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CONSTRUCŢII. ARHITECTURĂ

THE CONCEPT OF QUALITY IN THE STRENGHT STRUCTURE OF THE CONSTRUCTIONS

BY

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The strength structure represents one of the main components of every construction having as main purpose to provide resistance and stability of the entire assembly. Therefore, the strength structure can be defined as the system meant to safely allow the taking over and further transmission of the loads acting on the constructions; these loads should be further transmitted to the ground. The strength structure should also create conditions for the proper functioning of the building, respecting the purposes it was first designed for.

1. The assembly forming the strength structure of a civil building, as well as its component elements, has to successfully fulfil the performance requirements.

The requirements regarding the structural strength and the stability of the assembly are based on the principle of obtaining a rational safety of the building with respect to the limit conditions of normal exploitation and the final limit conditions, in a semi-probabilistic approach.

The requirements for constructions' fire-safety aim to guarantee the safety of the strength structure and its constructions' elements in case of fire by securing the integrity and stability of the building for a long enough period to evacuate the people inside and to allow the intervention of the fire department.

At the same time it has to guarantee the capacity of resistance and durability of the building after the fire has been stopped, by adopting measures that will provide a degree of safety at least equal to that previous to the fire.

The requirements regarding the durability aim to guarantee long lasting integrity and resistance of the materials and products used in the structural elements, under the action of external environmental factors (natural and artificial environment) and, at the same time, to provide protection for the structural elements against the action of the humidity derived from the condensation of water vapours which can provoke damages of the construction elements.

The performance requirements regarding the economic problems aim to limit the initial investment value, to limit the input of main resources (material, energy, manual labour) and to provide the minimum level needed to industrialize the execution of the works on site.

The successful fulfilment of all these categories of specific requirements for the reinforced concrete works represents the decisive factor that determines the quality of the reinforced concrete elements and the structure as a whole.

2. There are several types of strength structures, but those using the reinforced concrete are standing up due to a series of elements that provide the construction with the needed quality.

From a functional point of view, each type of structure is chosen in accordance with the architectural requirements so as to provide resistance, stability and durability for the building, considering also the technological and economical elements.

Compared to the structures using other construction materials, the reinforced, pre-compressed concrete structures possess several advantages.

The use of reinforced concrete for the strength structures of the civil buildings has become more and more common due to its advantages. The concrete is a cheap material that offers the possibility to realize a large volume of investments at relatively low cost. The reinforced concrete constructions have a better behaviour in case of fire than those made of other materials.

In the case of reinforced concrete structures the reinforcements are protected by the concrete covering layer, the protection being more and more efficient when the layer is thicker.

The monolithic character of the reinforced concrete constructions offers the possibility to create some spatial connections which increase the structure assembly stiffness, thus providing a greater stability during the actions of different factors.

The mechanical strengths of the reinforced concrete constructions are higher than in the case of masonry or wooden constructions; therefore, when the actions have a dynamic character the use of reinforced concrete structures seems more indicated.

The reinforced concrete can be used at the realization of any form and can satisfy the architectural and execution constructive demands since it can be poured into formworks at the ambient temperature, with no subsequent processing.

During exploitation, the reinforced concrete structures are considered to be more economical and hygienical because they need no maintenance works.

The use of reinforced concrete also has several disadvantages that may arise some reticences in using it or may require some measures to eliminate them.

The disadvantages regard the necessity to use formworks and scaffoldings, the dependence *versus* the weather conditions during pouring, quality check which can be rather difficult, large dead weight, the concrete's permeability to liquids, temperature and sounds, the difficulty, even impossibility to subsequent changes of the used static schemes.

One of the main disadvantages is that the reinforced concrete elements crack at low loads in the extended areas because of the reduced tensile strength of the concrete; the cracking process is viewed as a reality that needs to be accepted as such, without damaging the strength and the stability of the buildings. Over the years, there were found several remedies for the disadvantages of the reinforced concrete and this is the reason for which it is presently the most used construction material.

3. The reinforced concrete structures are usually statically undetermined ones. Their calculation is quite different from that of the structures with homogeneous materials due to two important distinctions:

a) The reinforced concrete elements are the result of the union between two materials: concrete and steel, which are different as strength and characteristic curves.

b) The strength and deformability of the elements are influenced by the materials' quality, quantity of reinforcements and its distribution in longitudinal profile and cross section.

During the production of the structures are inevitably interfering some geometrical imperfections which may have repercussions on the overall behaviour of the structure, its functionality and aesthetics.

The differences that exist between the behaviour of a reinforced concrete structure and that of one made of homogeneous materials become more obvious when the loading state increases.

If there are considered the moderate loads, such as those during exploitation, the static calculation is quite similar to the real state of stresses, taking into account that the concrete areas with cracks present no special importance.

If we move on, the post-elastic calculation becomes less and less similar to the real behaviour of the structure.

It is generally accepted that the reinforced concrete structures should be calculated based on the principles of the static calculation as the homogeneous materials with few changes so as to eliminate the inconsistencies.

The pre-cast concrete has several technical-economical advantages that the monolithic system does not: the high quality of the elements, raw materials savings, especially wood, conditions for mechanization reducing the need for labour force, increased productivity, reduced execution time, elimination of the seasonal character of the construction industry, the possibility to realize the connections in the designed areas, the precast elements can be pre-compressed, etc.

The main disadvantages of pre-casting are: precast constructions do not have the continuity and stiffness of the monolithic ones, pre-cast elements are generally heavy and need expensive lifting equipments, high investments for the industrial pre-casting, during the design stage there have to be considered other factors, such as storage space, equipments for lifting, transport, unloading and mounting; the reinforcement will be realized accordingly to these factors.

4. The decision for the most rational construction system has to be made considering all the advantages and disadvantages of the two systems, monolith and precast, and the possibilities for a practical execution of the design.

Over the last 15...20 years, there has been the wish to combine the main advantages of the two systems, developing mixed pre-cast - monolithic structures which in many occasions are the best answer at the problem regarding the needed period for the execution of the structures.

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CONCEPTUL DE CALITATE ÎN STRUCTURA DE REZISTENŢĂ A CONSTRUCŢIILOR

(Rezumat)

Structura de rezistenţă reprezintă una din componentele principale ale oricărei construcţii, având drept rol principal asigurarea rezistenţei şi stabilităţii de ansamblu a acesteia. Ca urmare, structura de rezistenţă poate fi definită ca un ansamblu menit să asigure preluarea şi transmiterea tuturor acţiunilor care se exercită asupra construcţiei şi transmiterea acestora la teren în condiţii de siguranţă. De asemenea, ea trebuie să creeze condiţiile pentru asigurarea unui spaţiu funcţional adecvat scopurilor pentru care se proiectează construcţia.