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CONTACT JOINTS STRENGTH OF MODIFIED CONCRETE COMPOSITE CONSTRUCTIONS

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The availability of modified concrete in industrialized construction, monolithic construction and reconstruction is regarded. The influence of hyperplasticizer STACHEMENT-2000M upon the contact joints strength of concrete composite constructions is viewed. An experimental data analysis of contact joints strength was carried out and inferences about the availabilities of hyperplasticizer in concrete composite constructions were drawn.

The guaranteeing of strong and solid conjunction of concrete and reinforced concrete composite constructions is a very relevant question relating to new construction (while manufacturing industrialized components, during concrete pause in monolithic construction, right up to long-delayed consruction) and reconstruction [1].

Concrete admixtures have found their use all over the world. They enable not only to enhance the mobility of concrete, to increase concrete strength and water resistance, but also to reduce cement content, to increase frost-resistance, rust resistance, to adjust mobility of concrete and rate of strength gain, etc.

There is a large variety of concrete admixtures in Vitebsk region, but the most common ones are the following – S-3, FREM production, STACHEMENT, Penetrat, etc.

Concretes with admixtures possess high technological and running ability properties and can increase final strength characteristics, reduce shrinkage of hardening concrete, so there is a chance to get high-strength concrete and reinforced concrete elements. While using concrete admixtures it is very important to save not only on building materials, but also on energy supply and manpower.

But there is no information about the impact of concrete admixtures on load-carrying ability of a composite construction. Another question is whether a strong combined action of such an element will be ensured. There is a need to carry on an investigation because of insufficient information on the use of modified concrete of combined constructions. The aims of this investigation are as follows: 1) the analysis of strong and solid conjunction of contact joint and 2) further combined action of composite concrete and reinforced concrete elements right up to destruction [2].

To implement a specified goal an investigation into contact joint strength of "old" and "new" concrete with hyperplasticizer STACHEMENT-2000M was carried out.

The investigations were conducted on П-shaped composite elements. STACHEMENT-2000M was added to concrete mix of "new" concrete. An "old" concrete was without any admixture. An experimental model is shown on Fig. 1.

Fig. 1. An experimental model

Experimental models were designed to determine such a concrete mix of a "new" concrete, which will ensure the highest strength of concrete joint. The investigation was approached to real conditions. In this connection every "old" concrete element was of the same strength class and they were 1.5 years of age. The first concrete mix of a "new" concrete model was without any admixture (a reference specimen C1-6-0%, C2-12-0%). The second concrete mix was with hyperplasticizer STACHEMENT-2000M (0.7% by weight of cement) and with water variation in such a way that a slump test changed (C2-12-0.7%, C1-18-0.7%).

Composite construction manufacturing technique of every element was equal and was confined as follows: the "new" concrete was put onto a prepared surface of the "old" concrete element. The surface was previously cleaned through cement skim erasing [3]. Before putting the "new" concrete the surface of the "old" element was moistened.

While carrying out the investigations we identified the contact joint strength. The mode of failure of experimental models was investigated. The results of investigations are showed in table 1.

Table 1 – The strength characteristics of composite elements

Experimental model		A percent of admixture used, %	A slump test, cm	$f^{G}_{c,cube}$, MPa of "new" concrete	Conditional strength class of "new" concrete
With admixture	C2-12-0,7%	0,7	12	58,67	$C'\,46,94/58,67$
	C1-18-0,7%	0,7	18	46,75	$C'\,37,4/46,75$
Without admixture	C1-6-0%	0	6	45,75	$C'\,36,6/45,75$
	C2-12-0%	0	12	39,45	$C'\,31,56/39,45$

The analysis of the mode of failure shows that every experimental model broke down in the place of contact between the "old" element and the "new" element. The failure had an abrupt character. The models with admixture had adhered parts of the "new" concrete on the surface of the "old" concrete element and the surface of the models without admixture was clean and smooth (Fig. 2).

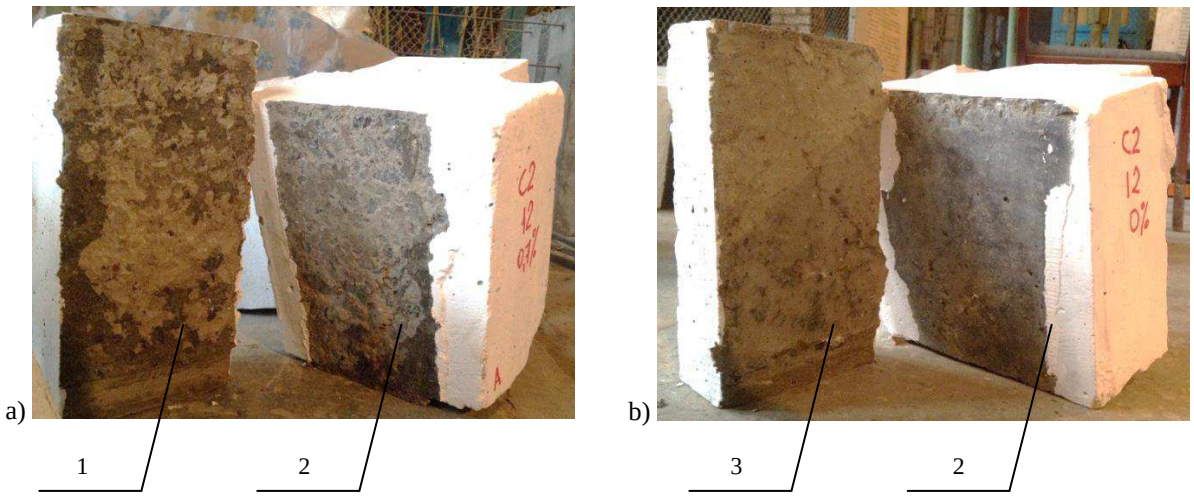

Fig. 2. A general view of failure models: a) with admixture, b) without admixture;
1 – "new" modified concrete, 2 – "old" concrete, 3 – "new" concrete without admixture

According to the results of the investigations the following deductions were made:

– The contact joint strength when hyperplasticizer STACHEMENT-2000M of 0.7% by weight of cement was added is superior to the reference specimen (models without admixture);

– The contact joint strength when hyperplasticizer STACHEMENT-2000M was added and with a slump test of 12 cm is superior to the models with a slump test of 18 cm;

– When hyperplasticizer STACHEMENT-2000M is added the contact joint strength is 1.5 and even higher that can guarantee a strong and solid conjunction of "old" and "new" concretes and also ensures combined action of composite elements.

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