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## TYPOLOGICAL FEATURES OF MULTIFUNCTIONAL PUBLIC BUILDINGS

**Annotation:** Multifunctional public buildings play a significant role in contemporary architecture and urban planning. Their design requires consideration of numerous factors, including functional organization, aesthetic qualities, sustainability, and energy efficiency. This article explores the key typological features of such buildings, focusing on spatial and planning solutions, the integration of diverse functions, and the application of modern technologies. Special attention is given to multifunctional complexes, their impact on the urban environment, and current architectural trends.

**Keywords:** Innovation, architecture, construction, trends, multifunctionality, public buildings, complexes, space.

**Аннотация:** Многофункциональные общественные здания занимают важное место в современной архитектуре и градостроительстве. Их проектирование требует учета множества факторов: функциональной организации, эстетических характеристик, устойчивости и энергоэффективности. В статье рассматриваются основные типологические особенности таких зданий, включая пространственно-планировочные решения, интеграцию различных функций и использование современных технологий. Особое внимание уделено многофункциональным комплексам, их роли в городской среде и архитектурным тенденциям.

**Ключевые слова:** Инновация, архитектура, строительство, тенденции, многофункциональность, общественные здания, комплексы, пространство

**INTRODUCTION.** In recent years, the design and construction of high-rise multifunctional complexes have gained widespread popularity, becoming a significant factor in enhancing the energy efficiency of construction practices and urban development. Today, these complexes play a crucial role in shaping energy-conscious construction culture and advancing urban spaces in cities worldwide. One of the key features of modern high-rise complexes is their focus on improving energy efficiency and environmental sustainability. The integration of advanced technologies, such as smart energy management systems, the use of renewable energy sources, and green roofs, significantly reduces the carbon footprint while enhancing the ecological quality of the urban environment. For instance, green roofs not only improve the microclimate and support biodiversity conservation but also help reduce air conditioning costs and mitigate the urban heat island effect.

**RESEARCH MATERIALS AND METHODOLOGY.** Multifunctional public buildings represent modern architectural structures that integrate various functional zones designed to meet the diverse needs of users. These buildings are designed to create unified spaces capable of providing comfortable conditions for work, leisure, living, and entertainment in one location. This approach to design ensures optimal use of space and resources, enhancing convenience for users.

The popularity of multifunctional buildings is growing due to their adaptability to the evolving needs of urban populations and their economic feasibility. However, their design poses several challenges, including ensuring functional zoning, ergonomics, and sustainability.

Moreover, multifunctional complexes play a significant role in social development by bringing together residents of different ages and professions within a shared space. These buildings serve as hubs of urban activity, fostering a comfortable and safe environment and promoting the development of local communities.

Thus, the design and construction of multifunctional complexes represent not only a contemporary trend but also a critical direction in architecture and urban planning. They contribute to the creation of more sustainable, convenient, and modern cities. These buildings shape the future, embodying humanity's pursuit of harmony between innovation and nature, comfort and eco-friendliness, economic efficiency, and social responsibility.

**RESEARCH RESULTS.** The primary concept behind the creation of multifunctional public buildings is the integration of various functions within a single structure. This approach enables the most efficient use of land resources while establishing convenient infrastructure for residents and visitors (Pic. 1).

Multifunctional complexes play a pivotal role in shaping the modern urban environment, serving as a vital tool for the comprehensive development of urban areas. Their uniqueness lies in their ability to combine diverse functions within a unified architectural form, optimizing resource utilization and providing a high level of convenience for users. Such buildings typically include office spaces, residential areas, retail zones, recreational spaces, and elements of urban infrastructure, making them a versatile solution to meet the diverse needs of society.



**Picture 1. Multifunctional complex "O Dos Vasconcelos" by Landa Arquitectos. San Pedro Garza García, Mexico. This complex is divided into a residential section, a commercial section, and a hotel, which is located in the tallest building and is relatively independent from the other elements of the project.**

Multifunctional public buildings play a key role in shaping the modern urban environment, serving as an essential tool for the comprehensive development of urban territories. Their uniqueness lies in their ability to integrate diverse functions within a unified architectural form, enabling efficient resource use and providing a high level of convenience for users. Such buildings typically include office spaces, residential areas, retail zones, recreational spaces, and urban infrastructure elements, making them a versatile solution to meet the varied needs of society.

One of the primary challenges in designing multifunctional buildings is the development of optimal spatial and planning solutions. It is crucial to ensure appropriate functional zoning that accounts for the flow of people and goods, minimizes route intersections, and creates comfortable conditions for all user categories.

Multifunctional complexes often feature the following:

- **Residential areas**, typically located on the upper floors to ensure privacy and tranquility.
- **Commercial and office spaces**, situated on lower levels for easy visitor access.
- **Public zones**, such as food courts, playgrounds, and recreational areas, integrated into the building's structure to facilitate comfortable interactions between residents and guests.



**Picture 2. Veko Complex Belgrade, Serbia**

Complex spatial structures of multifunctional complexes require the use of modern design approaches, such as Building Information Modeling (BIM). This allows designers to thoroughly address the interaction of all building elements and optimize its operational characteristics (pic.2).

The integration of multiple functions within a single building promotes the optimal use of urban space, especially in densely developed areas:

- The combination of residential, commercial, and recreational zones reduces the need for separate buildings and creates a harmonious urban environment, which, in turn, saves space.
- The presence of multiple functions within one complex reduces the need for long-distance travel, helping to reduce traffic congestion and air pollution, which decreases transport flows.
- Function integration allows for a more even distribution of operating costs and increases the building's profitability, thereby enhancing economic efficiency.

An example of successful integration is the creation of multifunctional complexes with green roofs, where parks, recreational areas, or vegetable farms are located. Such solutions not only increase the building's ecological sustainability but also add additional useful functions.

Modern technologies play a crucial role in the design and operation of multifunctional buildings. Key solutions include:

- Automation and control systems. Smart energy management systems minimize costs for lighting, heating, and air conditioning while ensuring comfort for users.
- Renewable energy sources. The use of solar panels, wind turbines, and geothermal systems reduces the building's carbon footprint and improves the environmental condition of the urban area.
- Green technologies. The inclusion of green roofs, vertical landscaping, and rainwater harvesting systems improves the microclimate and promotes biodiversity conservation.



**Picture 3. Multifunctional complex "Vodny", Moscow, Russia**

Multifunctional complexes are becoming centers of urban activity, around which the life of megacities is formed. They contribute to the development of local communities by creating a comfortable environment for communication, leisure, and professional activities. Moreover, such buildings play a significant role in the sustainable development of cities, reducing the strain on natural resources and improving the quality of the urban environment (pic. 3).

**CONCLUSION.** Multifunctional public buildings represent a significant achievement in modern architecture and urban planning, helping to address key challenges facing society in the 21st century. These buildings combine comfort, functionality, sustainability, and economic efficiency, making them an integral part of sustainable urban development.

The design of multifunctional complexes requires consideration of numerous factors, including functional zoning, the use of modern technologies, and ensuring environmental sustainability. Such buildings not only shape the appearance of the modern city but also contribute to strengthening social bonds, improving the quality of life, and developing urban infrastructure. In the future, multifunctional public buildings will play an increasingly significant role, reflecting humanity's striving for harmony between innovation, nature, and comfort.

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