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Test report no. B 12.13.140.01 en

Order: Testing services performed on a decoupling mat following
DIN EN 1348:2007

Client: Dural GmbH & Co. KG
Mr. Norbert Wicharz
Applications Engineering Department
Südring 11
56412 Ruppach-Goldhausen

Order dated: 17.09.2013

Construction project: -

Sample material: Decoupling mat:
• DURABASE CI++ rolled-up mat
Tiling mortar:
• Sopro's No.1 flexible adhesive
• Sopro megaFlex S2

Inbound delivery: 02.09.2013

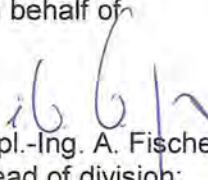
Sample receipt no.: 12/13/501/039-1

Sample storage: in 23/50 climate from inbound delivery until testing

Testing date: Sept. – Oct. 2013

on behalf of

D-99423 Weimar,
16.03.2015


Dipl.-Ing. A. Fischer
Head of division:





Dipl.-Ing. (FH) G. Rost
Person in charge

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Appendix 1 Photographic documentation

1 Task Definition

Under an order dated 17 September 2013, MIPA Weimar has been entrusted by Dural GmbH in Ruppach-Goldhausen with testing a decoupling mat in accordance with DIN 1348 as follows:

- Test the adhesive strength of the decoupling mat on the substrate after dry storage
- Test the adhesive strength of the decoupling mat on the substrate after heat exposure
- Test the adhesive strength of the decoupling mat on the substrate after water immersion
- Test the adhesive strength of the decoupling mat on the substrate after-exposure to freezing and thawing .

2 Sample material provided

Decoupling mat:

- DURABASE CI++ rolled-up mat

Tiling mortar:

- Sopro's No.1 flexible adhesive
- Sopro megaFlex S2

3 Characterization of substrate

DIN EN 1323:2007 "Adhesives for tiles - Concrete slabs for tests" defines the substrate used for determining the properties of mortars and adhesives for tiles and slabs.

The substrate used for the tests described below are cast stone slabs made by Grimmplatten GmbH & Co. KG based in Malchinger Str. 17, 82256 Fürstenfeldbruck, Germany, and designated as quartz-concrete slab, grey, blasted. The concrete slabs have a size of (40 x 40) cm, are blasted on the surface and have a mean thickness of 38 mm.

The following parameters have been determined:

	Test result	Requirement as per DIN EN 1323:2007
Water absorption according to Carstens (test duration: 4 hours)	0.5 cm ³	0.5 to 1.5 cm ³ after 4 h
Surface tensile strength	5.1 N/mm ²	Minimum: 1.5 N/mm ²
Residual moisture	1.3 CM%	Maximum: 3 CM%

4 Fresh mortar production

According to the indications provided in the technical data sheets on processing, the

- Sopro's No.1 flexible adhesive had to be mixed with a water quantity of 10.0 – 10.5 l / 25 kg of dry mortar and had to be processed after a fresh mortar maturing period of between 3 and 5 minutes and an additional mixing time of 15 seconds. The mean mixing water quantity was used and a five-minute maturing time was observed for the fresh mortar during the tests.
- Sopro megaFlex S2 had to be mixed using a liquid component B of 8.25 kg / 25 kg of powder component A and had to be processed after a fresh mortar maturing period of 5 minutes and an additional mixing time of 15 seconds. A five-minute maturing time was observed for the fresh mortar during the tests.

Every mix was prepared using distilled water.

The other mixing parameters corresponded to the specifications set forth in DIN EN 1348.

5 Manufacture of test slabs

A thin layer of tiling mortar was applied to the substrate concrete slabs using a finishing trowel according to the specifications made by the customer. After this, a thicker layer was applied and combed off using a notched trowel with (4 x 4) mm toothing and a centre-to-centre distance of 8 mm.

Then the decoupling mat was applied and rolled on using a steel roller as defined in DIN EN 1903 "Adhesives - Test method for adhesives for plastic or rubber floor coverings or wall coverings - Determination of dimensional changes after accelerated ageing" (Figure 1) in order to achieve defined and uniform adhesion and thus guarantee the comparability of all test slabs.

The surface of the decoupling mat was trowelled, applying the corresponding tiling mortar so as to achieve the best possible saturation. Subsequently, a layer of tiling mortar was applied and combed off using a notched trowel with a toothing of (6 x 6) mm and a centre-to-centre distance of 12 mm. Tiles in a size of (50 x 50) mm were placed on this in accordance with the standard and loaded with weights. The test slabs were then subjected to different conditions of exposure as defined in DIN EN 1348.

The test slabs were prepared in different combinations (decoupling mat / tile adhesive) according to the customer's specifications applicable to the different conditions of exposure.

6 Conducting Tests and Test Results

6.1 Adhesive strength under tension after dry storage

6.1.1 DURABASE CI++ rolled-up mat and Sopro's No.1 flexible adhesive

Testing in accordance with DIN EN 1348:2007 "Adhesives for tiles - Determination of tensile adhesion strength for cementitious adhesives".

In derogation of the standard, the testing surfaces (50 x 50) mm have been cut clear down to the concrete slab before testing.

Measurement (Photographic documentation showing the arrangement of measuring points in Appendix 1)	Pull off strength			Fracture pattern (Photographic documentation in Appendix 1)
	Test value	Deviation from the mean value	Significant values for evaluation	
	N/mm ²	%	N/mm ²	
1	0.12	7	0.12	Between gauze fabric, mat and tile adhesive under the tile
2	0.13	1	0.13	Between gauze fabric, mat and tile adhesive under the tile
3	0.16	24	-*	Between gauze fabric, mat and tile adhesive under the tile
4	0.09	30	-*	Between gauze fabric and tile adhesive under the tile
5	0.11	15	0.11	Between gauze fabric, mat and tile adhesive under the tile
6	0.13	1	0.13	Between gauze fabric and tile adhesive under the tile
7	0.15	16	0.15	Between gauze fabric and tile adhesive under the tile
8	0.13	1	0.13	Between mat and gauze fabric
9	0.13	1	0.13	Between mat and gauze fabric
10	0.14	9	0.14	Between mat and gauze fabric
Mean value	0.13		0.13	

* Individual value deleted for deviating from the mean value by more than 20%

6.2 Adhesive strength under tension after heat exposure

6.2.1 DURABASE CI++ rolled-up mat and Sopro`s No.1 flexible adhesive

Testing in accordance with DIN EN 1348:2007 "Adhesives for tiles - Determination of tensile adhesion strength for cementitious adhesives".

In derogation of the standard, the testing surfaces (50 x 50) mm have been cut clear down to the concrete slab before testing.

Testing was performed with the customer in attendance.

Measurement (Photographic documentation showing the arrangement of measuring points in Appendix 1)	Pull off strength			Fracture pattern (Photographic documentation in Appendix 1)
	Test value	Deviation from the mean value	Significant values for evaluation	
	N/mm ²	%	N/mm ²	
1	0.13	6	0.13	Between gauze fabric and tile adhesive under the tile
2	0.12	2	0.12	
3	0.11	11	0.11	
4	0.11	11	0.11	
5	0.12	2	0.12	
6	0.12	2	0.12	
7	0.12	2	0.12	
8	0.13	6	0.13	
9	0.15	22	-	
10	0.12	2	0.12	
Mean value	0.12		0.12	

* Individual value deleted for deviating from the mean value by more than 20%

6.3 Adhesive strength under tension after water immersion

6.3.1 DURABASE CI++ rolled-up mat and Sopro megaFlex S2

Testing in accordance with DIN EN 1348:2007 "Adhesives for tiles - Determination of tensile adhesion strength for cementitious adhesives".

Determination of tensile adhesion strength for cementitious adhesives"; in derogation of the standard, the testing surfaces (50 x 50) mm have been cut clear down to the concrete slab before testing.

Measurement (Photographic documentation showing the arrangement of measuring points in Appendix 1)	Pull off strength			Fracture pattern (Photographic documentation in Appendix 1)
	Test value	Deviation from the mean value	Significant values for evaluation	
	N/mm ²	%	N/mm ²	
1	0.20	2	0.20	Between mat and gauze fabric
2	0.23	13	0.23	Between gauze fabric and tile adhesive under the tile
3	0.20	2	0.20	Between gauze fabric, mat and tile adhesive under the tile
4	0.20	2	0.20	Between mat and gauze fabric
5	0.17	17	0.17	Between mat and gauze fabric
6	0.19	7	0.19	Between mat and gauze fabric
7	0.21	3	0.21	Between gauze fabric, mat and tile adhesive under the tile
8	0.20	2	0.20	Between mat and gauze fabric
9	0.21	3	0.21	Between mat and gauze fabric
10	0.23	13	0.23	Between gauze fabric, mat and tile adhesive under the tile
Mean value	0.20		0.20	

6.4 Adhesive strength under tension after exposure to freezing and thawing

6.4.1 DURABASE CI++ rolled-up mat and Sopro megaFlex S2

Testing in accordance with DIN EN 1348:2007 "Adhesives for tiles - Determination of tensile adhesion strength for cementitious adhesives".

Determination of tensile adhesion strength for cementitious adhesives"; in derogation of the standard, the testing surfaces (50 x 50) mm have been cut clear down to the concrete slab before testing.

Measurement (Photographic documentation showing the arrangement of measuring points in Appendix 1)	Pull off strength			Fracture pattern (Photographic documentation in Appendix 1)
	Test value	Deviation from the mean value	Significant values for evaluation	
	N/mm ²	%	N/mm ²	
1	0.21	19	0.21	Between gauze fabric and tile adhesive under the tile
2	0.17	3	0.17	Between gauze fabric and tile adhesive under the tile
3	0.19	8	0.19	100 % in the non- woven
4	0.21	19	0.21	Between gauze fabric and tile adhesive under the tile
5	0,18	2	0.18	100 % in the non- woven
6	0.16	9	0.16	100 % in the non- woven
7	0.15	15	0.15	Between mat and gauze fabric
8	0.19	8	0.19	Between gauze fabric and tile adhesive under the tile
9	0.15	15	0.15	100 % in the non- woven
10	0.15	15	0.15	100 % in the non- woven
Mean value	0,18		0.18	

7 Summary of the Test Results

Tests (in accordance with DIN EN 1348)	Test results	
	DURABASE CI++ rolled-up mat and Sopro`s No.1 flexible adhesive	DURABASE CI++ rolled-up mat and Sopro megaFlex S2
Adhesive strength under tension after dry storage	0.13 N/mm ²	-
Adhesive strength under tension after heat exposure	0.12 N/mm ²	-
Adhesive strength under tension after water immersion	-	0.20 N/mm ²
Adhesive strength under tension after exposure to freezing and thawing	-	0.18 N/mm ²

End of the test report

Appendix 1 - Photographic documentation

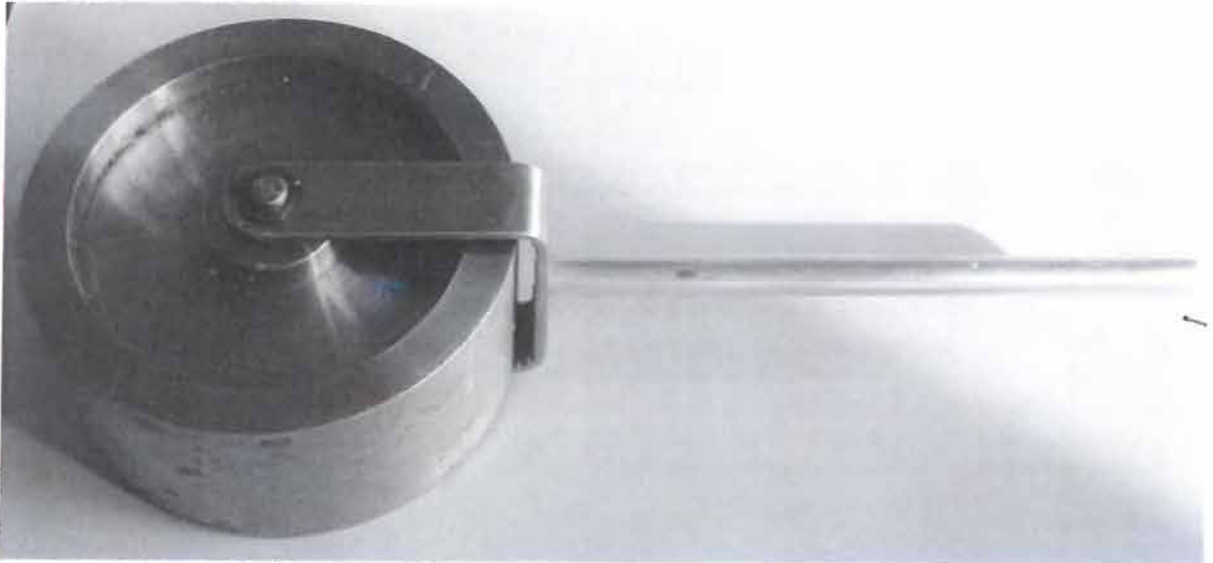


Figure 1.: Roller as per DIN EN 1903:2008:
 (55 ± 1) mm wide,
 with a diameter of (90 ± 1) mm,
 (3.50 ± 0.01) kg of total mass and
 a handle at an angle of 90° to the axis

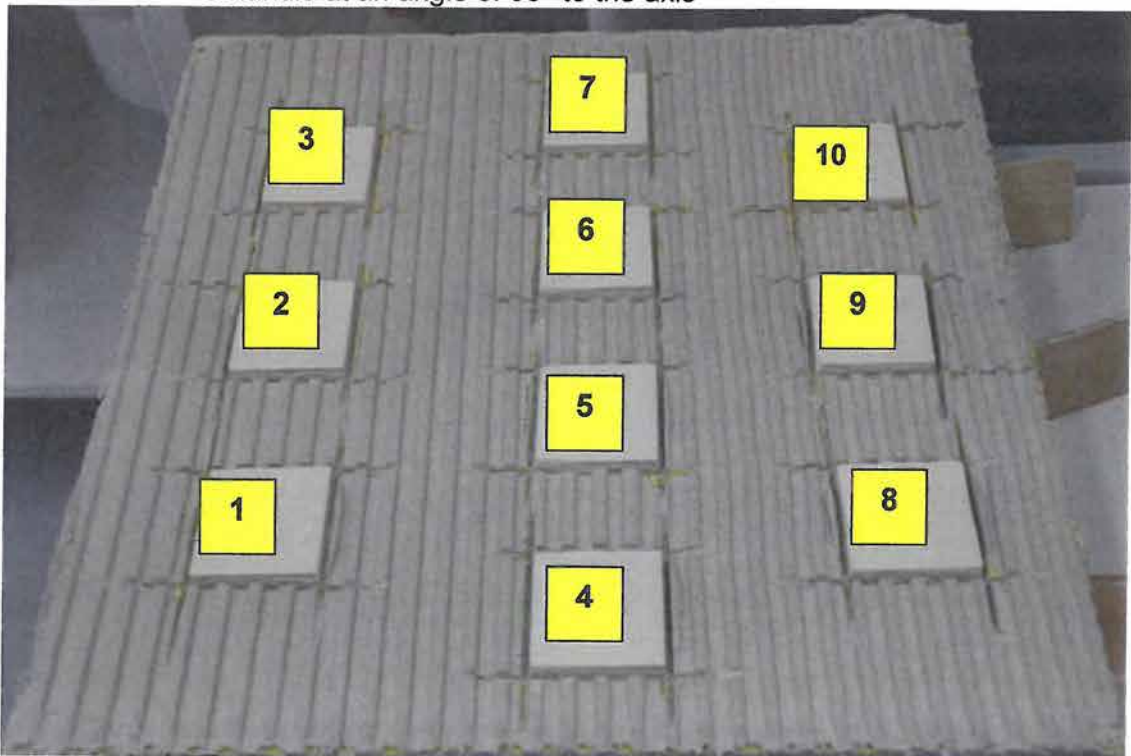


Figure 2.: Arrangement of test points for testing adhesive strength

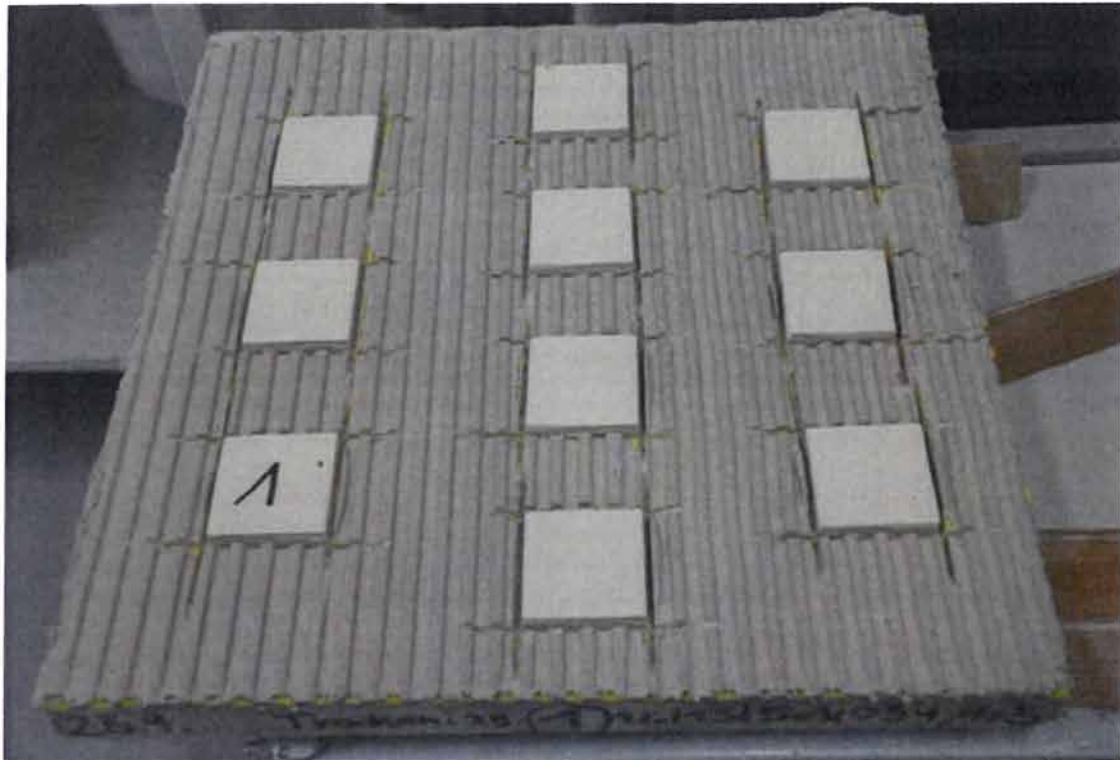


Figure 3.: Slab with DURABASE CI++ rolled-up mat and Sopro`s No.1 flexible adhesive after dry storage



Figure 4.: Slab with DURABASE CI++ rolled-up mat and Sopro`s No.1 flexible adhesive after dry storage and after the adhesion test

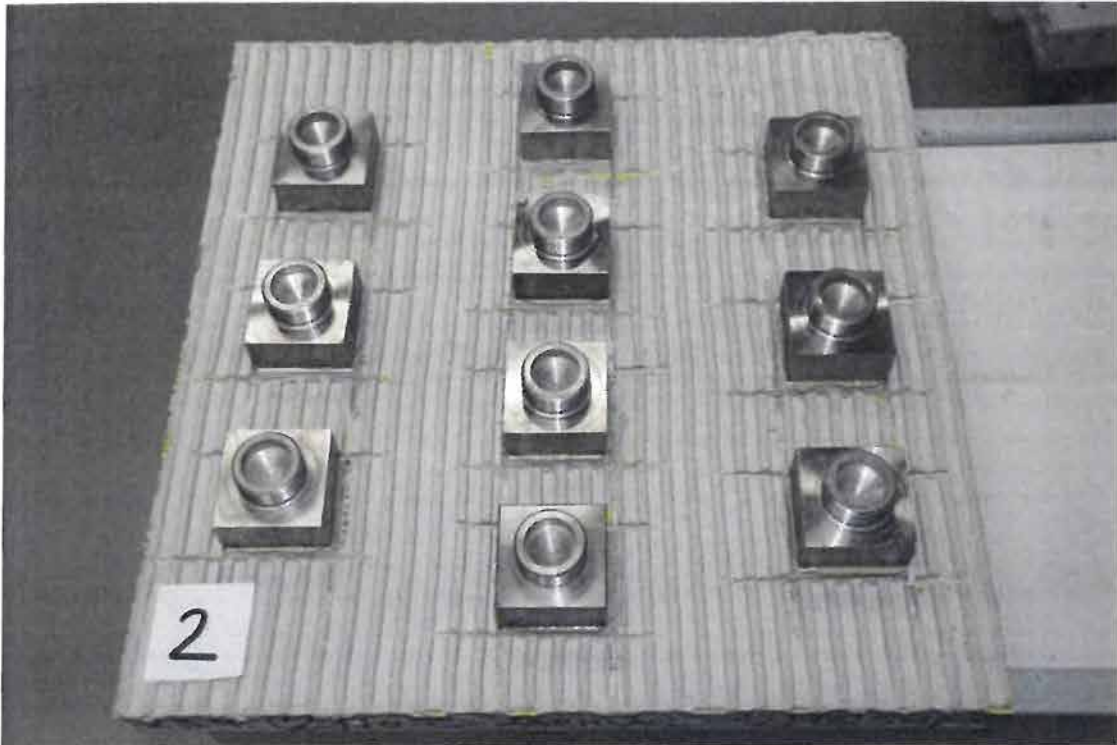


Figure 5.: Slab with DURABASE CI++ rolled-up mat and Sopros No.1 flexible adhesive after heat exposure



Figure 6.: Slab with DURABASE CI++ rolled-up mat and Sopros No.1 flexible adhesive after heat exposure and after the adhesion test

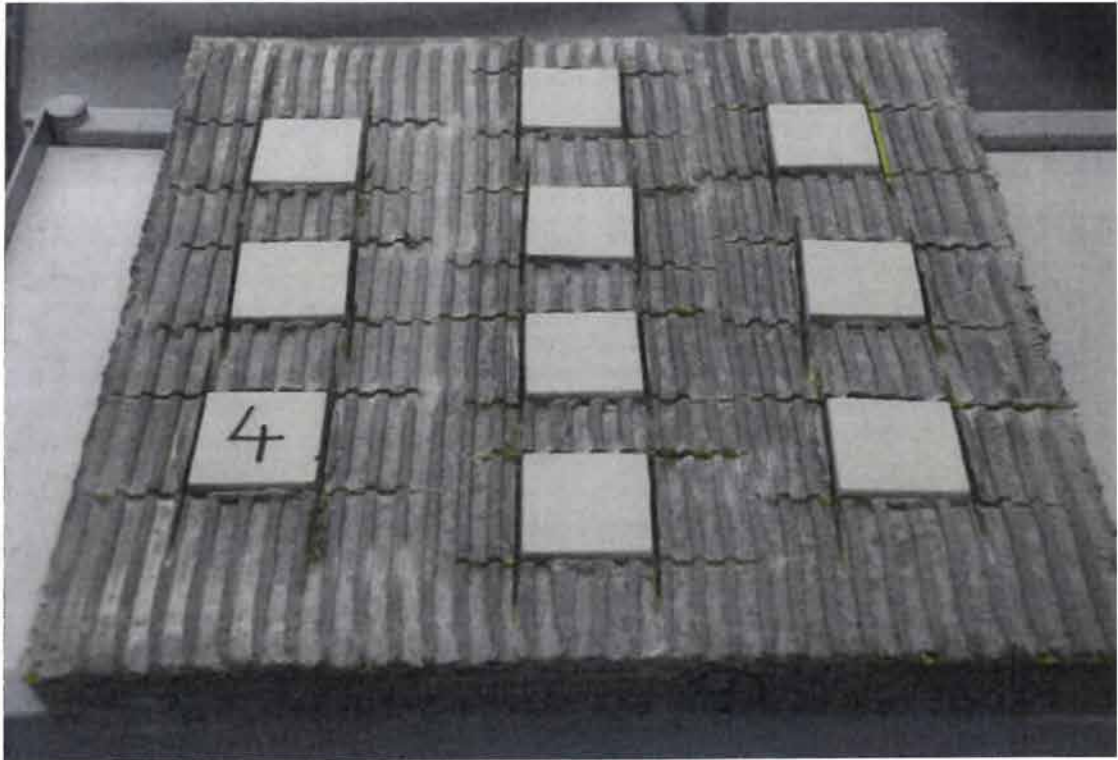


Figure 7.: Slab with DURABASE CI++ rolled-up mat and Sopro megaFlex S2 after water immersion



Figure 8.: Slab with DURABASE CI++ rolled-up mat and Sopro megaFlex S2 after water immersion and after the adhesion test

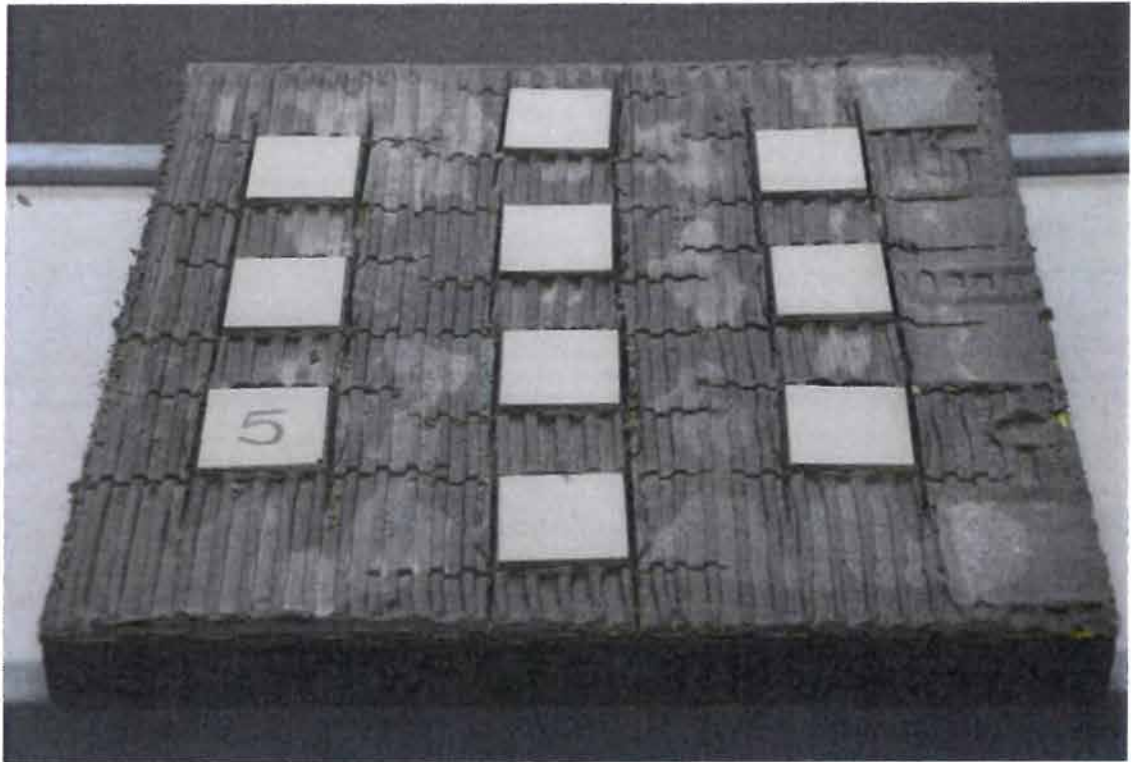


Figure 9.: Slab with DURABASE CI++ rolled-up mat and Sopro megaFlex S2 after exposure to freezing and- thawing



Figure 10.: Slab with DURABASE CI++ rolled-up mat and Sopro megaFlex S2 after exposure to freezing and- thawing and after the adhesion test

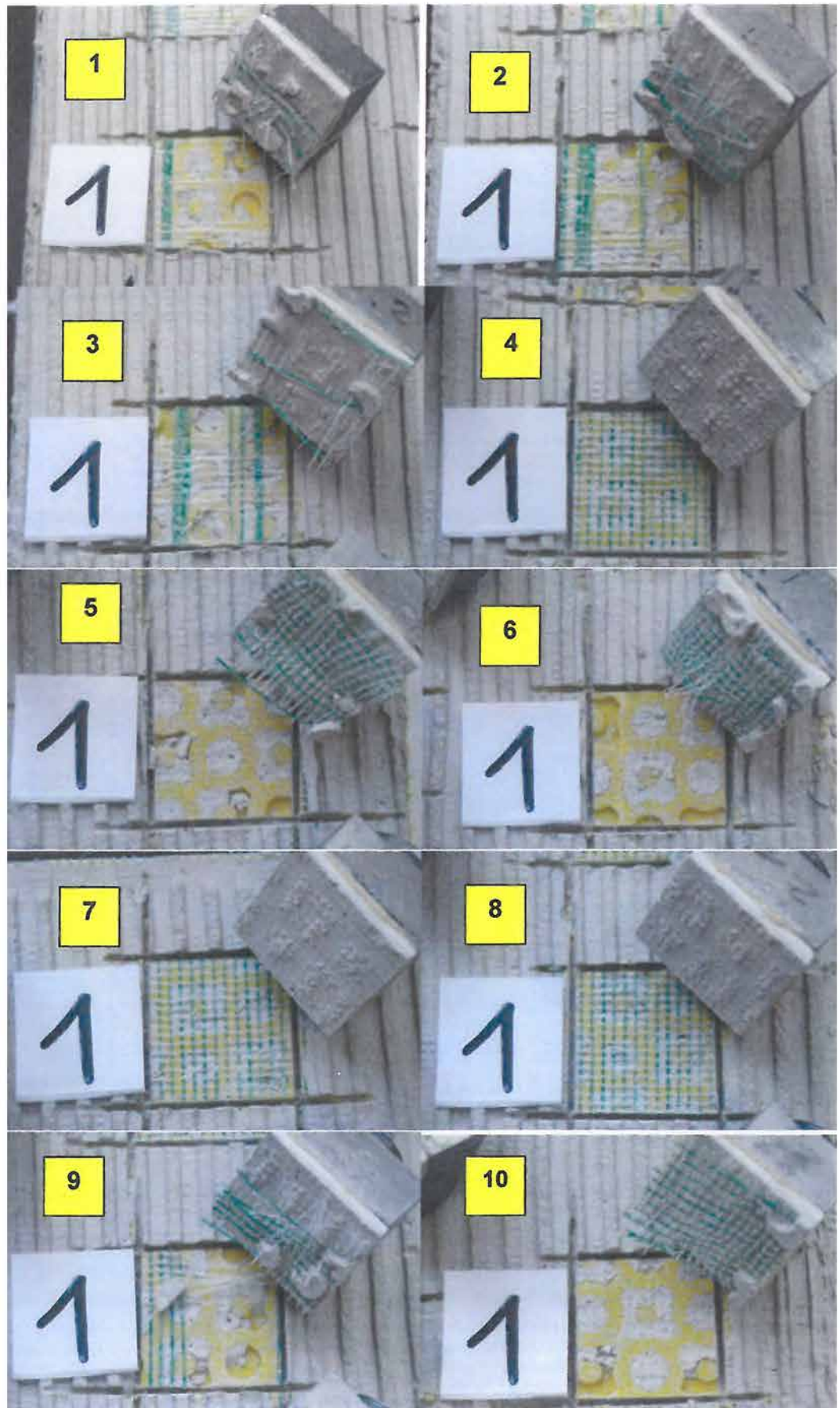


Figure 11.: Surfaces torn off in test points 1 to 10 after the adhesion test on the slab with DURABASE CI++ rolled-up mat and Sopros No.1 flexible adhesive after dry storage