

TÜV Rheinland Industrie Service GmbH
Regional Area BBM

Halle, March 29, 2007
Reg. No. 630-9700737

Result Report
Results of a test on the adhesive pull strength of an epoxy resin coating (primer) on different substrates

Client: Remmers Baustofftechnik GmbH
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Contractor: TÜV Rheinland Industrie Service GmbH
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In charge: Dr. W. Hentschel

Order No.: 630-9700737

1. Assignment

The client has developed a substrate-tolerant, transparent epoxy resin "Epoxy FAS 100", the universal suitability of which was to be tested in regard to adhesion to different substrates.

For the test, sample plates made of different materials were presented in the 7th calendar week of 2007 which had been coated beforehand by the client with the above named priming resin according to "Technical Information Sheet - Art. No. 0916".

2. Execution of the Test

The test for adhesion of the plastic coating to the substrates was carried out in accordance with DIN EN ISO 4624:2003 for assessing the adhesion of plastic coatings to substrates.

Depending on the substrate, different test set-ups were used:

Metal sheets: Test head Ø 30 mm, opposing force through a test head cemented to the back side, suspended freely moveable in a tensile testing device

Ceramic tiles: Test head Ø 30 mm, opposing force through a perforated disk surrounding the test head, test set-up fixed in the tensile testing device

Concrete floor: Test head Ø 50 mm, opposing force through a 3-point support, adhesive pull device "Freundl", power controlled

Test period: Concrete floor February 19, 2007, test plates March 28, 2007.

3. Test Results

No.	Substrate		Adhesive pull strength in N/mm ²		Type of failure
			Individual value	Mean value	
1a	Old concrete, oil contaminated, cleaned with Bioversal	Primer rolled, scrubbed, rolled ¹⁾	2.85 3.0	2.92	100 % B/Y
1b		Primer rolled, blinded with quartz sand 0.6/0.8 mm ¹⁾	1.5 1.67	1.58	30 % A/B, 70 % B/Y 10 % A/B, 90 % B/Y
2a	Floor tile, large, unglazed		3.26 4.78 4.32	4.12	Tile material broken
2b	Wall tile, small, glazed		2.07 1.56 1.77	1.80	Tile material broken
3a	Steel sheet, black, 6 mm		5.83 5.88 6.16	5.96	80 % A/B, 20 % B/Y 80 % A/B, 20 % B/Y 70 % A/B, 30 % B/Y
3b	Sheet metal, stainless, 3.2 mm		5.09 4.05 4.89	4.68	70 % A/B, 30 % B/Y 90 % A/B, 10 % B/Y 80 % A/B, 20 % B/Y
3c	Sheet metal, galvanised, 2 mm		11.93 8.70 6.59	9.08	100 % A/B 100 % A/B 100 % A/B
3d	Copper sheet, 1 mm		≈ 0 ²⁾	≈ 0	100 % A/B

Separation type A/B: adhesion failure between substrate and coating

Separation type B: cohesion failure in the coating

Separation type B/Y: adhesion failure between the cement and the coating

Separation type Y/Z: adhesion failure between the cement and the test head

¹⁾ Test in a hall with high humidity on cold floor (dew point condensation not excluded)

²⁾ Coating detached without mentionable resistance from the substrate completely as a closed film

4. Additional Remarks on the Results of the Tests

- (1) The test set-ups to determine adhesion behaviour were selected as prescribed in the governing Technical Rules (DIBt Approval Principles for coatings on concrete as well as for interior coatings in steel tanks, DIN EN 14879-1).
- (2) According to information provided by the manufacturer, one-half of the substrate on the sample plates was cleaned before coating.
However, this was neither marked nor visible through the transparent coating.
Neither were there any significant differences in the samples taken from the different halves of the plates.
- (3) According to general knowledge of engineering and the experience of the testing body, de-greasing the surface and even more so roughening the surface (as of R_2 approx. 30 μm) clearly increases adhesive pull strength.
- (4) The A/B (adhesion failure to the substrate) type of failure found on many samples is also typical for substrates with little or no pre-treatment.
- (5) The test for adhesive pull strength on a primed concrete substrate executed on February 19, 2007 at Bioversal Delitzsch was carried out in a hall in the vicinity of a large door at a temperature of approx. 5 °C and high humidity. Under these conditions it cannot be excluded that the low adhesive pull strength values as well as the large number of failures between the cement and the substrate were caused by separation problems with the cement.
On the other hand, these conditions are representative of an unfavourable case of use that is on the border of what can be justified.

5. Conformity Statement

The statement made by the manufacturer in the "Technical Information Sheet - Art. No. 0916 Epoxy FAS 100" concerning the requirement that the tensile strength of the substrate surface must be 1.5 N/mm² on average is verified by the results of the test insofar as these values are achieved as an adhesive pull strength of the bond by the substrate materials ceramic tiles – glazed and unglazed, steel – ferritic and austenitic, galvanised surfaces, concrete and concrete de-oiled with Bioversal in conjunction with the primer "Epoxy FAS 100".

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