

Bellaterra : 10th January 2025
Report number : **24/32304901**
Petitioner Reference : **POLIUREA SYSTEMS CHEMICAL S.L.U**
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TESTS REPORT

RECEIVED MATERIAL

On 10th June 2024 coated substrates applied with polyurea were received at Applus Laboratories, with the following references:

POLIUREA PS-008

REQUESTED TESTS

PRODUCTS AND SYSTEMS FOR THE PROTECTION AND REPAIR OF CONCRETE STRUCTURES. Definitions, requirements, quality control and evaluation of conformity. UNE-EN 1504-2:2005 Part 2: Surface protection systems for concrete

- 1- Measurement of bond strength by pull-off , EN 1542
- 2- Determination of water-vapour transmission properties, EN ISO 7783
- 3- Determination of liquid water permeability, EN 1062-3
- 4- Falling-weight test, EN ISO 6272-1
- 5- Abrasion resistance (Taber), EN ISO 5470-1
- 6- Resistance to temperature shock, UNE-EN 13687-5
- 7- Determination of crack bridging properties, EN 1062-7 Method A

TESTS DATE: from 10/06/2024 to 08/01/2025

RESULTS : See attached pages.

Responsible for Construction Materials
LGAI Technological Center S.A.

Technical Manager
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The results included in this document refer exclusively to the indicated materials and has been tested according to the specifications given.

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Page 1 – The present document consists of **6** pages long, whereof **0** are appendixes

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RESULTS:

Mix ratio: Component A:B - 1:1 by weight

Thickness: 2mm

1- Measurement of bond strength by pull-off , EN 1542

The reference samples, are 300 x 300 x 100 mm specimen, with a maximum aggregate size of 8 mm or 10 mm and prepared with a grit-blasted surface, according to EN 1766 (MC 0,40).

The specimens were preserved in the laboratory at 21°C - 60% RH.

There were No bubbles, cracks or surface defects after curing.

Specimen	Bond strength (N/mm ²)
1	3,66 A/B
2	2,96 A/B
3	3,52 A/B
4	3,21 A/B
5	3,34 A/B
Mean	3,3 MPa

NOTE: Mode of failure is shown between brackets.

A: Cohesion failure in the concrete substrate

A/B: Adhesion failure between the substrate and product

B: Cohesion failure

Requirements according to EN 1504-2:2005 Table 5			
Flexible Systems		Rigid Systems	
Without trafficking	With trafficking	Without trafficking	With trafficking
≥ 0,8 MPa	≥ 1,5 MPa	≥ 1,0 MPa	≥ 2,0 MPa

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2- Determination of water-vapour transmission properties, EN ISO 7783

- Three cylindrical test specimens have been prepared, approximate surface=0,0079 m² (100 mm diameter), to test with the substrate.
- After curing for 28 days in laboratory conditions, the test specimens undergo 3 cycles of immersion in water and drying.
- Site ambient conditions: 23°C and 50% R.H.
- Saturated solution in capsules: dihydrogen ammonium phosphate (93%RH).
- Pressure difference (Δp)= 1210 Pa.

To create an atmosphere of 93% R.H. inside the capsule, a saturated solution with dihydrogen ammonium phosphate is used, whereby a 50% humidity shall be maintained outside the capsule and 93% inside, thereby reducing the mass of the sample-capsule set.

Final results:

Specimen	Water-vapour flow rate G (g/h)	Water-vapour transmission rate V (g/m ² * day)	Diffusion-Equivalent air layer thickness Sd (m)	Water vapour resistance factor μ
1	0,00014	0,35	59,4	28140
2	0,00013	0,33	63,0	31021
3	0,00013	0,34	62,5	30340
Mean	0,0001	0,34	61,6	29834

Requirements according to EN 1504-2:2005 Table 5	
Class I (permeable to water vapour)	Sd < 5 m
Class II	5m ≤ Sd ≤ 50 m
Class III (dense against water vapour)	Sd > 50 m

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3- Determination of liquid water permeability, EN 1062-3

Ceramic specimens have been used as the substrate: approximate size 150x150mm, 30 mm thick, density 1650 kg/m³ and liquid water transmission index 7,5 Kg/(m²·h^{0,5}). After curing the product for 28 days in laboratory conditions, the test specimens undergo 3 water immersion and drying cycles, and a final drying.

Specimen	W (Kg/m ² h ^{0,5})
1	0,0003
2	0,0003
3	0,0003
Mean	0,0003

Requirements according to EN 1504-2:2005 Table 5	
Capillary absorption and permeability to water	W < 0,1 Kg/(m ² * h ^{0,5})

4- Falling-weight test, EN ISO 6272-1

The product has been applied on a concrete surface. Impacts on the surface have been performed with a sphere-shaped head, 20 mm diameter, free mass 1000 g.

Height from which the first cracks are produced	> 2500 mm*
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* From this height NO cracks are produced

Diameter of the trace produced from 2500 mm	1,0 mm
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IR value (Impact Resistance) from a 2500 mm height	24,5 Nm
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Requirements according to EN 1504-2:2004 Table 5	
Class	No cracking or de-lamination
I	≥ 4 Nm
II	≥ 10 Nm
III	≥ 20 Nm

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5- Abrasion resistance (Taber), EN ISO 5470-1

Test conditions:

- Abraser: Taber 5150 Abraser
- Abrading wheel: H22
- Weight: 1000 g
- n° cycles: 1000

Specimen	Weight loss (mg)
1	79
2	56
3	57
Mean	64
Requirements according to EN 1504-2:2005 Table 5	
Weight loss	< 3000 mg

6- Resistance to temperature shock, UNE-EN 13687-5

The reference slabs are 400 x 400 x 50 mm plates made with aggregates with a maximum size between 8 and 12 mm. with a sandblasted surface with reference concrete MC (0,40) according to EN 1766:2000.

After performing the thermal shock to the specimen (150°C - 85°C as minimum), the specimen was examined visually and tested by bond strength according to UNE-EN 1542:1999 with the following results:

There is NO bubbles, cracks or surface defects after the curing.

Tensile strength (N/mm ²)		
Point no.	Test Sample	Reference Sample
1	3,31	2,65
2	3,25	2,35
3	3,01	2,45
4	2,99	2,74
5	3,34	2,21
Average	3,2	2,5
Failure	(A)	(A/B)

NOTE: between brackets the failure pattern.

A: cohesive failure in the concrete

B: cohesive failure in the product

A/B: adhesive failure between concrete and 1st layer applied.

Requirements according to EN 1504-2:2004 Table 5			
Flexible Systems		Rigid Systems	
Without trafficking	With trafficking	Without trafficking	With trafficking
≥ 0,8 MPa	≥ 1,5 MPa	≥ 1,0 MPa	≥ 2,0 MPa

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7- Determination of crack bridging properties, EN 1062-7 Method A

Method A : C.1 Static tensile test

The reference samples are specimens of dimensions 75x50x20 mm, manufactured with MC 0,45 reference concrete according to UNE-EN 1766.

After ageing 7 days at 70°C, the obtained results are as follows:

After conditioning, no type of defect is observed (blistering, cracking, color change, etc.).

Specimen	Crack width (µm)	Class 23°C	Crack width (µm)	Class -10°C
1	4231	Class A5	2711	Class A5
2	4163	Class A5	2563	Class A5
3	4853	Class A5	2602	Class A5

Classification according to UNE-EN 1504-2:2004 Table 6

Class	Width of the crack (µm)
A1	>100
A2	>250
A3	>500
A4	>1250
A5	>2500

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