Spectrum Journal of Innovation, Reforms and Development
Volume 21, November, 2023 | ISSN (E): 2751-1731
Website: www.sjird.journalspark.org

WEAR RESISTANCE OF MONOLITHIC CONCRETE INDUSTRIAL FLOORS

Goncharova N. I.
Ph.D., Associate Professor, Fergana Polytechnic Institute,
Fergana, Uzbekistan

Abstract
The article is devoted to the urgent problem of increasing the wear resistance of monolithic concrete industrial floors experiencing the aggression of industrial environments. It shows the improvement of cement concrete structure by introducing modifying additives into concrete composition, improving deformative and strength properties of concrete coatings and providing compaction of its surface, reducing surface abrasion.

Keywords: industrial floor, industrial aggression, monolithic concrete, concrete modification with polymer reagent, abrasion reduction.

Introduction

The development of industrial construction in Uzbekistan is associated with an increasing need for the arrangement of industrial floors, which are subjected to the impact of force and aggressive factors of technology. Nowadays, monolithic floors based on cement concrete are widely used in industrial buildings. Despite the high technological and economic efficiency, there are cases of monolithic floors destruction in the form of peeling and cracking of the surface layer of concrete, which is associated with insufficient adhesion and strength and deformation properties.

Method

The solution of the problem of increasing the efficiency of cement concrete is associated with the application of progressive technology of floor production and modification of concrete structure by introducing polyfunctional polymer additives that increase the operational properties of monolithic floors of industrial buildings [1]. From the point of view of technological execution, topping floors (concrete floors with the top layer reinforced with additional components) are effective. The use of stabilizing polymeric additives derived from local industrial waste as modifiers is of great interest.

Result

The design of monolithic concrete on the ground and the technology of its production have been developed [2]. The design of monolithic concrete on the ground provides for the following structural layers: - base (soil or a mixture of sand and crushed stone); - a layer of thermal and waterproofing material; - a frame of reinforcement; - the concrete slab itself; - the top layer with the use of hardeners.

Optimal compositions of polymer-cement concrete with polymer additives for monolithic floors of industrial buildings have been developed [3].

It was found that the introduction of polymeric admixture POLY- ANS 2 dosage 0.02% contributes to the reduction of water separation and delamination in 1.8-3 and 1.6-2.7 times [3].

The cubic strength of concrete increases with POLY- ANS 1 (0.01%) by 9-10%; with POLY- ANS 2 (0.02%) by 20-28%; with POLY- ANS 3 (0.03%) by 28-36%, and flexural tensile strength by 11-12; 26-39; 40-54%, respectively, depending on cement consumption [4].

The performance properties of the modified concrete were studied. Frost resistance of concrete with additives of different concentrations POLY- ANS 1, POLY- ANS 2, POLY- ANS 3 was respectively F250, increased from 4 to 6-12 ATI or 1.5-4 times.

One of the main quality indicators of industrial floor coatings is resistance to abrasion. Abrasion resistance is a characteristic of the surface of the floor covering (it was determined in the laboratory as the ratio of the mass loss of the sample in grams to the unit area of 1 cm2 under abrasive wear).

The resistibility of cement stone was studied on specimen beams of 4x4x16 cm (Fig.3.1.12). After molding the beams were kept for several hours (2-3 hours) in the laboratory room, after which their hardening was continued in the steaming chamber under the regime of 4+6+2 hours at the temperature T=75-800 C. The abrasion resistance was determined on the abrasion wheel of the device LKI-3 in accordance with the instructions attached to the device.

Indicators of cement stone properties and abradability are given in Tables 1 and 2. The obtained data of cement stone abrasion allow to estimate its share of abrasion in cement concrete.

Table 1. Indicators of cement stone properties

Cement	W/C	Average density,kg/m3		Tensile strength in kg/cm2 at		IV kg/mm^2
		dough	stone	bend	compression	
Portland cement	0,2	1830	2100	65,6	558	35,7
	0,3	1990	2040	67,4	391	30
	0,4	1910	1850	52,1	228	19,4

Табл.2. Groutability of cement stone in cm

Cement	W/C	I_{140}	I_{280}	I_{560}	I_{840}	I_{1120}	Tpr turns
Portland cement	0,2	0,119	0,241	0,438	0,636	0,85	1400
	0,3	0,14	0,26	0,502	0,77	1,032	1000
	0,4	0,093	0,175	0,35	0,504	0,632	1600

For the tested cements, the dependence I=f (T) has a constant character and can be accepted as corresponding to the straight-line equation I=KT.

Then, cement concrete beam specimens were subjected to the study. Alitic Portland cement was used for concrete production with grinding in a vibromill to a specific surface area of about 5200 cm2/g. Quartz sand and fine crushed stone from dense rocks were used as aggregates. The concrete compositions are given in Table 3.

Table 3 Concrete mix compositions

Solution composition by weight	W/C	Consumption of materials per 1m3 of mortar in kg			Cone blur in mm
		Cement	water	sand	
1:2,4	0,3	615	185	1470	110
1:4,8	0,6	320	192	1530	130
1:7,2	0,9	222	200	1600	125

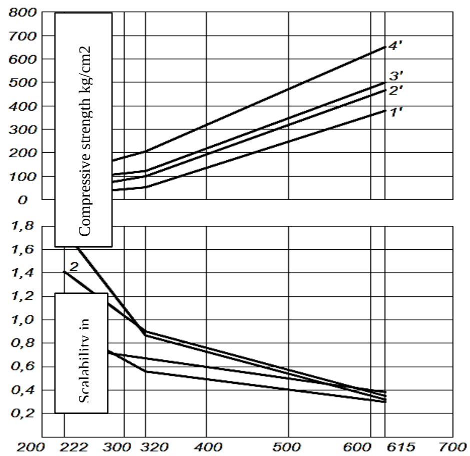
In the process of testing the samples for abrasion resistance the following was noted: Composition 1:7.2; B/C=0.9. There was observed intensive abrasion of quartz sand (aggregate) and significant chips at the corners and perimeter of the specimen. The surface of the specimen after the test is uneven (the holes are formed by speckling of sand grains).

Composition 1:4.8; B/C=0.6. The character of the abrasion process and the type of abrasion surface are basically the same as in the previous composition, but the surface roughness is less, the perimeter chipping is less. The aggregate grains are somewhat better retained in the cement stone.

Composition 1:2,4; B/C=0,3. o The aggregate vyprazovanie aggregate is insignificant, there is no spalling around the perimeter of the sample. There is abrasion of both cement stone and aggregate.

Fig.1. shows the dependence of abrasion resistance of cement mortars on compressive strength.

As can be seen from the graphs, the transition from low strength of mortars to high strength is accompanied by a significant decrease in abrasion. At high strength of mortars further reduction of strength practically does not affect the abrasion.

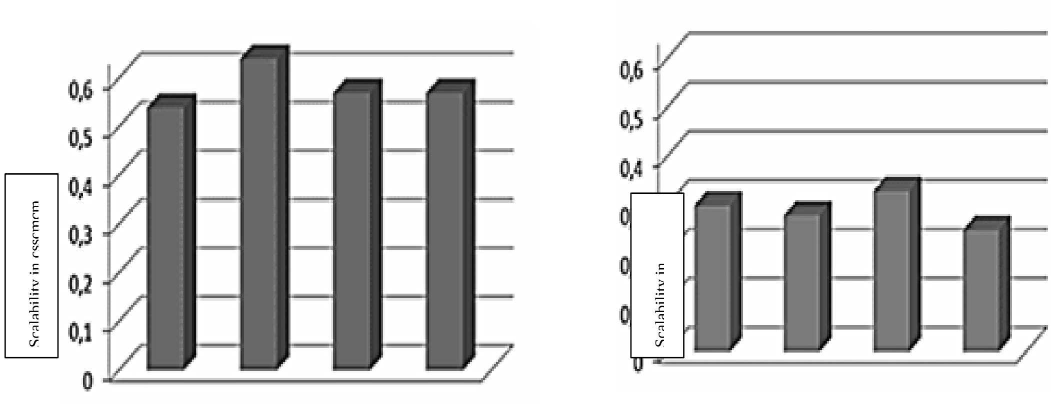


Cement consumption in kg per 1m3 of concrete

Fig.1. Tensile strength and compressive strength of mortars depending on cement consumption at different curing times: 1.1`-3 days; 2.2`-7 days; 3.3`-14 days; 4.4`-28 days.

The diagram in Fig.2. shows the abrasion results of concrete without polymer additive (a) and with 0.02% polymer additive (b) at different curing times.

It is noted that the transition from low to high strength of concrete is accompanied by a significant in abrasion. At high strength of concrete, further reduction of strength practically does not affect the abrasion resistance.



.

Fig.2.Results of abrasion tests of concrete specimens without additive (a) and with 0.02% polymer additive (b)

Modification of fine-grained industrial concrete with polymer additive reduces the abrasion of the coating. The abradability is up to 0.35 g/cm2

Conclusion

Thus, it is possible to increase the abrasion resistance of coatings of monolithic concrete industrial floors by modifying the concrete structure with POLY- ANS polymer additive, which improves the deformative and strength properties of concrete coatings and provides compaction of its surface, reducing the abrasion resistance of the surface.

References

[1]. Galkina O.A. Increase of efficiency of concretes for monolithic floors by polymeric additives / Abstract of Candidate of Technical Sciences 05.23.05 - Building materials and products.-M.-2004

[2]. Potapov A.A. Development of compositions and technology of modified fine-grained concrete for poured floors / / Abstract of Candidate of Technical Sciences 05.23.05 - Building materials and products.-M.-2014

[3]. Goncharova N.I., Abobakirova Z.A. GENERATING COMBINED CEMENTING MATERIALS WITH MICROFILLER AND GEL-POLYMER ADMIXTURE. //ISSN: 2456-6683 International Journal of Research Culture Society. Monthly, Peer-Reviewed, Refereed, Indexed Journal (№23) Scientific Journal Impact Factor: 5.245, Volume - 4, Issue - 2, Feb – 2020.

[4]. Glagolev, E.S. Deformative properties of fine-grained concrete / Glagolev, E.S.; Lesovik, R.V.; Klyuev, S.V.; Bogusevich, V.A. /Building materials. Scientific-technical and production journal. -January-February 2014.

[5]. Goncharova, N. I., & Abobakirova, Z. A. (2021). Reception mixed knitting with microadditive and gelpolimer the additive. Scientific-technical journal, 4(2), 87-91.
[6]. Goncharova, N. I., & Abobakirova, Z. A. (2019)Technological Features of Magnetic Activation of Cement Paste. International Journal of Advanced Research in Science, Engineering and Technology Vol. 6, Issue 5 ,(05.00.00; № 8) P. 9513-9516
[7]. Goncharova, N. I., & Abobakirova, Z. A. (2020) Influence Of Polymeric Additives On The Corrosion Resistance Of Concrete. The American Journal of Engineering and Technology, 2(10), Page 1-5
[8]. Goncharova, N. I., & Turopov, M. (2019). Optimization of the structure of cement concrete with activated liquid medium. Scientific-technical journal, 22(3), 60-64.
[9]. Goncharova, N. I., Abobakirova, Z. A., & Mukhamedzyanov, A. R. (2020). Energy saving in the technology of enclosing structures. In Energy-resource-saving technologies and equipment in road and construction industries (pp. 107-112).
[10]. Goncharova, N. I., Raxmanov (2018). Properties of concrete with polymer additives-wastes products. Scientific-technical journal, 1(2), 149-152.
[11]. Goncharova, N. I., Abobakirova, Z. A. (2016). Development of salt-resistant concrete for structures with large open surface modulus. Young Scientist, (7-2), 53-57.
[12]. Goncharova, N. I., & Abobakirova, Z. A. (2020) Polymer reagent in construction practice. /E3S Web of Conferences 365
[13]. Goncharova, N. I. Energy Efficient Lightweight Guarding Structures. The American Journal of Engineering and Technology (ISSN – 2689-0984) Published: June 16, 2021 | Pages: (11-15)
[14]. Goncharova, N. I. /Reagent polymer in construction practice / FarPi Ilmiy Technik Journal. - Fargona, 2022, T.26, mahsus son. No.1, 85-90 betlar, (05.00.00; No.20)
[15]. Abobakirova Z. A., Bobofozilov O. Remont betonnogo pola–vidы povrejdeniy i merы po ix [14]. Goncharova, N. I. /Reagent polymer in construction practice / FarPi Ilmiy Technik Journal. - Fargona, 2022, T.26, mahsus son. No.1, 85-90 betlar, (05.00.00; No.20)
[16]. Abobakirova Z. A. Regulation Of The Resistance Of Cement Concrete With Polymer Additive And Activated Liquid Medium //The American Journal of Applied sciences. – 2021. – Т. 3. – №. 04. – S. 172-177.
[17]. Nabiev, M. N., Nasriddinov, H. S., & Kodirov, G. M. (2021). Effect of Water Soluble Salts on Performance Properties of Exterior Walls. TA'LIM VA RIVOJLANISH TAHLILI ONLAYN ILMIY JURNALI, 1(6), 44-47.
[18]. Bakhromov, M. M. (2020). Investigation of negative friction forces of thawing soils in field conditions. Young Scientist, (38), 24-34.
[19]. Bakhromov, M. M., & Raxmanov, U. J. (2020). Problems of construction on subsidence loess and weak soils and their solution. Internauka, (37-1), 5-7
[20].Махмудов, З. Б. (2023). СПОСОБ УСИЛЕНИЯ МОНОЛИТНОЙ ЖЕЛЕЗОБЕТОННОЙ РАМЫ КАРКАСА ПРОИЗВОДСТВЕННОГО ЗДАНИЯ. Ломоносовские научные чтения студентов, аспирантов и молодых ученых–2023, 435.
[21]. Mirzababaeva, S. M. (2022). SOLUTIONS OF WOOD STRUCTURED BUILDINGS IN THE CONSTRUCTION OF THE SMART CITY. Journal of Integrated Education and Research, 1(5), 390-395.