

Testing of Eco-coat in accordance with AS/NZS 4158:2003

Materials Performance

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Commercial-in-confidence

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Revision A	Interim Report	20 Nov 2023	CSIRO, Par Ferro Coatings Pvt. Ltd.	
Revision B	Final Revision B	17 Jan 2024	CSIRO, Par Ferro Coatings Pvt. Ltd.	Results for Cathodic disbondment and UV are included

Prepared on behalf of CSIRO and Authorised signatory

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1 Introduction

This report describes the testing of the coated specimens in accordance with AS/NZS 4158:2003 Cl 2.3.2 'Hot Water Immersion', Cl 2.3.5 'Impact Resistance', Cl 2.3.7 'Abrasion Resistance', Cl 2.3.8 'Cathodic Disbondment', and Cl 2.3.10 'Ultraviolet Radiation'.

2 Specimen Description

The powder coated specimens were supplied by the client as below:

- 1 of 100x100 coated specimen for Hot Water Immersion.
- 2 of 100x100 for Abrasion Resistance.
- 2 of 100x100x6mm for Impact Resistance
- 3 of 100x100mm for Cathodic Disbondment.
- 3 of 6x25x200mm for Ultraviolet Radiation.

The specimen description as provided by the client:

Product Trade Name: ECO-COAT

Full description: Batch no: 01/09/12A; Mfg Dt: 09.09.2023

Coating Type: Fusion Bonded Epoxy

Specimens received 26/09/2023.

CSIRO were not involved in specimen preparation.

3 Test Methods

3.1 Hot Water Immersion

The specimens were exposed in accordance with AS 3862:2020 for 14 days at 50±2°C (ERM.030.023) as required by AS/NZS 4158:2003. The adhesion of the coating was undertaken, in accordance with AS 1580.408.2-2004 Adhesion – Knife test.

The coating thickness for three panels were measured using ER.017.2. The intersecting cuts were made with a Stanley Knife.

The testing was undertaken by M. Arora for the period from 06 October-20 October 2023 and the results relate to the specimens as supplied.

3.2 Impact Resistance

The impact resistance was determined on a coated 6 mm flat plate in accordance with AS 1580.406.1-2004 'Resistance to impact – falling weight test' using Impact tester (ER.008.1). The requirement of AS/NZS 4158:2003 is for testing in accordance with ASTM G14. The tup used on ASTM G14 is the same size (15.8 mm) as that used. However, AS 1580 Method 406.1 requires visual inspection at 10x magnification to determine penetration rather than a Holiday Detector used in ASTM G14.

The testing was undertaken by Z. Lu on 14 November 2023 and the results relate to the specimens as supplied.

3.3 Abrasion Resistance

The specimens were tested for abrasion resistance in accordance with AS 1580.403.2-2006. This method is derived from ASTM D4060 which is required by AS/NZS 4158:2003.

The taber abrader (ERM.014.2) was set with 1000g load per arm, CS17 wheels (LT01E1, Exp August 2026) and operated for 1000 cycles in accordance with the requirements.

The testing was undertaken by A. Menisi on 3rd November 2023 and the results relate to the specimens as supplied.

The testing was conducted under routine conditions; $23 \pm 3^{\circ}\text{C}$ and $60 \pm 15\% \text{ RH}$.

3.4 Cathodic Disbondment

The tests were carried out in accordance with AS 4352-2005 at $23 \pm 2^{\circ}\text{C}$ for 28 days as required by AS/NZS 4158:2003. Test cell A-concentric pot was used.

The testing was undertaken by Z. Lu for the period from 17 November-15 December 2023 and the results relate to the specimens as supplied.

3.5 Ultraviolet Radiation

The coating was tested in accordance with ASTM D2565:2023 for 100 days as required by AS/NZS 4158:2003. The exposure was undertaken in the CSIRO Atlas i4000 Xenon Arc Weatherometer ERM.021.3. The holiday testing was conducted in accordance with AS 3894.1-2002 at 2400 V.

Holiday Detector-PCWI compact DC30, Asset Number 203280 with calibration valid until 13/11/2025 was used.

The testing was undertaken by M. Arora for the period from 06 October-15 January 2024 and the results relate to the specimens as supplied.

4 Results

The results for XC3942 are detailed in the Table 1 below.

Table 1: Results for XC3942 Eco-Coat

AS 4158:2003 Clause No	Test Description	Test Method	Requirements	Results
2.3.2	Hot Water Immersion	AS 3862:2020 – 14 days@ 50 ± 2°C AS 1580.408.2:2004	Rating ≤1	Thickness=381um Rating = 0, 0, 0
2.3.5	Impact Resistance	AS1580.406.1* Method A	≥ 2.0 Joule	Thickness= 103.4um ≥ 2.0 Joule No cracking, stripping, or failure
2.3.7	Abrasion Resistance	AS1580.403.2*	≤ 40 mg	12.4 mg, 18.5 mg Av=15.5mg
2.3.8	Cathodic Disbondment	AS 4352-2005	≤ 15 mm	No blistering or other defects. Min=12 mm, max= 15 mm, av=13 mm
2.3.10	Ultraviolet Radiation	ASTM D2565:2023 AS 3894.1-2002	No holidays in tension face @1% strain when tested at 2400 V	No Holidays or cracks in tension face@1% strain when tested at 2400 V

**AS1580.406.1 was used for Impact Resistance which is equivalent to ASTM G14 and AS1580.403.2 for Abrasion Resistance which is derived from ASTM D4060. Refer section 3 for more details.*

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