Test Report.

Client

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Order content	Test of two paint systems
Test item/Sample	zinc spray layers
Date of order	2016-07-20
Samples submitted on	2016-07-20
Order number	-
Testing period	2016-07-22 to 2016-10-24
Editor	Joachim Ströber, T. +49 911 655 5707

1 Contract content.

The „KompetenzZentrum Oberflächentechnik“ was commissioned to perform a test at test sample plates with two paint systems. Additionally to the adhesive strength, the corrosion resistance according to DIN EN ISO 9227-NSS and a condensate climate test according to DIN EN ISO 6270-2 were tested.

2 Test conditions.

2.1 Test item

The test materials were selected and provided by the client.

- 4 spray cans zinc spray „Zinc 240“ from TECH-MASTERS
- 4 spray cans zinc spray „Zinc 720“ from TECH-MASTERS

No.	Identification
1	Zinc spray “Zinc 240”
2	Zinc spray “Zinc 720”

3 Test procedure.

3.1 Test sample preparations

First, the test specimen were examined visually and the conditions for documentation photographed.

According to the manufacturers’ instructions, steel plates with dimensions of 150 x 70 mm were coated with different layer thicknesses [Picture 1]. The different layer thicknesses were diversified by one to three spray procedures. After the mandated ventilation time, these coatings were put on wet in wet. After mandated drying time, the test samples were undergone following tests, where a part of the steel plates was scratched for corrosion tests [Picture 2].

3.2 Coating thickness

For classification of the coating, the test samples were undergone a coat thickness measuring by electromagnetically procedure according to DIN EN ISO 2178.

3.3 Mandrel-bending test

To determine adhesion respectively ductility of the coating system on the base material, a bending test according to DIN EN ISO 1519 with a cylindrical mandrel (mandrel diameter = 2 mm) was performed.

3.4 Determination of adhesive strength

To determine adhesion off the coating system on the base material a cross cut test according to DIN EN ISO 2409 was performed. Therefor, a multiple cutting edge tool with a scratch gap of 1 mm for layers <60 µm [Picture 3] and 2 mm for layers >60 µm [Picture 4] was used.

3.5 Corrosion test acc. to DIN EN ISO 9227 NSS

The coated plates were undergone a salt spray test acc. to DIN EN ISO 9227 NSS (test temperature 35°C, salt concentration 5%) for 720 hours. Tested were components with intact as well as scratched surface. During the test, the plates were regularly investigated visually. After the test, an evaluation took place.

3.6 Corrosion test acc. to DIN EN ISO 6270-2 CH

The coated sheets were subjected to a condensation water test in accordance with DIN EN ISO 6270-2 CH (test temperature 40 °C and a humidity of 100%) for a period of 2000 hours. Components with uninjured surfaces and components with Sikken's pre-damaged surface were inspected visually at regular intervals during the course of the test. After completion of the test, an evaluation was carried out.

4 Results/evaluation of the examination

No.	Coating thickness	Mandrel-bending test	Cross-cut value		DIN EN ISO 9227 NSS (720h)	DIN EN ISO 6270-2 CH (2000h)
1 (Zinc 240)	~ 20-30 µm ≙ 1 spraying cycle	no crack formation at all test samples	1	Scribing-line	Strong rust formation / no remote protection effect / no under-rusting [Fig. 6]	moderate rust formation / low remote protection effect / incipient sub-rusting [Fig. 18]
				Surface	strong rust formation [Fig. 7]	selective rust formation on the entire surface [Fig. 19]
	~ 30-50 µm ≙ 2 spraying cycles		1	Scribing-line	Rust formation at the scribe / no remote protection effect / no under-rusting [Fig. 8]	isolated rust points at the scribe / remote protection effect present / no under-rusting [Fig. 20]
				Surface	low rust formation at certain points [Fig. 9]	incipient punctual rust formation [Fig. 21]
	~ 70-90 µm ≙ 3 spraying cycles		1	Scribing-line	Rust formation at the scribe / no remote protection effect / no under-rusting [Fig. 10]	isolated rust spots at the scribe / remote protection effect present / no under-rusting [Fig. 22
				Surface	very low rust formation at 3 points [Fig. 11]	no rust formation [Fig. 23]
2 (Zinc 720)	~ 40-50 µm ≙ 1 spraying cycle		1	Scribing-line	Rust formation at the scribe / no remote protection effect / no under-rusting [Fig. 12]	isolated rust spots at the scribe / remote protection effect present / no under-rusting [Fig. 24]
				Surface	punctiform very low rust formation [Fig. 13]	selective rust formation [Fig. 25]]
	~ 70-90 µm ≙ 2 spraying cycles		1	Scribing-line	Rust formation at the scribe / no remote protection effect / no under-rusting [Fig. 14]	isolated rust spots at the scribe / remote protection effect present / no under-rusting [Fig. 26]
				Surface	no corrosion [Fig. 15]	sporadic punctual rust formation [Fig. 27]
	~100-130 µm ≙ 3 spraying cycles		1	Scribing-line	low rust formation at the scribe / no remote protection effect / no under-rusting [Fig. 16]	moderate rust formation at the scribe / remote protection effect partially present / no under-rusting [Fig. 28]
				Surface	no corrosion [Fig. 17]	no rust formation [Fig. 29]

4.1 Further findings

On the basis of the corrosion tests, carried out on the coated test samples, the following statement can be summarised with regard to the corrosion resistance on the undamaged surface:

No.	Layer thickness	Resistance to DIN EN ISO 9227 NSS without occurrence of corrosion	Resistance to DIN EN ISO 6270-2 CH without occurrence of corrosion
1 (Zinc 240)	~ 30-50 µm ≦ 2 spraying cycles	240 hours	1000 hours
	~ 70-90 µm ≦ 3 spraying cycles	480 hours	1416 hours
2 (Zinc 720)	~ 70-90 µm ≦ 2 spraying cycles	720 hours	1416 hours
	~100-130 µm ≦ 3 spraying cycles	720 hours	2000 hours

5 Signature.

TÜV Rheinland Akademie TÜVRheinland® Oberflächentechnik

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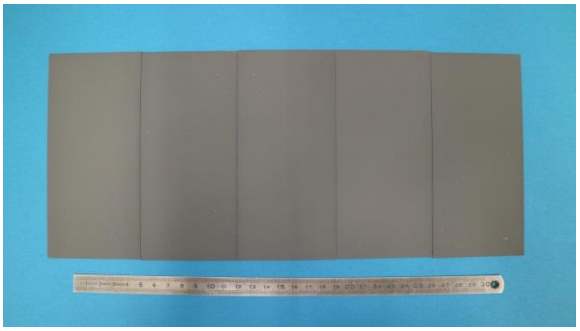
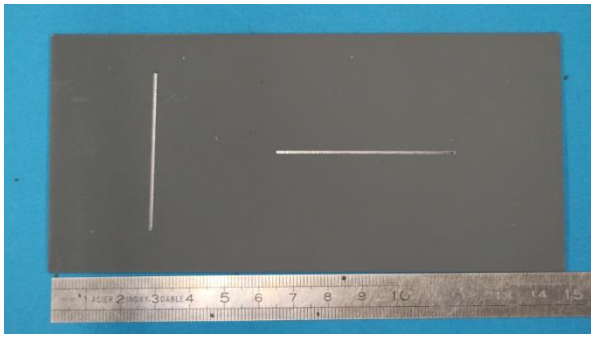
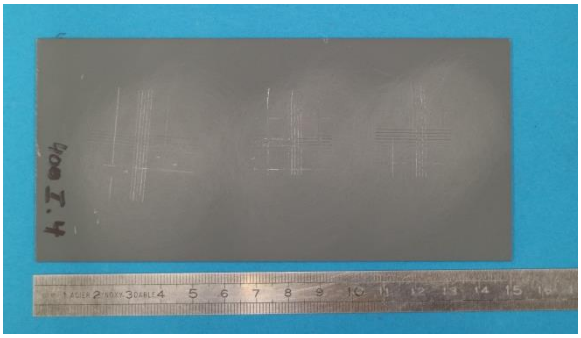
Picture attachment.



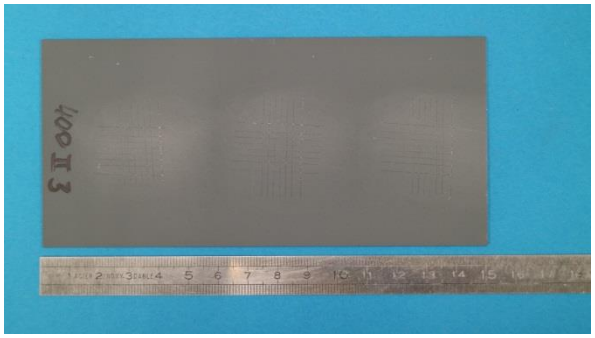
Picture 1
Coated sample plates



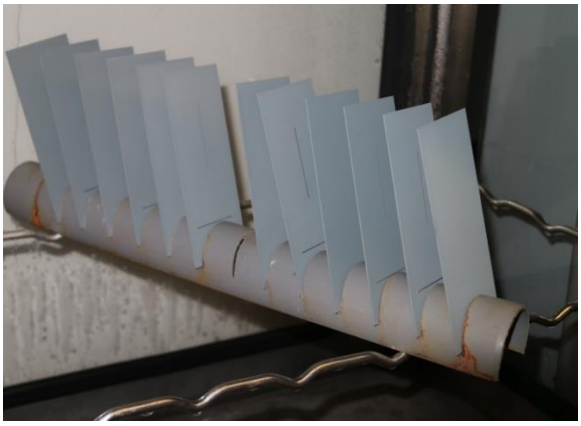
Picture 1
Coated sample plate with scribes



Picture 2
Specimen plate after cross cut test 1mm



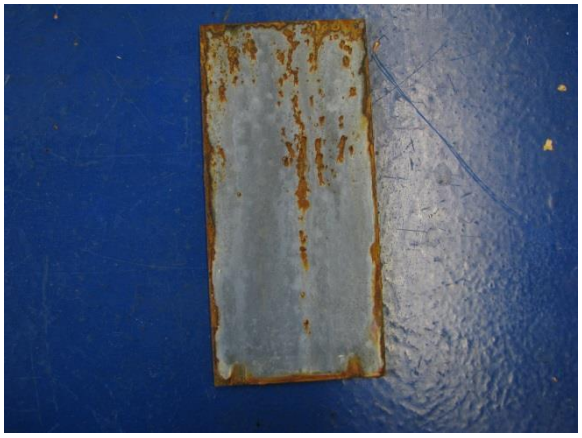
Picture 3
Specimen plate after cross cut test 2mm



Picture 4
Storage of the samples in the condensation water test

Picture attachment.

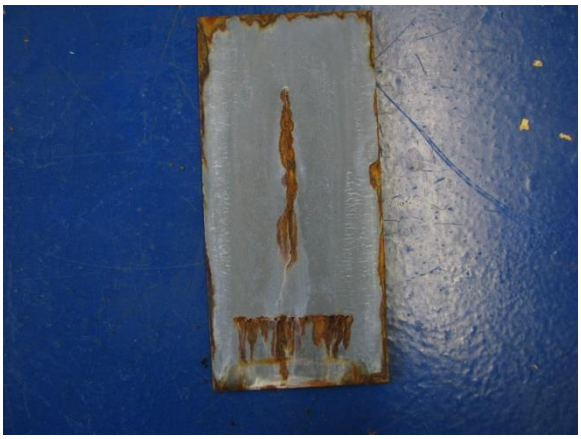
Picture 1
Zinc 240 20-30µm after 720h salt spray test



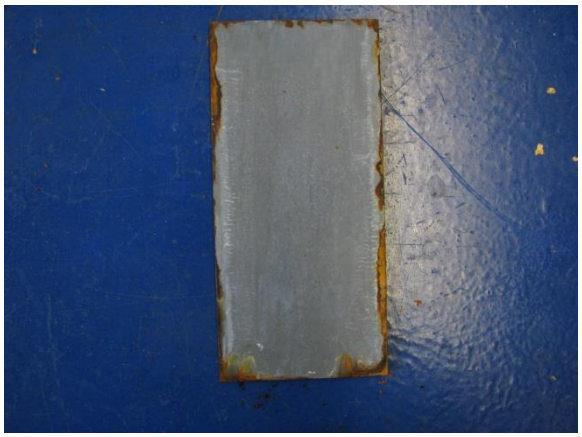
Picture 2
Zinc 240 20-30µm after 720h salt spray test

Picture 3
Zinc 240 30-50µm after 720h salt spray test

Picture 4
Zinc 240 30-50µm after 720h salt spray test

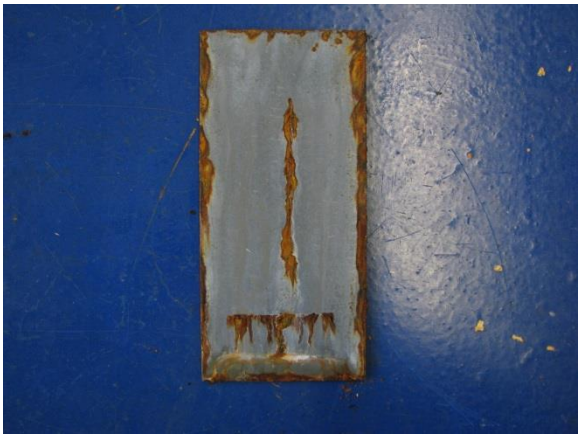


Picture 5
Zinc 240 70-90µm after 720h salt spray test



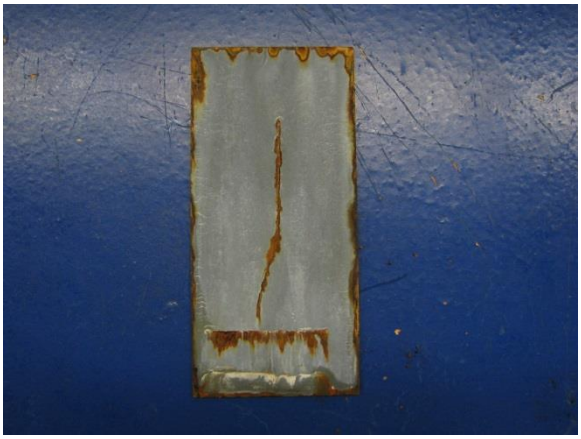
Picture 6
Zinc 240 70-90µm after 720h salt spray test

Picture attachment.



Picture 7
Zinc 720 40-50µm after 720h salt spray test

Picture 8
Zinc 720 40-50µm after 720h salt spray test



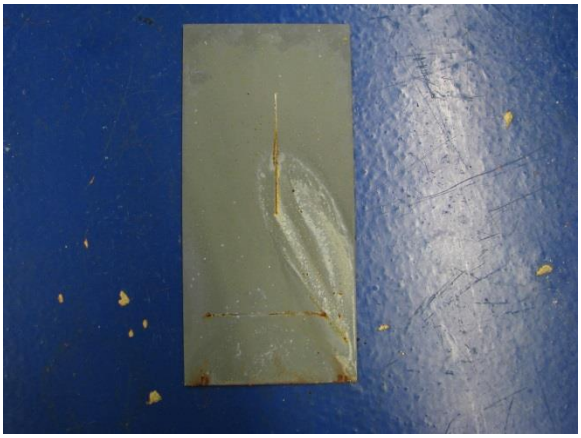
Picture 9
Zinc 720 70-90µm after 720h salt spray test

Picture 10
Zinc 720 70-90µm after 720h salt spray test

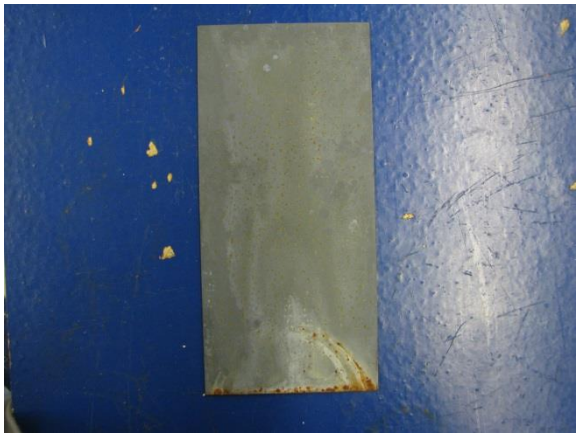
Picture 11
Zinc 720 100-130µm after 720h salt spray test

Picture 12
Zinc 720 100-130µm after 720h salt spray test

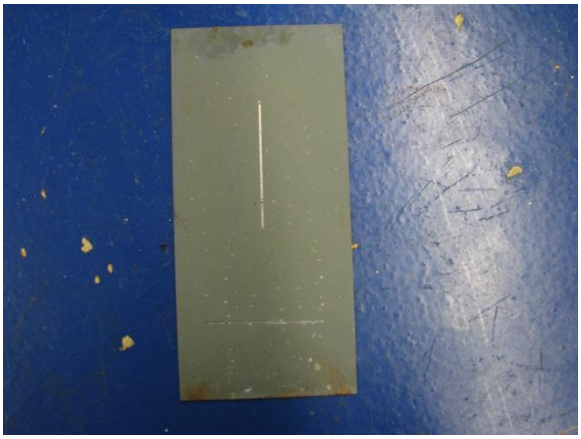
Picture attachment.



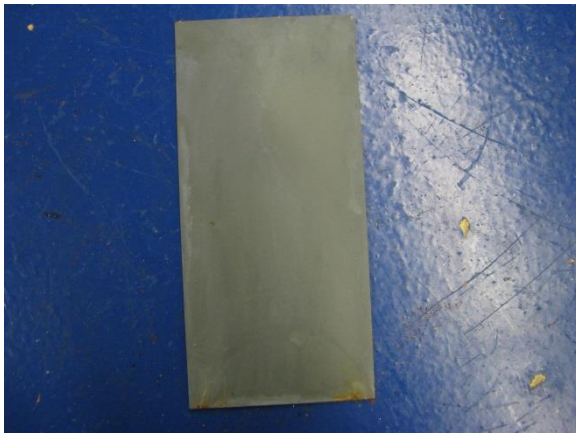
Picture 13
Zinc 240 20-30µm after 2000 h condensation water test



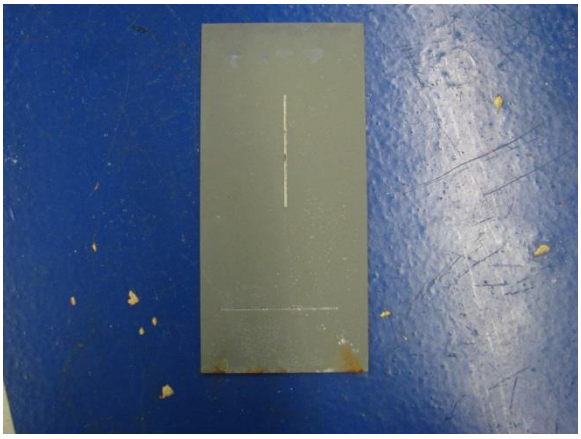
Picture 14
Zinc 240 20-30µm after 2000 h condensation water test



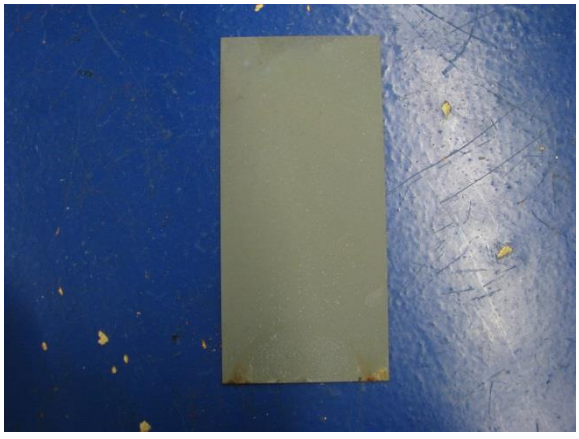
Picture 15
Zinc 240 30-50µm after 2000 h condensation water test



Picture 16
Zinc 240 30-50µm after 2000 h condensation water test

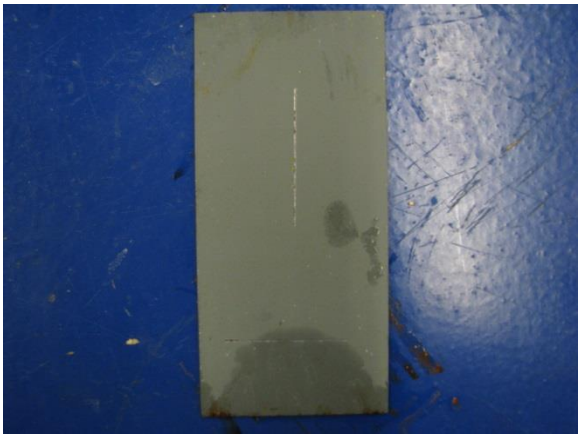


Picture 17
Zinc 240 70-90µm after 2000 h condensation water test

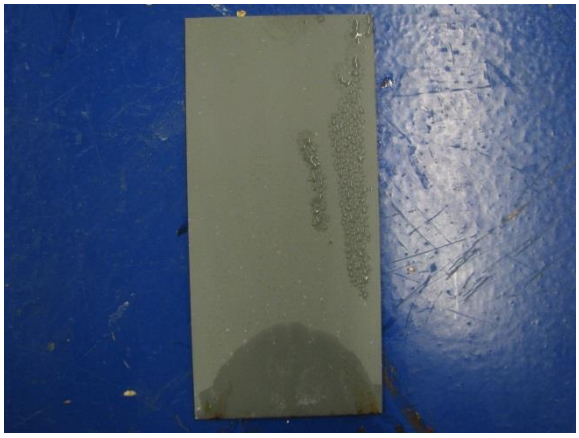


Picture 18
Zinc 240 70-90µm after 2000 h condensation water test

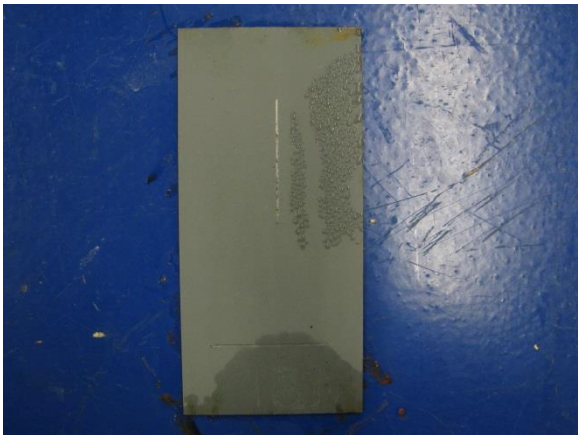
Picture attachment.



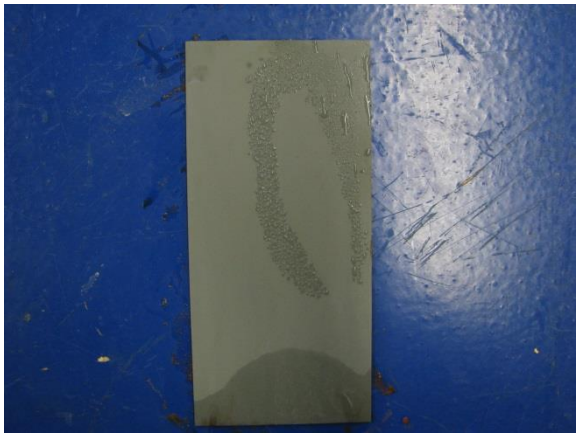
Picture 19
Zinc 720 40-50µm after 2000 h condensation water test



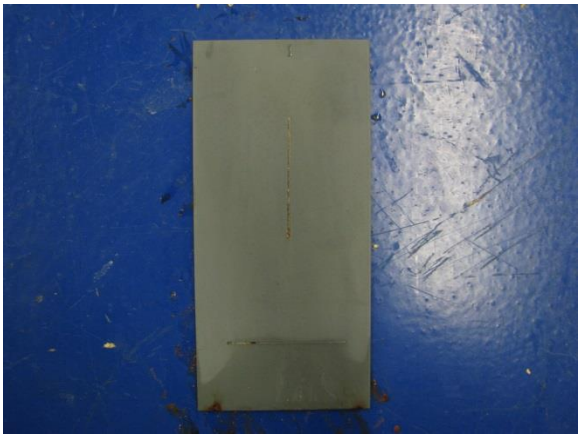
Picture 20
Zinc 720 40-50µm after 2000 h condensation water test



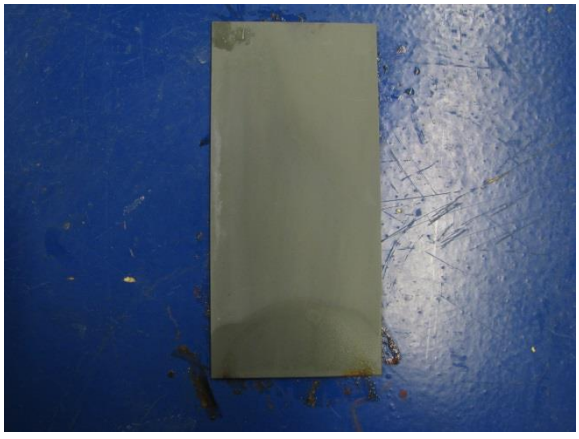
Picture 21
Zinc 720 70-90µm after 2000 h condensation water test



Picture 22
Zinc 720 70-90µm after 2000 h condensation water test



Picture 23
Zinc 720 100-130µm after 2000 h condensation water test



Picture 24
Zinc 720 100-130µm after 2000 h condensation water test