

UDC 624.072.14

TECHNICAL SOLUTIONS FOR REHABILITATION OF REINFORCED CONCRETE RIBBED SLABS

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The constant need to repair and reinforce ribbed reinforced concrete cover slabs reveals the need to describe and structure current methods of structural rehabilitation.

Existing reinforcement solutions can be divided into two main groups: traditional and innovative (using composite materials). The traditional ones are: building up the top layer of monolithic reinforced concrete, installing additional monolithic reinforced concrete ribs, installing piers on transversal ribs, installing piers on longitudinal ribs, installing sprue reinforcement in joints between slabs, installing unloading metal beams. The main method using composite materials is external reinforcement.

For an overall assessment of both groups of technical solutions, it is necessary to look in more detail at the technology and features of each method.

The technology of building up the reinforced concrete layer consists of several steps: notching the upper surface of the ribbed slab, removing the protective layer in the middle of the slab and exposing the reinforcement, cleaning the surface and installing the reinforcement, laying the cement batter, laying and compacting the concrete mix.

The method of supplying additional monolithic reinforced concrete ribs consists of creating unloading structures to reduce the tensile zone. The technological process includes making holes in the body of the slab, installing formwork, installing structural reinforcement, placing and compacting the concrete mix, and dismantling the formwork.

Methods using metallic supplementary structures can be grouped together into one group, the characteristics of which will be less labour and time-consuming, but higher metal consumption.

Composite solutions are less common due to their high cost. The price of the most common high-strength carbon and glass fibre is usually compensated for by the labour intensity of the work and the ability to carry it out without interrupting the operation of the facility. The use of this type of material is due to its high strength and modulus of elasticity.

The main advantages of modern methods of restoring the performance of ribbed slabs are their higher physical and mechanical properties, resistance to corrosion, low thermal conductivity and the low dead weight of the material.

When reinforcing structures, the greatest effect is achieved by covering the selected cross-section entirely with solid strips of composite material.

The external reinforcement method involves four basic steps. The first is surface preparation, which is divided into marking the structure, cleaning the surface from finishing building materials and cement mortar. The second stage is the trimming of the material panels to the size of the reinforcement design, the preparation of adhesive components and the application of the first layer of binder. The third part is subdivided into the installation of composite reinforcement panels, removal of cavities and excess adhesive composition. The fourth and final step is the application of protective coatings on the new reinforcement.

When using fabric composites as the external reinforcement material, pre-packaging and impregnation with a low-viscosity resin is necessary.

After structuring and evaluating the technical solutions for reinforcing reinforced concrete ribbed slabs, the main disadvantages and advantages of the different methods must be highlighted.

Conventional methods lead to an increase in the dead weight of the structure, which increases the design load and reduces the effectiveness of the reinforcement. Also, in some cases it is not possible to rehabilitate the slabs using such methods without interrupting the operation of the building, which increases the final cost of the work. The main advantages are the low price of materials and work and the technological simplicity of execution.

The use of composite materials has two significant disadvantages: the high price of the raw material, which does not allow for widespread use of this technical solution at the present time, and peeling of the bonding adhesive under high and low temperatures in the operating conditions of the reinforced structure.

For the most complete comparative analysis of all technical solutions to restore the performance characteristics, it is necessary to conduct a numerical analysis of the labor cost of the work, the cost of materials required for each method, the cost of work, the possibility of work without stopping the operation of the object. After obtaining the results for each item and further comparison of the results, it will be possible to identify the best solutions for reinforcing the reinforced concrete ribbed slabs.

In real site conditions, the choice of rehabilitation method for reinforced concrete ribbed slabs depends on many factors and must be tailored to each technical solution.