INCREASE THE LEVEL OF HEAT PROTECTION IN THE CURRENT RESTORATION OF EXISTING MULTI-STOREY RESIDENTIAL BUILDINGS

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Abstract: This article outlines the development of effective ways to apply energy efficiency measures to current and capital repairs of existing residential buildings. Reducing the associated energy consumption while maintaining comfortable conditions in buildings are conflicting objectives and represent a typical optimization problem that requires intelligent system design.[13]

Key words: Energy efficiency, energy conservation, construction, electricity, current and overhaul, heat protection, energy performance, thermal comfort.

Introduction. Current renovation is a set of measures aimed at maintaining the internal characteristics of the building during the use of the building. In this case, it is determined taking into account the building characteristics of the building, its technical condition and the period of use of the building. According to analyzes, existing high-rise residential buildings lose their initial state over the years, that is, energy efficiency decreases during wear and tear. This is followed by cold temperatures in the winter and hot weather in the summer months. As a result of monitoring houses, we were convinced that this will become a serious problem not only for the owners of apartments, but also for the economy of our homeland. Because houses are artificially cooled, heated by natural gas, or electricity consumption.

The main reason for the energy deficit of existing buildings is that over time, the characteristics of the building decrease, which means that the building does not meet the requirements of energy efficiency. Excess energy losses are usually explained by the following:

- the introduction of changes in the process of long-term use of buildings by the owners of the premises, contrary to the solution of mudflat, which violates the Hermeticism of the building;

- due to the use of outdated equipment, the failure to meet modern requirements of the thermal-protective properties of materials used in the process of reforming and building construction;

- low efficiency of heating and air conditioning systems;

- the obsolescence of engineering communications, as well as the abundance of the share of previously built buildings that do not meet modern requirements of energy efficiency in terms of its technical indicators.

In order to prevent this, it is necessary to carry out the energy-efficient work of the premises. In this case, it is necessary to check and take into account not only the condition of the building, but also its energy efficiency state during the General Technical Examinations, which are held mainly twice a year in spring and autumn. Because now the amount of multi-storey houses in our Republic is 35 thousand, most of them consist of large-panel houses. They do not meet the current modern energy conservation requirements. In halting this problem, it is extremely important and relevant, first of all, to apply effective methods of saving energy in the process of current and overhaul of existing multi-storey residential buildings.

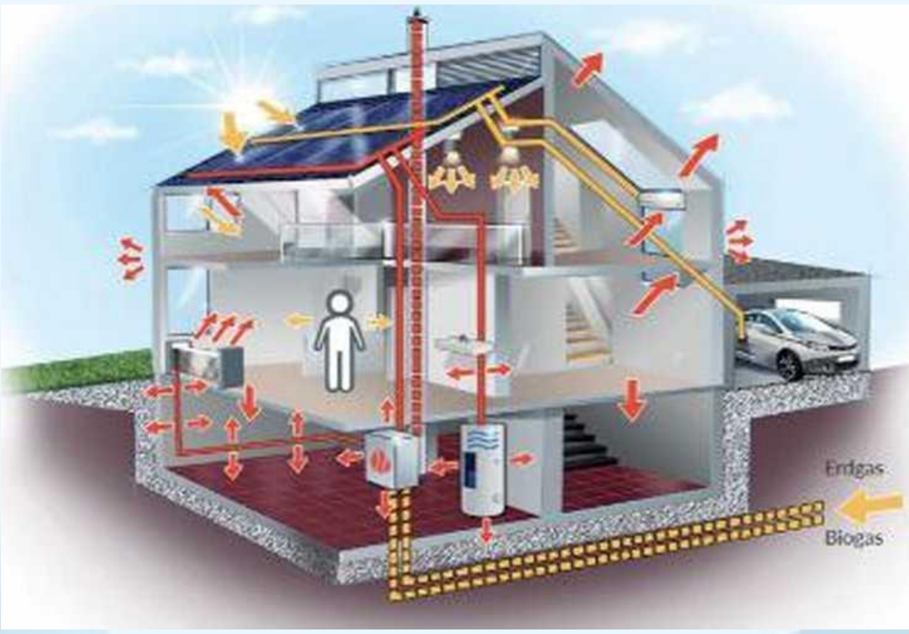
Materials and Methods. Scientific research aimed at the effective use of fuel and energy resources by buildings, improving and assessing their energy efficiency is one of the very priorities in the world. Long-term national energy programs of developed countries provide for a reduction in energy consumption by at least 20%. According to the" International Energy Agency", 31% or 2890 million tons of final energy consumption is due to the buildings. For some countries, this figure is 30 - 40%. In this regard, the development of building management systems and monitoring energy consumption, the introduction of technologies to improve their energy efficiency are in great demand in world practice.

In the world, special attention is paid to determining the energy efficiency of public and other types of buildings, developing methods for monitoring and analyzing the energy consumption of buildings, creating energy-saving technical means and technologies. The implementation of targeted research in this direction, in particular, the development of methods for assessing and comparative analysis of energy consumption of various types of buildings, the development of energy-saving means for modeling, forecasting and monitoring systems of energy consumption, the development of energy-saving means for ensuring indicators of internal climate, is one of the important requirements for improving the

In our republic, a number of measures are being implemented to assess and improve the energy efficiency of residential and public buildings, the standards of energy efficiency indicators of buildings are being revised, energy-saving technologies are being widely introduced.

Scientific research aimed at the development of energy consumption monitoring systems, energy efficiency assessment and energy-saving technologies is carried out in many of the world's leading higher educational institutions, in particular, the California Institute for Energy and Environment, University of California (USA), University of Cambridge (England), Universiteit Gent (Belgium), Riga Technical University (Latvia), Moscow Energy Institute (Russia).

Research on the development of energy consumption monitoring systems, energy efficiency assessment, the creation of energy-saving technologies on a global scale has solved a number of tasks and achieved the following important scientific results: the Xbos Consumer Energy Management System (California Institute for Energy



and Environment, C1EE, AKS1) has been developed; methods and models of analysis for the introduction of renewable; B. to study the influence of factors on energy consumption.developed bem System(University of Cambridge, England); developed e-Cube zero energy consumption construction project (Universiteit Gent, Belgium); developed an integrated approach to improving the energy efficiency of the building (Riga Technical University, Latvia); developed information and analysis system "accounting and control of energy consumption" (Moscow Energy Institute, Russia); developed building energy management system (Tashkent State Technical University, Uzbekistan); A system for measuring and analyzing energy consumption has been developed in the Republic, Region, District and organizations (LLC"scientific and Technical Center", Uzbekistan).

In the world, scientific research on improving methods for modeling and evaluating energy consumption of buildings, developing energy-saving technical means and technologies is carried out in the following priority areas: development of methods for assessing energy consumption; development of methods for monitoring energy consumption; automation of energy monitoring; energy-saving means for ensuring internal climatic indicators of buildings; development of construction projects with zero energy; development of construction systems based on renewable energy sources.

Result and Discussion. A number of measures are being implemented in our republic to assess and improve the energy efficiency of residential and public buildings, standards for building energy efficiency indicators are being revised, and energy-saving technologies are being widely introduced [1]. The Action Strategy for the Further Development of the Republic of Uzbekistan for 2017-2021 defines the tasks of "...reducing the energy intensity and resource intensity of the economy, widespread introduction of energy-saving technologies into production, expanding the use of renewable energy sources, increasing labor productivity in economic sectors, implementing these provisions, including determining energy efficiency indicators both at the system level and at the level of individual object, development of methodology, methods, algorithms and software tools for monitoring and analyzing energy consumption are very relevant and are considered one of the most important tasks.

Saving energy resources is impossible without obtaining the necessary information about where and how they are spent. Without detailed accounting and collection of information on the consumption of energy resources, it is impossible to control and organize their effective use. Therefore, one of the main directions in the field of energy saving and improving the energy efficiency of buildings is the organization of accounting for consumed energy resources, as well as the collection and analysis of these data [2]. At the same time, such systems of accounting, collection and analysis of energy consumption data are an integral part of the overall energy management system of management facilities.

Unlike from the initial moment of construction of an apartment building, its current actual condition is characterized by an excess amount of energy loss due to a violation of the design tightness of the building. Below, the article examines the impact of the leak-tightness of an unheated stairwell and the tightness of antisysmic seams on the level and structure of energy consumption by the building.

The methodology presented in the document for energy calculations is based on EN standards – mainly ISO 13790:2008, EN 15 316-x-x and other supporting standards and documents [3, 4].

This methodology is compiled according to the quasi-stationary state method (described in the EN ISO 13790 standard), which calculates the thermal balance with a calculated step of one month, which allows you to take into account the dynamic effect using the utilization coefficient, which is determined empirically.

And the importance of the energy-saving measures taken in the process of current repairs. The object of the study was the Object of the study: A large-panel 4-storey 72-apartment residential building No. 42 in Chilanzar district, 19th quarter of Tashkent. Temperature measurements during the period of abnormal cold from January 10 to January 24, 2023. the average temperature value for 14 days, which according to ISO comply with international rules for energy monitoring of buildings.

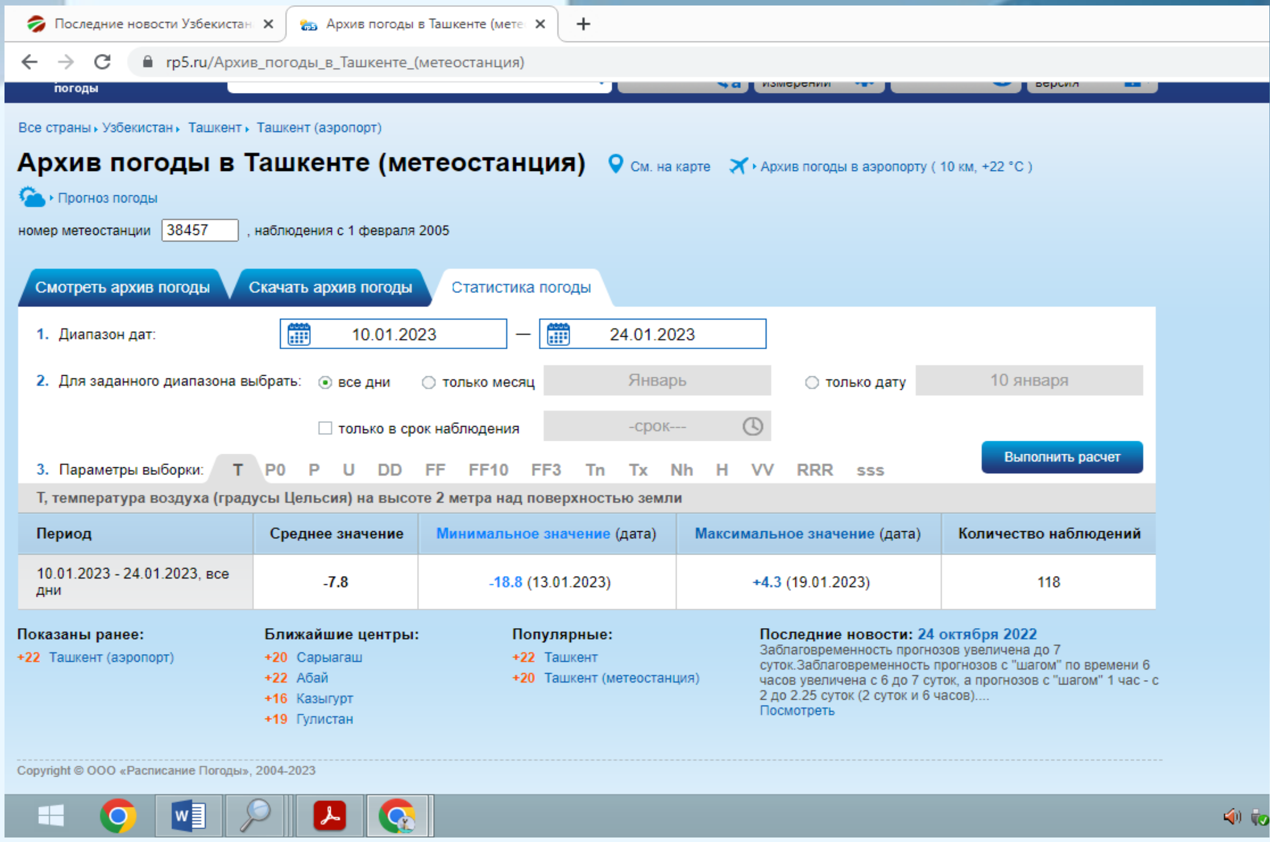


Fig. 1. Weather statistics during the period of abnormal cold from January 10 to January 24 with an average temperature of 7.8^0 C.

Fig. 2. The actual condition of the building at the time of the experiment.

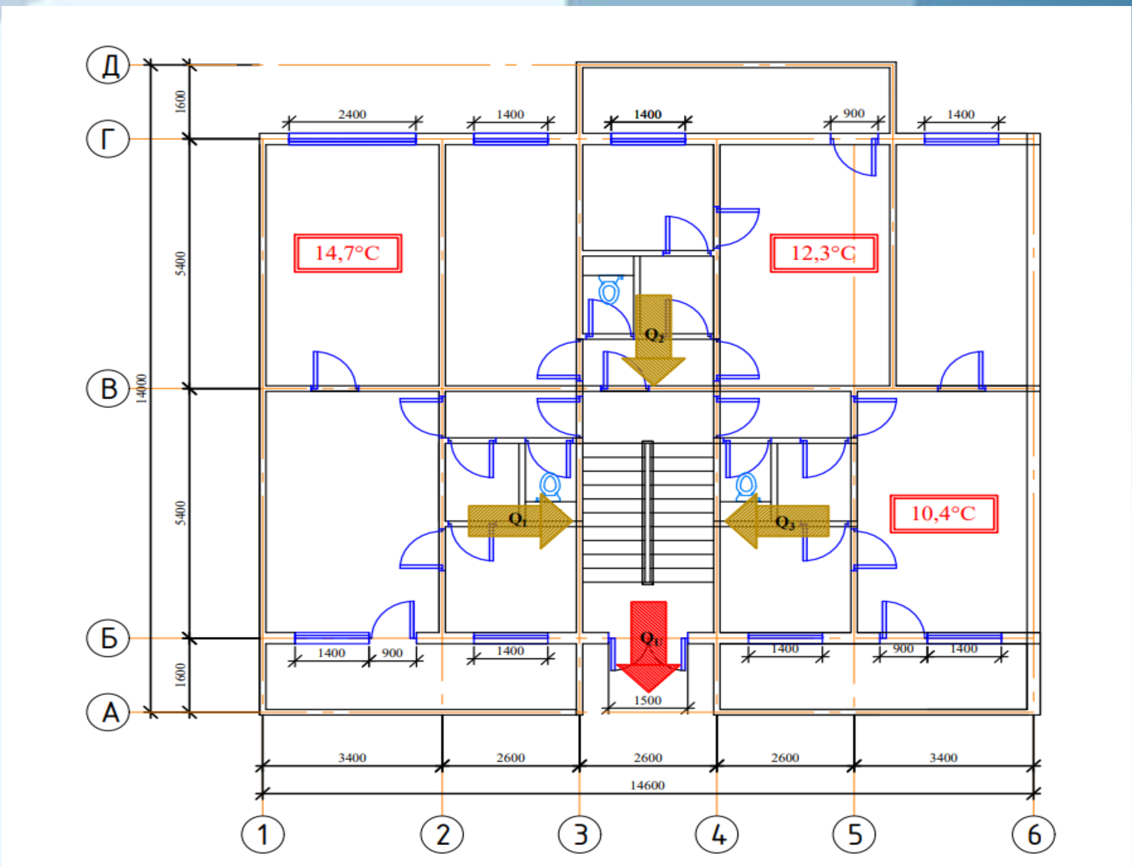


Fig. 3. Average temperature values and heat fluxes during the period of energy monitoring.

Heat flows Calculated heat losses through unprotected hermetic non-enclosed stairwells amount to 2295.9 Wh/°C, which occupies the 2nd place in the overall structure of heat losses of the calculated apartment. Therefore, the importance of sealing the stairwell is of paramount importance compared to increasing the thermal protection of the walls [5,6].

The second area of research is to study the effect of violation of the design tightness of seismic seams on heat loss through these seams and their importance in choosing priorities for energy-saving measures when performing routine repairs.

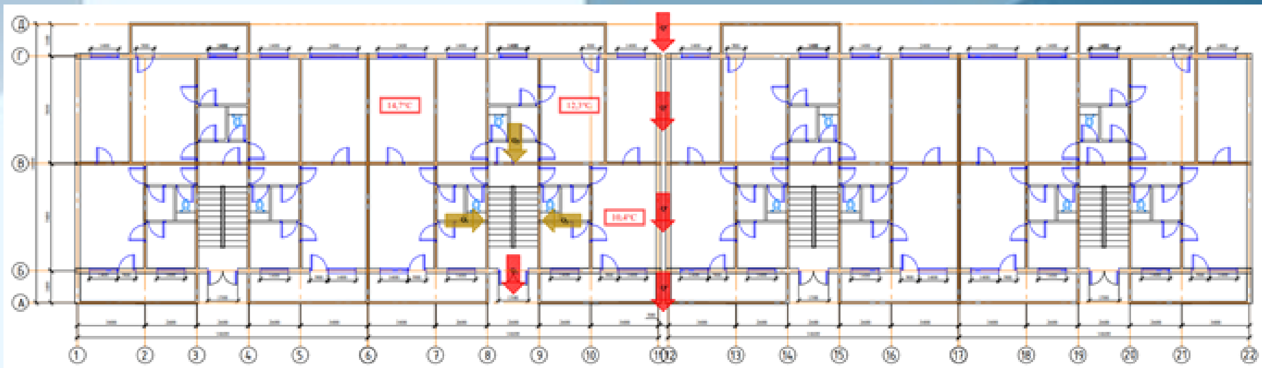


Fig. 4. Thermal losses occurring through hermetically unprotected seismic seams.

During the long-term operation of a building, the tightness of seismic seams is often violated.

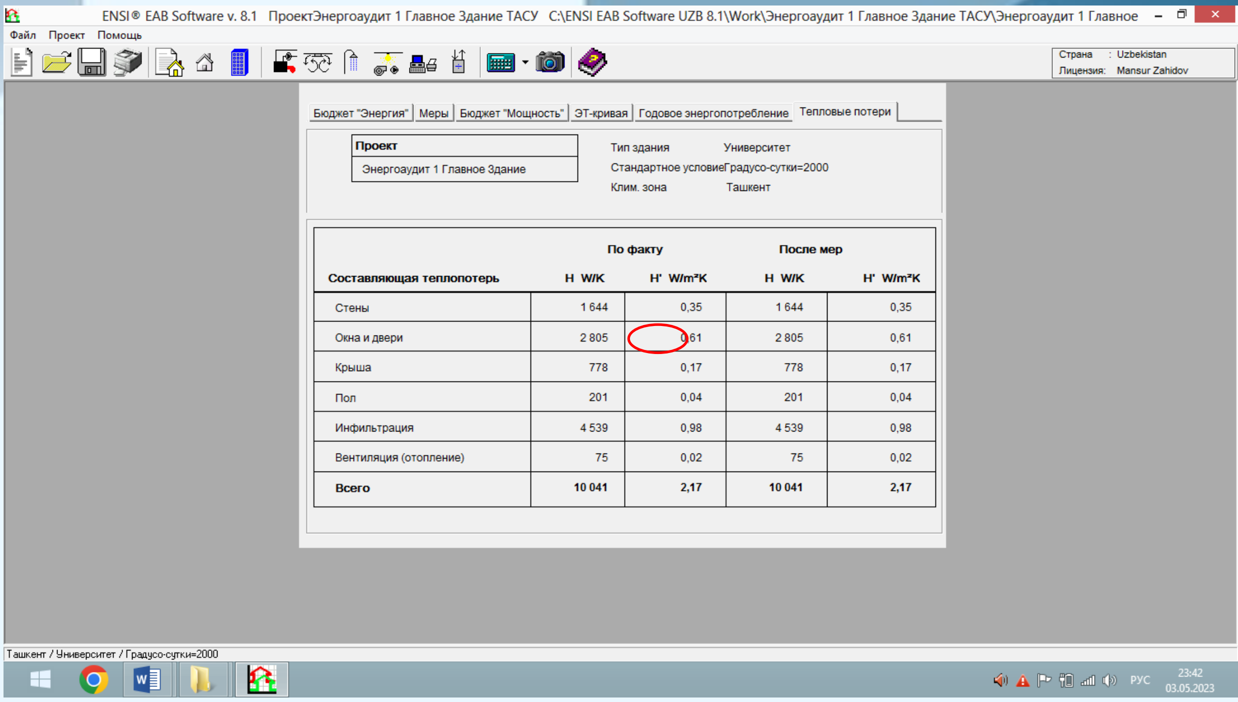
With a normal arrangement of seismic seams, the air temperature of the seismic seam is equal to the average value of adjacent rooms. And a through violation leads to a decrease in the air temperature in the seismic seam closer to the outside air temperature by several 3-5 degrees exceeding its value.

The walls of the seismic seams, as well as the internal load-bearing walls, are made of heavy reinforced concrete with a thickness of 140 mm. In case of abnormal cold and with a maximum through breach of the tightness of the seismic seam, heat losses may amount to:

$$\mathbf{R = R_{в} + \delta/\lambda + R_{н} = 0.115 + 0.14/1.92 + 0.043 = 0{,}125\ м2\ {}^{0}C/\ Вт.}$$

Heat loss through the area of paired seismic walls is equal to:

$$\mathbf{Q = 2x[(5{,}4+5{,}4)x13{,}0]/0{,}125(14.7-5.0)24x131 = 113184{,}0\ кВт\ ч/год.}$$



Составляющая теплопотерь	По факту H W/K	По факту H' W/m²K	После мер H W/K	После мер H' W/m²K
Стены	1 644	0,35	1 644	0,35
Окна и двери	2 805	0,61	2 805	0,61
Крыша	778	0,17	778	0,17
Пол	201	0,04	201	0,04
Инфильтрация	4 539	0,98	4 539	0,98
Вентиляция (отопление)	75	0,02	75	0,02
Всего	**10 041**	**2,17**	**10 041**	**2,17**

The heat loss through all the walls of the building is:

1644 Вт/К x 20 x 24 x 131= =103 374,7 кВт ч/м2 год [7,8].

With a through breach of the tightness of the seismic seam, heat loss through the seismic seam is almost equivalent to heat loss through all the walls of the building.

Conclusions. The renovation of existing houses in accordance with the requirements of "Building standards and rules" 2.04.01-18 will not lead to the desired result of energy savings, since most of the energy in its current actual condition is lost due to the loss of the design tightness of the building.

In apartment buildings of large-panel construction, first of all, during current repairs, it is necessary to include work aimed at restoring the design tightness of the building shell. Namely, the work aimed at restoring the design tightness of the stairwell and the seismic seams between the individual compartments of the building.

The next stage of the current repair project should include works that significantly reduce energy consumption for heating at minimal cost.

In abnormal cold, the air temperature in houses with the loss of the design tightness of the stairwell and a through breach of the tightness of the seismic seam quickly descends and reaches values of 10-12 ^{0}C, creating thermal discomfort for residents of an apartment building.

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