

APPROVED BY

Deputy director for science of NIISP of the
Ministry of regional construction
(Minregionstroy) of Ukraine,
Ph.D in Technical Science

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on laboratory test of waterproofing materials "Penetron" and "Penetron Admix" for compliance with DSTU-P B V.2.7-126:2006 "Modified dry building mixtures. General specifications", executed by the laboratory of building chemistry of NIISP

1. The reason for the execution of the tests: The contract No. 654 from the 02nd of June, 2008, concluded with limited liability partnership (TOV) "PENETRON - KIEV".

2. The purpose of the tests: Testing of waterproofing material "Penetron" and "Penetron Admix" for compliance with the standards and the development of recommendations for their application.

3. Normative references: The list of normative documents referenced in this report is given in the table 1.

Table 1

Designation of normative document	Title of normative document
DSTU B V.2.7-47-96 (GOST 10060.0-95)	Concretes. Methods for the determination of frost-resistance. General requirements
DSTU B V.2.7-49-96 (GOST 10060.2-95)	Concrete. Rapid method for the determination of frost-resistance by repeated alternated freezing and thawing
DSTU-P B V.2.7-126:2006	Modified dry building mixtures. General specifications
GOST 166-89 (MCO 3599-76)	Vernier callipers. Specifications
GOST 4233-77	Sodium chloride. Specifications
GOST 2874-82	Drinking water. Hygienic requirements and quality control
GOST 7328-2003	Weights. General specifications (GOST 7328-2001.IDT)
GOST 10180-90	Concretes. Methods for strength determination using reference specimens
GOST 12730.2-78	Concretes. Method of determination of moisture content
GOST 12730.3-78	Concretes. Method of determination of water absorption
GOST 12730.5-84	Concrete. Method of determination of water resistance
GOST 24104-88	General purpose laboratory balances and comparison balances. Performance. Specifications

4. The tests were carried out: During the period from 25.06.08 till 28.08.2008 according to DSTU B V.2.7-47, DSTU B V.2.7-49, DSTU-P B V.2.7-126, GOST 10180, and GOST 12730.5.

5. The samples of waterproofing materials: The company TOV "PENETRON-KIEV" delivered to the laboratory of building chemistry NIISP the following samples: "Penetron" — Waterproofing of concrete surfaces according to TU 5745-001-77921756-2006 (lot No. 001 from 25.01.2008) in the amount of 5 kg and "Penetron Admix" — Waterproofing additive to the concrete according to TU 5745-001-77921756-2006 (lot No. 004 from 05.12.2007) in the amount of 4 kg.

6. Type and the basic characteristics of testing equipment and measuring means: The list of the equipment and measuring means is given in the table 2.

Table 2

The name of the equipment and measuring means	Factory number	The date of certification and verification		Certificate number
		Last	Next	
1	2	3	4	5
Counter-balance T-5000 according to GOST 24104, the error in the range of weighing is: 200 — 500 g \pm 150mg; 500 — 5000 g \pm 300 mg	7710	05.2008	05.2009	Stamp the 2 nd quarter of 2008
The set of weights "Г-2-210" according to GOST 7328	292	05.2008	05.2009	35-02/0896037
Hydraulic Press "П-50"	4358	10.2007	10.2008	34/5827
Vernier calliper of the 2 nd class according to GOST 166	9128743	12.2007	12.2008	23-18/00719
Drying cabinet WS-30	81436	10.2007	10.2008	24-L3988
Climatic chamber ILKA 3101	09281	04.2008	04.2009	24-3/0816
The device "АГАМА-2РМ"	0108	07.2007	07.2008	Stamp

7. The samples of concrete of cubic form with the size 70 mm × 70 mm × 70 mm and of cylindrical form with the diameter 150 mm and the height 35 mm have been made by laboratory of building chemistry NIISP and conditioned according to GOST 10180, DSTU B V.2.7-43 and TU 5745-001-77921756-2006.

The composition of fine-grained concrete mixture, mass: Portland cement of the grade 400-0,5; sand-1,3; water-0,2. Fractional composition of the sand, mass %, by fractions, mm: (4-5)-9,0; (3,5-4,0) - 5,0; (2,0-3,5)-4,0; (1,25-2,0)-7,0; (1,0-1,25)-8,0; (0,9-1,0)-7,0; (0,63-0,9)-6,0; (0,5-0,63)-10,0; (0,315-0,5)-10,0; (0,25-0,315)-12,0; (0,2-0,25)-12,0; (0,14-0,2)-10,0. The composition of concrete mixture corresponds to concrete class "B20".

Two series of concrete samples have been made: the samples which do not contain "Penetron Admix" and the samples containing "Penetron Admix", the part of the samples of the first series were processed by the material "Penetron".

The following designations of samples were accepted: "C" — control samples; "P" - the samples processed with the material "Penetron"; "A" — the samples containing "Penetron Admix".

8 Test methods

8.1 Compressive strength — according to GOST 10180.

The following samples were tested: air-dry concrete samples (the influence of waterproofing materials on compressive strength was determined) and water-saturated samples (the influence of waterproofing materials on frost resistance was determined).

8.2 Water absorption — according to GOST 12730.2 and GOST 12730.3.

Air-dry and water-saturated samples were tested for the purpose of determination of the influence of waterproofing materials on water absorption of concrete samples.

Frost resistance was determined according to DSTU B V 2.7-47 and DSTU B V 2.7-49.

Water resistance was determined according to DSTU-P B V 2.7-126 and GOST 12730.5.

The test according to DSTU-P B V.2.7-126 were carried out because the materials "Penetron" and "Penetron Admix" refer to dry building mixes, and specifically - to dry mixes of the group "Г11" intended for the construction of rigid waterproofing.

9. Test results

The results of testing air-dry concrete samples for compression are given in the table 3.

Table 3

Designation of the samples	Cross-sectional area	Breaking load, N	Compressive strength reduced to basic size, kilogram-force/cm		Fracture pattern
			of the samples	average	
C - 1/c	49,70	15400	270	272	normal
C - 2/c	51,48	16300	275		normal
C - 3/c	51,10	15900	271		normal
P - 1/c	53,29	17300	282	286	normal
P - 2/c	52,56	17600	291		normal
P - 3/c	53, 28	17500	286		normal
A - 1/c	51.12	17200	293	305	normal
A - 2/c	50.41	18000	311		normal
A - 3/c	50,76	18200	312		normal

The results of testing concrete samples for water absorption are given in the table 4.

Table 4

Designation of the samples	Volume of the samples, dm ³	Weight of the samples, kg		Water absorption, mass %	
		dry	water sated	of the samples	average
C - 1	0,373	0,797	0,838	5.14	5,24
C - 2	0,358	0,782	0,825	5,50	
C - 3	0,365	0,768	0,807	5,08	
P - 1	0,378	0,788	0,815	3,43	3,87
P - 2	0,376	0,807	0,842	4,34	
P - 3	0,397	0,849	0,882	3,89	
A - 1	0,355	0,769	0,795	3.38	3,21
A - 2	0,363	0,785	0,810	3.20	
A - 3	0,358	0,789	0,813	3,04	

The results of testing concrete samples for frost resistance are given in the table 5.

Table 5

The results of testing the samples for frost resistance													
Control			BASIC										
			INTERMEDIATE					AGGREGATE					
No. of sample	Compression strength in saturated state, MPa	Average strength	No. of sample	Number of intermediate cycles	Compression strength, MPa	Average compression strength, MPa	Variation of average strength, %	No. of sample	Number of cycles from the beginning of the tests	Compression strength, MPa	Average compression strength, MPa	Variation of average strength, %	Conclusion to test results (grade)
C-1	261	258	C-4	75	250	253	1,93	C-7	100	242	246	4,65	F100
C-2	256		C-5	75	247			C-8	100	246			
C-3	257		C-6	75	262			C-9	100	250			
P-1	281	277	P-4	150	260	269	2,89	P-7	200	259	264	4,69	F200
P-2	274		P-5	150	274			P-8	200	266			
P-3	276		P-6	150	273			P-9	200	267			
A-1	282	290	A-4	150	291	283	2,41	A-7	200	271	277	4,48	F200
A-2	293		A-5	150	277			A-8	200	281			
A-3	295		A-6	150	281			A-9	200	279			

Notes:

- All the values of compression strength of the concrete are given for basic size.
- Fracture pattern is normal.
- The presence of large (of the volume over 1 cm³) shells and caverns and the traces of lamination has not been detected.

The results of testing concrete samples for water resistance are given in the table 6.

Table 6

The characteristic of the concrete	Concrete grade with respect to water resistance, W	The estimate of the efficiency of waterproofing materials
Control samples	2	—
The samples processed with the material "Penetron"	10	Increase of water resistance by 4 grades
The samples which composition includes "Penetron Admix"	12	Increase of water resistance by 5 grades

According to the planned schedule of the contract, the material "Penetron" has been tested according to the item 11.2.12 of DSTU-P B V 2.7-126.

Water resistance during 24 hours was not less than 0,25 MPa.

CONCLUSION

Dry mortar mixtures of the brands "Penetron" and "Penetron Admix" which have been submitted for the tests are highly effective waterproofing materials. When a surface of concrete is processed with the material "Penetron" and when the additive "Penetron Admix" is introduced into concrete composition (or solution), increase of concrete strength, decrease of water absorption, increase of water resistance and frost resistance are obtained.

The material "Penetron" complies with the norm DSTU B V.2.7-126 given in the standard for dry mixes of the grade "Г11" recommended for the construction of rigid waterproofing.

Notes:

1. Test report applies only to the samples which have been submitted to the laboratory of building chemistry NIISP by TOV "PENETRON-KIEV".
2. Full or partial reprinting, duplicating or distribution of the report No. 39-2008 from the 28th of August, 2008, without the permission of NIISP of the Ministry of regional construction of Ukraine is forbidden.

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