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STRENGTHENING THE REINFORCED CONCRETE FLOOR OF A MULTISTORY FRAME BUILDING CONSTRUCTED IN A REGION OF HIGH SEISMICITY

Annotation: The article is devoted to the results of a full-scale instrumental examination and strengthening of a monolithic continuous reinforced concrete floor of a building being built in a region of high seismicity

Key words: building, crack, deflection, redistribution of effort, seismic resistance.

Introduction

The constructive solution of a monolithic reinforced concrete floor When designing a monolithic reinforced concrete floor, the requirements of CMC 2.03.01-96 "Concrete and reinforced concrete structures" were met. The floor structure is an example of a cross-beam system.

Materials and methods:

This includes empirical methods such as modeling, fact-finding, experiment, description and observation, as well as theoretical methods such as logical and historical methods, abstraction, deduction, induction, synthesis and analysis, as well as methods of heuristic strategies. The research materials are: scientific facts, the results of previous observations, surveys, experiments and tests; means of idealization and rationalization of the scientific approach

An uncut monolithic reinforced concrete slab with a thickness of 200 mm rests along the contour on longitudinal and transverse reinforced concrete frames. The calculated span of the crossbars is equal to 7350 and 8400 mm, the height of the crossbars is equal to 700 and 800 mm, meets the requirements of norms and practices of designing monolithic housing construction. The current regulations propose to design the height of the crossbars within 1/10 – 1/12 of the calculated span. This condition is met in the project. The width of the cross-section of the main crossbars is assumed to be 700 and 600 mm, which is more than ½ of the cross-section height. Some parts of the reinforced concrete monolithic floor were subjected to premature formation and opening of cracks during the construction process. The damaged floor slabs are located in the basement, at around -0.30 m. All floor elements (crossbars, floor slab, including columns) are built with monolithic concrete of class B50 and reinforced with class AIII reinforcement. The slab part of the floor is reinforced with double reinforcement, in the upper part in two mutually perpendicular directions with class A-III fittings with a diameter of 10 mm, in increments of 250 mm, in the lower part in two mutually perpendicular directions with class A-III fittings with a diameter of 12 mm, in increments of 200 mm. The concrete protective layer of reinforcement in slabs of monolithic floors is assumed to be equal to 25 mm, in columns it is assumed to be equal to 40 mm, in crossbars it is assumed to be equal to 30 mm. At the joints, the anchoring length of the working reinforcing rods in monolithic slabs is assumed to be 500 mm. Instrumental assessment of the formation and opening of cracks in the damaged part of the monolithic reinforced concrete floor Instrumental examination of the formation and opening of cracks in the damaged part of the monolithic reinforced concrete floor made it possible to assess their technical condition. Excessive cracks reaching up to 0.5 mm have formed in parts of the floor slab (Fig. 1).

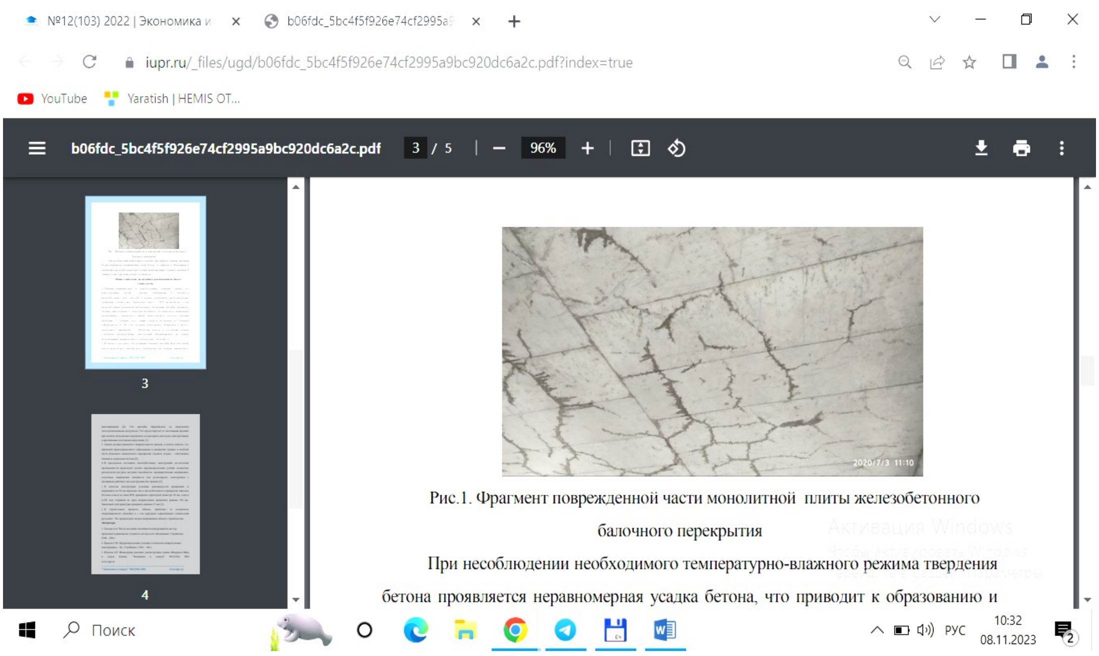

Fig.1. A fragment of the damaged part of a monolithic slab of reinforced concrete beam floor.

Results and discussion:

Such crack opening sizes violate the conditions that limit the permeability of structures and the safety of fittings in structures.

If the required temperature and humidity regime of concrete hardening is not observed, uneven shrinkage of concrete manifests itself, which leads to the formation and disclosure of unforeseen cracks and deflections in reinforced concrete structures. In this case, these processes also took place.

Conclusion:

1. The spatial planning and structural solutions of the building, its structural parts meet the requirements [9], the strength of reinforced concrete slabs, crossbars and floor columns are instrumentally tested, corresponds to the design class - B50, despite this, excessive deflections and crack opening were observed on the reinforced concrete floor, even during the construction of the facility. This forced the use of an extraordinary creative, heuristic approach to solving the problem [5]. In addition, the building is being built on a region of 9-

point seismicity [6]. In this situation, we had to resort to the method of marginal equilibrium [7]. The computational model and algorithms for evaluating statically indeterminate structures were formed based on the use of empirical and theoretical strategies [8].

2. During the full-scale examination, deflections of a reinforced concrete slab of a monolithic continuous floor were measured using engineering leveling [4]. These deflections were formed before loading with operational loads. This warns against negative phenomena when the overlap is fully loaded with the following long-term and temporary payloads [1].

3. Analysis of the distribution and direction of cracks in the slabs showed that the cause of premature formation and opening of cracks in the slab part of the monolithic beam floor was shrinkage – its own volumetric shortening of concrete [2].

4. In the limiting state of reinforced concrete structures of sufficient length, a complete redistribution of efforts occurs, bearing capacity resources are fully realized, pre-stresses, shrinkage stresses are removed or relaxed, structures with cracks work as structures without cracks [3];

5. As a reinforcement structure, it is recommended to reinforce and increase by 50 mm the upper part of the reinforced concrete floor with heavy concrete of a class not lower than B50, to reinforce with reinforcement of a diameter of 10 mm, class A-III, the pitch of the rods in two directions should be equal to 150 mm. The protective layer of the reinforcement should be taken equal to 15 mm [3].

6. In the construction process, they usually resort to accelerating the turnover of the formwork and at the same time violate the regulatory technical regulations. This happened at the construction site in question.

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