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## **MODULAR TECHNOLOGY AND ITS APPLICATION IN MODERN CONSTRUCTION**

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**Problem statement.** Today in our country, serious attention is being paid to the use of new technologies that would significantly improve the rate of return on projects, the quality of construction and, accordingly, to shorten as much as possible the milestone dates of the works. In other words the efficiency of the project as a whole. The modular construction technology guarantees the highest degree of industrialisation in the manufacture of buildings in the world.

**Purpose of the study.** Since construction is a branch of the real sector of the economy and belongs to the most capital-intensive industries, its priority task is to reduce capital intensity, which is achieved by this specific technology. Reducing costs and environmental impact as well as project timelines is always relevant to development companies, and the use of modern modular technologies, such as industrialized fabrication with apartments modules, multilayer glued wood panels (CLT-panels) and light steel thin-walled structures seems to be the best and most effective way of achieving these objectives. Not only the profitability of MC, but also the reduction of negative factors on the environment being achieved by reducing the duration of building. In the last five to seven years, these structures have gained particular popularity due to their energy efficiency, since individual structural modules and volumetric block-modules are made utilizing energy-efficient materials; there are also modules (containers, blocks, boxes, etc.) with already build-in finishing.

**Main results.** Objects erected using this method, namely buildings, structures, etc., are assembled from blocks or modules manufactured at the manufacturing plant, which are transported to the construction site and assembled together accordingly. Alongside to the assembly of reinforced concrete block-modules, there is a growing trend towards MC of lightweight structures in the form of spatial frameworks similar to shipping containers, several times lighter than their reinforced concrete counterparts, they have found their use in many countries. As an another fitting example in Switzerland in the 90s. of the last century, for the first time, multilayer glued wood panels were used, consisting of wooden lamellas stacked in rows. The products are glued together and pressed together. The rows are arranged crosswise relative to each other. Vertical lamellas provide a high bearing capacity, and horizontal ones – stiffness in the longitudinal plane [1]. Due to the increased public interest in eco-construction, the technology has become a huge demand, from such panels they began to

erect not only one- storeyed, but also multi-story buildings, as well as an apartment buildings. In Western Europe, this technology is taking an increasing share of the industry. New technology has more advantages than disadvantages, so its popularity is constantly growing, but now, unfortunately, the main disadvantage lies in the high costs for ordinary manufacturer – compared to other building materials, and for developer this may become unprofitable [3].

Despite its flaws, MC is marked by the safety of performing assembling and installation works, some researchers, on the contrary, underscore that from the point of view of the work-performing safety, named technology lacks proper studies which show the dependencies between the causes of the accidents. After analyzing the existing data, we can definitely note that “in order to improve the safety performance of modular prefabricated construction, it is necessary first and foremost to conduct further studies to stabilize structures during their lifting, storage and permanent installation, second to provide fall protection during assembly of units on site when working with height and to develop a curriculum and government standards focused on modular construction ”.

Modular construction technology allows to erect a building with any required dimensions, layout, and level of comfort in the shortest possible time. A distinctive feature of modular blocks is the variety of designs. So, at the design stage, specialists take into account the customer's personal preferences regarding the height of the building, area, building layout and finishing materials. As a rule, manufacturers of modular blocks provide the ability to create a building up to three floors (Norveststroy [3], K-module [4]), however, some manufacturing companies successfully implement modular buildings up to six floors (Modulraum DE ). Blocks entail the main communication systems: heating and ventilation, water supply and power supply.

Thanks to this technology, facilities can be built efficient and swiftly, but in terms of the level of comfort and quality of construction, they are practically not inferior to capital buildings. Also, the advantages of this type of execution include: high quality production within an optimal factory conditions, minimizing adverse site effects. Rational integration of all types of work “under one roof”, and thanks to organized teams of specialists in production and standardization of work processes, the labor intensity of work on the construction site is reduced due to the maximum mechanization of all work in the factory (approximately up to 80 % of the labor costs for the fabrication are transferred to the factory). Another advantage is the ability to separate the construction of a building and certain types of work into independent operational blocks. What is important in the modern world is the reduction of environmental pollution in the construction area, which has a positive effect on the ecology.

Among the disadvantages, the following can be distinguished – a significant increase in the carrying capacity of the mechanisms and vehicles used. Also, the main investments are needed long before the start of construction work on the site, especially when purchasing imported modules.

In Ukraine, there may be a lack of technological capacities (the necessary equipment, trained personnel, the introduction of special software) for the production of modules with strict adherence to design solutions and high quality, which leads to significant additional work on the construction site and, consequently, to an increase in the duration of construction [5; 6].

Let's not forget about the scarcity and gaps in technical regulation both for the production of modular blocks in the factory, and for the construction of modular buildings in general (no design stage “Factory documentation”, quality control standards for the production of modular blocks and construction and installation works) [8].

**Conclusion.** Having considered all the advantages and disadvantages, as well as the potential for using modular construction, we can conclude that these technologies can be used

in almost all areas of construction [5; 6]. However, for the full use of this technology, it is necessary to adapt the regulatory legal framework and fix the necessary provisions regarding modular construction in the legislation of Ukraine. The use of modular structures and especially volumetric block-modules should be considered as one of the promising options for ensuring energy-efficient reconstruction [7; 8]. The main ways to improve organizational and technological solutions, as well as the energy efficiency of built-on floors are to increase the size, while reducing the mass of assembly modular elements.

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