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

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REPORT

Testing coated samples with COT sample number 24-09-18/0589 according to ISO 12944-6 C5 High test regime 1

Haarlem, 06 February 2019

Client	:	Zingametall Bvba Industriepark -Rozenstraat 4 9810 EKE Belgium Contact person: Mr. J. Serck
Project number	:	20180053
Report number	:	LAB19-0049-REP REV 2
Handled by	:	Mr. K. Coppoolse Mr. N. Blokker

CONTENTS

1 INTRODUCTION

1.1 Order

By order of Zingametall Bvba in Eke, Belgium, the Centrum voor Onderzoek en Technisch advies (COT bv) in Haarlem, The Netherlands, has tested the samples with COT sample number 24-09-18/0589 according to ISO 12944-6 C5 High test regime 1.

The order has been confirmed by signing the COT offer LAB18-0066-OFF, dated February 8, 2018.

Tests marked with 'Q' are under accreditation according to ISO/IEC 17025 with registration number L535.

1.2 General information

Table 1: Received samples

COT sample number	Sample	Received
24-09-18/0589	17 Grey coated steel panels, dimensions 75 x 150 x 5 mm, numbered* 1 - 8, 10 - 16, 18 and 20	20-09-2018

*) numbered by the client.

The coating system has been applied to the test panels by the client.
The following information has been received from the client.

Application data

Substrate
Steel panels.

Surface preparation
Blasted to Sa 2.5 grade cleanliness according to ISO 8501-1.
Surface roughness Medium (G) according to ISO 8503-1.

Coating system build up and specified dry film thickness

Zingalu	: 110 µm
Test specification	: ISO 12944-6
Corrosivity category	: C5
Durability range	: High
Test regime	: 1

2 PROCEDURE

2.1 Determination of the dry film thickness using a magnetic induction gauge, ISO 17025 Scope number 1 (Q)

Before starting the tests, the total dry film thickness of the coating system has been measured according to ISO 2808:7C, COT Instruction 30.01.12-2 with a magnetic dry film thickness meter (COT E004) and corrected for surface roughness (C = correction value) according to ISO 19840. On each panel 5 measurements have been carried out.

2.2 Adhesion

Before adhesion testing the panels have been conditioned for 7 days at 23 ± 2 °C and 50 ± 5 % R.H., the test has been performed under the same conditions. All individual values have been reported.

Depending on the uncorrected mean DFT of the coating system, the following methods are used:

If lower or equal to 250 micrometers; crosscut method according to ISO 2409, if higher than 250 micrometers; pull-off method B according to ISO 4624.

2.2.1 Crosscut test assessing the resistance of paint coatings to separation from substrates when a right-angle lattice pattern is cut into the coating, penetrating through to the substrate, according to ISO 2409, ISO 17025 Scope number 3 (Q).

The adhesion of the coating system has been determined according to ISO 2409, COT Instruction 30.01.20-1 by cross-cut test using a single blade cutting tool.

Distance between incisions is determined by the nDFT of the coating system;
- <60 µm: 1 mm,
- 60-120 µm: 2 mm,
- 120-250 µm: 3 mm,
- >250 µm: method unsuitable.

Loose paint will be removed using ISO 2409 method A1 (brushing).

On each panel three trials have been performed, with three extra when the variation of results was greater than 1 unit.

2.3 Determination of the resistance against corrosion in artificial atmospheres, Neutral salt spray, ISO 17025 Scope number 4 (Q)

Resistance to Neutral Salt Spray (NSS) has been tested in accordance with ISO 9227 NSS, COT Instruction 30.01.27-1 on three test panels. The fully cured coating system has been scribed horizontally down to the steel substrate, the scribe line being 2 mm wide and 50 mm long.

General data

Apparatus number	:	COT S008
Type of water	:	Demineralised water (< 1 µS)
Salt	:	Sodium chloride (NaCl) p.a.
Test temperature	:	35 ± 2 °C
Collected salt solution	:	1.0 – 2.0 ml/hour/80 cm^2
pH of the collected salt solution	:	6.5 – 7.2
Salt concentration of the collected solution	:	50 ± 5 g/l
Exposition angle	:	approx. 20 ° from the vertical
Test duration	:	1440 hours

Immediately after exposure the panels were evaluated for visual surface defects according to ISO 4628-2, -3, -4 and -5.

The corrosion at the scribe has been determined within 8 hours after the end of the exposure. The corrosion at the scribe 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)

After the assessments photos have been taken (See Annex).

2.4 Determination of the resistance to Humidity–CH test, ISO 17025 Scope number 6 (Q)

Resistance to water condensation has been tested in accordance with ISO 6270-1, COT Instruction 30.01.41 on three test panels.

General data

Apparatus	:	Cleveland condensation tester (COT C001)
Temperature of the air space	:	38 ± 2 °C
Temperature environment	:	23 ± 2 °C
Exposition angle	:	approx. 60 ° to the horizontal
Test duration	:	720 hours

Immediately after the test, the panels have been examined for defects according to ISO 4628. After the assessments photos have been taken (See Annex).

2.5 Requirements

Only one of the three panels shall be allowed not to comply with the requirements.

2.6 Reference adhesion before tests

Table 2: Adhesion before tests

Adhesion ISO 2409 (ISO 17025 Scope number 3)		**Requirements**
ISO 2409	Individual values	Class 0-2

2.7 Assessment after Neutral Salt Spray test

Table 3: Assessment after Neutral Salt Spray test

Neutral salt spray ISO 9227- 5.2 NSS, 1440 hours (ISO 17025 Scope number 4)		**Requirements**
ISO 4628-2 ISO 4628-3 ISO 4628-4 ISO 4628-5	Blistering Rusting Cracking Flaking	0(S0) Ri 0 0(S0) 0(S0)
Corrosion from scribe		≤ 1.5 mm
ISO 2409	Individual values	Class 0-2

2.8 Assessment after Condensation test

Table 4: Assessment after Condensation test

Condensation ISO 6270-1, 720 hours (ISO 17025 Scope number 6)		**Requirements**
ISO 4628-2 ISO 4628-3 ISO 4628-4 ISO 4628-5	Blistering Rusting Cracking Flaking	0(S0) Ri 0 0(S0) 0(S0)
ISO 2409	Individual values	Class 0-2

3 RESULTS

3.1 Dry film thickness

Table 5: Dry film thickness test panels. (ISO 17025 Scope number 1)
Test date: 01-10-2018

Dry film thickness ISO 19840 (C = 25 µm)	**COT sample number 24-09-18/0589**	
	Panel 1	**Panel 3**
Readings (n=5)	117 107 132 124 123	109 100 114 115 118
Min. - Max. (µm) Average, SD (µm)	107 - 132 121 ± 9	100 – 118 111 ± 7
	Panel 7	**Panel 10**
Readings (n=5)	91 95 103 113 105	95 104 113 99 111
Min. - Max. (µm) Average, SD (µm)	91 – 113 101 ± 9	95 - 113 104 ± 8

	Panel 12	**Panel 13**	**Panel 14**	**Panel 15**
Readings (n=5)	85 91 106 90 97	128 117 160 146 127	108 106 113 108 96	112 101 125 130 115
Min. - Max. (µm) Average, SD (µm)	85 - 106 94 ± 8	117 - 160 136 ± 17	96 - 113 106 ± 6	101 - 130 117 ± 11

	Panel 18
Readings (n=5)	90 94 106 104 89
Min. - Max. (µm) Average, SD (µm)	89 - 106 97 ± 8

3.2 Assessment before tests

Table 6: Reference assessment of coating adhesion. (ISO 17025 Scope No. 3)
Test date: 09-10-2018

	Reference Adhesion	**COT sample number 24-09-18/0589**		
Q	**ISO 2409 cross-cut test**	**Panel 7**	**Panel 12**	**Panel 18**
Q	ISO 2409 Adhesion Classification	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0

3.3 Assessment after Neutral Salt Spray test

Table 7: Assessment after Neutral Salt Spray test (ISO 17025 Scope No. 4)
Test date: 4-10-2018 till 3-12-2018, adhesion 11-12-2018

Q	**Neutral salt spray ISO 9227 - 5.2 NSS Exposure 1440 hours**		**COT sample number 24-09-18/0589**		
			Panel 3	**Panel 14**	**Panel 15**
Q	ISO 4628-2	Blistering	0(S0)	0(S0)	0(S0)
Q	ISO 4628-3	Rusting	Ri 0	Ri 0	Ri 0
Q	ISO 4628-4	Cracking	0(S0)	0(S0)	0(S0)
Q	ISO 4628-5	Flaking	0(S0)	0(S0)	0(S0)
	Corrosion from scribe (mm)		0	0	0
Q	ISO 2409 Adhesion	Classification	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0

3.4 Assessment after Condensation test

Table 8: Assessment after Condensation test (ISO 17025 Scope No. 6)
Test date : 9-10-2018 till 8-11-2018, adhesion 19-11-2018

Q	**Condensation ISO 6270-1 Exposure 720 hours**		**COT sample number 24-09-18/0589**		
			Panel 1	**Panel 10**	**Panel 13**
Q	ISO 4628-2	Blistering	0(S0)	0(S0)	0(S0)
Q	ISO 4628-3	Rusting	Ri 0	Ri 0	Ri 0
Q	ISO 4628-4	Cracking	0(S0)	0(S0)	0(S0)
Q	ISO 4628-5	Flaking	0(S0)	0(S0)	0(S0)
Q	ISO 2409 Adhesion	Classification	0 / 0 / 0	0 / 0 / 0	0 / 0 / 0

4 SUMMARY

Table 9: Summary of the test results of samples with COT sample number 24-09-18/0589.

Test method	Test duration	Pass / Fail
Reference adhesion (ISO 17025 Scope number 3)	N.A.	Pass
Neutral Salt Spray ISO 9227 (ISO 17025 scope number 4)	1440 hours	Pass
Condensation test ISO 6270-1 (ISO 17025 scope number 6)	720 hours	Pass

5 CONCLUSION

The coated samples with COT sample number 24-09-18/0589 meet the requirements of ISO 12944-6 C5 High test regime 1.

CENTRUM VOOR ONDERZOEK
EN TECHNISCH ADVIES (COT bv)

ba

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ANNEX

Photographs

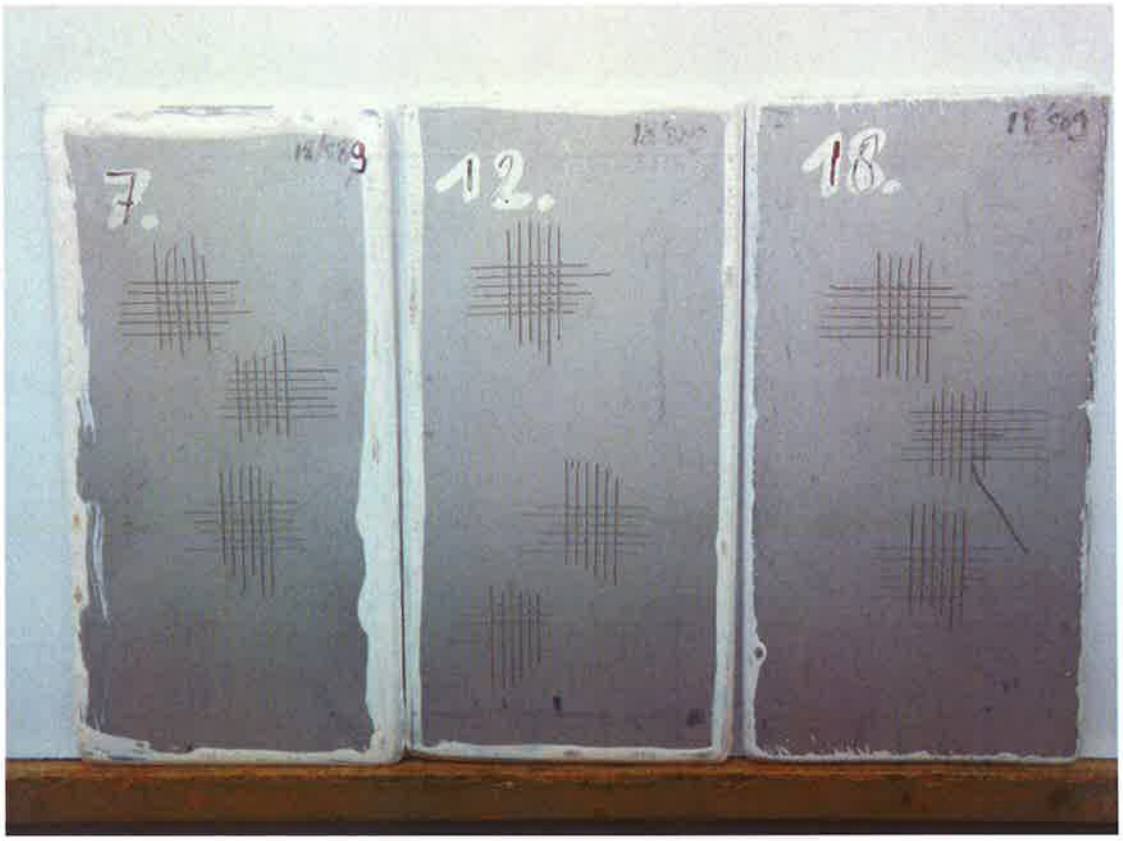

Photo 1: Panels 7, 12 and 18 Reference adhesion.

Photo 2: Panels 3, 14 and 15 after 1440 hours Neutral Salt Spray test.

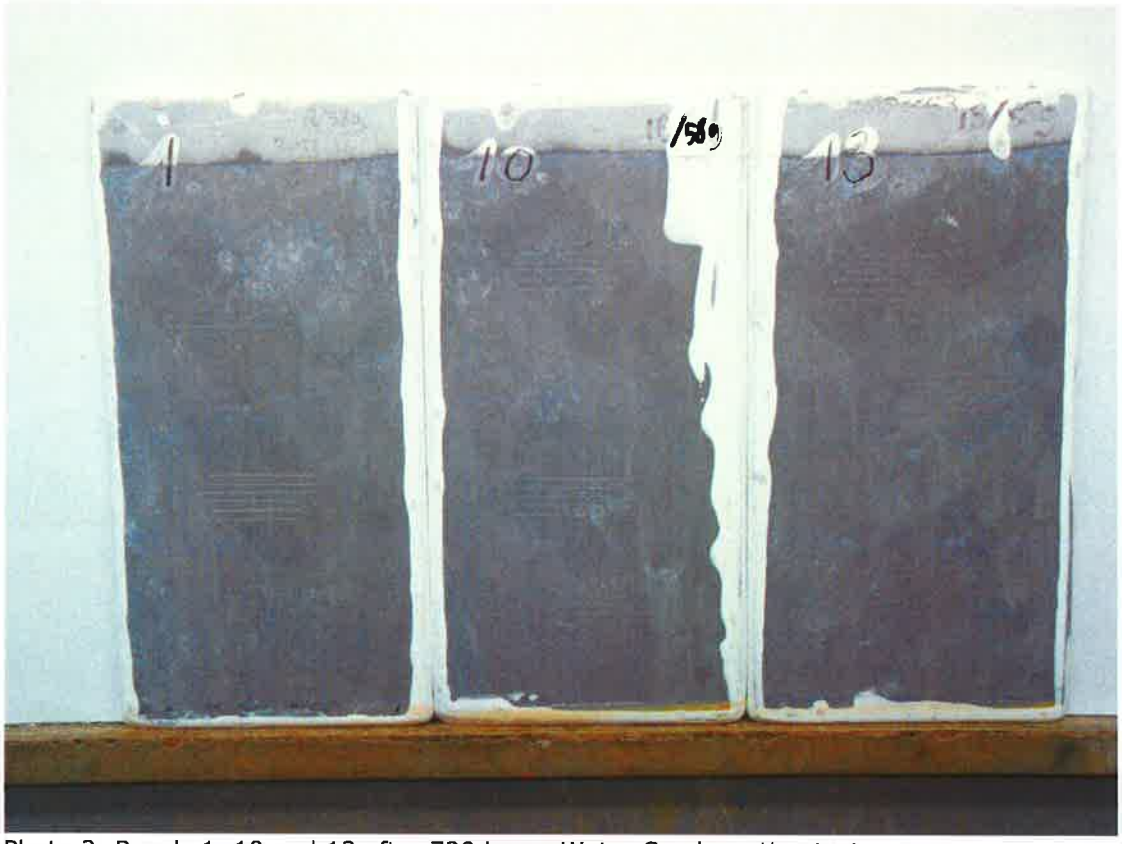

Photo 3: Panels 1, 10 and 13 after 720 hours Water Condensation test.