

CRITERIA FOR CREATING ENERGY EFFICIENCY IN INNOVATIVE BUILDINGS AND STRUCTURES

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ABSTRACT

The article is devoted to the consideration of the basic principles of creating efficiency of innovative buildings and structures formed using new technologies and means of achieving comfort in different ways.

Keywords: innovation, energy efficiency, uniqueness, engineering, eco-ministructure, building, eco-urban.

INTRODUCTION

Increasing number of formation of innovative buildings is due to the nature of market relations, the need for qualitative transformation of the environment of life, the emergence of modern technology and increased human requirements for the surrounding architectural environment. Integral properties of such buildings are their novelty, economic and social feasibility. They will be in demand by society in the future too.

The main criteria for the effectiveness of innovative buildings can be distinguished:

- Ecological and urban efficiency;
- Social efficiency;
- Engineering efficiency;
- Economic efficiency;
- Integral efficiency.

Ecological and urban efficiency of innovative buildings is quite high and is caused by the appearance of innovative nature-integrated buildings. Such buildings improve the indicators of temperature, humidity and wind modes, insolation mode of the territory, reduce pollutants,

eliminate electromagnetic and ionizing radiation, provide air conditioning and ozonation, the relationship of artificial and natural environment, reduce greenhouse gas emissions, reduce human impact on the environment, guaranteeing environmental safety to humans. (Picture 1.) The inclusion of innovative nature-integrated buildings in the urban environment contributes to:

- Preservation and maintenance of existing natural elements of the urban environment (creation of innovative buildings with the inclusion of gardens on artificial bases to replace the lost fragments of the natural component of the city);
- Strengthening of the existing natural elements of the urban environment (transformation of parts of the natural landscape by complication of the horizontal and vertical structures of green spaces, included in the created innovative architectural objects);
- Creation of new natural elements of the urban environment (creation of innovative buildings, aimed at an integrated replacement of natural processes and phenomena through the creation of artificial bio- and eco-structures).



Picture1. The Living Green Wall. London

Innovative eco-ministructure and eco-hyperstructure buildings will have a high positive impact on the living environment.

The eco-ministructure buildings allow us to preserve and create a "human" city by combining them with the natural environment. Low-carbon city with innovative buildings eco-ministructures will allow to form an architectural environment for comfortable collective human life to provide the best (optimal) conditions of production and consumption of material and spiritual goods, culture, art, science, etc. It will have high environmental performance of the urban environment through the use of environmental transport and its organic combination with urban infrastructure.

Innovative eco-hyperstructure buildings, despite their vertical scale and the development of the urban environment vertically, will also have a positive ecological impact on the living environment. Eco-hyperstructure buildings including vegetation (roof gardens, winter gardens, vertical gardening, etc.), geoplastics, water devices and surfaces (reservoirs, pools, fountains, waterfalls, etc.) in their structure will improve the environmental and aesthetic performance of the environment.) will improve the ecological and aesthetic indicators of the environment, create a favorable microclimate and reduce the level of pollution by reducing the load on the urban infrastructure (no dust, ozonation, air humidity control), provide a connection with the

natural environment and preserve the biological diversity of habitats, will have a positive soothing effect on the psychological state and health of people. Such innovative dominant buildings in the structure of the city will also form architectural flaws and reduce the visual impact of man-made environment; will be compositional accents in space (rib points for fixing the gaze), will improve the psychological impact on the person, thanks to the scale, complexity in configuration and pronounced silhouette will play an important role in creating a comfortable visual environment (from the local element of the city, perceived by a person from a limited number of points, to a landmark object of urban significance that forms the silhouette of the city).

Such innovative buildings will have biopositive properties, act as a means of organically combining the natural and architectural environment of the city.

Especially promising are mobile eco-hyperstructure buildings. They interact with the natural components for utilitarian and decorative purposes and will promote the rational use of the new free urban and natural water surfaces for the organization of the human environment. Approbation of such solutions of innovative objects in modern densely built-up megacities will help to save ground space (due to vertical orientation, reduction of occupied area and localization of the object), to expand the existing urban infrastructure due to the possibility of their autonomous self-sufficient existence far from land without causing damage to the existing aquatic ecosystem.

One of the decisive criteria for the effectiveness of the creation of such innovative buildings due to the specifics of their formation should be engineering and technical expediency.

Innovative buildings contribute to the engineering and technical efficiency of the living environment through the introduction of the latest modern engineering and structural systems, automated intelligent technologies (achievements of cybernetics, bionics, laser optics, etc.) to improve the utilitarian and aesthetic qualities of the object.

Unique innovative buildings have a positive impact on people through integrated automated life support systems with the ability to regulate and fully control the microclimate of the building premises. They improve the control processes of the architectural environment with a number of indicators - lighting, electrical equipment, fire extinguishing systems, video surveillance, automatic human identification and other systems that record violations in the operation of the facility and the surrounding area, regulated via the global Internet with remote controls and panels.

Innovative buildings will improve and strengthen the engineering base also through the use of nanotechnology, building materials and structures with new properties and further processing: vibration-damping and self-repairing high-strength steel, low-emission glass, whose transparency depends on the intensity of insolation, thermal insulation panels and double glazing with adjustable microclimate; infrared thermal regulation system (heat is directed to the person in the room); buried volume of the building in the ground; green roofs with hydroponic irrigation system to protect against overheating and air conditioning, etc.



Picture 2. The Bosco Verticale project. Milan

Effective formation of innovative buildings with high quality characteristics at all stages of the life cycle contributes to the right choice of their structural system (volume-block, large-element, small-element, monolithic, mixed, etc.). Innovative buildings, formed with the use of complex structural systems, can withstand additional loads associated with the operation of equipment, harmoniously combine architectural and engineering solutions to minimize the cost of their production and operation, reduce the time of construction of facilities, ensure longevity and economy of materials. (Pic.2)

Erection of innovative buildings using mobile transformable structures provides qualitative and quantitative transformation of the object and its elements (rotation of facades, coatings and envelopes, roofs, floors, the movement of the entire volume), will enable multiple use of interior and exterior space, will create a comfortable microclimate, will allow to place objects in areas with harsh climatic conditions, where there is no infrastructure, resources and base for capital construction, to will contribute to energy savings, increase aesthetic performance and create a uniquely attractive image of the building.

Innovative buildings will contribute to the creation of a qualitatively new architectural and artistic image using color, light, transformation effects, means of light and media design. Currently, they are the basis for the implementation of the most non-standard design solutions, organically combining the design of the building itself and the unique interactive lighting, video art. Media facade of the innovative building, interacting with the environment, gives the object an artistic expression and carries a powerful informative load. Such objects have a high capacity to transform the negative visual impact of anthropogenic elements and, as independently functioning elements, provide diversity of urban development.

Rational inclusion of innovative buildings with individual changing image in the structure of the city will contribute to the development of innovative technologies and economy, improving the quality of life of society and the environment, achieving architectural and artistic expression, the formation of a unique attractive architectural environment, compliance with global trends, stimulating business and attracting foreign investment.

Social effectiveness is expressed in the positive consequences for the population from the implementation of projects of innovative buildings: improving the quality of life by increasing the volume of new objects and the functions they provide; creating a comfortable environment for people with a paramount consideration of their social (individual and family, group (collective) and public) needs, anthropometric and psychological features in order to achieve greater harmony and interaction system "man - architecture - the natural environment".

Innovative buildings, formed with the use of new technologies and means of achieving comfort, allow to improve the socio-psychological state of a person; to optimize the artificial architectural environment, giving it properties that promote social interaction between people. Such buildings contribute to the development of neighborhood and social contacts, sports activities, organization of children's leisure due to the inclusion of the natural component in their structure.

Such objects with high above-mentioned indicators increase individual comfort of people and, as a consequence, general social efficiency of the whole architectural environment and progress of mankind.

Innovative buildings rationally use material, financial and labor resources in construction, which allows us to develop effective design solutions that meet human needs throughout the life cycle of the object.

Through the creation of innovative buildings the introduction of a fundamentally new ideology of building objects based on the union of architecture, man and nature. Such objects will radically change the urban planning concept of organization of urban settlements; make a decisive turn towards social and natural integration, characterized by humane attitude and sustainable development.

In the future, innovative buildings will solve the problems of organizing the processes of human life with the maximum realization of its value orientations, professional interests, which will be possible through the introduction of new compositional techniques and technical means. They will have the following positive social effect:

- Will increase the functional features of the development of urban cultural and household infrastructure;
- Will contribute to the creation of a better system of objects for the development of the residential environment (solving the problems of social housing, improving conditions, etc.)
- Will have a significant impact on the creation of better health care facilities (outpatient and rehabilitation centers, sanatoriums, hospitals and other institutions);
- Solve the problems of more effective education of children (innovative children's play centers, institutions of pre-school education and upbringing, etc.);
- Will develop various objects of relaxation and collective forms of leisure (tourist, sports, recreational and spa centers, etc.);
- Create a better cultural and entertainment infrastructure (media libraries, art galleries, Internet cafes, cinemas, circuses, exhibition halls, stadiums, etc.).

Innovative buildings will make it possible to create a more diverse environment, taking into account demographic characteristics (children, youth, adult generation, pensioners), capable of responding quickly to social changes in society. They will correspond to the methods of organization of synergetic dynamic spaces, promote organic integration, differentiation and

adaptation of the architectural environment to the physical capabilities of people, facilitate and accelerate the implementation of life processes, clear orientation of people in space, identifying primary and secondary semantic and visual connections, reducing communication, creating a visual diversity in visual perception and conditions of psychophysical equilibrium.

Thus, innovative buildings stimulate the creation of the most advanced post-industrial construction technologies, accelerating the humanization and development of the environment of life with the involvement of intellectual capital of society.

For the purpose of rational choice of a variant of the design decision of innovative buildings it is necessary to define the comparative economic efficiency reflecting how much one variant of the design decision is more effective than another. The criterion of comparative economic efficiency of capital investments is a minimum of reduced costs.

As a result, the most objective criterion for assessing the formation of innovative buildings in the urban environment should be integrated efficiency of the living environment, which provides for systematic interaction and consideration of all of the above criteria.

LIST OF REFERENCES

1. Anisimov A. N. Synergetic method of urban design [electronic resource] / A. N. Anisimov. // Architecton : the news of universities, - 2008. - No. 22.- Mode of access : http://archvuz.ru/2008_22/37.
2. N. Principles of synergetics in architecture [electronic resource] / V. N. Babich. // Architecton : the Izvestiya vuzov, - 2008. - № 21. - Access mode : http://archvuz.ru/magazine/Numbers/2008_1/template_article?ar=TA/ta3.
3. Budanov V. G. Methodology of synergetics in post-non-classical science and education. / V. G. Budanov. - Moscow : LIBROCOM, 2009. - 240 c.
4. Baikova E. V. Biomorph structures in the city space. / E. V. Baikova. // Bulletin of the SSTU. - 2011, № 2 (55). - Vyp. 1. - C. 227-232
5. Balandin R. K. K. Nature and civilization / R.K. Balandin, L.G. Bondarev. - Moscow: Mysl, 1998. - 3
6. Temur Khidoyatov; Tatyana Nazarenko; Dildor Begmatova; Kamol Allayarov, The article examines the features of the architectural organization of the school of the new direction using the example of the irkutsk smart school //An International Multidisciplinary Research Journal ISSN: 2249-7137 Vol. 11, Issue 12, December 2021 SJIF 2021 = 7.492
7. Begmatova D. Methods Applied in the Production of Decorative Glass in Uzbekistan/Solid State Technology. - 2020. - T. 63. - №. 5. - C. 6963-6966
8. Maktuba Abdujabbarova, Tatyana Nazarenko, Dildor Begmatova, Maftuna Tuxtayeva; Industrial Production Of The Republic Of Uzbekistan //The American Journal Of Applied Sciences (ISSN - 2689-0992), December 2021
9. Matniyazov Zafarbek Erkinovich, Adilov Zarifjon Himmatovich, Tadjibayev Jur'at Hamrayevich, Daminova Umida Olimovna, Saidxonova Umida Ziyodullayevna. (2020)
10. "Improvement Of The Environmental Situation Of The Aral Region Through Landscape Design", INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 9, ISSUE 04, APRIL 2020 pp. 3450 - 3455.