COT bv
Independent advice, research and management for construction and industry

Civil projects
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REPORT

Testing of 2 layers SIGMASHIELD 1200
according to NORSOK M-501, Rev. 5, System 7

Haarlem, 7 December 2010

Client	:	PPG Protective & Marine Coatings Koprawag 35, Westpoort 7615 1047 BP AMSTERDAM Contact person: Mr. R. Kruijt
Project number	:	20100138
Report number	:	LAB10-1078-REP
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CONTENTS

1 INTRODUCTION

1.1 Order

By order of PPG Protective and Marine Coatings in Amsterdam, the Netherlands, the Centrum voor Onderzoek en Technisch advies bv (COT) has tested the 2 layers Sigmashield 1200 system according to Norsok M-501, Rev. 5, System 7.

1.2 General information

Samples	:	Coated steel test panels with 2 layers Sigmashield 1200
COT sample number	:	18-02-10/0162
Received	:	17 February 2010
Start of tests	:	6 April 2010
End of tests	:	19 November 2010

2 PAINT APPLICATION

The coating system has been applied at PPG on mild steel panels, abrasive blasted to Sa 2½ (ISO 8501-1), with a surface profile equivalent to ISO 8503 G, Fine (G).

Specified Dry Film Thickness: 2 layers Sigmashield 1200, 400 µm per layer

3 PERFORMANCE TESTS

3.1 Seawater immersion

The fully cured system has been scribed horizontal down to the bare metal. The scratch line is 2 mm wide and 50 mm long. The panels have been immersed in synthetic seawater (according to ISO 15711) at 40°C during 4200 hours according to ISO 2812-2.

3.2 Ageing test

The fully cured system has been scribed horizontal down to the bare metal. The scratch line is 2 mm wide and 50 mm long. The panels have been exposed to the following cycle according to ISO 20340 Annex A:

72 hours	UV-A 340 nm weatherometer in accordance with ISO 11507 Method A (4 hours UV-light at 60°C / 4 hours condensation at 50°C)
72 hours	Salt Spray Test according to ISO 9227 NSS
24 hours	Exposure to low temperature (-20°C)

The total exposure time is 4200 hours.

3.3 Cathodic Disbonding

Cathodic disbonding has been determined according to ISO 20340-2009 (ISO 15711). After 6 months exposure time the maximum disbonding has been measured.

3.4 Adhesion test

The adhesion before and after the seawater immersion and after the ageing test has been determined by a pneumatic adhesion tester in accordance with ISO 4624. The coating surface and the dolly have been sanded lightly and the epoxy adhesive has been applied. After curing of the adhesive and prior to testing the coating and the adhesive have been drilled around the dolly down to the bare metal. Three trials on the unexposed panel and 2 trials on each of the tested panels have been done and the average has been reported.

4 REQUIREMENTS

4.1 Seawater immersion test

After exposure to the specified time, the test panels shall comply with the following requirements:

Method		Requirements
--	Corrosion creep from scribe*	≤ 8.0 millimetres
ISO 4628-2	Blistering	0(S0)
ISO 4628-3	Rusting	Ri 0
ISO 4628-4	Cracking	0(S0)
ISO 4628-5	Flaking	0(S0)
ISO 4624	Adhesion	minimum 5.0 MPa and maximum 50% reduction from original value

* The corrosion creep is calculated from the equation: M=(C-W)/2, where
M = corrosion creep (mm)
C = average of the nine measurements (mm)
W = the original width of the scribe (mm)

4.2 Ageing test

After exposure to the specified time, the test panels shall comply with the following requirements:

Method		Requirements
--	Corrosion creep from scribe*	≤ 8.0 millimetres
ISO 4628-2	Blistering	0 (S0)
ISO 4628-3	Rusting	Ri 0
ISO 4628-4	Cracking	0 (S0)
ISO 4628-5	Flaking	0 (S0)
ISO 4624	Adhesion	minimum 5.0 MPa and maximum 50% reduction from original value

* The corrosion creep is calculated from the equation: M=(C-W)/2, where
M = corrosion creep (mm)
C = average of the nine measurements (mm)
W = the original width of the scribe (mm)

4.3 Cathodic disbonding

After exposure to the specified time, the test panels shall not show disbonding around the holiday with an equivalent diameter < 20 mm.

5 RESULTS

5.1 Original adhesion value

	Panel 7
Dry film thickness (µm)	949 ± 21
Adhesion value (MPa)	19.3 ± 1.0

5.2 Seawater immersion

Exposure time : 4200 hours

Method		Panel 4	Panel 5	Panel 6
--	Dry film thickness (µm)	932 ± 17	892 ± 15	874 ± 27
ISO 4628-2	Blistering	0(S0)	0(S0)	0(S0)
ISO 4628-3	Rusting	Ri 0	Ri 0	Ri 0
ISO 4628-4	Cracking	0(S0)	0(S0)	0(S0)
ISO 4628-5	Flaking	0(S0)	0(S0)	0(S0)
--	Corrosion creep from scribe (mm)	3.1	3.1	3.3
ISO 4624	Adhesion (MPa)	18.3 ± 2.0	17.1 ± 1.0	19.0 ± 1.0

5.3 Ageing test

Exposure time: 4200 hours

Method		Panel 8	Panel 9	Panel 10
--	Dry film thickness (µm)	774 ± 32	796 ± 10	811 ± 33
ISO 4628-2	Blistering	0(S0)	0(S0)	0(S0)
ISO 4628-3	Rusting	Ri 0	Ri 0	Ri 0
ISO 4628-4	Cracking	0(S0)	0(S0)	0(S0)
ISO 4628-5	Flaking	0(S0)	0(S0)	0(S0)
--	Corrosion creep from scribe (mm)	6.7	6.4	6.8
ISO 4624	Adhesion (MPa)	12.5 ± 1.0	11.6 ± 1.0	11.4 ± 2.0

5.4 Cathodic Disbonding

Exposure time : 4200 hours

Method		Panel 1	Panel 2	Panel 3
--	Dry film thickness (µm)	893 ± 16	909 ± 32	942 ± 17
ISO 15711	Equivalent diameter disbonding	5 mm	5 mm	5 mm

6 CONCLUSION

The 2 layers Sigmashield 1200 system (COT sample number 18-02-10/0162), dry film thickness 2 x 400 µm, meets the requirements of Norsok M-501 R Rev. 5, System 7.

CENTRUM VOOR ONDERZOEK
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