UDC 624.012.3

CONTACT JOINTS SHEAR STRENGTH OF COMPOSITE CONCRETE STRUCTURES LACED WITH STACHEMENT-2000M HYPERPLASTICIZER

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The urgency of using composite concrete and reinforced concrete structures and the problem of solid adhesion of the element in the zone of the contact joint of composite concrete and reinforced concrete structures are considered in the article. The investigations of contact joints shear strength laced with STACHEMENT-2000M hyperplasticizer are carried out. Conclusions are drawn from the results obtained.

Combined action of composite concrete and reinforced concrete structures as well as its reliable service is impossible without ensuring the strength of the contact joint. The strength of the contact seam depends both on the technology and quality of the preparation and on the methods of concreting and concrete composition. Currently, there is a wide variety of adhesion types of concrete and reinforced concrete structures which differ in materials, connection technology and constructive solutions [1].

One alternative for ensuring a reliable connection of composite concrete and reinforced concrete structures in the area of the contact joint is the use of chemical additives in concrete. Plasticizers as well as super- and hyperplasticizers are especially popular over the past decades all around the world.

In Polotsk State University a study was carried out to test the strength (shear resistance) of contact joints of composite concrete structures using the STACHEMENT-2000M hyperplasticizer and to select the optimal dosage of the hyperplasticizer in the concrete mix.

The tests were carried out in accordance with the normative documents after the concrete strength was set to hardness under natural conditions. The experiment was close to real conditions [2, 3].

The analysis of the nature of the fracture shows that all the samples collapsed in contact zone between old concrete and new concrete. Destruction in all cases was sharp and fragile.

According to the results of the experiment it was found that in samples with the addition of the hyperplasticizer STACHEMENT-2000M the surface of old concrete had adhering concrete particles of new concrete, while in the non-additive samples the surface on which destruction occurred was relatively clean and smooth.

This is due to the fact that the hyperplasticizers contribute to the creation of a finer porous and homogeneous structure of concrete, thereby reducing the concentration of stresses in the contact zone. In its turn that led to an increase in the strength of the contact joint.

Proceeding from the results of the experimental shear strength of additional and non-additive samples, it can be concluded that when using the STACHEMENT-2000M hyperplasticizer in a new concrete the strength of the contact joint increases by 1.5 and more times compared to the no-additive concrete.

In the course of the experiment, studies were conducted on the selection of the optimal dosage of the hyperplasticizer, which would ensure the most reliable combined action of composite concrete structures.

Comparing the results of the experiment, it can be concluded that the optimum amount of additive to increase the strength of the contact seam is 0.7% of the mass of cement with a cone slump of 12 cm.

Based on the experimental data, a dependence of the shear strength of a composite structure for a series of samples designed to determine the effect of the amount of additive used in concrete was constructed (Fig. 1).

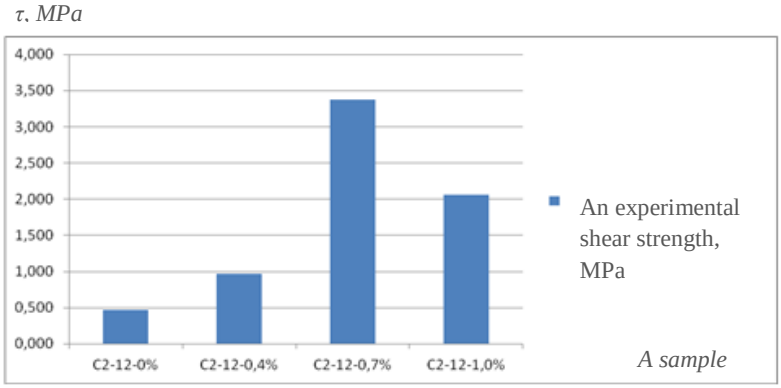

Fig. 1. A histogram

According to the histogram, it can be concluded that the use of the additive significantly increases the strength of the contact joint and improves the combined action of the two elements. The use of the STACHEMENT-2000M hyperplasticizer in an amount of 0.7% of the cement mass is optimal for achieving the best concatenation results of concrete.

A general view of the surfaces of new concrete after the destruction of some samples is provided in figure 2 [1].

a) b) c)

Fig. 2. A general view of the surfaces of new concrete after the destruction:
a – a sampleC2-12-0,4%, b – a sample C2-12-0,7%, c – a sample C2-12-1,0%.

According to the results of the research the following conclusions can be drawn:

1. Addition of modifiers in new concrete, in particular STACHEMENT-2000M additives, increases the strength of the contact joints in comparison with the non-additive samples by 1.5 and more times.

2. The optimum ratio of the use of STACHEMENT-2000M hyperplasticizer to the mass of cement is 0.7%. Shear strength of the contact joint increases by more than 4 times in comparison with the non-additive samples, and also by 1.5 and 3 times in comparison with the addition of a hyperplasticizer in an amount of 0.4% and 1.0%, respectively.

3. Addition of the STACHEMENT-2000M hyperplasticizer can allow to refuse such complex measures as the dowels placing, grooves with sufficient removal from the surface of only the cement film, i.e. creating a minimal surface roughness.

REFERENCES

1. Калитуха, В.В. Прочность контактного шва железобетонных составных конструкций : автореф. маг.дис. …маг. тех. наук / В.В. Калитуха. – Новополоцк, 2017.
2. Головнев, С.Г. Сцепление бетона в зоне технологического шва / С.Г. Головнев, С.Б. Коваль, М.В. Молодцов // Вестник Южно-Уральского государственного университета. Сер. : Строительство и архитектура. – 2005. – Вып. №13(53). – С. 71–75.
3. Юнг, В.М. Основы технологии вяжущих веществ / В.М. Юнг, Ю.М. Бутт. – М. : Стройиздат, 1975. – 112 с.
4. Хаютин, Ю.Г. Монолитный бетон: (Технология производства работ) / Ю.Г. Хаютин. – М. : Стройиздат, 1981. – 447 с.