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INVESTIGATION OF CROSSBARS WITH REINFORCED CONCRETE AND 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

Nowadays, polymer composite fittings are effectively used in road transport infrastructure facilities, high electromagnetic fields formation, chemical industry, water preparation and treatment, melioration facilities, construction of seaports and port facilities, urban engineering infrastructure facilities, construction of Metropolitan mines and tunnels, as well as the construction, repair and reconstruction of load-bearing and barrier structures of buildings and structures.

A promising scientific direction is the use of polymer composite fittings instead of steel fittings of reinforced concrete structures, which work especially in conditions of an corrosive environment.

In the development of the economy of the Republic of Uzbekistan, in raising its material and technical base, it is important to introduce into practice those elements that have new constructive solutions, which are economically efficient, based on theoretical and experimental research.

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.

To carry out experimental studies, test models-sample barriers-were prepared, the cross-section of which was rectangular. Simple heavy concrete was used for the beams. As a binder, the portlandsement of the cement plant “Turon” in the Beshariq District of the Fergana region with an activity of 42.5 MPa for concrete was applied. As fillers,Quartz river sand from Akbarabod quarry, Quwa district, Fergana region, whose fraction is 5-15mm li granite Flint (sheben) and the bulk modulus is M2, 25, was used. The composition of the concrete was chosen so that its cubic strength would have a compressive strength

corresponding to the B25 class. Granite Flint was sown, washed in a special device, and then dried (Table 1).Material consumption for 1 M3 concrete mixture is given in Table 1[1-11].
In conjunction with the fence samples, cubes with dimensions of 10x10x10 CM were also made from the same mixture. After 28 days of storage under conditions of normal temperature t=20±20C and relative humidity φ=60-65%, the sample cubes were tested in a hydraulic press until they broke under compressive strength.
Once the cubic strength of the concrete was determined the corresponding prismatic strength RB=0.75 R was calculated by expression, while the strength in the stretch $r_{bt}=0.5\sqrt[3]{R^2}$ was calculated by formula[12-16].
To achieve the set goal, it was necessary to carry out the set tasks. For this, experimental-theoretical studies were required.

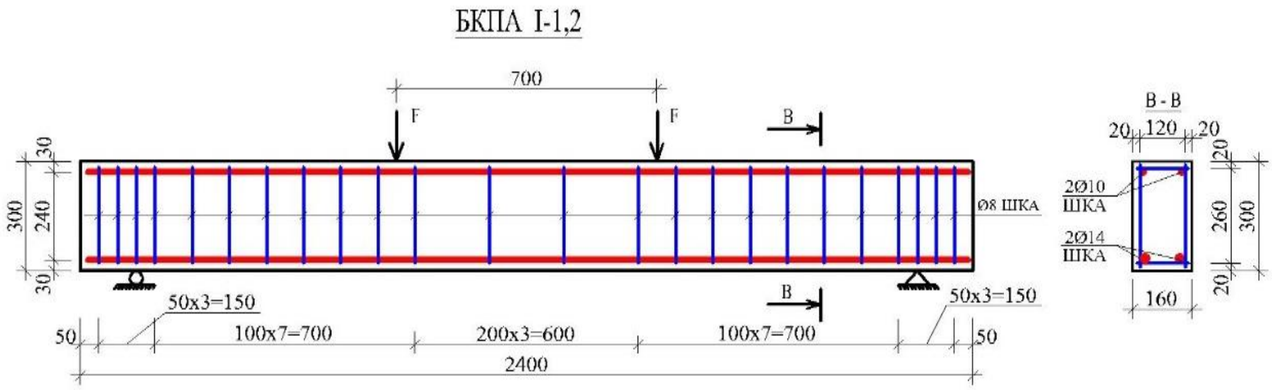

Figure 1. Fitting and loading schemes of sample barriers.

For experimental studies, beams equipped with composite fittings with a cross-section size of 16x30cm, a length of 240 cm were prepared. The beams were made in wooden molds. The inner surface of the molds was covered with metal lists. 2Ø14 ShKA to the stretching area as the working fittings 2ø10shka to the compression area, Ø8ShKA fittings as the housings were laid with a step of 7.5 cm (figure 2.2). Composite fittings designed for khomuts were attached to longitudinal fittings with soft steel wires, woven and fastened. Fittings were fixed and fixed to the molds in the place of the project. The barrier samples were made from heavy concrete of class C25. Together with the sample beams, cubes of 6 and 9 pieces, the size of which is 10x10x10cm, were also made of the same concrete at the same time.

Table 1.Concrete composition for sample beams

№	Naming	quantity	unit of measurement
1	Fergana region Beshariq district “Turon” cement plant portland cement M400	394	kg
2	Sheben	1197	kg
3	Quartz sand	495	kg
4	Water	212	litr
	Density of concrete:	2298	kg/m^3
	Water / cement ratio of concrete (S/S	0,54	

The concrete was prepared in a concrete mixer with a volume of 0.25 m^3 and compacted using a vibrator (vibrator), pouring it into molds.

The materials were dosed in accuracy up to ±0.1 kg by weight. For this, electronic scales with high accuracy were used. The results of the tests of cubes are presented in Table 2.

Table 2. Results of testing cubes made of sample barrier concrete

№	Fence cipher	Concrete age (diary)	Edge of sample cubes, cm	Concrete strength in compression, MPa	Strength of concrete		
					R_b, MPa	R_{bt}, MPa	E_b*10^{-3} MPa
1	BKPA -1	30	10	32,3	18,3	1,58	29,5
2	BKPA -2	30	10	30,4	17,3	1,51	27,5

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 B25 is suitable for classes in strength to compression. 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 listed in Table 3[17-21].

Table 3.

Concrete type	hardening conditions	Concrete age, 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	29	18	1,55	27,5	205	0,82	3,6

The dimensions of the sample barriers prepared for the experiment, the loading range affecting the sample barriers, the concrete classes used and the number of longitudinal stretch and compression fittings, the diameter, the number and diameters of transverse fittings (housing)are listed in Table 5.

The main characteristics of sample barriers. Table 4.

.Sample №	Sample to ' sin cipher	Dimensions, sm			Armature			Load range, cm	Project Class of concrete
		b	*h*	h_0	Transverse fittings (raw materials)	Longitudinal stretching	Longitudinal compressible		
BKPA -1		16	30	28,0	2Ø 8 ShKA	2Ø 14 ShKA	2Ø 10 ShKA	70	B25
BKPA -2		16	30	28,0	2Ø 8 ShKA	2Ø 14 ShKA	2Ø 10 ShKA	70	B25

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 cargo was given in a 40-ton hydraulic domkrat. 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.

After each stage load was given and at the end of the stage, indicators on the meter pribors were recorded. In the experimental process, the positioning and installation schemes of measurement pribors and devices on sample barriers are shown in the figure below (Figure 5)[22-26].

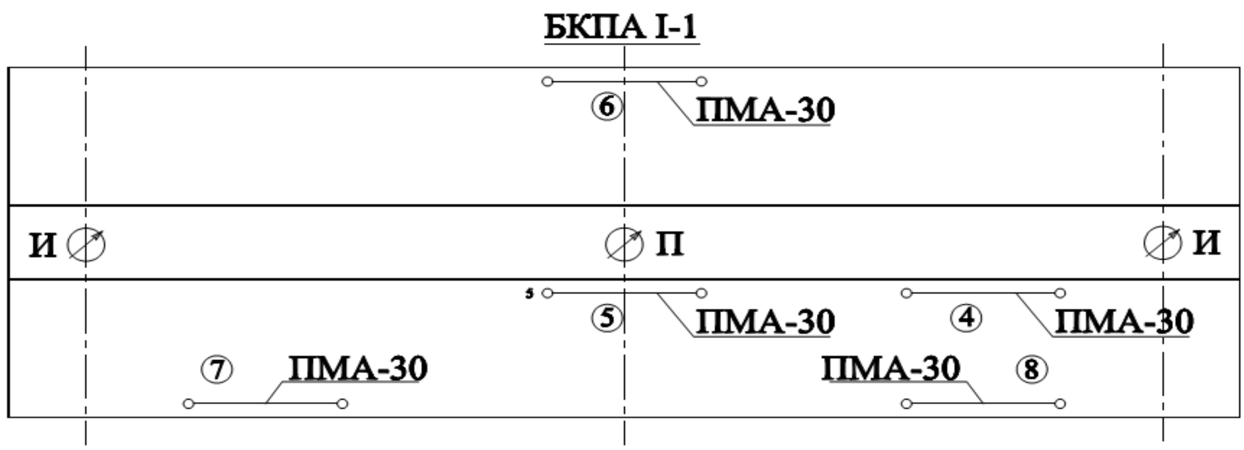

Figure 2. Location and installation schemes of measuring pribors and devices on sample barriers;

PMA-30 is a portable messura (base 300 mm) for measuring defformations in reinforcement; PMB-30 is a portable messura (base 300 mm) for measuring defformations in concrete; I is a clock-Type Indicator;

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.

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 sample barriers, the breakdown occurred in oblique sections.
At the time of the experiment, sample breakdowns occurred at values close to accounting loads, in all cases it was noted that the experimental load differs from the accounting load by an average of 10-20%.
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 cases where the fracture begins with a stretching armature, a crushing fracture of the compressive area concrete has been found. In the area of pure flexion also a condition close to the fracture occurred when the fracture occurred in oblique sections.
After the strength value (0.9-0.95)given in most of the broken samples in terms of oblique cross-sections reached the slit values, the junction nodes of the khomuts with longitudinal fittings-a violation of the links occurred, and the shear of the tightening areas of the barrier was observed.
In order to measure the deformations produced under force in longitudinal Composite fittings,in the process of preparing the fittings of the sample-beams, hammocks made of steel pipes with a wall thickness of 2-2.2 mm were worn on the stretch and compression fittings. Holes are drilled in the grooves with Ø5mm, which are located in opposite directions. Over the holes, the ø5mm nut was welded to the Tube-Housing by means of an electric arc. After being worn on a composite armature, the hump was secured by twisting it from the inside using a Ø5mm short stiffener bolt until it was stirred to the armature. Externally the same Ø5mm li long bolt was unscrewed freely. The long bolt was pushed out to 2-3cm beyond the opening hole in the sample barrier mold. The part of this bolt with fittings up to the inner surface of the mold was wrapped with Ø1-2mm soft wire dense and covered with a thin plasticine coating. When the beams were molded and concreted, they

were emptied from the molds after 5-6 days had elapsed, and the wires wrapped in the long bolts of the device were removed.

Reinforcement indicators of sample barriers Table 5.

Sample barrier cipher	Armature										Distance between loads, sm	Longitudinal reinforcement coefficient μ_f, %	Transverse reinforcement coefficient μ_{fw}, %
	Transverse (vertical grooves)	Khomut steps, S_{fw}, mm	R_{fw}, MPa	A_{fw}, sm^2	Longitudinal stretching	R_f, MPa	A_f, sm^2	Longitudinal compressible	R_{fs}, MPa	A_{fc}, sm^2			
BKPA-1	2Ø 8	75	200	1.01	2Ø 14	490	3,08	Ø 10	100	1.57	70	1,07	0,118
BKPA-2	2Ø 8	75	200	1.01	2Ø 14	490	3,08	Ø 10	100	1.57	70	1,07	0,118

Long bolts were pulled out before the beams could be tested and replaced with Ø10mm slats with an Ø5mm rezba opening at one end. These slats have special recesses (Kerns)on which the indicator barbell is retracted, to which the movable messura barbells are retracted, and deformations of the longitudinal armature at a base of 300mm have been measured. Devices in the form of a hump were installed in such places on longitudinal fittings. In this, the crossbars were 300 mm, and they were placed in the middle of the area of pure bending and the interval of shear[27-29].

Conclusions:

The load-bearing capacity of single-reinforced bending concrete elements with 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;

-the opening width of cracks in flexible concrete elements with glassaplastic Composite reinforcement is determined to be significantly higher (larger) than in steel reinforcement elements, this 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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