**UDK 691.175.3**

# EXPERIMENTAL DETERMINATION OF STRENGTH, DEFORMABILITY AND CRACK RESISTANCE OF CONCRETE BEAMS WITH BFRP

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**Abstract**. On the basis of the laboratory of the Department of Reinforced Concrete Structures and Transport Facilities, OGASA, two series of field experiments were carried out with single-span beams reinforced with BFRP, under the action of static and low-cycle reloading of high loading levels in accordance with state budgetary themes.

Full-scale experiments with single-span beams reinforced with BFRP, for the actions of high-level static and low-cycle reloading, were performed in accordance with state budgetary topics State Registration №0107U000809, 0108U000559. The prototypes were made according to the tri-factor three-level D-optimal plan of Box B3. The following factors were chosen as research factors (which varied at three levels): relative span of the cut, $a/h_0$ = 1, 2, 3; concrete class, C16/20, C30/35, C40/50; transverse reinforcement coefficient $\rho_{fw}$ (AKB-800) = 0.0029; 0.0065; 0.0115. Coefficients of the upper and lower longitudinal reinforcement $\rho_{lf}$=$\rho_{ls}$=0.0176.

For testing prototype beams, special power plants were designed, manufactured and certified. The load was applied in a four-point scheme with the help of a DG-50 hydraulic jack and a distribution beam-traverse by two concentrated forces to steps: according to (0.04...0.06) $F_{ult}$, then – according to (0.08...0.12) $F_{ult}$t to destruction. Exposure of the load on the degree was up to 15 minutes with all measurements at the beginning and at the end of each degree of load.

The obtained experimental data on the strength, deformability and crack resistance of reinforced concrete and basalt concrete beams 2000x200x100mm. Longitudinal reinforcement of reinforced concrete beams – 2Ø14A500C, and basalt concrete – 2Ø14BFRP (AKB800). The transverse reinforcement of reinforced concrete beams was 2 Ø 3, 4, 5 VrI, basalt concrete – 2Ø4, 6, 8BFRP (AKB800). The beams were made of heavy concrete of classes C16/20, C30/35 and C40/50.

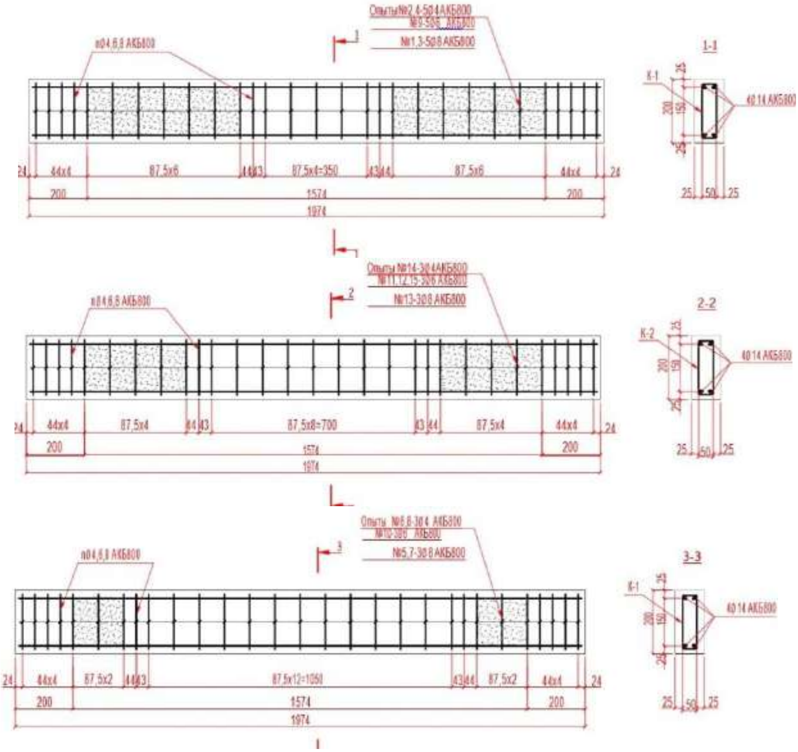


Fig. 1. Reinforcement schemes for prototypes of beams.

The prototypes were tested according to a four-point scheme as beams freely supported, loaded with two concentrated forces. The load in the series of experiments was stepwise increasing static and low-cycle repeated high levels of 0.50; 0.65; and $0.80F_{ult}$. The distance from the supports to the concentrated forces (shear span), $a/h_0$, was varied within 1, 2, 3. The prototypes were manufactured and tested according to the theory of experiment planning according to the D-optimal plan of Box B4. A comparative analysis of the main parameters of the performance of reinforced concrete and basalt concrete beams for the action of the specified load is carried out.

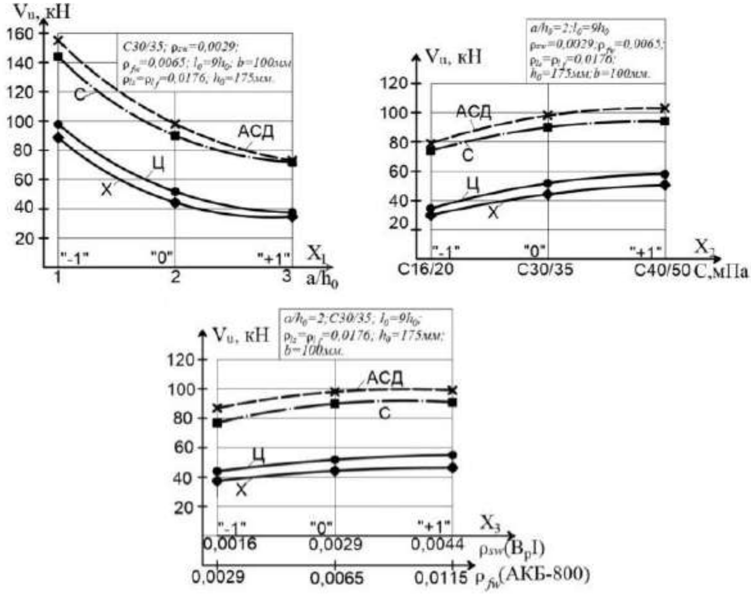


Fig. 2. Comparison of the bearing capacity of the supporting sections of the prototypes of beams reinforced with basalt-plastic reinforcement with similar beams reinforced with steel reinforcement.

Fig. 3. Experimental propulsion system.

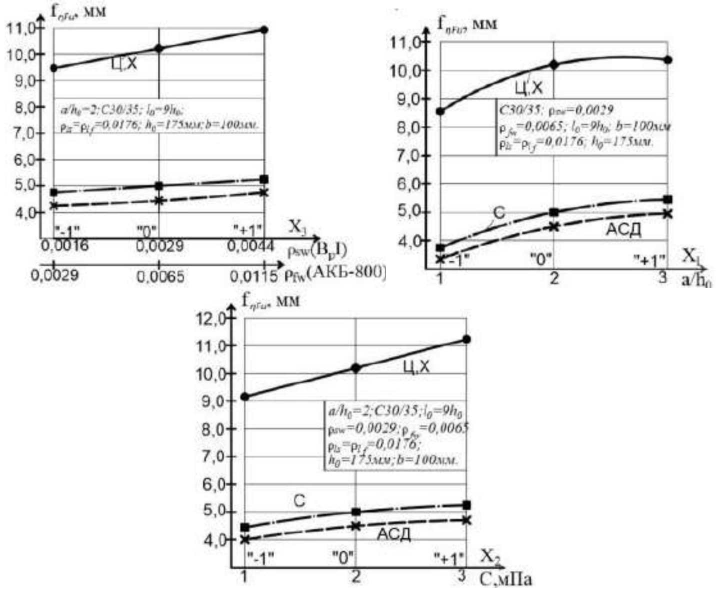


Fig. 4. Comparison of deflections of basalt concrete and reinforced concrete beams during operational loaded.

Fig. 5. Experienced beams after testing.

**Conclusions.** The need for these studies is due to the unsatisfactory convergence of the research and calculated values of the bearing capacity of the inclined sections of basalt concrete beams, determined according to the existing regulatory methods.