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FLEXIBLE-TWISTING FIXED-MONTAGE CONCRETE LOAD-BEARING CAPACITY OF STRUCTURES EXPERIMENTAL STUDY

Usmanov Valiakhmat Fayzillaevich
Doctor of Technical Sciences, Professor, Samarkand State University of Architecture and Construction named after Mirzo Ulugbek
e-mail: usmanov51@mail.ru
ORCID: 0000-0002-8194-0496
Karshiyeva Shodiyona Khudaynazar kizi
Basic doctoral student, Samarkand State University of Architecture and Construction named after Mirzo Ulugbek
e-mail: qarshiyeva.shodiyona@samdaqu.edu.uz
ORCID: 0009-0008-6937-3979

Abstract. The article presents the methodology for conducting experimental studies to determine the laws of deformation, crack formation, and strength of precast-monolithic reinforced concrete structures under complex resistance - torsion and bending. The most important of the studied parameters are: crack-forming and destructive loads, schemes of formation of spatial cracks and the width of their opening; deformations of compressed concrete and reinforcement in a complex stress-strain state.
Keywords: precast-monolithic reinforced concrete, torsion, bending, experimental studies, deformations, crack resistance, strength.

Relevance of the issue. Beams installed on one side of multi-story building floors bend in their plane and rotate relative to this plane (Figure 1.a). Failure to take this into account when calculating multi-story frame buildings can lead to the destruction of structures, and in some cases, the entire building. Similarly, the outer edges of spatial roofs can be cited as an example of bending-torsional elements (Figure 1.b).

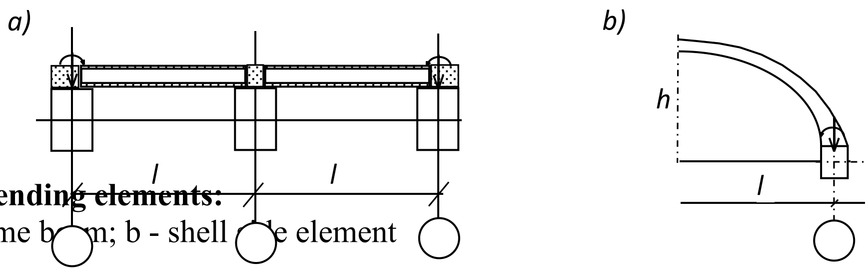

Figure 1. Bending elements:
a - outer frame beam; b - shell edge element

To date, bending and torsion in reinforced concrete remains one of the least studied issues, both theoretically and experimentally.

In complex and responsible buildings and structures built of precast-monolithic reinforced concrete, it is necessary to improve the calculation method based on experimental studies, taking into account the stress-strain state of bending-torsional structures. For this purpose, an experimental study of bending and torsion of samples made of precast-monolithic reinforced concrete elements is planned.

To date, experimental studies of reinforced concrete structures under the action of bending and torsion, conducted only in isolated cases and with a limited number of studied

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parameters, provide very limited, and sometimes contradictory, information about their stress-strain state, crack resistance, and the coordinates of spatial cracks [1].

Therefore, based on experimental studies, the need to improve methods for calculating bending with torsion and the development of the theory of precast-monolithic reinforced concrete structures is an urgent task.

In this work, a methodology for conducting experimental studies of precast and precast-monolithic reinforced concrete samples for the development of a method for calculating bending-torsional precast-monolithic structures is presented.

Research methodology. Planned experimental studies are aimed at determining the main parameters of reinforced concrete structures during bending with torsion: the load on the formation of transverse cracks $P_{sup,src}$, the load on the destruction of the samples $P_{sup,u}$, the actual height of the compressed zone of concrete in the cross-section x_{fact};; the deflections of the structures; the width of crack opening at the level of the longitudinal and transversely elongated axis of reinforcement along the entire crack profile; the change in the distance l_{crc} between cracks and the crack length h_{crc} with increasing load, etc.

Measurement of experimental parameters is carried out by mechanical instruments installed on experimental samples - precast-monolithic reinforced concrete beams. In particular, indicators in the form of clocks with a division of 0.01 mm are used to measure the displacements of experimental sample beams (Fig. 2). Reinforcement deformations are measured with special devices for securing indicators in the form of clocks with a cleavage value of 0.001 mm on a base of 250 mm.

Concrete deformations are measured with indicators in the form of clocks with a division of 0.01 mm. In the process of short-term loading, readings by mechanical instruments are taken twice: immediately after the application of the load and after its temporary maintenance.

The elongated zone of each beam-sample is studied using an MPB-2 microscope with a magnification of 24x and a division value of 0.05 mm. The appearance and subsequent spread of cracks are carefully recorded on special tablets. With an increase in the test load, the appearance of new cracks and the development of existing cracks are observed.

The reinforcement scheme of the sample beams is shown in Fig. 2 and 3.

СБ-1

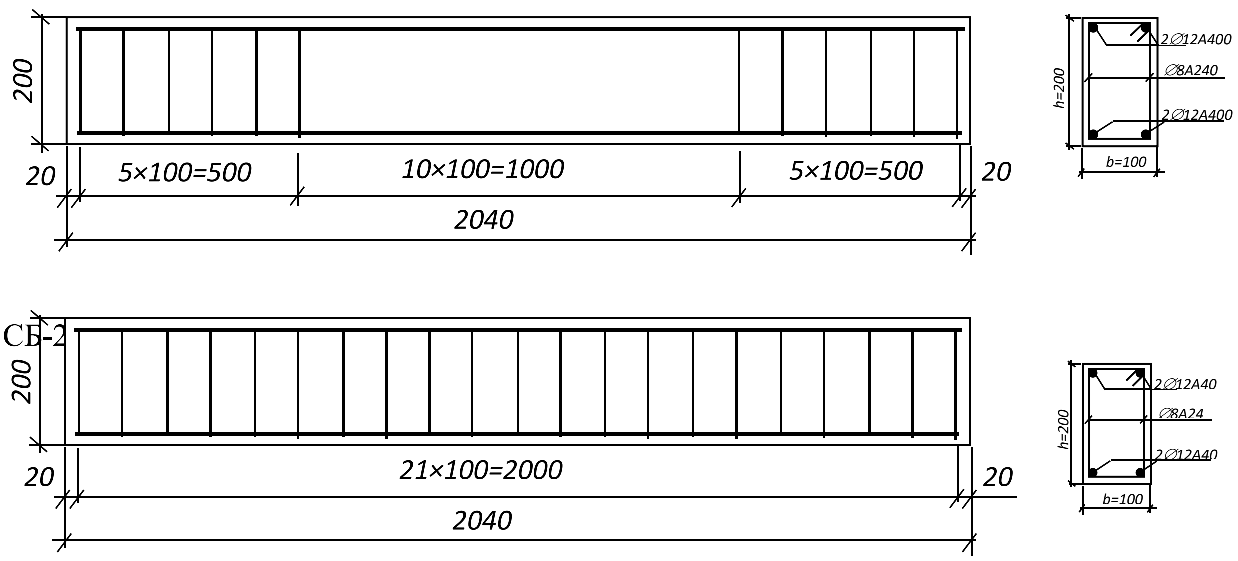

Figure 2. Experimental samples (prefabricated beams)

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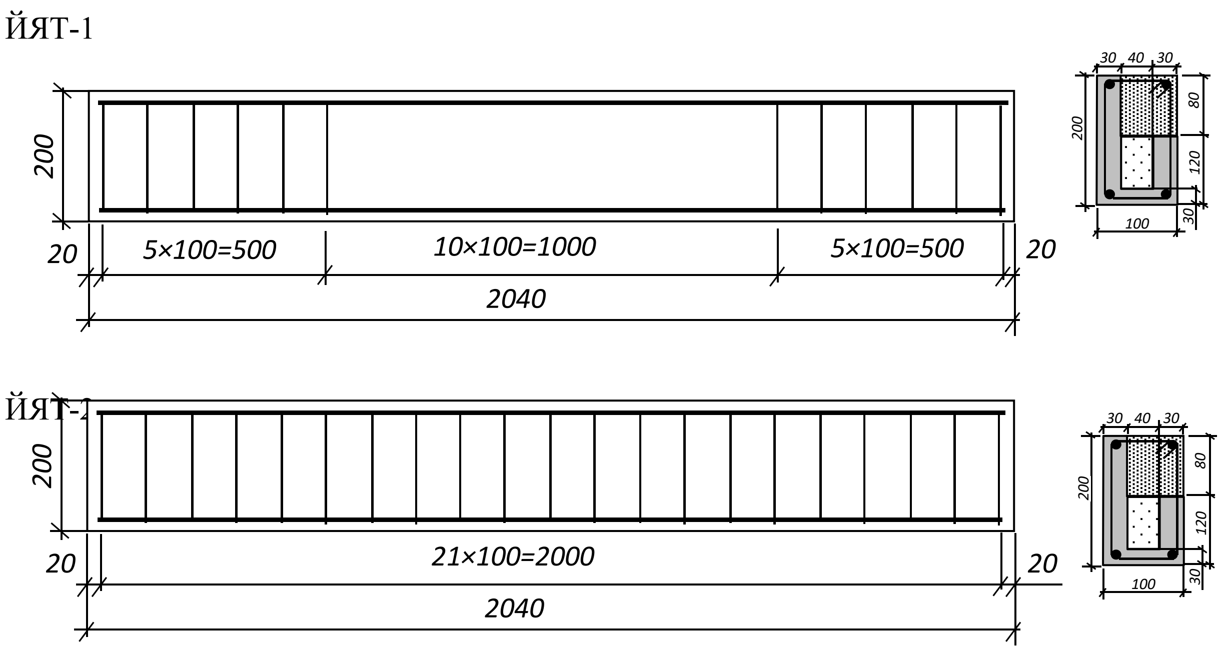
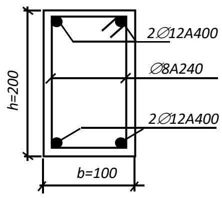
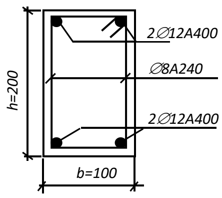
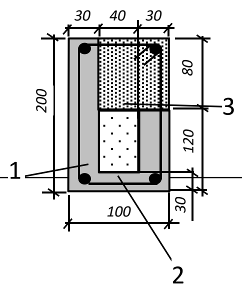


Figure 3. Experimental samples (prefabricated beams)

Table 1. Main test scope

№	Sample brand	Cross-sectional shape and dimensions (dimensions, mm)	Number of samples in the series, units.	Explanation
I	ЙТ-1		3	The transverse amature beam is placed in the support zones at a distance of 1/4 with a step of s=100 mm.
II	ЙТ-1		3	The transverse reinforcement is placed along the entire length of the beam l with a step of s=100 mm.
III	ЙЯТ-1		3	The cross-section of the beam consists of three types of concrete: the prefabricated element is made of heavy concrete (1), and the stretched zone is filled with

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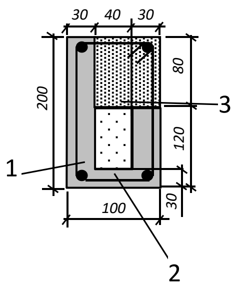
				aerated concrete (2). The prefabricated element is fully cross-sectioned with heavy concrete (3). The transverse amature beam is placed in the support zones at a distance of l/4 with a step of s=100 mm.
IV	ЙЯТ-2		3	It is the same as in the BSM-1 series, but the transverse reinforcement is laid along the entire length l with a step of s=100 mm.

Conventional symbols accepted in the table:

ЙТ-1 – folding beam;

ЙЯТ-2 – Prefabricated beam.

The test equipment is shown in Figure 4. The installation of measuring instruments in test samples is shown in Figure 5.

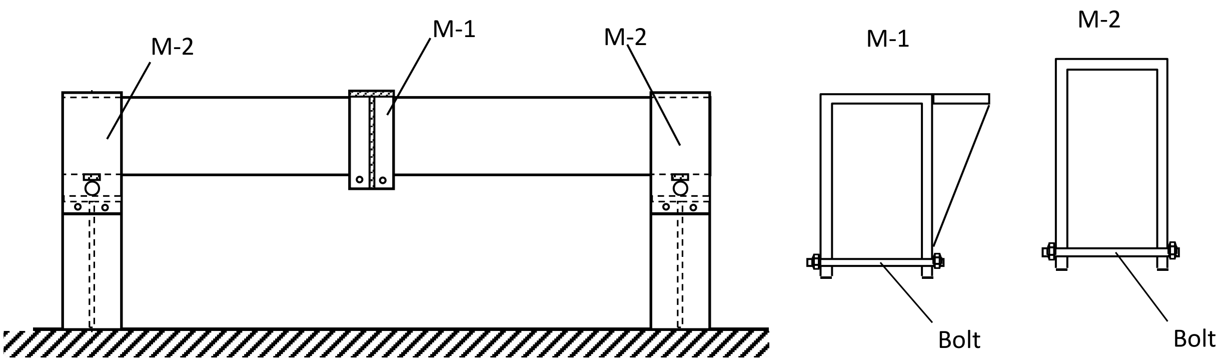


Figure 4. Testing equipment

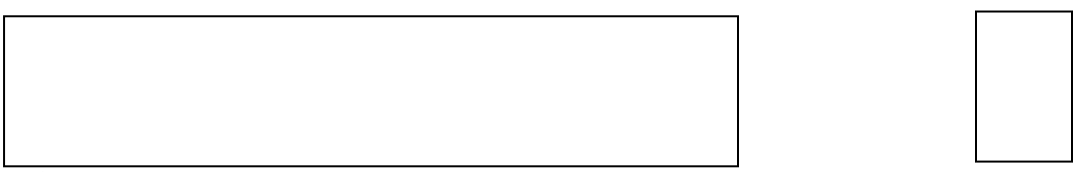


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Figure 5. Installation of measuring instruments on the test sample

The results of the experiment are planned to be presented in the author's subsequent publications.

Conclusion. The results obtained from experimental studies with precast-monolithic reinforced concrete samples allow for the verification of the reliability of calculation models and the improvement of the calculation method for bending-torsional precast-monolithic reinforced concrete structures.

References:

1. Демьянов А.И., Колчунов Вл.И., Покусаев А.А. Экспериментальные исследования деформирования конструкций при кручении с изгибом// Строительная механика инженерных конструкций и сооружений. – 2017. -№6. – с.37-44. Doi: 10.22363/1815-5235-2017-6-37-44