Experimental Research Program For Determining The Strength Of A Fibroconcrete Column

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ABSTRACT

In the article, a program of conducting special experiments to determine the deformability and strength of the elements of the column made of fiber concrete was created. Based on the developed program, special experiments were conducted to determine the deformability and strength of the elements. The theoretical and practical results were compared.

Keywords: fiber concrete, elements, deformation, mathematical planning, indicators, steering reinforcements

Special experiments were conducted to determine the deformability and strength of compressible reinforced concrete elements.

Research was conducted with short reinforced concrete columns 16x30 cm long and 100 cm high as the object of research. These columns are reinforced with 14mm diameter A-III class steel reinforcements.

The optimal value of samples was determined by means of mathematical planning of experiments. Eccentricity of external force as variable factors eo /ho=0.2; 0.5; 0.8 and sample storage mode is selected:

- permanent mode (A)
- protection from temperature changes and solar radiation (V)
- lack of protection from temperature changes and solar radiation (S)

Three-tier and two-factor plans are selected. The value of the factors and the variation intervals are shown in table (1) [1-5].

Table 1
Planning experiments

Code	Code value	The value of the factors	
Basic level	0	0,5	B
Variation interval		0,3	-
High level	+	0,8	A
Lower level	-	0,2	C

A total of 18 columns and 120 prisms were prepared (Table 23).

Mathematical statistics methods were used to ensure the reliability of the results. Due to this,

the series is free from errors and the possibility of justifying the research results has increased.

During the preparation of reinforced frames, 5 rods with a length of 1000 mm were selected from each batch. Control rods were tested for elongation according to Uz.RST 30062-93. In order to maintain the design position of the reinforcement during molding and to provide a protective layer of concrete, special washers made of plastic were attached to the framework of the reinforcement. To measure the deformations in the reinforcement, metal rods with a diameter of 12-14 mm were welded to them. Before concreting, the beams were protected by wrapping them with a layer of plasticine.

Table 2.

Mechanical properties of reinforcement

Reinforcement class	Steel brand	Transient resistance Rs (Mpa)	Yield strength σ_s (МПа)	Modulus of deformation $E_S \cdot 10^{-3}$ (МПа)
A-III A-I	35ГС Ст 3	683 395	424 264	1,82 2,01

Portland cement of the Navoi cement plant with an activity of 39.5 MPa and a normal density of 26% was used for the preparation of the concrete mixture. UzRST 719-96 with a maximum thickness of 20 mm is used as a large filler (table 2). expanded clay gravel of the Tashkent expanded clay plant that meets the requirements was used. Quartz sand from Norin ka'er was used as a fine filler. The concrete mixture was prepared in a metal mold and compacted in a vibrofield. The selection of the concrete composition was carried out in a standard way. To measure the deformation of the concrete in the stretching and compressive zone, beams with a diameter of 20 mm and a thickness of 50-60 mm were installed on the basis of a 250 mm base. Deformations were measured using an indicator [6-10].

Table 3.

Physical and mechanical characteristics of slag

Fraction, mm	Volumetric mass кг/м^3	Strength when compressed in a cylinder Мпа	Water absorption (after one hour) %	Water absorption (after 48 hours) %	Porosity % between grains
5-10 10-20	550 500	3,9 2,7	16,2 18,5	25 29,5	35,5 41

All the samples were prepared in August. During this period, the average daily temperature difference is 200 C, and the daily average fluctuation of relative humidity is 20%. A relative humidity is less than 15%. All columns were kept in the mold under a moist sawdust for 7 days and then removed from the mold.

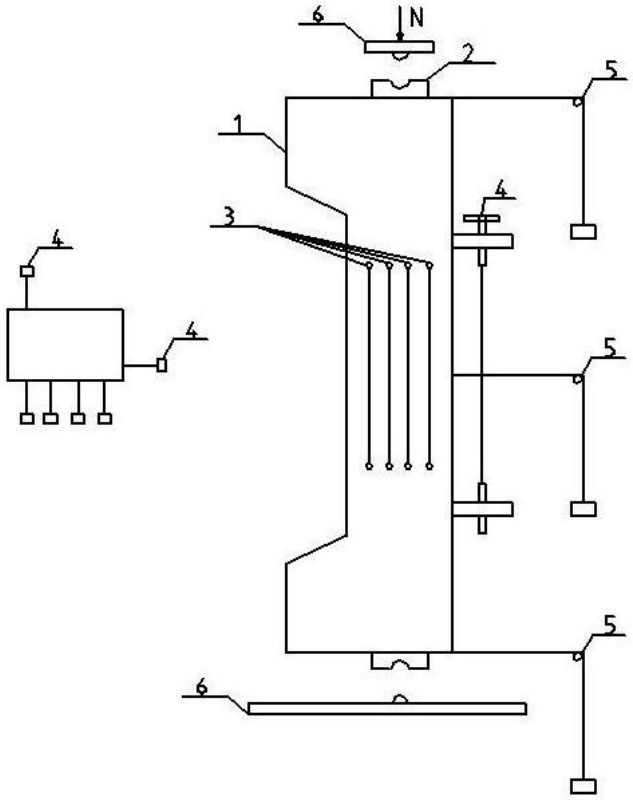

Figure 1. Scheme of testing columns under the influence of short-term loading where: column 1; 2-loading device; indicators for measuring the deformation of concrete; 4-indicators for measuring the deformation of reinforcement; 5-cool meter; Device under column 6

Table 4
Characteristics and storage conditions of experimental columns

Conditional character of the column	Storage conditions	Age of concrete (days)			Solar radiation direction	Load type and level
			Download type			
			Short-term loading			
К-1 К-2 К-3	Normal	- - -	568 569 570		- - -	Until a short-term breakdown without loading
К-4 К-5 К-6	In constant mode		572 573 574		- - -	Until a short-term breakdown without loading

K-7 K-8 K-9	Protected from solar radiation		576 577 578		- - -	Until a short-term breakdown without loading
K-10 K-11 K-12	Not protected from solar radiation	- - -	580 582 583		The stretching zone is directed to the south	Until a short-term breakdown without loading

After removing the columns from the mold, 3 columns are in normal conditions (K-1, K-2, K-3), 3 columns (K-4, K-5, K-6) are in constant mode (t=28-320C W=65-70%), 3 of them (K-7, K-8, K-9) were protected from solar radiation in the open field, and the remaining 3 (K-10, K-11, K-12) were kept under direct solar radiation. After 19 months, all columns were tested to failure under the influence of short-term loading. Short-term loading tests were carried out using a PM-250 hydraulic press [11-17].

Tests 0.2; carried out with eccentricities of 0.5 and 0.8.h0. The load range was increased by 0.05 percent of the expected destructive load. After the cracks were formed, a load of 0.1 percent was given. Wait 10-15 minutes after each stage of loading. During the tests, the deformations of the concrete and the frame, the opening width of the cracks and the stiffness in the stretching zone were measured.Deformations along the height of the column were measured with strain gauges on a 50 mm base and with clock type indicators. Strain gauges were connected to the AID measuring instrument and reports were made. The opening width of cracks was measured using a microscope with 24 times magnification.

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