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ANALYSIS OF THE DESIGN OF REINFORCED CONCRETE STRUCTURES OF BUILDINGS FOR CONSTRUCTION

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ABSTRACT

The article raises the question of the need to analyze the design of reinforced concrete structures of buildings for construction. The materials of the article contain brief information on the study of the design of reinforced concrete structures, and the use of prefabricated monolithic reinforced concrete structures

Introduction: Reinforced concrete structures are one of the most common structures in all areas of construction. They are used in industrial, civil, agricultural, transport and other areas of construction. Reinforced concrete structures are used to build factories and residential buildings, hospitals and schools, bridges and tunnels, hydroelectric power stations and nuclear reactors, irrigation systems and dams, stadiums and arenas, mine structures and underground workings, subways, launch pads for launching space rockets and airfield coatings.

Today it is difficult to name the branch of construction where reinforced concrete would not be used. Reinforced concrete structures are also used in mechanical engineering (support frames for metal-cutting machine tools), shipbuilding (cargo barges), rocket science (spacecraft elements), medicine (reinforced modified spine elements) and other areas.

Reinforced concrete has gained popularity in the construction industry and spread around the world for a number of positive reasons and qualities:

- long life cycle
- durability;
- fire resistance
- fire resistance;
- resistance to corrosive influences;
- high resistance to static and dynamic loads;
- low operating costs for the maintenance of buildings and structures;
- low price factor
- relative cheapness of production.

The presence of a common large and small aggregate, which is used for the manufacture of reinforced concrete, makes it applicable in all corners of the globe and even beyond.

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The emergence and development of building structures, including reinforced concrete, is inextricably linked with the conditions of the material life of society, the development of productive forces. The appearance of reinforced concrete coincides with the period of accelerated development of industry, transport and trade in the second half of the 19th century.

This manual is based so far on the specified normative document and highlights the main fundamental provisions of the calculation of the simplest reinforced concrete structures.

The design of reinforced concrete structures is the most important stage in construction, the purpose of which is to obtain accurate reinforcement data. The stability of the future structure, the timing of the project and the investment attractiveness of the enterprise depend on the calculations and design of the segments.

The process consists of several stages:

- development of formwork drawings;
- calculation of the structure for acting loads;
- layout of fittings and parts;
- specification.

Effective innovative developments in the field of reinforced concrete have made it possible to create reinforced concrete structures that are elegant in every detail. The construction of residential buildings, various objects of cultural, household or other purposes is now unthinkable without the use of reinforced concrete structures. Particularly in demand and popular are reinforced concrete structures in industrial construction. Any construction cannot be imagined without their use. Reinforced concrete structures are and will be the main components of construction. According to the manufacturing method, reinforced concrete structures in the practice of their design are divided into monolithic, prefabricated and precast-monolithic.

In recent years, there has been a tendency to increase the use of monolithic reinforced concrete structures with the widespread use of sliding, adjustable and fixed formwork. The use of prefabricated reinforced concrete structures has also expanded. This is especially true for the construction of residential buildings. In order to perform a structural analysis of reinforced concrete structures, that is, to establish the dimensions of their sections, the cross-sectional area of u200b\u200bthe reinforcement or to check the bearing capacity, it is necessary to know the values of internal forces M, T, V and N that occur in the design sections of these structures from the action of external loads or influences. Force values are obtained as a result of static calculation. Static calculation of reinforced concrete structures can be carried out according to the theoretical principles of structural mechanics as for elastic bodies. But, due to the manifestation of specific features of the behavior of reinforced concrete under load (creep and inelastic deformation of concrete, the formation and opening of cracks in it, the possibility of breaking the adhesion of reinforcement to concrete, the fluidity of reinforcement, etc.), the use of structural mechanics methods in static calculations of reinforced concrete structures in many cases does not make it possible to obtain results that correspond with sufficient accuracy to the actual value of the forces arising in the sections of reinforced concrete structures.

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This is especially true for statically indeterminate reinforced concrete structures, in which the presence of inelastic deformations leads to the formation of plastic hinges and, as a result, the redistribution of forces between individual sections.

This phenomenon of redistribution of forces violates the ratio of their values calculated for the conditions of elastic operation of the structure, and therefore needs more specific methods for their determination.

The strength and stability of reinforced concrete structures of buildings and structures must be checked at the design stage without fail:

– for the operational stage;

– for the stage of transportation and installation

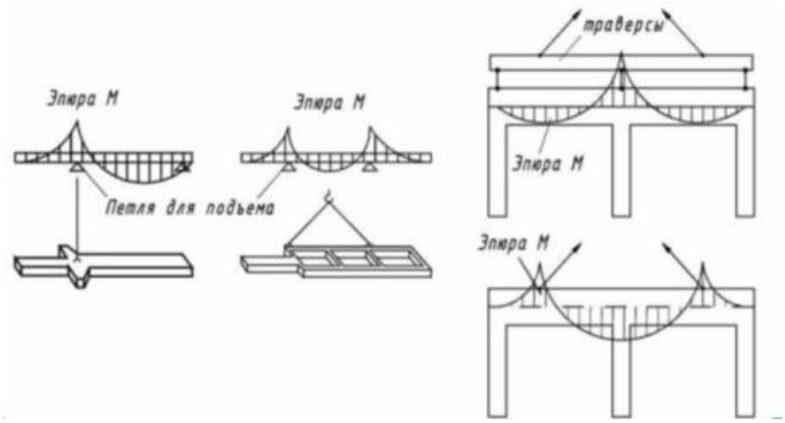

Figure 1. Transportation, installation of reinforced concrete structures

The use of improved methods for calculating the values of internal forces acting in sections of reinforced concrete structures contributes to their rational reinforcement, since the process of redistribution of forces can be controlled.

In the calculations of statically indeterminate reinforced concrete structures, this is achieved by using the limit equilibrium method with the implementation of static, kinematic methods and the method of additional diagrams of moments.

The essence of the limit equilibrium method lies in the fact that in the calculations of the bearing capacity of a statically indeterminate reinforced concrete structure, its limiting state is taken to be one in which, as a result of the formation of plastic hinges in its sections, it turns into a mechanism with one degree of freedom. In other words, if the bearing capacity of a statically indeterminate reinforced concrete structure is exhausted due to excessive growth of local plastic deformations in its sections without complete destruction of any part of it, then the calculation of the bearing capacity of such a structure can be performed by the limit equilibrium method. At the same time, at all stages of loading the structure for any of its sections in the span, the condition is not violated: the sum of the span and the corresponding parts of the support moments is equal to the moment of the freely supported beam.

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