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Influence of Porization and Molding Methods on the Quality of Cellular Concrete

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Abstract. An interesting method is the manufacture of aerated concrete products with different indicators, both strength and density along the periphery and cross-section. The essence of this method is as follows, the filling of the cellular-concrete mass occurs in a closed form, having small holes in its side and upper faces.

Keywords: concrete, technology, raw materials, temperature, method, manufacturing.

One of the first most important technological changes in the manufacture of aerated concrete is molding. At this stage, the porosity of the finished product is formed, for this it is necessary to observe the rules for setting the gas release rate and increasing the rheological characteristics of the mixture.

In the field of creating equipment and technology for the use of shock pulse in the manufacture of cellular-concrete mixtures. The average density of aerated concrete produced using this technology is 10% less than that of aerated concrete of similar composition made using injection molding technology, which forms the reasons for reducing the consumption of aluminum powder when creating aerated concrete of identical density. A 15-25% decrease in the water content of the mixture leads to an improvement in the strength indicators of aerated concrete by 25-50% with identical compositions.

An interesting method is the manufacture of aerated concrete products with different indicators, both strength and density along the periphery and cross-section. The essence of this method is as follows, the filling of cellular concrete mass occurs in a closed form, which has small holes in its side and upper faces, the presence of a "hump" is a serious drawback in the technology of manufacturing aerated concrete. Excessive costs are necessary for pruning and removing the hump, and they are justified only in large automated enterprises. Therefore, the method of forming aerated concrete "under the lid", despite the fact that it was still proposed in the late 50s, is still relevant. The lid with this method of manufacture must be rigid and securely attached to the mold. In the course of experimental studies, it was found that after filling the entire volume with the mixture, transparent water comes out of the mixture through the gaps between the elements of the mold lining. The removal of excess water and the setting of aerated concrete under pressure contributes to an additional increase in its strength, reducing the duration of exposure of the product before heat and humidity treatment. The mechanism of cutting the cellular concrete mass is as follows: in the process of contact of aluminum powder particles with calcium hydroxide particles at the contact points at a temperature of at least 25-35 ° C, hydrogen begins to be released. In the microzones adjacent to the aluminum powder molecules, the gas that exerts pressure on the visco-plastic mass, until this indicator exceeds the maximum shear stress, the cellular-concrete mass is not parried. The physico-chemical processes of gas formation in the cement dough solution system are quite complex. The speed and volume of the mechanism depends mainly on the fineness of the grinding of the gas educator, the climatic regime of the medium and the concentration of hydrogen ions of the medium (pH).

The main prerequisite contributing to the production of rapidly swelling cellular concrete with a minimum number of defects is the unevenly distributed grain composition of aluminum powder, rather late interaction of large or weakly active aluminum particles due to the pressure appearing in the process of gas formation during the strength gain of the binder.

To obtain a very light, rapidly swelling aerated concrete, the gas educator (aluminum powder) should be ground to a larger specific surface area. The authors obtained the composition of aerated concrete with an average density of 180 – 215 kg/m3 and a thermal conductivity of 0.078 – 0.083 W/ (m · °C). A low average density indicator is obtained due to the joint grinding of the binder, mineral fillers and the gas educator.

The process of late reaction of the gas educator and measures to prevent it are well studied in the production of aerated concrete. This is achieved by changing the water-cement ratio and the temperature of the mixture, the introduction of surfactants.

Which can, through the surface, determine the technological criteria for the mechanism of building a porous structure at the time of swelling of the cellular-concrete mixture by gas release? The gas release through the surface can be divided into two stages: the first stage in the process of intensive swelling and the second stage after the end of the swelling of the composition. The absence of the second stage of gas release indicates that the selected composition of cellular concrete is considered optimal.

In the works, data have been obtained showing that for the manufacture of aerated concrete with a low average density, multidimensional packing of pores of various radii obtained by gas foam porization is required. This method makes it possible to form a porous structure due to air entrainment during mixing of the mixture with chemical additives.

A variant of foam gas formation was obtained, based on the fact that during the initial period in the molding mixture, pores are formed by introducing foam into its composition, and later large pores are obtained for the molded mass by introducing gas formers.

The use of a vibro-pulping method is considered, which makes it possible to obtain a cellular concrete mass with evenly distributed pores of approximately the same size. For the manufacture of products having a porosity of about 80% or more, it is advisable to produce vibro-expanded thermal insulation gas foam concrete with an average density of 300-350 kg / m3.

The analysis of gas and foam methods of porizing the raw mixture, which are used in cellular concrete technology, was carried out. Based on their analysis, the rationale for combining two methods of cuts in one technology is given. According to the authors, heat-insulating cellular concrete obtained under conditions of pressure variotropy can be used both for the manufacture of piece products and in monolithic construction.

The optimization carried out at the same time makes it possible to eliminate overspending of the main components and obtain products with the specified characteristics.

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