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

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REPORT

Testing of system consisting of
3 layers POWER COAT "3 in 1"
according to Norsok M-501, Edition 6, System 1

Haarlem, 14th November 2013

Client	:	J.S. Cock A/S Nedre Rommen 3 0988 Oslo Norge/Norway Contact person: Mr. T. Stald
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1 INTRODUCTION

1.1 Order

By order of J.S. Cock A/S in Oslo, Norway, the Centrum voor Onderzoek en Technisch advies (COT bv) in Haarlem, The Netherlands, has tested the system consisting of 3 layers Power Coat "3 in 1" according to Norsok M-501, Edition 6, System 1.

1.2 General information

COT sample number	Sample	Colour	Batch number	Received
16-01-13/0018	Power Coat "3 in 1"	RAL 7035	574	15 January 2013
16-01-13/0019	Power Coat "3 in 1"	RAL 9007 mio	8304 and 8274	
16-01-13/0020	Kombi-Verdünning	--	--	

Substrate
Mild carbon steel, dimensions 150 x 75 x 5 mm.

Surface preparation
The panels have been abrasive-blasted to a cleanliness degree equivalent to Sa 2½ (ISO 8501-1).

System and specified dry film thickness
Power Coat "3 in 1" RAL 7035 : min. 100 µm
Power Coat "3 in 1" RAL 9007 mio : min. 100 µm
Power Coat "3 in 1" RAL 7035 : min. 100 µm

Application data
The system has been applied to the test panels by COT bv and the data have been reported in Annex 1.

Dry film thickness
After curing of the last coating layer the dry film thickness of the coating system has been measured according to ISO 2178 with a magnetic dry film thickness meter (COT E004). On each panel ten measurements have been carried out and the values have been corrected with a correction value of 25 micrometer according to ISO 19840. The minimum, the maximum, the average and the standard deviation have been reported.

2 PERFORMANCE TESTS

2.1 Ageing test

The fully cured coating 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.

The start of the ageing test was March 29th, 2013.
The end of the ageing test was September 20th, 2013.

2.2 Adhesion test

The adhesion before and after the ageing test has been determined by a pneumatic adhesion tester in accordance with ISO 4624. The coating surface and the dolly (diameter 20 mm) 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 two trials on each of the tested panels have been performed and the average has been reported.

The adhesion of the coating system has been determined begin October 2013.

2.3 Overcoatable without mechanical treatment

After the ageing test the exposed panels have been over coated with Power Coat "3 in 1" RAL 7035 without mechanical treatment. After 7 days the adhesion has been determined according to ISO 4624.

The adhesion of the topcoat has been determined begin October 2013.

3 REQUIREMENTS

3.1 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 4628-6	Chalking	maximum rating 2
ISO 4624	Adhesion	minimum 5.0 MPa and maximum 50 % reduction from original value
ISO 4624	Overcoatable without mechanical treatment	minimum 5.0 MPa

* 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 RESULTS

4.1 Original adhesion value

Test	Panel 5	Panel 6
Minimum – Maximum Dry film thickness (µm)	342 – 379	334 – 391
Dry film thickness (µm)	364 ± 13	362 ± 19
Adhesion value (MPa) Place of rupture	6.0 ± 0.6 20 % in 2nd coat 80 % in 3rd coat	6.8 ± 0.2 20 % in 2nd coat 80 % in 3rd coat

4.2 Ageing test

Exposure time: 4200 hours

Method		Panel 1	Panel 3	Panel 4
	Min – Max Dry film thickness (µm)	309 – 351	330 – 350	310 – 352
--	Dry film thickness (µm)	335 ± 13	337 ± 7	332 ± 13
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)
ISO 4628-6	Chalking	2	2	2
--	Corrosion creep from scribe (mm)	7.8	7.9	7.6
ISO 4624	Adhesion (MPa) Place of rupture	5.4 ± 0.8 From substrate	5.6 ± 0.4 From substrate	5.7 ± 0.2 From substrate
ISO 4624	Adhesion of overcoat* (MPa) Place of rupture	6.5 ± 0.1 From substrate	6.3 ± 1.0 From substrate	7.0 ± 2.0 75 % from substrate 25 % between 3rd and 4th coat

* Is the 4th layer in the over coated system.

5 CONCLUSION

The system consisting of 3 layers Power Coat "3 in 1", dry film thickness 100/100/100 µm, with COT sample numbers 16-01-13/0018 and 0019, meets the requirements of the pre-qualification of Norsok M-501, Edition 6, System 1.

CENTRUM VOOR ONDERZOEK
EN TECHNISCH ADVIES (COT bv)

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ANNEX I

Table 1: Application data

Application data	**1st coat**	**2nd coat**	**3rd coat**
Paint system	Power Coat "3 in 1" RAL 7035	Power Coat "3 in 1" RAL 9007 mio	Power Coat "3 in 1" RAL 7035
Surface preparation	Grit blasting	--	--
Blasting standard	Sa 2½	--	--
Roughness (Rz)	87 ± 7 µm	--	--
Water soluble salts (Bresle test)	11.5 mg/m^2	--	--
Date	15-02-2013	22-02-2013	28-02-2013
Batch Number	574	8304	574
Equipment used	Air spray	Air spray	Air spray
Air pressure (bar)	4	4	4
Tip size (mm)	1.5	1.5	1.5
Volume solid (% by volume)	53	53	53
Kombi-Verdünning (% by mass)	10	10	10
Theoretical wet film thickness (µm)	220	220	220
Theoretical dry film thickness (µm)	100	100	100
Air temperature (°C)	19	20	19
Relative Humidity (%)	35 - 40	20 - 25	25 – 30
Steel temperature (°C)	18	22	22
Dew point (°C)	4	- 2	1