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RECOMMENDATIONS FOR DESIGNING MULTI-STOREY HOUSES (ON THE EXAMPLE OF SAMARKAND)

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ABSTRACT

Studies of architectural design solutions and compliance of medium-and multi-storey residential buildings with natural and climatic conditions show that there are several negative aspects when forming residential buildings of this type. It should be noted that with the change in the socio-economic situation after the 1990s, housing construction financed by the state was in crisis, as a result of which, firstly, the existing industrial enterprises of housing construction began to collapse, and secondly, large design organizations owned by the state were left without orders, and highly qualified specialists working in them were left without work. After that, the construction of medium-sized and multi-storey residential buildings passed into the hands of individual entrepreneurs, and small and inadequate specialists of design organizations began to perform design work.

KEYWORDS: *Multi-Storey Buildings, Microclimate, Courtyard, Settlement Density, Green Room, Passive Design.*

INTRODUCTION

The mass use of medium - sized and multi-storey residential buildings in the conditions of the Samarkand region is closely related to the issues of urban planning and the lifestyle of the population. These include the weakening of the functional connections of the apartment with the open environment and the inability of the courtyard to perform its function as a constructive element of the apartment and dwelling, the isolation of apartments from the Ground, the deterioration of the microclimate of residential premises and the loss of the comfort level of the psychological climate in them.

The importance of summer rooms in the formation of dwellings lies in the fact that in the conditions of the Samarkand region, to create comfortable conditions in dwellings, on the one hand, protection from the summer heat is necessary, and on the other hand, protection from the sharp winter cold and wind. The implementation of the first event necessitates the widespread use of country houses and a courtyard stage in a residential complex. In modern construction practice, in medium-sized and multi-storey residential buildings, summer rooms are placed in the form of a balcony, loggia, terrace, porch. In residential buildings of this type, summer rooms are also organized under the roof. But country houses of this type cannot form a microclimate in a residential building. Sometimes summer rooms occupy a wider space as a "green room" on a certain floor in the middle. In folk architecture, the type of porch from summer rooms is common. The veranda is a covered room with a canopy, surrounded by a wall on two and three sides. The porch is located at a right angle in front of or next to the living quarters. Sometimes a porch is arranged on the roof of a building. At the entrance to the courtyard, a porch is placed open on both sides.

METHODS

A well-maintained and irrigated courtyard, bounded by four buildings, serves as a source of coolness and comfort. In the courtyard area, the windows of all living rooms are facing, and all the elements of the living room, as a whole, are able to enjoy a common comfortable microclimate. The use of the courtyard in the conditions of the Samarkand region is one of the main features of folk architecture. In the warm season, most of the household and life processes take place in the yard. This circumstance affects the spatial structure of residential premises, affecting the lifestyle of the population. The spatial layout and planning solutions of residential premises consist of an open courtyard layout, a semi-open entrance layout and a closed spatial layout of premises. Each of these elements of the project has its own characteristics, but they are able to form a microclimate only as a single system. These elements are functionally closely related to each other and may lose their relevance when considered separately.

The ratio of the yard area to the area of buildings built around it is also of great importance in the formation of residential buildings. In residential buildings of the city of Samarkand, the yard area is equal to the area of buildings built around it, that is, in the ratio of 1:1. In country yards, this ratio is equal to 2:1. Thus, the yard was fully adapted for the life and household processes of the family in the warm season and effectively served as a living space. All household processes are carried out in the courtyard, including such processes as receiving guests and sleeping.

In the city of Samarkand and the region, the basis of the dwelling is an open courtyard. The geometric shape and dimensions of the courtyard are of particular importance for our study. The main shape of the yard is square or rectangular with an aspect ratio of 1:1 to 1:1.5. Residential and utility rooms can be located on one, two, three and four sides of the yard. With a two-sided arrangement, buildings can be either opposite to each other, or next to each other, or L-shaped. In a three-sided arrangement, the buildings have a U-shaped shape, and in a four-sided arrangement-a full perimeter. In traditional architecture, the division of the courtyard into two parts through the building in the middle was also widely used.

The size of the courtyard is directly related to the height of the surrounding buildings. If the ratio of the size of the yard area to the height of the buildings surrounding the yard is equal to 1.5-2.0, it becomes possible to provide insolation of the yard area and buildings in all seasons of the year.

The priority factor in the formation of the microclimate, as well as the size of the yard and buildings, is. But the changes in microclimatic indicators are different. The inertia of small yards is higher than that of large ones. According to our observations, during the summer in the yard with an area of 120 square meters, the temperature change indicators will be 5 – 6 degrees higher than in the yard with an area of 60 square meters. While the daily amplitude of the air temperature change in the courtyard with an area of 120 square meters is 15 degrees, the daily amplitude of the air temperature change in the courtyard with an area of 60 square meters is 12 degrees. Here we see the influence of the degree of openness of the yard to the environment on the microclimatic indicator.

Thus, the patio is the main factor affecting the microclimate of a residential building, and is a component that retains sunlight, protecting the dwelling from overheating in summer and protecting it from cold winds in winter.

One of the main reasons for the wide spread of low-rise housing is the possibility of increasing the density of settlement. This possibility is achieved by grouping and blocking residential premises. As a result of blocking and grouping, each house can have its own courtyard or atrium. The simplest type of grouping is a linear form, in which residential premises are placed along the street. Summer rooms are placed on the second floor in the form of a balcony or loggia. In residential buildings built on the basis of such a solution, small courtyards are formed. In low-rise residential buildings of this type, a small open courtyard is organized, which is called the "atrium" or "Green Room". The living rooms are located around the atrium, and the courtyards and living rooms have good functional and design connections. Block apartments are designed as one-and two-storey, and functional zoning is well solved. Residential premises are mainly focused on open courtyard areas with good opportunities for the formation of a microclimate. The design solutions of block apartments allow you to block residential premises in various forms. Thanks to this, the density of development increases and a higher freedom in terms of urban planning is achieved. The area of the open courtyard is 60-100 square meters. The styles of townhouses are oriented to the main street, creating interesting views when one-and two-story townhouses are used.

Single-storey block apartments have become widespread, and their use has its advantages. In residential premises of this type, functional zoning is conveniently organized, directly connected with open courtyards and residential premises that are intensively used. This type of block apartments is organized according to a G-shaped and P-shaped scheme, it is blocked from three and four sides, and each apartment has a separate open courtyard environment.

Two-storey residential buildings occupy less construction space compared to single-storey ones, providing a higher population density. A residential block of this type is arranged at a right angle and in an L-shaped shape. Functional zoning can be organized mainly in a vertical orientation. All living rooms are oriented to the open courtyard, and the rooms on the first floor have a direct connection to the open courtyard.

Since the apartments in the third type of residential buildings are located separately on the floors, the apartment on the first floor has a larger open courtyard and has good functional connections between the living rooms and the open courtyard. The "green room" for the apartment on the second floor is organized in an open form, and all the living rooms on the second floor have good connections with the "green room".

Based on the examples discussed above, it should be noted that in the course of our study, a direct dependence of the volume – spatial and functional solutions of low – rise residential buildings on local natural and climatic conditions was revealed. As a result of our research, it was found that an integrated approach is required when designing and constructing low-rise residential buildings that are being formed in the Samarkand region. From the point of view of urban planning, the current projects do not correspond to the scale of cities, and these projects do not make it possible to effectively use fertile land. It is established that the existing houses typologically do not correspond to the local social, demographic, natural and climatic conditions and lifestyle and national and everyday customs of the general population.

In this regard, when designing low-rise residential buildings, it is necessary to adhere to the following recommendations:

- ✓ When placing low-rise residential buildings, it is necessary to pay attention to the orientation of the streets and the houses located on them;
- ✓ Natural and climatic conditions, i.e. the terrain, landscape, the presence of vegetation, the direction of winds, the presence of water sources, are necessarily taken into account;
- ✓ The density of residential premises, their height and the ratio to the width of the open courtyard, the interaction of side buildings (one building should not shield the other from the sun);
- ✓ When organizing landscaping works in residential premises, it is necessary to select and place plants in such a way that they protect the premises from sunlight in the summer, and in winter they do not interfere with the sun's rays to heat the premises.
- ✓ When designing energy – efficient residential premises, natural and climatic conditions are taken into account as much as possible, houses are correctly placed on the sides of the horizon, the wind direction is most effectively used for natural ventilation, the external structures of the house are selected with the necessary degree of thermal conductivity and cold permeability;
- ✓ The use of solar energy is effective in the conditions of the Samarkand region in residential buildings using renewable energy. Currently, there are various ways to use solar energy: the cheapest and most convenient of them is the accumulation of solar energy in the structures and volumes of houses, more complex are the conversion of solar energy into electrical energy using special devices (solar bridges).

RESULTS AND DISCUSSIONS

An urgent issue is the development of a unified project program for the city and the region using the existing scientific and technical potential for the development of modern projects of medium and multi-storey residential buildings. The main directions of the program will be closely related to the solution of environmental issues in accordance with modern economic and social conditions. Ecology is one of the fundamental sciences of our time, it is connected with all the reforms that are being carried out in our society, and should lead to an improvement of the existing living environment for people.

The program should include two main areas:

- The first direction is related to scientific research and includes scientific research, starting from the natural conditions of the territory of the Samarkand region and ending with demography, geographical environment and climatic indicators, a comprehensive assessment of available resources, district planning and urbanization processes. The scientifically based principles of population demography deserve special attention in this direction. Based on demographic indicators, it becomes possible to optimize the placement of the population in the region and plan the accelerated development of productive forces. Demographic data also leads to the management of migration issues within the region. And all the demographic data allow you to optimally place housing in cities and villages. One of the main issues is the preservation of land that supplies agricultural products that are irrigated and valuable for housing settlements. Taking into account the ecological situation when expanding territories, it is advisable to develop certain restrictions in the development of cities and villages at the expense of fertile lands. Also, within the framework of this direction, it is important to determine the state of available energy resources and develop ways to use methods and technologies for the effective use of renewable energy sources.

- In the second direction, it is necessary to identify and solve environmental problems. The identification of problems allows us to develop scientifically based recommendations for economic and social development. When developing recommendations, it is important to rely on a scientifically based analytical database. For example, when building cities, it will be advisable to solve urban planning issues, taking into account the fact that their surroundings are surrounded by fertile lands. At the same time, the issue of placing residential areas without the use of fertile land remains relevant. As part of the second direction, the issues of increasing the density of residential development on the basis of secondary planning with limited expansion of the territories of cities and villages can be solved. An increase in density can be achieved by revising the layout of buildings, placing new residential buildings on empty and inefficiently used territories and increasing the number of floors of residential buildings. Within this direction, it is necessary to take into account important factors for the construction of socially oriented housing.

Modern principles of the formation of medium-sized and multi-storey residential buildings are closely related to their placement, based on urban planning requirements. At the same time, firstly, it is necessary to take into account the natural conditions when planning residential buildings, and secondly, to take into account the local situation in a particular area of the city and its dependence on the location of buildings around the housing under construction. In architectural and design terms, the definition of the concept in accordance with the main goals in solving buildings in the formation of medium and multi-storey residential buildings, determining the degree of compactness of buildings and finding a common compositional solution are among the main issues. Structurally, to ensure the energy efficiency of buildings, the external structure of their walls, the overall level of glazing in the external walls and the structural solution of the roof are of great importance.

Design and technological solutions limit the extensive development of the urban area, make it necessary to increase the density of development and more efficient use of the existing urban area. This approach, along with improving the operational characteristics of residential premises and creating comfortable conditions for residents living in houses, serves to solve issues of environmental and energy efficiency.

Questions of energy efficiency of residential buildings for the development of the formation of residential buildings corresponding to natural and climatic conditions in the conditions of the city of Samarkand and the region, our study identifies the following areas:

1-ensuring the energy efficiency of residential premises.

2-the use of renewable energy sources in residential premises.

The use of energy lamps in residential premises and increasing their efficiency require the inclusion of interrelated measures in a harmonious system, such as indoor lighting, heating and protection from cold winds in winter and cooling and protection from sunlight in summer. For example, the fact that the living rooms have natural lighting does not mean that the houses are adapted to natural climatic conditions. Simultaneously with the illumination of the internal environment of residential premises with sunlight, there is discomfort in the lighting as a result of blinding from sunlight, and due to excessive irradiation of the internal environment of the room, its thermal state overheats. At the same time, the orientation of living rooms, design patterns of windows, equipment for sun protection and the heating and cooling system of houses are of no small importance.

To ensure the energy efficiency of residential premises, a combination of natural lighting of residential premises with artificial lighting is required. The reduction of energy consumption in residential premises is achieved due to the harmonious strategy of their natural and artificial systems in buildings. The development of such a strategy is directly related to the design solutions of residential buildings. The use of energy-efficient technologies for the use of renewable energy sources in the design solutions of residential buildings in order to ensure energy efficiency with full consideration of local natural and climatic conditions.

Design solutions adapted to natural and climatic conditions bring positive results when applied in combination with theoretical research and existing practice. Our hypothesis is based on metrological indicators and basic physical laws. The practical results were determined on the basis of a survey of residents of a residential building and theoretical observations, a comparison of weather indicators. Natural and climatic conditions allow us to register microclimatic indicators in a typical state and apply them in the design solutions of residential buildings. This circumstance helps to establish the principles of design solutions adapted to natural and climatic conditions, forming an empirical database.

CONCLUSION

Thanks to the technologies of "passive design", it is possible to generate energy from natural sources through architectural and design measures and create comfortable thermal, visual and biologic conditions in residential premises. It is also possible to use "active design" technologies in residential buildings. Active design helps to create a healthy and comfortable environment in residential premises, without having a negative impact on the environment. The active design also uses modern technologies using natural climatic conditions. For example, solar panels or wind turbines are used to generate energy.

Compliance with the following recommendations in the design and volume solutions of your houses when forming residential premises will lead to a satisfactory result:

- The living rooms are mainly oriented to the southern side of the horizon, and the utility rooms are oriented to the north;
- in the internal structure of the apartment, it is necessary to ensure free air circulation in the room from one room to another, since warm air from the room located on the south side spreads throughout the apartment;
- The external structures of houses are used to heat the premises, taking solar energy in winter and converting it into heat;
- The exterior structures of houses should be equipped with equipment that protects them from excessive solar radiation in the summer;
- The internal structures of the house should have the ability to concentrate sunlight, converting it into thermal energy;
- The house must have structures that effectively accumulate heat inside the room, ensuring the penetration of sunlight into the living rooms through windows facing south.

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