

MODERN TECHNOLOGIES IN CONSTRUCTION AND ARCHITECTURE

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Innovative trends in the development of society and the constant introduction of modern technologies and materials in the field of construction and architecture make it possible to activate the activities of this field and increase its competitiveness. The scientific and technical progress of the era of digitalization provides architects with many new tools for moving building design to the next stage of development.

The following scientists were engaged in the study of issues of development and implementation of the latest technologies in construction: H. O. Androschuk, A. P. Galchuk, O. M. Grechko, O. B. Zgalat-Lozinsky, E. K. Karapuzov,

V. P. Klymenko, I. Z. Kret, N. E. Lyalikova, S. P. Myhal and others. The problems of information modeling and the implementation of modern information technologies in the construction process are highlighted in the works of M. B. Kuleba, K. I. Kyivska, P. A. Manin, V. V. Talapov, O. O. Terentyev, and S. V. Tyutsyura, etc.

As V. I. Voskalo notes, the integration of modern technologies in construction and architecture is carried out in the following directions: building materials and technologies; architecture and urban planning; construction machinery and equipment; highways and road structures; engineering networks and equipment; ecology and safety in construction (Voskalo V.I., 2010).

Nowadays, engineers of the world's largest companies are working on the creation of innovative materials that allow the construction of buildings with unique characteristics, unusual shapes, safe, cheap, and also in a short time.

In seismically dangerous countries, for example, projects are being developed for buildings that can rise above the ground during earthquakes (Japanese company Air Danshin Systems Inc).

In many developed countries, during the construction of houses, only concrete and bricks are not used for a long time - manufacturers use wooden structures that do not burn, 3D printing from construction waste, self-cleaning paints, self-healing concrete.

The most promising modern technologies in construction and architecture are the following:

1. Information modeling of buildings (BIM technologies).

In recent years, the largest and most innovative builders have been implementing the building information modeling (BIM) system in their activities. It is based on a three-dimensional information model, on the basis of which the work of investors, customers, designers, contractors, architects and operating organizations is organized. That is, everyone who can participate in the implementation of the construction project. In the process of information modeling, there is a collective creation and use of information about the construction, which forms the basis for all decisions during the life cycle of the object (from planning to construction and

operation).

The principle of operation of the BIM system can be compared to a cloud storage or a global network, where all information on construction, design, etc. is collected. It is collected in real time and loaded into the virtual one. After that, all the information can be viewed wherever there is an Internet and make adjustments, automate routine operations, focusing on creativity. The incredible capabilities of BIM software and its constant development make it possible to evaluate a three-dimensional model of a project. Thanks to the integration of all construction processes in BIM-models, construction can be performed not only efficiently, but also taking into account the architecture of sustainable development. You can fully study all the pros and cons of the project, strengthening all the weak points, make timely changes, calculate and reduce energy consumption and CO2 emissions due to the use of special materials (Kyivska K. I., Luzina Y. V., 2021).

2. Prefabrication is an assembly of ready-made elements-modules, which is becoming more and more popular due to the speed of use and economy. Building blocks and structures are prepared in the workshop, and simply assembled at the site. This helps to reduce costs and speed up the construction process. In timber residential construction, pre-fab residential units for high-rise buildings consist of Cross Laminated Timber (X-LAM) panels. They are characterized by high strength, which is why they are used in the construction of high-rise buildings. Technologies for the manufacture of more complex MEP (Mechanical, electrical, and plumbing) elements are already being implemented (Tekhnolohii budivnytstva: zastosuvannia innovatsii).

3. Internet of Things (IoT). Internet of Thing applications are designed to facilitate and simplify the work of engineers and designers. In the process of designing the object, the specialist can receive information about all new materials and can introduce them into construction. All necessary materials and components are delivered directly to the construction site.

4. 3D printing is a technology that makes it possible to quickly and with high accuracy create a guarantee for building elements. BIM applications use this technology very effectively. 3D printing technologies are also widely used in

construction projects, and entire buildings are now being printed. (Zgalat-Lozinska L. O., 2020).

5. Laser 3D scanners and drones.

The use of laser 3D scanning makes it possible to view the model on the construction site and make the necessary changes. With the help of drones, architects can collect information from objects in real time and transfer it to a computer for verification and processing. This makes it possible to clearly control the construction process. (Muwafaq, Wadhah & Al-Jabri, Khalifa, 2022).

6. 4D, 5D and 6D scans.

By using 4D scanning, it is possible to establish construction time intervals, estimate the amount of time that will be spent on the implementation of any of the engineering solutions. 5- and 6D modeling makes it possible to evaluate not only the appearance, but also the thermal insulation, acoustic and other characteristics of the project. Already at the modeling stage, it is possible to calculate the cost and energy efficiency of the project (Tekhnolohii budivnytstva: zastosuvannia innovatsii).

7. Virtual and augmented reality.

Based on the use of special glasses, the client can view the presentation model of the project directly in the office. At the same time, the function of augmented reality enables the client and the engineer in glasses connected to the computer to evaluate the full-scale model on the landscape. And immediately determine the need for all changes introduced in the development process and their effectiveness at the facility (Azarshahr S., Motamadniya A., 2013).

As we can see, there is a trend of rapid emergence of new ideas and proposals on the world market to ensure maximum comfort and safety of modern housing. Scientists all over the world are working on the creation of new ultra-strong and safe building materials, developing incredible, sometimes cosmic architectural ideas that are being implemented.

Therefore, the review of modern technologies and innovative implementations in construction and architecture proves the necessity of their application in the activities of domestic construction enterprises and architectural bureaus. The

introduction of the latest technologies makes it possible to reduce construction time, construction costs, improve the environment thanks to the use of environmentally friendly building materials, and also increase the efficiency of construction activities.

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