

## EFFECTIVENESS OF USING LOCAL HEAT PROTECTION MATERIALS IN RURAL HOUSES OF KARAKALPAKSTAN

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***Annotation.** This article provides information on energy-efficient heating options for rural houses. In particular, detailed information and recommendations for calculating the energy consumption of low-rise buildings built by the local population in the villages of the Republic of Karakalpakstan are given.*

***Key words:** country houses, energy saving, construction, brick, heat capacity, wheat straw.*

There is a shortage of fuel and electricity in some regions of our republic, especially in villages. Therefore, our government has developed a program designed to solve energy supply problems within five years starting from 2020. It is planned to increase the production of natural gas by 1.2 times.

There is also an affordable alternative way of solving the problem of energy scarcity for the rural population that conserves non-renewable fuel sources. This is to reduce the energy used for heating by using heat protection devices in rural areas in those energy-deficient areas. Currently, more than 90% of the rural population lives in self-built houses without any energy-saving measures, and the implementation of large-scale energy-saving measures in them can save large amounts of fuel and electricity. Naturally, energy-saving methods should be affordable and easy to build.

The construction of buildings and facilities in the Republic of Karakalpakstan was built and formed with attention to the climatic conditions of that region [1]. Winter is much colder than other regions of Uzbekistan, for example, the winter cold index for

Tashkent city is 2450 degree-days, the coldest region of Karakalpakstan is 4045 in Karakalpakstan, and the hottest region is 3250 in Nukus. That is, 40% and 25% cooler, respectively.

In the construction of rural houses, special attention is paid to the design of the house and the solution of external wall structures to protect it from the winter season and heat. At the same time, insufficient attention was paid to the orientation of the buildings when placing them on the plot of land.

Currently, most of the houses in the villages of the Republic of Karakalpakstan are built from local materials - raw brick, thatch, wooden planks and brick. The main part of the houses is 65-70% raw brick. Individually built rural houses are mostly one-story, compact, rectangular in design, living and auxiliary rooms are arranged in two rows, and effective energy-saving measures are not used.

This article aims to determine the amount of heat energy used for heating and natural ventilation and the effectiveness of reducing this energy consumption using established norms and other acceptable methods, on the example of houses with different architectural and constructive solutions built in the villages of Nukus district. Prospects of using cheap local materials have been considered in order to ensure that the measures used are within the means of the population. The calculations are aimed at calculating the energy consumption of a one-story 6-room brick house (table 1) and a one-story 5-room brick house (lime-sand plastered) (table 2).

According to QMQ 2.01.04-97\* "Construction thermal engineering", it is envisaged to apply thermal protection of the II degree to residential buildings [3]. However, if based on the research, conclusions of foreign experts and the results of the design work of the TAQI master's course on "Design of Energy-Efficient Buildings", unlike the requirement of QMQ, the use of III or higher level energy protection methods for residential buildings can be an economically effective solution. For example, increasing the thickness of the thermal protection layer from 50 mm to 100 mm when increasing the energy efficiency of walls leads to an increase in total costs by 8-10%, while this measure leads to a decrease in the energy used for

heating the house by 16-18%. Therefore, level III thermal protection is more effective than level II. The obtained results correspond to the results of foreign experts in many respects.

The practical project OT-A14-15 "Application of energy-saving technologies based on the use of local construction materials without increasing their price" was completed in 2017-18 by the scientists of the Tashkent Institute of Architecture and Construction on the basis of a state grant. In order to carry out the theoretical and experimental scientific work envisaged within the framework of the project, an experimental house was built from local materials widely used in villages in Zangota district of Tashkent region. As a result of four years of continuous experience from 2017 to now, it has been shown that wheat straw can be used in rural houses, which is not less efficient than modern energy-saving materials. Applying this technology to existing country houses can save a lot of energy. In this article, as an effective solution, the application of a 150 mm thick layer of thatch in existing rural houses is considered.

In order to compare the calculation results, all calculations were taken for the climatic conditions of the city of Nukus. The heating period is 143 days, the average outdoor air temperature during the heating period is  $-0.6\text{ }^{\circ}\text{C}$ , the average room temperature is  $+20\text{ }^{\circ}\text{C}$ .

The energy used for heating and natural ventilation of buildings is required to be no more than  $150\text{ W/m}^2$  according to the regulations for a one-story country house for conditions above 3000 degrees - day [2]. Nukus sh. For the external temperature according to "B" parameters is equal to  $-200\text{C}$ [1]. Nukus sh. for the annual specific heat consumption is  $[150:(20-(-20))\times[20-(-0.6)]\times24\times143=265\text{ kWh/m}^2\text{ year}$ .

The use of ordinary wheat straw as an energy protection material is close to the results of the use of thermal protection of the III degree, giving the opportunity to reduce energy consumption by 48%. The conducted research shows that the use of energy-saving measures in residential buildings built individually from local materials in the territory of the Republic of Karakalpakstan, depending on their design and

constructive solution and current condition, allows to reduce the fuel used for heating by 30-50%.

These constructive solutions are proposed to be used and widely used in country houses.

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