

Thermal insulation of facades is achieved through comprehensive measures. Here it is necessary to consider and heat-conducting properties of finishing materials, and additional thermal insulation, used under the cladding, if any is present, and the material the house is built of. There are many ways to line the facades, which are designed not only protect the walls of the building from weather disasters, but also ensure the attractive appearance of it. Materials play a key role in any technology for decorating facades. Today, three main trends are used in external decorating of buildings, namely various front panels, plasters, tile or stone.

It is these options are used for finishing the facade of the building; they will not only enable to decorate it, but also become a reliable protection against natural aggressors.

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MATHEMATICAL MODELING OF THERMAL EFFICIENCY OF THE BUILDING ENVELOPE ISOLATION WITH ACCOUNT FOR THE ACTUAL CONDITION

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In contrast to studying the thermal state of the buildings that undergo general thermal modernization, studying thermal processes that occur due to partial insulation of the enclosing structures is not extensive. This is proved by the results of the search for scientific developments on this topic in scientific databases. In a number of the analyzed articles the following terms can be found: “individual insulation”, “patch insulation”, “partial insulation”, “fragmentary insulation”, “non-systemic insulation” and “uncontrolled insulation”.

Currently, the official regulations of Ukraine do not reflect the problem that has arisen in housing and communal services, namely, the individual insulation of the external walls of the apartment buildings within individual apartments. However, national scientists have repeatedly stressed the inadmissibility of such actions.

After analyzing the actual condition of the building envelope of the residential buildings, the residents of which are consumers of KP Lozova “Teploenergo” (44 houses), it was found that the percentage of individual insulation (performed by the residents within their own apartments) of the external walls of the apartment buildings ranges from 0% to 16.3% of the total area of the outer surface of the external walls. According to the statistical method "median", the average value of the individual insulation for these buildings for 2019 is 4.4%. Due to the absence of the controlling mechanisms over this process at the state and local levels, there will be a tendency to increase the rate of individual insulation. Thus, there is a need to define the process of individual insulation as an integral element of the current state of housing and communal services of Ukraine.

Individual insulation is a complex of non-systemic measures taken by the residents of the apartment buildings and aimed at reducing the heat loss from the premises when heating is turned on.

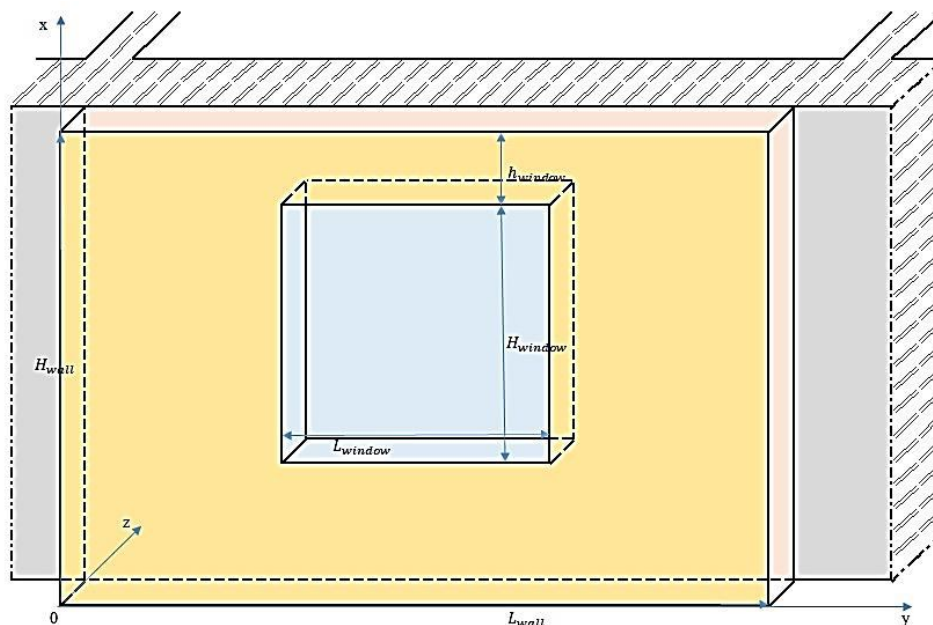


Fig.1 – Construction of the external wall with a fragment of partial insulation

The purpose of this study is to determine the heat flux through a fragment of the external wall of a residential apartment building having a layer of insulation. In the case shown in Figure 1, the heat flux is distributed not only across the envelope, but also along in the horizontal and vertical directions, and, therefore, there is a need to build a three-dimensional mathematical model.

A mathematical modeling of a partially insulated wall of an enclosing structure with determination of the heat flux was carried out by solving a three-dimensional differential equation of thermal conductivity with the task of boundary conditions of the II, III and IV kind and distribution of the characteristics of the layer of the building structures and insulation. Fig. 2 shows

the result of researching the enclosing structure of the room with a window having an insulating glass unit (blue colour). Two variants of calculation were carried out: for the cases when all the adjacent premises are insulated (Fig. 2 a), and when only the wall under consideration is insulated (Fig. 2 b).

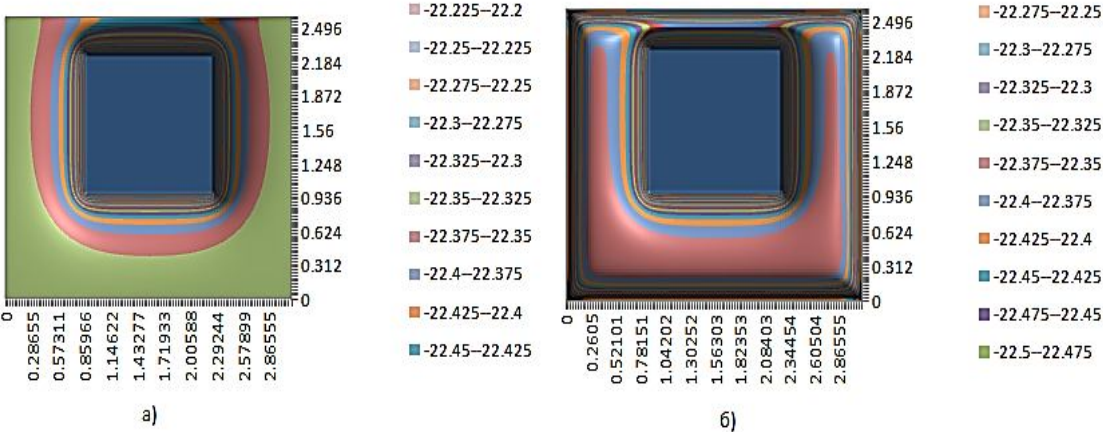


Fig.2. Results of modeling for the temperature distribution

As a result, the increase of heat flow through the wall in the option **b** compared to the option **a** is 11%, and in comparison with the one-dimensional calculation (without regard to the insulating glass unit) it is twice a large.

In the future, according to the previously considered methodology, the redistribution of the internal temperature in the premises of the building and the thermal efficiency of the entire enclosing structure will be calculated.

**DEVELOPMENT AND IMPLEMENTATION METHODS
MULTICRITERIA EVALUATION OF EFFICIENCY ENERGY SAVING
ACTIVITIES IN THE FIELD OF HEAT SUPPLY**

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In recent years a significant number of cities in Ukraine have joined the Covenant of Mayors on Climate and Energy, which provides for the holding municipal authorities measures to significantly reduce greenhouse gas emissions by 30% by 2030 [1]. Achieving this result requires a new strategy for the use and development of the municipal energy system, which envisages increasing the environmental safety of boiler plants and thermal power plants through the introduction of innovative high-efficiency energy-saving, environmental and economically sound technologies [2].