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ISSUES AND VIEWPOINTS OF SCIENTIFIC RESEARCH IN THE FIELD OF DESIGNING ENERGY EFFICIENT BUILDINGS IN UZBEKISTAN.

ELENA SCHIPACHEVA[1], RAKHMATULLO PIRMATOV[2], KHABIBULLO PIRMATOV[3], JASUR RASHIDOV4

[1]*Doctor Of Technical Sciences, Tashkent State Transport University, Uzbekistan, Tashkent.*

[2]*Candidate Of Technical Sciencec, Tashkent State Transport University, Uzbekistan, Tashkent.*

[3]*Phd, «Tashkent Institute Of Irrigation And Agricultural Mechanization Engineers » National Research University, Uzbekistan, Tashkent.*

[4] *PhD, Tashkent Institute Of Architecture And Civil Engineering, Uzbekistan, Tashkent*

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Corresponding Author:
ELENA SCHIPACHEVA
Doctor Of Technical Sciences, Tashkent State Transport University Tashkent, Uzbekistan,
Orcid Id:0000-0003-3165-7067

ABSTRACT

This research paper provides the main issues that need to be addressed for the development of a domestic scientific school on the design of energy-efficient buildings and discusses issues pertaining to their widespread introduction in the Republic of Uzbekistan. In addition, this paper presents the results of the scientific research carried in this field at the Tashkent State Transport University.

KEYWORDS: building structures, climate, energy efficiency, thermal protection, mathematical model.

INTRODUCTION

For more than 12 years, the UNDP GEF program has been operating in Uzbekistan to familiarize specialists and the public with the prospects for the development of technologies in the construction industry related to improving the energy efficiency of residential and public buildings. Much has already been done in the field of popularization of this direction, and in the processing of the regulatory framework. Separate social facilities have been thermally renovated, for newly built buildings it has become mandatory to introduce a layer of insulation into the structure of the outer wall and to abandon central heating in favor of an individual boiler, double-glazed windows and plastic frames are used everywhere. However, at the same time, there is a virtual absence in the republican scientific journals, in the materials of conferences of publications related to the development of the domestic scientific school on the design of energy-efficient construction projects. There is very little information about the experimental studies carried out, about the development of new energy-saving external enclosing structures or systems, about the development of extraordinary planning solutions for civil buildings. But our special climatic and economic conditions, and sometimes national traditions, do not provide the desired effect from the use of foreign experience in the design of energy-efficient buildings without its rethinking and significant processing.

METHODS OF RESEARCH.

What questions seem to be the most relevant and require both practical and theoretical solutions?

Firstly, it is necessary to update KMK 2.01.01-94 "Climatic and physical-geological data for design". This is explained by the fact that the energy consumption of buildings, among other things, is influenced by the climatic characteristics of the construction area, the main of which in the calculation of enclosing structures is the degree-day of the heating period. And KMK 2.01.01-94 "Climatic and physical-geological data for design" is based on data from more than 25 years ago, which is unacceptable under the conditions of modern global climate change. The updated climatic parameters will make it possible to clarify the regulatory requirements in Construction heat engineering for the design of energy-efficient buildings and their engineering systems, as well as for the planning of urban and rural settlements.

As part of the ongoing scientific research of the department "Construction of buildings and industrial structures" of the TGTrU, we studied the dynamics of climatic parameters according to weather stations in Uzbekistan in the period from 1975 to 2015, and on the basis of this, a computer program "Construction climatology of Uzbekistan" was developed, which allows calculate all the necessary statistical meteorological parameters, taking into account the latest climate dynamics. It was proposed building-climatic zoning of the territory of Uzbekistan, based on climate, as well as zoning according to the levels of thermal protection for winter and summer (overheating) periods [1]. Particular attention was paid to the study of solar radiation and the correctness of its consideration when considering the formation of the thermal regime of the building [2]. The energy possibilities of the climate were also studied in order to determine the feasibility of using alternative energy sources in construction in various regions of Uzbekistan [3].

Secondly, it is necessary to theoretically and experimentally substantiate the economic feasibility of a significant increase in the calculated resistance to heat transfer of external

ELENA SCHIPACHEVA *Doctor Of Technical Sciences, Tashkent State Transport University Tashkent, Uzbekistan,*

enclosing structures in the climatic conditions of the Republic of Uzbekistan.

In this direction, an extremely small amount of research and experimental work has been carried out in the republic. They are of a one-time nature, and, therefore, their results are not subject to statistical processing and generalization.

Over the past 15 years, we have theoretically studied such issues as the formation of the thermal regime of building premises under the influence of solar radiation [4], the process of formation of the temperature and humidity regime of attic premises [5], the process of heat transfer in multilayer external enclosing structures (in walls and in coating) taking into account solar radiation in the hot climate of Uzbekistan [6]. In addition, a method has been developed for calculating non-stationary temperatures and heat flows in vertical multilayer enclosing structures during the warm season, which makes it possible to determine the thermal stability of enclosures with greater accuracy than according to known dependencies. Mathematical models have been obtained and corresponding computer programs have been developed.

Thirdly, it is necessary to improve the methodology for calculating the reduced resistance to heat transfer for thermally inhomogeneous fences, which are the outer walls of earthquake-resistant civil buildings, which will improve the quality of their design, as well as most accurately determine the required energy consumption for the formation of a favorable microclimate in residential premises.

In foreign countries, a new method for calculating the reduced resistance to heat transfer is becoming more widespread, a distinctive feature of which is the streamlining of accounting for additional heat losses through heat-conducting inclusions. The technique belongs to the category of exact calculation methods. However, its widespread use in design organizations is problematic due to its increased labor intensity and the need to purchase special software. In addition, domestic regulatory documents are still focused on old methods. As a result, most designers traditionally use simplified calculation methods. This leads to systematic errors in the calculations, which, in turn, contribute to an increase in the consumption of thermal energy by buildings. In a number of CIS countries (Russian Federation, Republic of Belarus and Turkmenistan), focusing on advanced foreign experience, a method was adopted for calculating the reduced resistance to heat transfer of an inhomogeneous outer enclosure, based on determining the specific heat loss through heat-conducting inclusions. To ensure the introduction of advanced techniques into domestic design practice, it is necessary to fill the lack of data on specific heat losses for heat-conducting inclusions present in the external enclosing structures of standard series of residential buildings and create appropriate catalogs of "thermal bridges".

Currently, as part of the preparation of a doctoral dissertation, we have begun to conduct similar studies in relation to our projects and to our climatic conditions [7, 16, 17, 18].

Fourthly, it is necessary to work on improving the space-planning solutions for individual and semi-detached residential buildings, as well as apartments in buildings in order to improve the microclimate of the premises (especially in summer) through natural means (organization of intensive ventilation, sun protection, functional division of the apartment, directional movement of heat flows, reduction of the area of external fences, etc.). The solution of this issue makes it possible to develop standard designs of civil buildings that ensure the minimum impact of climate on the formation of indoor air temperature in winter and summer. Based on the national and historical heritage of various regions of the republic, as well as modern

international experience in designing buildings with economical energy consumption, appropriate standard house designs should be developed. In addition, these developments should form the basis of a regulatory document for the design of energy efficient buildings in the territory of the Republic of Uzbekistan.

As part of the research work of students, design proposals were developed for residential buildings and office buildings in different regions of the republic [8, 11, 12], to improve the shape of sun protection covers, depending on the orientation of the light apertures [9].

Fifth, express methods are needed to evaluate the thermal properties of various building materials that appear on the domestic market. In most cases, designers have to trust the information provided by the manufacturer. However, there is a certain risk in this, and, unfortunately, it can be quite difficult to conduct full-fledged studies.

Currently, the department is working on a detailed study of the formation of the structure of cellular concrete, the development of a method for its assessment and methods of directed structure formation, the development of an express method for assessing thermal conductivity for cellular concrete has been completed [10].

CONCLUSION

These are the issues that lie on the surface, and the solution of which will contribute to the development of the national school of designing energy-efficient facilities on the territory of the Republic of Uzbekistan. An increase in the number of theoretical and experimental studies is a guarantee that the newly developed regulatory documents will be based not only on the analysis of foreign information sources, but also on the results of scientific research carried out in relation to the specific conditions of the Republic of Uzbekistan. The constructed buildings will ensure the planned saving of energy resources to maintain a favorable microclimate of the premises.

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