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CONSTRUCTION OF CONCRETE BEAMS WITH COMPOSITE REINFORCEMENT

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Abstract
This article presents an analysis of the results of research work on the study of composite reinforcement elements, widely used at present in the restoration of concrete structures in buildings and structures under construction in the Republic of Uzbekistan and abroad.

Keywords: composite, basalt, concrete, smoothness, strength, texture, polymer.

Introduction

In many countries of the world, in the field of construction, scientific work is being carried out on the use of reinforcements made of composite materials as an alternative to steel reinforcements in reinforced concrete structures and the implementation of their results in construction practice. - their size is increasing every year. As an example, we can cite researches and facilities built in Germany, Russia, China, Japan, USA, Canada and other countries. Currently, polymer composite reinforcements are used in road transport infrastructure facilities, in areas where high electromagnetic fields are generated, in the chemical industry, water treatment and purification, land reclamation facilities, in the construction of seaports and pre-port facilities, in urban engineering infrastructure facilities, in mines and metros. It is effectively used in the construction of tunnels, as well as in the construction, repair and reconstruction of load-bearing and barrier structures of buildings and structures. The use of polymer composite reinforcements instead of steel reinforcements of reinforced concrete structures working in especially corrosive environments is a promising scientific direction. In the development of the economy of the Republic of Uzbekistan, in the improvement of its material and technical base, it is important to put into practice the elements that have new constructive solutions and are economically effective based on theoretical and experimental research. From year to year, the volume of construction improvement works in the Republic of Uzbekistan is growing. The successful implementation of the planned large-scale construction work requires the widespread use of new innovative technologies. The introduction of polymer composite fittings into construction practice in the conditions of Uzbekistan assumes their research in the conditions of our country. Therefore, conducting research in the direction of reinforcement of concrete structures with polymer composite fittings is an urgent problem with social and economic relevance.In recent years, important decisions are being made by the president of the Republic of Uzbekistan and the Cabinet of Ministers to increase the standard of living of the population and improve living conditions. In the implementation of these decisions, it is required to create economically affordable construction structures with high strength, bikrality, as well as to use them in practice in the construction of production enterprises, residential buildings, engineering structures necessary for the economy. The issues posed in this direction also take the application of composite materials that are relevant today according to their coverage. The use of composite materials in construction increases the overall reliability, technical economic efficiency of production, residential, public buildings and engineering structures in the reception of permanent, temporary and earthquake stresses.The application of reinforcing bending elements with composite fittings in production, residential, public buildings and engineering structures requires a scientific basis based on a new theory, confirmed by the results of expressive studies. On the basis of scientific research, appropriate recommendations and practical solutions should be developed.O‘zbekiston Respublikasida yildan-yilga qurilish obodonlashtirish ishlari hajmi o‘sib bormoqda. Rejalashtirilgan ulkan hajmdagi qurilish ishlarini muvaffaqiyatli amalga oshirish uchun yangi innovatsion texnologiyalarni keng qo‘llash talab etiladi. O‘zbekiston sharoitida polimer kompozit armaturalarni qurilish amaliyotiga joriy etish mamlakatimiz sharoitida ularni tadqiq etishni taqazo qiladi. Shu sababli beton konstruksiyalarni polimer kompozit armaturalar bilan armaturalash yo‘nalishida tadqiqotlar olib borish ijtimoiy va iqtisodiy axamiyatga ega bo‘lgan dolzarb muammo hisoblanadi.[1-10].

Therefore, a number of scientific research works were carried out. One of these is a study on bending concrete beams with combined Composite reinforcement. To carry out this study, 2 test samples made of grade B20 concrete were placed with 2ø14bka in the stretching area as working fittings, 2Ø12BKA in the compressive area, Ø6A-I fittings in the raw materials with a step of 7.5 cm. Ø6A-I fittings designed for khomuts were attached to longitudinal fittings by soft steel wires. Fittings were fixed and fixed to the molds in the place of the project. The barrier samples were made of heavy concrete of class B20. Together with the sample beams, cubes of 9 pieces with a size of 10x10x10cm were also made from the same concrete at the same time. The reinforcement of the beams is shown in Table 1.

The concrete was prepared in a concrete mixer with a volume of 0.25 m3 and compacted using a vibrator (vibrator), pouring it into molds.

Barrier samples were emptied from the molds after the cubes were kept in the mold for 5-7 days and kept in laboratory conditions until testing. The initial cubes were tested 28 days after molding. They were then found to have cubic strength even before testing indirect barriers. Based on the results of the compression testing of cubes after 28 days, it was found that the concrete of the sample barriers is suitable for classes in strength to compression B20. The tests were tested on a 50-ton hydraulic press. Sample-Cube testing was carried out until the breakdown. The tests were carried out on the basis of the requirements of GOST

10180-2012, which were established according to the standard method. The test results are shown in Table 2.

Table 1

Sample №	Sample to ' sin kod	Dimensions, sm			Armature			Load range, cm	Project Class of concrete
		b	*h*	h_0	Transverse fittings (raw materials)	Longitudinal stretching	Longitudinal compressible		
BKPA -1		12	24	18,5	Ø 6 A-I	2Ø 14 BKA	2Ø 12 BKA	70	B20
BKPA -2		12	24	18,5	Ø 6 A-I	2Ø 14 BKA	2Ø 12 BKA	70	B20

Table 2.

Concrete type	hardening conditions	Beton yoshi, sutka	R, MPa	R_b, MPa	R_{bt} MPa	E_b*10^3, MPa	ε_{bn}	γ_{bn}	W, %
In normal harsh	natural conditions	28	25	14,3	1,33	30,1	205	0,82	3,6

The beams were mounted on the stand's 2-screw supports designed for sample testing. One of the scarves is made excitable, the other is made excitable. The mass between the forces was 700 mm, while the distances from the supports to the load were 420mm. The distances from the base to the edge of the beams are 100 mm Dan. The load was given by a hydraulic domkrat driven by a 24-ton hand. Distributive traverses were used for this.

Prior to the start of the tests, initial measurements were recorded on all pribors installed in the sample barrier. These were taken as" conditional zeros". Loading was slowly given in several stages. The stage load accounted for about 10% of the destructive load. After each stage was loaded, it was expected to stabilize for up to 20 minutes.

Deformations of the concrete and reinforcement, the sagging of the beams, the formation time (load) of the cracks, and the width of the opening were measured until the samples were broken. The value of the load was recorded from domcrath's manometer. After the load reached the specified value, the valve of the domkrat was clamped and held at that value for 15-20 minutes. After the indicators were recorded through the pribors, the next stage load was given. In this way, the tests were continued and carried out until the samples were broken[11-19].

Results of the study:

After the end of the tests, the position of the formed cracks was determined, samples were photographed and the height of the cracks was measured, the distances between them were determined, the protective layers of the working armature were determined and the working height was measured.

During the test, the deformations of concrete and fittings, the time and amount of load of the formation of normal and oblique cracks, the oscillations of the barrier were measured and recorded.

The deformations were measured using clock-type indicators with an accuracy of 0.01 mm at the base of 300 mm with a portable messura tool, the oscillations were measured at three points of the barrier-between the range and at the supports with a measurement accuracy of 0.01 mm clock-type indicators. Deformations of stretch and compression fittings, as well as the concrete compression area, were also measured at a 300 MM base at three previously defined points in cross-section height.

At the time of the experiment, the surface of the sample barriers at each stage was carefully examined, as soon as the initial cracks appeared, they were immediately marked and recorded, and their width was measured. At the same time, the value of the achieved load was also set.

When the given load value reached about 85-90% of the disruptive load, the gauge pribors were removed and loaded until the sample was broken, and its breakdown character was monitored. In the bkpa-3 and bkpa-4 sample barriers, the breakdown occurred with the breakdown of concrete in the compressible part of the barrier.

At the time of the experiment, the load on the breakdown of bkpa-3 and BKPA-4 samples was almost 2 times higher than the accounting loads. It was noted that the experimental load on the bkpa-3 and bkpa-4 sample barriers varies from the accounting load to an average of 85-95%.

After the experiment, the samples were removed from the stand and placed in a separate place, and the crack card was drawn and photographed. It was noted that the location of the cracks in the beams, their dimensions, the width of the opening were very similar and close to each other.

In most of the samples where the fracture occurred in the compressible part, it was observed that the strength value given (0.9-0.95)the concrete lost its viscosity after reaching the slit values. The formation of normal cracks in sample barriers is given in Table 3[20-25].

Table 3.

Sample barriers cipher	Distance between forces, sm	Bending moment in the formation of Normal cracks, kNm		M^t_{ult}	$\frac{M^t_{crc}}{M^t_{ult}}$	$\frac{M^t_{crc}}{M^x_{crc}}$
		Experimental M^t_{crc}	Account M^x_{crc}			
BKPA -3	42	3,15	2,16	22,7	0,229	1,458
BKPA -4	42	3,15	2,18	23,8	0,132	1,445

At certain stages of loading (II and later) at the onset of load on bkpa-3.4 sample barriers, up to 2 or 3 normal cracks first appeared on the barriers in the area of pure bending, and then again new normal cracks formed as the load increased. The opening width of the initially formed cracks was 0.05-0.09 mm, as loads increased, normal cracks developed, the tip of which was observed to rise in cross-section height, and at the same time the opening width of the cracks also increased. The opening graph of Normal cracks is shown in Figure 1[26-29].

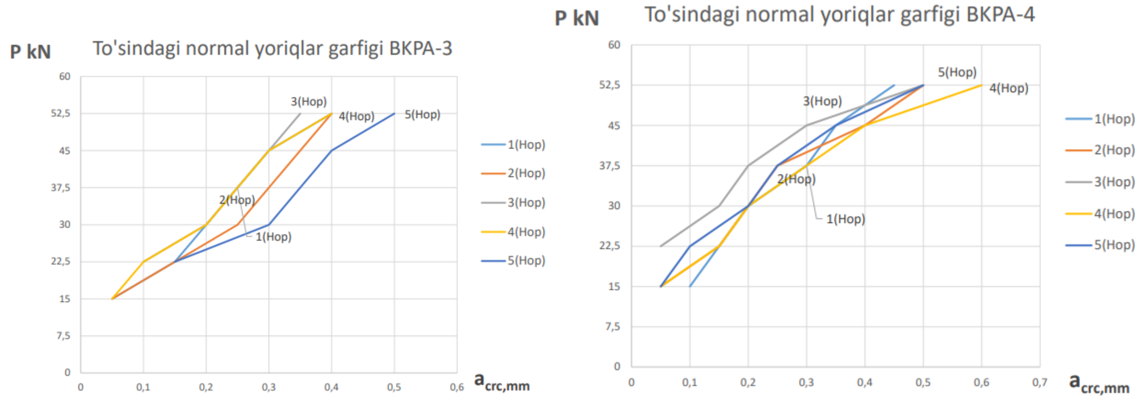

Figure 1. The opening graph of normal cracks in sample barriers.

Formation of oblique cracks in sample barriers4-jadval.

Sample barriers cipher	Shear interval (distance from base to force), sm	Transverse force in the formation of oblique cracks, kN		$\frac{Q^t_{crc}}{Q^x_{crc}}$	Q^t_{ult}, kN	$\frac{Q^t_{crc}}{Q^t_{ult}}$
		Tajribaviy Q^t_{crc}	Hisobiy Q^x_{crc}			
BKPA -3	42	14,5	12,45	1,16	54	0,27
BKPA -4	42	14,9	12,65	1,18	57	0,26

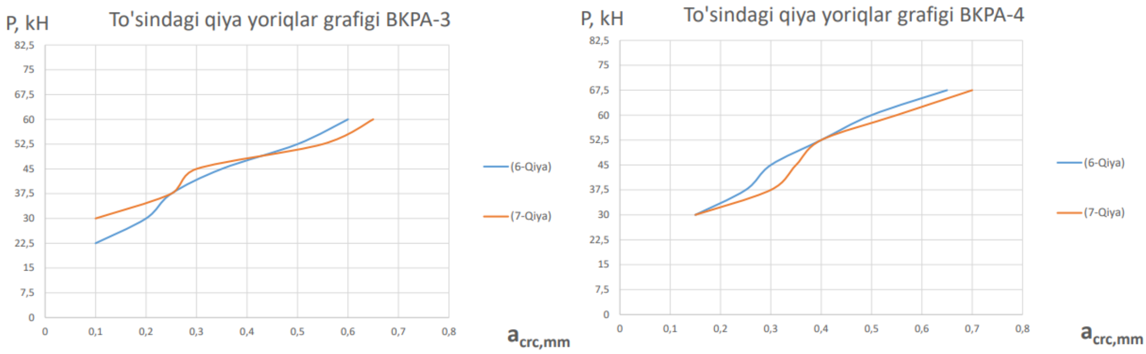

Figure 2. The opening graph of oblique cracks in the sample barriers.

Conclusions

- the load-bearing capacity of single-reinforced bending concrete elements with basaltplastic and shishaplastic sterjens will be very close to that of similarly reinforced steel reinforced elements;

-the load-bearing capacity of reinforced elements according to the double-armature scheme with composite fittings is dictated by the fact that the reinforced elements with steel fittings according to the same scheme are lower than the load-bearing capacity, and this situation is explained by the low resistance of the composite armature in compression;

- in basaltplastic and shishaplastic Composite reinforcement bending concrete elements, the opening width of the cracks is determined to be significantly higher (larger) than in steel reinforcement elements, which is explained by the fact that the composite reinforcement has a small elasticity Module (~4 times) ;

-in composite reinforced bending concrete elements, the oscillations are also greater than those of reinforced elements with steel sterjens, this situation has also been explained by the low modulus of elasticity in basaltplastic and shishaplastic fittings; however, at normative loads, it was noted that even in composite reinforced bending concrete beams, the amount of oscillations is at the level of requirements for reinforced concrete structures.

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