Dynamic Architecture. New Style Forming Aspects

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Abstract. The article deals with the methods of buildings and structures transformation in the light of modern solutions in dynamic architecture. The mechanism for the formation of a modern object is proposed. Such design methods are becoming rather relevant in view of today's trends while the priority of dynamic architecture directions keeps increasing.

1. Introduction
The time of well-established canons and rules is in the past. Today in architecture there is an active search for new forms and principles that could reflect the rapid dynamics of our era.

The modern level of development of architectural design and construction technologies allows using the principles of staticity, as well as the methods of dynamic architecture that are being improved today, when creating projects of buildings and other structures[1-3].

2. Methodology
The term "dynamic architecture" in the middle of the last century was suggested by architect A.A. Gaiduchenya, who on the basis of existing projects at the time and its achievements, identified four of its directions [4].

Transformative architecture:
- buildings with transformable volume;
- buildings with internal transformation.

The principle of seasonal and diurnal transformation is often used in buildings that, in a certain season or days, for a better dosage of insolation, aeration and communication with the external environment, change the degree of closure of the interior space due to transformable elements of coatings, walls and other enclosing structures [5,6]. These can be greenhouses, ice arenas, summer theaters, galleries, observatories, agricultural and industrial buildings [7,8].

Mobile architecture:
- movable buildings and structures;
- movable and portable buildings and structures.

The main advantage of this direction is the multiple redeployment of the object with minimal time spent on its assembly and disassembly in remote and hard-to-reach places. Mobile buildings and structures are often used in scientific expeditions, in regions of natural disasters [9,10].

Evolutionary-adaptive architecture:
- buildings with flexible planning;
- buildings with flexible layout and varying volume.
The architecture of total movement (ATM) combines the best characteristics and features of other areas of dynamic architecture, is an example of the synthesis of architecture and the latest achievements of science and technology [11,12].

3. Analysis of selected aspects
The formation of a new direction of an architectural style is a complicated and contradictory process. Its elements, methods and methods are formed in the depths of the old style and gradually become dominant. One of the essential features of the new direction can be considered a constructive transformation [13]. Architectural dynamics can be expressed both by artistic imitation, and by the creation of buildings and structures capable of real movement.

One of the recent projects - the facade of parking at the Brisbane airport, developed by the Australian studio Urban Art Projects and is called "Vertical Lake" (Vertical Lake). The facade is formed of 250,000 aluminum elements, dependent on the wind. And it is called the "Vertical Lake", because the air currents are able to change the angle of the elements, forming an ever-changing relief of the facade, and it really looks like a lake where the wind picks up the waves (Figure 1)[14,15].

![Figure 1](dynamicarchitecture.net)

Another vivid example of the transformative architecture of Da Vinci Tower, a building with a variable form, the project of which is proposed for construction in Dubai (architect David Fisher). The tower consists of rotating blocks, strung on the central axis (Figure 2) [16,17].

The dynamic architecture has certain constructive, functional and aesthetic features. After the dynamic transformations, the structure not only receives a different architectural composition, but also a new three-dimensional spatial characteristic. Thus, the characteristic feature of dynamic designs is the provision of the needs of changing functional processes. The planning principle of variability is based on the real possibilities of overlapping large spans with the release of load-bearing structures of a large area and the use of light barriers. The implementation of this method allows transforming the internal space of the structure to optimize and effectively operate the building. Stationary structures provide for the implementation of one specific, once established functional process. Any changes in it make it necessary to overhaul the structure, since in the changed conditions the structure cannot fully meet the new requirements. Dynamic transformations of the basic constructive elements allow to react to changes in the functional process and to changes occurring in the natural and artificial environment surrounding the building and in addition, successfully solve a variety of aesthetic problems[18].
Figure 2. The facade of parking at the Brisbane airport, developed by the Australian studio Urban Art Projects and is called "Vertical Lake".

All the positive qualities of dynamic architecture are already widely used in the creation of modern sports facilities. Until recently, most of them were divided into winter and summer. In summer, when climatic conditions are favorable, most sports are held in the natural environment. In winter, the picture is changing and summer stadiums are used extremely narrowly. But despite the fact that the use of dynamic structures in modern facilities contributes to some appreciation at the design and construction stage, but they are not comparable with costs in the case of a complete or partial reprofiling of the structure for its efficient operation. An example of this approach to designing a sports facility is the London aqua center (architect Zaha Hadid) built for the 2012 Olympic Games (Figure 3). In the course of further operation, the aqua center will be reorganized into a public cultural institution. This possibility was initially incorporated in the design decision [19].

The idea of constructive transformation has stable historical traditions in Japan [20,21]. On the example of the national dwelling of this country, one can once again see what advantages it gives. The characteristic features of the principles of variability and constructive transformation, which make them an integral part of the new architectural style, are dynamic transformations within stationary bearing structures. Movements of this kind do not change the nature of the work of the basic structures and do not affect the static operation of the entire structure, but they mean the movement of structural elements for the purpose of efficient operation of this structure.

Figure 3. Olympic Center for Water Sports. 2011 London (Great Britain). In 2013, the capacity of 2,500 spectators. Arch. Z. Hadid.
4. Conclusion
The architecture of the future must meet all the requirements of a person and also dynamically change with him and his needs. As Christoph Bauder said: "Architecture has always been known as static, hard and heavy. Architecture in the future will physically adapt to our needs and expectations, because change is a constant process of our time, our environment needs the ability to change ".

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