TEST REPORT

|SQM_458_2022|

DETERMINATION OF THE CRACK-BRIDGING ABILITY IN STANDARD CONDITIONS (UNI EN 14891 STANDARD) OF AN IMPERMEABILIZING PRODUCT CONSISTING OF A MIXTURE OF POLYMERS AND SPECIAL CEMENT DENOMINATED "BASECRETE", PROVIDED BY THE COMPANY "CdC S.R.L.," MILAN (MI) - ITALY.

PLACE AND DATE OF ISSUE:	Faenza, 21st July 2022
COMPANY:	**CdC srl**
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TYPE OF PRODUCT:	*Liquid applied waterproofing agents to be used under ceramic tiles bonded with adhesives*
APPLIED STANDARD:	UNI EN 14891:2012
DATE OF RECEIPT IN LABORATORY:	30th March 2022
TESTS EXECUTED:	March - May 2022
TESTS EXECUTED BY:	CertiMaC, Faenza

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1 Introduction

This report describes the test of:

- *determination of crack-bridging capacity under standard conditions (23 °C),*

carried out on a type of product delivered to the CertiMaC laboratory in Faenza by the Client on 30th March 2022 (Refs. 2-a, 2-b). The test was carried out in accordance with the standards given in Ref. 2-c, on the basis of reference mortar samples developed in accordance with the standards in Refs. 2-d, 2-e.

2 References

a. Estimate: prot. 22164/lab dated 04th April 2022.

b. Confirmation: e-mail dated 05th May 2022.

c. UNI EN 14891:2012. Liquid-applied waterproofing products for use under ceramic tiling bonded with adhesives. Requirements, test methods, conformity assessment, classification and designation.

d. UNI EN 196-1:2005. Test methods of cements - Part 1: Determination of mechanical strengths.

e. UNI EN 197-1:2011. Cement - Part 1: Composition, specifications and conformity criteria for common cements.

3 Test object

The specimens were packed at the CertiMaC Laboratory in Faenza directly by the Client on 30/03/2022 by applying the mixture components on reference concrete substrates according to the following product specifications:

- Laying of 2 coats of the mixture called "BASECRETE" consisting of about 600 g of liquid part (polimers) and 2 kg of powder (cement and aggregates, 0.6 mm quartz) for a total thickness of 3 mm (1.5 mm for each coat) with interposition of mesh inside between each coat. Mixing is done with drill for 2-4 minutes, then allowed to rest for 2-3 minutes, then further mixing for 1 minute and resting for a few minutes.

Then, the samples were subjected to the curing treatment (Ref. 2-c), that is keeping the material in air for 28 days under standard temperature and humidity conditions. At the end of the curing period, the materials were subjected to testing. Six samples were made whose surface area affected by the waterproofing product was 60 x 30 mm.

4 Test execution and description of results

4.1 Introduction

The test was performed in full compliance with the standard at Ref. 2-c, which establishes methods for determining the crack-bridging capacity of waterproofing products on a standard mortar substrate. Crack-bridging capacity is measured by applying a tensile force continuously exerted on the reference specimen coated, on both sides, with a layer of waterproofing intervening on a 30x60 mm section. The test continues until the first defect becomes visible on the surface of the specimen. In addition, as required by the standard in Ref. 2-c, the test was performed on three specimens at room temperature.

4.2 Specimen preparation and conditioning

4.2.1 Preparation and curing of the substrate in reference mortar

The test specimens consist of a reference mortar substrate prepared in ad hoc molds. These specimens have a prismatic section with a size of 40x12x160 mm^3 and have a square hole with a side of 4 mm, in the center of the narrowest face, as can be seen in Figure 1 and Figure 2.

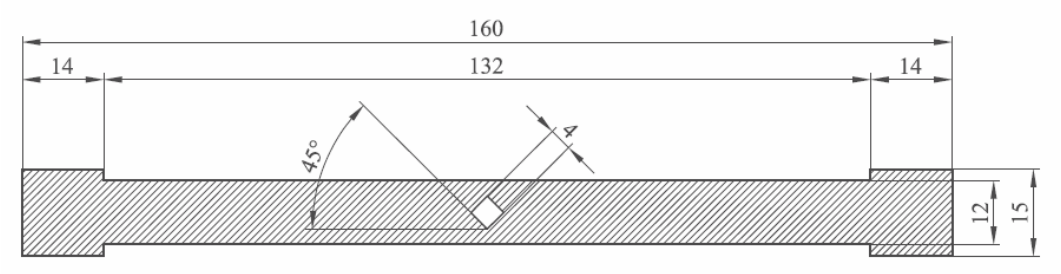

Figure 1. Theoretical reference section of the standard mortar sample

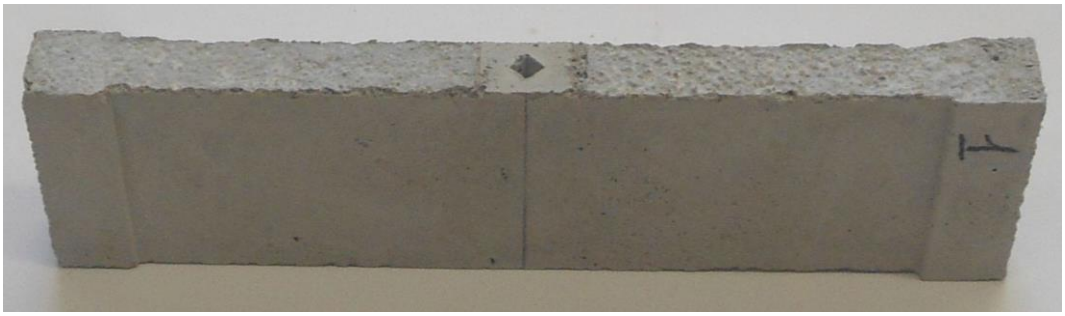

Figure 2. Real reference section of the standard mortar sample

The standards in Refs. 2-c, 2-d and 2-e present the specifications for making the standard mortar:

- CEM 52.5 R according to the standard in Ref. 2-e – 675 g;
- Silica sand according to the standard in Ref. 2-d – 1350 g;
- HRWR (highly effective water reducing additive) – 0.5÷1.5 % Sulla massa del Cemento
- Mixing water according to the standard in Ref. 2-d – 303 g;

The above formulation shows a 2:1 sand/cement ratio and a 0.45:1 ac-water/cement ratio. In addition, a superplasticizer was included to limit the bleeding effect of the cement mixture.

The specimens thus constituted were packed according to the standard in Ref. 2-d, and cured in water at 20 °C for the minimum required 28 days. After that, they were stored under reference conditions until the moment of pouring the waterproofing product.

4.2.2 Sample preparation for crack-bridging capacity measurement

At the end of the curing period of the control mortar, the preparatory operations for the application of the waterproofing product were started. The two flat faces of the sample were cleaned and sanded in order to remove efflorescence or traces of release agent. After that, the product was applied on the basis of the specifications given by the Client and on the indications provided by the standard in Ref. 2-d. The waterproofing product was then applied to the opposite faces of the specimen by means of a template with internal dimensions of 30x60 mm^2 until six specimens of the type in Figure 3 were obtained.

Figure 3. Example of a test sample

The samples were then conditioned in a laboratory environment in the following conditions: 23 ± 2 °C, 0.50 ± 0.05 R.H. for a period of 28 days as required by the standards in Ref. 2-c. At the end of this period, the actual testing phase was started.

4.3 Test procedure (under standard conditions – 23 °C)

As indicated by the standard in Ref. 2-c, at the end of the conditioning period, the prism was fractured at the square section hole by using a proper loading equipment (Figure 4) which is similar to the one generally

used for three-point bending test. This step was implemented without compromising the waterproofing layer. In fact, the square-section cavity allows the fracture to be localized at that point at limited loads, thus avoiding compromise of the sheathing applied above.

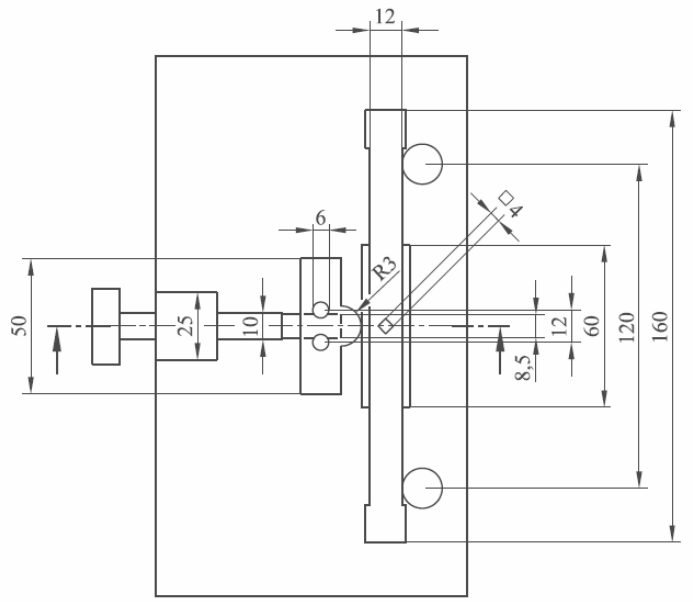

Figure 4. Typical apparatus for fracturing the specimen

The fracture stages and the subsequent tensile test to evaluate the actual crack-bridging capability were carried out according to the standard in Ref. 2-c, by means of a universal MTS machine [Ref. A], imposing stroke control on the actuator piston and recording the time course of both the applied load and the displacement (stroke) of the actuator. A sampling rate of 20 data/s was used for crack-bridging tests. The following are the details of the calibration certificates.

A. MTS uniaxial testing machine, model 30/M, serial no. 273305/05, equipped with load cell with full scale equal to 20 kN. Calibration certificate LAT 052 2005127FSE dated 07/05/2020 issued by LAT Calibration Center No. 52.

Two externally controlled hydraulic grippers were also attached to the pistons of the testing machine so that the cementitious sample could be gripped.

Once the sample is clamped, the piston is made to move axially so as to place the prefractured sample in tension. The test is implemented in stroke control by setting, as required by the standard in Ref. 2-c a feed rate of 0.15 mm/min and applying in the initial phase a preload of 20 N downstream of which the elongation is set to zero. Thereafter, advancing at the same speed in the absence of any twisting or bending acting on the specimen, tensile stress was continued until the first visible fracture occurred at which the test was stopped by recording the corresponding elongation value with a reading resolution of 0.01 mm.

The elongation at the onset of the first visible defect, that is, the formation of the first crack (small bubble) on the sheathing, was recorded for each sample.

Table 1 shows the results obtained on the three samples tested and Figure 5 shows an image of a specimen at the end of the test:

T [°C]	sample	Al [mm]
23	1	**0,75**
	2	**0,72**
	3	**0,81**
Average		**0,76**

Table 1. Final elongation values at the first defect under standard conditions

Figure 5. Detail of the resulting sample at the end of the test

5 Conclusions

The standard in Ref. 2-c sets as acceptance limits:

- Elongation at break under standard conditions ≥ 0.75 mm;

The product "Basecrete" satisfies the above acceptance limits, on the basis of the conducted experimentation.

6 Distribution list

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