat)																			
EHB3	A1.21	Sa 2.5	Vitrephos 560	C02	75	Vitreset 419	C32	200	-	-	-	275	*	15-25	10-15	5-10	2-5	2-5	5-10
EHB4		Sa 2.5	Vitrezinc 586	C02	75	Vitrezone 425	C13a	200	-	-	-	275	*	25+	15-25	10-15	5-10	5-10	10-15
						Vitreset 419	C32												
EHB5		Sa 2.5	Vitrephos 560	C02	75	Vitreset 416 MIO	C13	125	Vitreset 416 MIO	C13	125	325	*	25+	15-25	10-25	10-15	10-15	10-15
						Vitreset 419	C32												
EHB6		Sa 2.5	Vitrezinc 586	C02	75	Vitreset 416 MIO	C13	125	Vitreset 416 MIO	C13	125	325	*	25+	25+	25+	10-15	15-25	10-25
						Vitreset 419	C32												
EPOXY MASTIC - Surface Tolerant																			
EPM2		St 3	Vitreset 419	C32	75	Vitreset 419	C32	75	-	-	-	150	25+	10-25	5-10	2-5	-	-	5-10
EPM3		St 3	Vitreset 419	C32	200	Vitreset 419	C32	200	-	-	-	400		15-25	10-15	5-10	2-5	2-5	10-15

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POLYSILOXANE																			
PSL1		Sa 2.5	Vitrezinc 586	C02	75	Vitreguard 840	C37	125	-	-	-	200	*	12-25	15-25	10-15	-	-	15-25
PSL2		Sa 2.5	Vitrezinc 586	C02	75	Vitreset 416 MIO	C13	175	Vitreguard 840	C37	75	325	*	25+	25+	25+	15	15	25+
						Vitreset 419	C32												
PSL3		Sa 2.5	Vitrephos 560	C02	75	Vitreset 416 MIO	C13	175	Vitreguard 840	C37	75	325	*	25+	25+	15-25	15-25	10-15	25+
						Vitreset 419	C32												
POLYURETHANE/FLUOROPOLYMER - Two pack, solvent borne																			
PUR1		St 3	Vitreset 419	C32	125	Vitrethane 630	C26	50²	-	-	-	175	*	10-15	5-10	2-5	-	-	5-15
						Vitrethane 470	C15	75²				200							
PUR2	A1.15	Sa 2.5	Vitrephos 560	C02	75	Vitrethane 630	C26	50²				125	25+	10-15	5-10	2-5	-	-	5-15
						Vitrethane 470	C15	75²				150							

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			Type	PRN	Nom DFT µm	Type	PRN	Nom DFT µm	Type	PRN	Nom DFT µm		C1 Very low	C2 Low	C3 Med	C4 High	C5-I Very High Industrial	C5-M Very High Marine	T Inland Tropical
POLYURETHANE - Two pack, solvent borne																			
PUR2a	A1.17	Sa 2.5	Vitre zinc 586	C02	75	Vitrethane 470	C15	75	-	-	-	150	25+	15-25	10-15	5-10	2-5	2-5	10-15
PUR3	A4.08	Sa 2.5	Vitrephos 560	C02	75	Vitreset 419	C32	125	Vitrethane 630	C26	50²	250	*	25+	15-25	10-15	5-10	5-10	15-25
						Vitreset 416 MIO	C13		Vitrethane 470	C15	75²	275							
PUR4	A1.20	Sa 2.5	Vitre zinc 586	C02	75	Vitreset 419	C32	125	Vitrethane 470	C26	50²	250	*	25+	15-25	10-15	5-10	5-10	15-25
						Vitreset 416 MIO	C13		Vitrethane 470	C15	75^	275							
PUR5	A1.23	Sa 2.5	Vitre zinc 586	C02	75	Vitreset 419	C32	200	Vitrethane 470	C15	50²	325	*	25+	25+	25+	15-25	15-25	25+
PUR6		St 3	Vitreset 419	C32	75	Vitreset 419	C32	75	Vitrethane 470	C15	75²	225	*	15-25	10-15	5-10	2-5	2-5	5-15
PUR7	A1.19	Sa 2.5	Vitre zinc 586	C02	75	Vitreset 416 MIO	C13	75	Vitrethane 470	C15	75²	225	*	25+	15-25	10-15	5-10	5-10	10-15

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			Type	PRN	Nom DFT µm	Type	PRN	Nom DFT µm	Type	PRN	Nom DFT µm		C1 Very low	C2 Low	C3 Med	C4 High	C5-I Very High Industrial	C5-M Very High Marine	T Inland Tropical
FLUOROPOLYMER - Two pack, solvent borne																			
FEVE1 ⁴		Sa 2.5	Vitrezinc 586	C02	75	Vitreflon 790 [^] **	C15	125	-	-	-	200	25+	25+	15-25	10-15	10-15	10-15	15-25
FEVE2 ⁴		Sa 2.5	Vitrezinc 586	C02	75	Vitreset 416 MIO	C13	125	Vitreflon 790 [^] **	C15	75 ²	275	*	*	25+	25+	15-25	15-25	15-25
FEVE3 ⁴		Sa 2.5	Vitrezinc 586	C02	75	Vitreset 416 MIO	C13	200	Vitreflon 790 [^] **	C15	75 ²	350	*	*	25+	25+	25+	25+	25+

Whilst Vitreton 790 Fluoropolymer topcoats fall in the Polyurethane category as per Appendix D in AS2123.1:2014, Fluoropolymers are superior in performance to all other Polyurethane and Polysiloxane topcoats. FEVE Fluoropolymer coatings have higher bond energy in the molecular structure compared to maximum UV energy. Project around the world where FEVE Fluoropolymer has been used, show a recoat lifecycle of 40 - 50 years. The durability for this system is a variation to AS/NZS 2312.1:2014

* Whilst this system is highly durable in this corrosive category, it is deemed not to be economical

[^] Extended durability offered for higher topcoat DFT achieved above that quoted on the table. Variation from AS2313.1:2014

Notes to Table 6.3

Note 1 ISO 12944-5:2007 equivalent designation (to within ±25 µm total DFT). The durability given in ISO 12944-5 of ISO equivalent may be different.

Note 2 Multiple coats may be required with some colours to achieve optimum opacity

Note 3 Durability is defined in AS/NZS 2312.1:2014 as "The time elapsed before the first major maintenance (recoating or patch repairs, see AS2312.1:2014 Section 8) of a coating system becomes necessary, to arrest corrosion".

Note 4 FEVE Systems listed are a variation to AS2312.1:2014.

Abbreviations

PRN Paint reference number (see Appendix D in AS2123.1:2014)

DFT Dry film thickness

Sa, St See ISO 8501-1

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Paint reference numbers (PRN) and colour availability

Paint Ref No. (PRN)	Generic Description	Product Name	Data Sheet	Description	DFT Range	Colour Range
C02	Organic Zinc	Vitrezinc 586	1001	Two pack epoxy zinc rich primer	40-75	
C05	Alkyd Primer	Vitrethane 445	1098	Fast drying high build anti-corrosive primer for single pack applications	40-75	
C13	High-Build Epoxy (2 Pack)	Vitreset 416	123	High build epoxy with micaceous iron oxide for superior protection	200-300	
C13a	Very High-Build Epoxy (2 Pack)	Vitrezone 425	142	Ceramic or Glass reinforced epoxy providing enhanced build and protection properties	350-500	
C15	High-Build Polyurethane	Vitrethane 470	1112	High build polyurethane with brush and roll application properties	50-100	
		Vitrethlon 790	1003	Highly durable high build fluoropolymer with superior weathering and UV resistance	50-125	
C20	Gloss Alkyd Paint	Vitrethane 406	1095	High gloss single pack alkyd enamel coating	25-50	
		Vitrethane 407		High gloss single pack alkyd enamel with anti-corrosive pigment	25-50	
C26	Polyurethane Gloss (2 Pack)	Vitrethane 630	024	Durable polyurethane topcoat	50-100	
C32	Epoxy Mastic	Vitreset 419	1031	Two pack surface tolerant epoxy	125-250	
C37	Polysiloxane	Vitreguard 840	1069	Durable topcoat with very good weathering and UV resistance	75-125	

One colour only

Limited range of factory packaged colours

Available in the full range of colours

Limited range of colours - Contact A&I for colour availability