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The development of modular architecture as an alternative to expensive housing

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Abstract. The article analyzes all the positive aspects of the modular architecture. The result is the establishment of trends in modern design.

Introduction

The use of new technologies aimed at improving the quality of construction, speed of implementation and payback of projects as well as at reducing the time required for the production of works is of great importance today in Russia and abroad. Modular buildings are no less convenient and comfortable than the capital construction projects. They are manufactured with the use of modern technologies and meet all modern trends in construction. Modular construction is a combination of various technologies for the rapid buildings' construction. Extensive experience and practice of bulk-block construction of houses exist in Russia.

Purpose, objectives, methods of study

The purpose of the presented work is to identify the large positive qualities of the modular architecture.

To achieve this goal, the following tasks were performed: study of the modular architecture emergence history; identifying the features in the construction of such buildings; identifying advantages and disadvantages.

The main methods and means of solving a research problem are the analysis and comparison of the criteria in the modular buildings design and construction.

The practical value of the study is to identify the disadvantages and create the most cost-effective and energy-efficient architecture.

Formation of the exhibition space

Modular buildings are the sectional collapsible buildings consisting of several blocks - modules [1] (Figure 1).

Module sections are produced at a remote facility (most often factories), then delivered to the required place of construction. The production of blocks takes place already with external and internal decoration, previously agreed by the consumer, which reduces the time needed to commission the object (Figure 2).





Figure 1. Modular home



Figure 2. Manufacturing of modules

The complete assembly of such sections is completed on site. First of all, the sections are assembled, raised and placed with the help of a crane on the foundation or basement walls, connecting them together to create a single whole building. The modules are placed in different ways: side by side, from end to end, or stacked on the top of each other. If it is necessary to expand the premises, the blocks can be easily added or, on the contrary, removed without any disturbance to the structure of the entire building and causing no harm.

A large depth is not required for the modular homes foundation as the building has a relatively small weight. The use of materials for the wall insulation is made depending on the climate. Metal roof or professional flooring is suitable for the roof of the houses [2].

Each unit is manufactured separately, taking into account all transport and operational loads, which means that during the repeated transportation, installation and dismantling of buildings from such units there is no negative impact on its design and operational characteristics.

The popularity of modular buildings is undoubtedly primarily due to the low prices (cheap block sections, which are combined into a single building, allow minimum costs for the construction). Moreover, the quality and convenience of residential premises are not at all inferior. Modern construction companies offer their customers to choose their own individual design for each unit, thereby making each room more attractive and unique (Figure 3).



Figure 3. Interior option for a modular house

Modular pre-fabricated buildings are no worse than in terms of the convenience and comfort of the capital buildings. In the production of modular buildings, the advanced modern technologies and eco-materials are used. That allows to build modular buildings with the average market price in quality performance and in compliance with all the requirements.

Where did modular homes come from and what were they adapted for? The modular houses began to gain the popularity in the United States at the beginning of XX century. At the beginning it was a trailer home for traveling around the country. But after the Second World War such a house “turned into” housing and premises for employees of factories and plants engaged in military production for military bases. After the war the modular sphere began to develop strongly and rapidly. All the soldiers who had returned home needed to acquire housing to start a family. The demand for housing was high and the companies with the traditional construction process could not fully satisfy it, which led people to look for other solutions to this issue. All the necessary requirements were met by a modular construction process. Since that time, the era of modular homes began [3].

Refinement in construction and production has recently increased significantly due to the innovations in the assembly of houses with bridge cranes with a lifting capacity of up to 100 tons, which makes it possible to build larger modules and transport them over long distances. Installation and placement of such modules can take from several hours to several days. In the manufacture of each individual module it is necessary to take into account the width of the road from the factory to the construction site. Modern modular buildings are fully compliant with the fire safety requirements, they are environmentally friendly, consist of 3-6 different modules with a lifetime of more than 15 years.

Since the beginning of the operation, such buildings have been of poor quality, but today a sustainable method of construction has been developed by various companies around the world, making it possible to build more attractive, high-quality, interior and exterior decoration, open spaces and maximum natural light at home. In order to stand out from the mass of competitors, the builders seek to achieve the maximum energy efficiency by means of the materials processing, the LED lighting installation, the solar panels and environmentally friendly materials' use. Such a system serves to maximize the satisfaction of various consumer needs by adding or subtracting modules.

A positive aspect of the modular buildings production is the lack of waste during the assembly, because all the necessary materials come to the place immediately; the construction is performed in the most distant places. But there are also some negative aspects of such construction. The main drawback is the delivery of sections to the construction site. The large transport and huge expenses are needed for the delivery. In addition, not all banks are willing to invest money in this type of construction due to the lack of knowledge of the construction process and the fact that most of the payments must be made in advance. Nowadays most of the projects do not go through the planning stage or have some kind of failures, but the modular design has always inspired architects looking to the future. Construction technologies are constantly evolving, which makes it possible to make changes and innovations.

Summary

This article examined the general and most significant trends in the formation of a modular architecture, identified its advantages and disadvantages. The new technologies today are rapidly developing in the world, and the imperfections are changing. The harsh reality of our time is that all the mineral resources in the world have their own quantity and the younger generation has the main task to make their life more environmentally friendly, with a high level of housing combined with the technological possibilities of modular energy-efficient construction.

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