

Characteristics of a New Lightweight Pore Filler Concrete for Building Structures in Various Climate Conditions

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Abstract:

In this article, the peculiarity of the properties of lightweight concrete with new pore filler for barrier structures in the climatic conditions of Uzbekistan, the composition of the developed product and the technological parameters of quartz porphyry and carbonized kaolin soil pore It is explained that the experimental series of small block products of size 20x20x40 made of lightweight concrete based on filler was developed.

Keywords: new pore filler, lightweight concrete, local raw materials, ash additives, mineral binder.

Introduction: The rapid development of the world construction industry and the increase in prices for fuel and energy carriers lead to the need to create and implement resource- and energy-saving technologies in the production of construction materials and products. In this regard, including the use of new types of energy-efficient materials in the field of construction materials and products, the effective use of energy-saving technologies, the improvement of new construction materials and products and their existing technology, and through this, the physical-mechanical and physical-mechanical properties of lightweight porous fillers and concrete issues of improving physico-chemical properties occupy a leading place. In this regard, special attention is paid to the production of pore-filling and lightweight concrete based on local raw materials and coal waste, and to the creation of energy-efficient construction materials and products.

In the world, the preparation and production of lightweight concretes with pore fillers are being researched and researched to improve their properties. In this regard, among others, the selection of pore fillers for the production of high-quality, energy-efficient lightweight concrete, control of the formation of the structure of the hardening cement stone using fly ash additives, optimization of the composition of lightweight concrete, pore filler and A lot of scientific and research work is being carried out aimed at improving the contact zone between the mineral binder and forming the

strength structure. In this regard, it is important to research the physical and mechanical properties of lightweight concrete, reduce cement consumption using local raw materials and coal waste resources in their production, and produce energy-efficient wall materials.

In our republic, several works such as development of the construction industry, modernization of the production of construction materials and products, effective use of local and secondary raw materials in the production of construction materials, and at the same time increasing the volume of production are being carried out and certain achievements are being achieved.

Research results: One of the important tasks is to improve the production technologies of high-quality and environmentally friendly building materials and products in the production of light concrete with pore filler based on local raw materials and coal waste.

According to the developed product composition and technological parameters, an experimental series of small block products of 20x20x40 size was developed from light concrete based on pore filler with quartz porphyry and carbonized kaolin soil. A total of 20 m³, including 8 m³ of 5-10 mm grain and 17 m³ of pore filler with 10-20 mm grain, were produced under factory conditions for the study of the main physical and mechanical properties of lightweight concrete. The fact that the pilot batch of the pore filler was produced in factory conditions is confirmed by appropriate acts.

The obtained batches of the pore filler were used for laboratory research (2 m³), and the rest were used for the preparation of wall blocks from heat-insulating structural large-pore lightweight concrete of the C5 class, size 400x200x200 mm, the composition of these blocks is as follows (kg /m³): cement - 195, pore filler with 5-10 mm particles - 300, 10-20 mm particles - 450; water, l - 142, Angren IES fly ash additive calculated as dry matter - 5.85 kg, the hardness of lightweight concrete mixture was 5-10 s.

In May 2020, small blocks of B5 class heat-insulating structural large-pore light concrete with dimensions of 400x200x200 mm were produced at the JBI-plant landfill of the limited liability company "Construction materialsinvest" in the Ferghana region.

The preparation of lightweight concrete mixture was carried out in the following sequence in a mobile forced mixer: dosing of components, loading of an aqueous mixture of cement and additives, mixing (2 min); loading and mixing filler with particles of 5-10 and 10-20 mm (5 min). As a result of the experimental preparation of the mixture, the hardness and strength of the sample-cubes were determined after being held in medical conditions. The blocks are shaped using a special moving carriage.

Comment: Thus, as a result of experimental work, the efficiency of using lightweight concrete with pore fillers with quartz porphyry and Angren IES coal ash was determined for the preparation of small wall blocks. In this case, it is possible to save 15% of cement and reduce the duration of solidification of small blocks by 3.5 times.

1- Table. Light concretes with quartz porphyry and carbonized kaolin soil account book, 1 m³

Name of the material.	Standard consumption per 1 m ³ .	Unit of measure
Cement PS 400 D20	195	kg.
Amount of water	142	Litr
Quartz porphyry volume (zkg)	0.8	m ³
Quartz porphyry with grains of 5-10 mm (zkg)	300	kg.
Quartz porphyry with grains of 10-20 mm (zkg)	450	kg.
Fly ash (Angren IES)	5,85	kg.
Concrete mix density	1614	kg/m ³ .

Concrete density brand	1200	D
Total weight of concrete mixture	1614	kg.
S/S	0.59	
S:Q:shch:S proportions	1 : 3.1 : 1.5 : 0.6	kg.
Value		
Cement	600	kg/ soum.
Quartz porphyry (zkg)	900	kg/ soum
Fly ash (Angren IES)	80	kg/ soum
Total cost	1580	kg/ soum

The main characteristics of the use of pore filler for the preparation of lightweight concrete blocks with large pores are presented in Table 2.

Taking into account the additional costs of making masonry blocks from quartz porphyry and charred kaolin clay (base salary, social insurance contributions, workshop costs and profitability), it can be said that the cost of both options is almost the same. However, the effectiveness of using light concrete with pore fillers with quartz porphyry and zola-unos in the preparation of small wall blocks has been determined. In this case, the possibility of saving 15% of cement and shortening the solidification period of the blocks by 3.5 times is indicated.

Table 2

Indicators	Unit of measure	Results by grains	
		5-10	10-20
Volumetric mass	kg/m ³	750	730
Strength when compressed in a cylinder	MPa	2,5	2,3
Water absorption after 1 hour	%	15,5	14,5
Cold resistance	Cycles	50	50
Loss of mass:			
- in ferrous decay	%	-	-
- in silicate decay	%	-	-
- when pierced	%	-	-
- when boiled.	%	-	-

According to the table, it can be seen that lightweight concrete economic efficiency has been achieved due to the reduction of cement (fly ash) consumption.

Summary:

The study of the effect of successive wetting and drying made it possible to obtain the softening coefficient, which characterizes the stability of the studied lightweight concrete to successive wetting and drying. Thus, it can be seen from the research that this coefficient varies from 0.96 to 100 for concrete of different classes, which is similar to the indicators of lightweight concrete studied earlier. A technical-economical comparison of lightweight concrete made with brick testifies to an insignificant excess of value, but the reduction of the mass of small blocks, improvement of heat-technical indicators, reduction of consumption of energy resources for heating and ease of construction and assembly work - this construction compared to the analogue indicates that it is more energy efficient. Taking into account the additional costs of making building blocks from quartz porphyry and sulfur kaolinite soil (primary wages, social insurance contributions, workshop costs and profitability), it can be argued that the cost of both options is almost the same. However, for the preparation of small wall blocks, the efficiency of using lightweight concrete with porous fillers with quartz porphyry and fly ash has been determined.

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