

TRANSFORMATION AND ADAPTATION IN MODERN ARCHITECTURE

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Abstract: transformable elements, objects, and architecture have been used by people for a variety of purposes since ancient times. Analysis of the development of transformable systems shows how situations were solved when the execution of structures using conventional static structures became impossible, and there was a need to develop new structures. This article examines transformable architectural objects and systems, as well as the relationship between art, engineering and technology in architecture, which acquires the quality of response and adaptation to constantly changing functional requirements.

Keywords: architecture, art, transformation, dynamics, movement, adaptation, kinetic facade.

Unique buildings with a public function based on the application of architectural transformation have their own individuality and uniqueness. The image solution can be modified based on a dynamic form and depending on specific conditions. Transformable systems and dynamic forms allow not only to create unique imaginative solutions, but also to provide all the necessary functional processes, as well as to provide for the possibility of changing them in connection with emerging, over time, new needs. Such systems form a multi-functional space. Creating a multifunctional space can be achieved by using mobile structures and elements. At the same time, the transformation can be internal, due to the use of transformable walls, partitions, and other elements inside the building, and (or) external, based on changes in the volume of the building itself, its shell. Transformable systems based on innovative technologies make it possible to create highly efficient structures that preserve natural resources, which is currently a prerequisite for building construction. Application of the achievements of sustainable architecture related to eco-technologies, by using the dynamics of structural elements that regulate microclimate (for example, transformable facade systems allow you to adjust the parameters of the microclimate in the room is constantly changing under the influence of the environment: sun, wind, rain, etc.) [2].

The use of such systems is based on preliminary calculations and experimental studies, in which the building itself is considered as a single spatial system, which includes the bases and foundations, frame and coating, while equipped with the latest technologies. A comprehensive analysis has shown that the use of transformation in the architecture of unique public buildings increases the possibility of their operation, providing individuality, versatility, comfort. Thus, the transformation is implemented in public buildings in order to create: first, the uniqueness of the building, through the use of innovative structural systems and individual imaginative solutions; second, the necessary functional processes and the ability to adapt spaces, ensuring their versatility; third, the dynamics of the volumetric solution or its elements, depending on climatic conditions, and through the use of intelligent technologies, in order to create a favorable microclimate. The use of innovative transformable systems in the architecture of unique public buildings can be considered as a method of changing the spatial planning solution depending on the requirements, functional processes, specific conditions, as well as creating a sustainable architecture based on the introduction of "green" technologies [1].

The theory of "form-movement" By G. Linn allowed us to qualitatively rethink the understanding of an architectural object as a dynamic structure. Seven of his main theses [2]:

1. It is not appropriate for Architecture to maintain the usual inert state of static art.
2. Architecture must master the concept of movement.
3. The architect needs to work with modern software.
4. The spirit of the Baroque accompanied by computer developments and architectural forms.
5. It is Necessary to focus on the latest digital technologies.
6. Architecture must master the category of time and "organizing choreography". The project of form should be thought of in terms of force and movement.
7. The architect must gradually move away from the Cartesian statics and work with the shape dynamics.

The current level of development of architectural design and construction technologies allows you to use transformation methods when creating projects for buildings and other structures [3].

Structurally, the dynamics of the building is determined by the transformation of facade systems, roof, rotation of floors, and the mobile structure of the building. Functionally, sliding roof structures are used mainly in sports, entertainment, shopping and cultural facilities. Rotating panoramic restaurants and observation decks implement the idea of rotating floors. Conceptually, this idea has received significant development in the projects of "rotating" buildings [1].

However, the question arises as to how architecture can be involved in the process of reflecting social and historical activities and will be used as a learning environment for its users. Many architects have already tried to answer this question by designing a static building that is architecturally dynamic and has a transformable environment that allows users to change their environment during their stay in the building. Among these architects are D. Libeskind, R. Piano, and R. Rogers with their projects for the Jewish Museum in Berlin and the Pompidou center in Paris. What is realized in the work of these architects is that the configuration of static architectural and structural components allows visitors to be aware, experience and interact with the environment as they pass through the building's premises. In these cases, architecture is a stationary body that can fill with a sense of passing time, and virtual transformation occurs only when visitors move inside the building. Therefore, the architecture can convey new meanings and remind users of what happened in the past and generate new perspectives that illustrate the future [3].

An original example is the sports arena "Mercedes Benz Stadium "in Atlanta (arch." Helmut, Obata and Kassabaum "and" 360 Arkitekche", 2017).

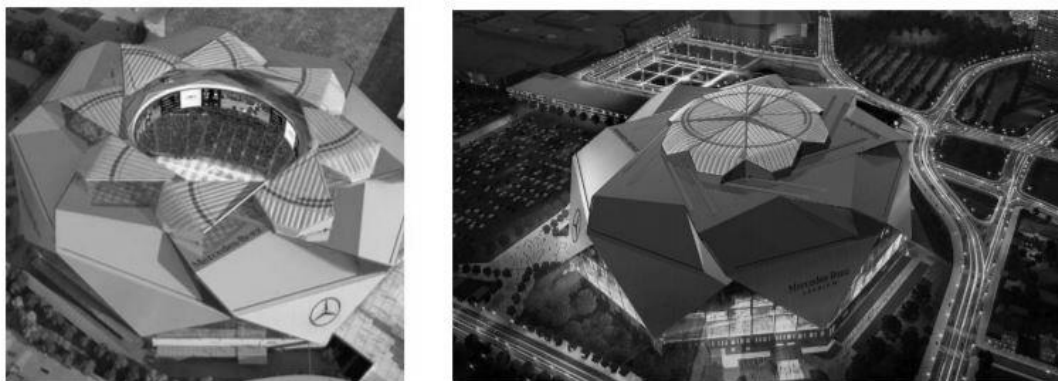


Fig. 1. Roof Transformation in the MercedesBenz Stadium sports complex, Atlanta, USA, 2017 [4]

The roof structure is additionally equipped with the latest HD technologies developed by the HOK group of architects. The stadium uses the transformation of the field itself, as well as seats for spectators. The designed capacity of the stadium is 71,000 spectators with the possibility of expanding to 81000. If you need to reduce the number of spectators, the capacity can be changed to 32,000 using the transformation. Retractable seats surrounding the field allow fans to get closer to the football action. Digital media platforms at the stadium provide flexible viewing opportunities for teams and sponsors via broadcast. Technologies and materials are used with which outdoor lighting can easily change the color of transparent facades [4].

One of the most important needs of architecture in a changing world is to respond to the changing demands of its users. Transformability can be seen as an important way to respond to the changing demands of today. Consideration of this issue shows that transformation is not just a way to expand the space of a building from center to center. These buildings can maintain their structural stability while still responding interactively to user requests. They can also create dynamic architectural spaces that allow users to expand their creative, social, environmental, and aesthetic knowledge.

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