

Riga Technical University Determination of Waterproofing

Rigas Technical University
Department of constructions
Subfaculty "Building Materials"

Customer: "Hidro Standarts" Ltd.
Contract: Nr.620497

Technical conclusion

It concern bond strength between Penetron (Integral Capillary System Concrete waterproofing, ICS/Penetron International Ltd,USA) and cement-concrete surface and determination of waterproofing.

Riga

April, 1997

According to an order from "Hidro standarts" Ltd the controlled laboratory tests have been performed to determine bond strength between cement-concrete surface and Penetron and its resistance to hydrostatic water pressure. Penetron is recommended for waterproofing of either the positive or negative side which are used in unfavourable conditions.

Object of research

Penetron. The tests have been performed in March-April ,1997 in the Rigas Technical University (department of construction, subfaculty "Building materials")

Purpose of research: determination of Waterproofing according to "Concrete, ways to determine waterproofing" approved by FOCT 12730. 5-84 (includes cement-concrete surfaces).

1. Determination of waterproofing.

Four (4) sampled cylinders (matrixes) have been made in laboratory (H=0=150mm) of plastic concrete, mixed with clean water (water:concrete-0.88). Cone settlement is 12cm. No vibrations so as waterproofing should be as low as possible ($W_2=0.2\text{Mpa} = 2\text{kG/sq. cm}$).

Waterproofing of the matrix was determined to the "Wet stain"- method according

to the requirements r'OCT 12730. 5- 84. The test-equipment is shown (pic. 1).

The upper horizontal surface of each sample has been washed and wire brushed. Penetron has been property mixed with potable water 2:1 by volume (according to recommendation of ICS Penetron Ltd). Surfaces should be damp and the Penetron-coating are applied twice (thickness 1...2mm) by brush.

Samples were placed in a normal-hardening camera (at +20°C, relative humidity > 95%, each coating was regularly moistened) before tested. Waterproofing of Penetron was determined in 14 days after mixing. Two versions were used:

1,1, Hydrostatic water pressure was directed from concrete surface. Penetron-coating was above and tended to come off, if pressure should increase,

1.2. Hydrostatic water pressure was directed from Penetron-coating and pressed the surface.

Water pressure was increased step by step (0.4,0.6,0.8,1.0Mpa) and it was kept on each stage during 16 hours (tab. 1).

Tab.1

Version	Water pressure, Mpa (kG/sq.cm)	Hours	
		1 samp.	2 samp.
From concrete surface (p 1.1)	0.4 (4)	16	16
	0.6 (6)	16	16
	0.8 (8)	16	16
	1.0 (10)	16	11 (fault to pass)
From Penetron coating (p.1.2)	0.4(4)	16	16
	0.6 (6)	16	16
	0.8 (8)	16	16
	1.0(10)	16	16

2. Determination bond strength between Penetron-coating and cement-concrete surface

Six (4x4x4cm cub.) were made of fine concrete in which one stub-nails (®=6mm) were nailed in the same time. When concrete surface had hardened wire brushing and washing with potable water was made. Then applying the Penetron-paste as coating on the surface (Penetron: water = 2:1) was made. Samples were placed in normal-hardening camera (at 20°C, relative humidity>95%, each coating was

regularly moistened) before tested.

Then the samples were bond-strength (coming-off) - tested by test-equipment (pic 1). The tests and results are shown (tab 2).

Tab.2

Sample	Section (sq.m.x0.0001)	Crushing load, kN	Tensile strength MPa (kG/sq.cm)
1	16	3.40	2.13 (21.7)
2	16	3.00	1.88 (19.2)
3	16	4.70	2.94 (30.0)
Average	16		2.32 (23.7)

3. Some recommendations concerning surface preparation.

3.1. The concrete surface should be sandblasting or wire brushing before Penetron-coating is applied. Remove unsound and contaminated concrete to get down to sound concrete. 3.2. Oil, grease must be removed by hot water.

3.3. Water-solvent foreign matters must be water-blasted. Non water-solvent foreign matters must be acid-etched. (hydrochloric acid, HCL, 5%) by brushing or sprayer when concrete surface is damp. Finally surface must be waterblasted.

3.4. Before Penetron is applied pores should be opened (permits concrete to breath).The concrete surface must be structurally sound.

3.5. Before Penetron-coating is applied concrete surface should be soak with water. Excess water must be removed.

3.6. Penetron-coating is applied by brush, sprayer or trowel.

3.7. Surface should be damp, until coating has hardened sufficiently (at least 14 days).

4. Conclusion.

4.1. Penetron stands hydrostatic water pressure 1Mpa (10kg/sq.cm). It's directed from Penetron-coating. In this case Waterproofing is W10.

4.2. Penetron stands hydrostatic water pressure 0.8MPa(8kg/sq.cm). It's directed from concrete surface (Penetron-coating is situated opposite. In this case Waterproofing is W8.

4.3. Penetron has tensile strength 2.32 Mpa (23.7kg/sq.cm). Penetron itself but not a joining area between Penetron and surface is broken if destruction or damage should happened.

5. Inference.

Penetron is recommend and can be applied from either the positive and negative side of cement-concrete surface and ensures permanent waterproofing and protection.

Projects: basements, tunnels, pipelines, tanks.

Penetron is recommended in any place where potential risk of water or chemical attack is possible.

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(The certificate is given by LBS.Its number is 828 "Building materials test")

2 April, 1997

