MICROCLIMATE CAPABILITIES OF RESIDENTIAL BUILDINGS PRODUCE ENERGY SAVINGS

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https://doi.org/10.5281/zenodo.7807635

Annotation: This article describes the thermal regime, climate parameters, microclimate indicators from the main indicators in the design of residential buildings, the installation of the outer wall insulation layer to increase the energy efficiency of buildings, effective heat materials, the calculation of the amount of heat consumed through external barriers.
Key words: microclimate, thermal insulation, climatic parameters, construction, project, wall, barrier structures, energy efficiency.

Each region of the Republic of Uzbekistan has its own climatic conditions. The northern parts of our republic - the regions of the Republic of Karakalpakstan and the Khorezm region have their own sharply changing climatic conditions, that is, they are distinguished from other regions by the fact that summer months are very hot and winter days are very cold.

Therefore, it is necessary to develop projects of residential buildings for each region based on the conditions of this region.

The formation of the thermal regime and, accordingly, the energy status of the house (energy costs to ensure the required thermal regime) is provided by the use of its thermal insulation materials. The choice of parameters of the heating subsystem depends on the characteristics of this energy subsystem.

Considering that the mathematical model of the thermal regime of the house is divided into three interrelated sub-models as a single thermal energy system, we can write as follows:

$h = p_1 \bullet p_2 \bullet p_3$

Here p_1 - heat and power efficiency indicator of optimal consideration of the influence of the external climate on the building;

p_2 - indicator of energy efficiency in optimal selection of heat and sun protection properties of external building envelopes;

p_3 - indicator of energy efficiency in optimal selection of microclimate systems.

1. Exterior building envelopes are light shielding (walls, lids, floors) and transparent (filling light openings).

2. Determining the optimal thermal performance of opaque coating designs was developed based on the generality of the requirements for them [1].

Provision of buildings with the necessary microclimate
directly related to the architectural solution, the compactness of the house project, the size of the windows and the ratio of their surface to the total building facade, types of residential buildings, the width of the building body, etc. depends on

Microclimate is a combination of room heat exchange and environmental factors affecting human health.

Microclimate is determined by a number of parameters, and the main ones are as follows:

❖ air temperature. This parameter is one of the most important and visible parameters. When entering a room whose temperature is several degrees different from the usual one, a person immediately feels discomfort. This parameter is normalized by room types, a deviation of +/- 2 degrees is allowed, for compliance with the requirements, measurements are made in the center of the room at a height of one meter from the floor;
❖ relative air humidity can have large changes in values, but should not exceed the norm from 40% to 60%;
❖ air speed should be 0.1-0.5 m/s;
❖ surface temperature.
❖ 2.01.01-22 urban planning norms and rules, climate parameters are defined as follows:
❖ repetitive. The ratio between the number of cases containing values in a given range and the total number of cases in the series;
❖ security. Recurrence of climate parameter values below or above their specified limits.

Hourly, daily, monthly, and annual supplies differ depending on which of the parameter values recorded by selecting a day, month, or year represents a case.
For example, the method for calculating the temperature of the coldest air stream with an annual supply equal to 0.93 is as follows:
a) determination of the coldest days of the year and the average temperature of the air every day during the observation period of n years;
b) the selected temperature values, that is, the order number is given in the indicators, and these values are arranged in a decreasing (decreasing) manner;
c) the air temperature indicator is rounded up to 0.50 C, the average order number is determined for each temperature indicator - chimney;
g) availability R for each temperature indicator is determined by the following formula:
$P=1-m_{av}-0,3n+0,4$
d) a probability grid (normal or lognormal) graph is drawn. Here, the ordinate axis represents temperature, and the abscissa axis represents supply. This graph will consist of a straight line;
e) from the graph of availability equal to the value of 0.98 and includes the stages of obtaining the desired temperature value [2].
In the design of buildings and structures, the following should be taken into account in order to reduce heat loss in the cold season and heat input in the hot season:
a) volume-planning solutions, in which external barrier constructions have the smallest surface, rooms with higher heat and humidity should be located on the side of the internal walls of the building;
b) rational use of effective heat insulating materials with a heat transfer coefficient not exceeding 0.1 W/ (m·0S);
c) the area of light intervals, in which it must correspond to the minimum value of the standard size of the natural illumination coefficient;
g) the protection of the light spaces by solar protection devices, in which the standard value of their heat transfer coefficient should ensure the unopposed entry of solar energy in the cold season of the year;
d) reliable sealing of joints and seams in external walls and roofs during their use [3].
Estimated heat consumption for heating and ventilation of the building being designed, as well as calculated cooling consumption for air conditioning and cooling, must comply with the normative values specified in QMQ 2.01.18-18.

In order to mitigate the negative effects of climate factors, various urban planning schemes are used and some of them are shown in the figure below (Figure 1).

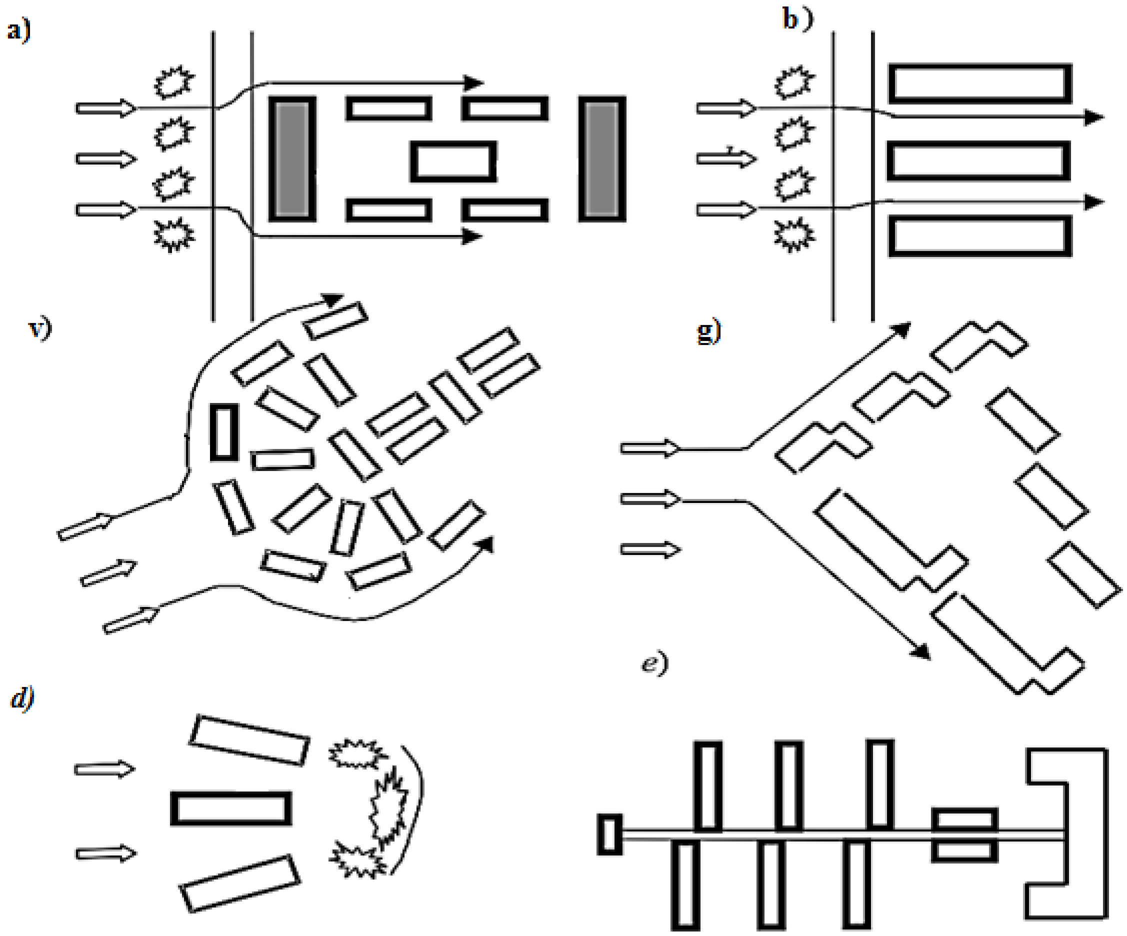

Figure 1. Methods of construction of urban areas for different climatic conditions: a) construction of a perimeter building in conditions of repetition of the weather with the transfer of measured particles; b) construction of a perimeter building of a simplified form by high-speed prevailing winds; c) construction of an open building with the transverse side of the building facing the stormy winds; g) construction of wind protection building; d) a plan that activates wind speed in hot climates; e) residential buildings with hot passages

The external air climate has a great influence on the exterior dimensional and planning solutions of buildings. The width of civil buildings heated for 9 months of the year is larger than the width of buildings designed in a temperate climate in order to save the amount of heat consumed. In the design of public and residential buildings in regions with a very cold climate, bay windows, loggias and balconies are not kept in the fall. In industrial buildings, the height of prolets is made the same, and lanterns providing light are rarely used.

The main microclimate indicators in building rooms include the following:

a) temperature on the surfaces of the external barrier structure and the main parts of the room;

b) air humidity in the room;

c) sanitary-hygienic condition (quality) of air in the room;

g) aggressiveness or progressiveness of indoor air environment in relation to closed structures [4].

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Aggressiveness or progressiveness of the air environment in relation to external barrier constructions depends not only on the presence or absence of chemical compounds in the air, but also on the temperature and humidity of the air environment.

Constructions that separate and demarcate rooms from the outside environment are of great importance in creating a microclimate in the rooms. Climate indicators that are important for human activity in rooms include the average temperature of the room air and its fluctuation during a day, the average temperature of the inner surface of all barrier structures, and the humidity and hygienic condition of the air in the room (Fig. 2).

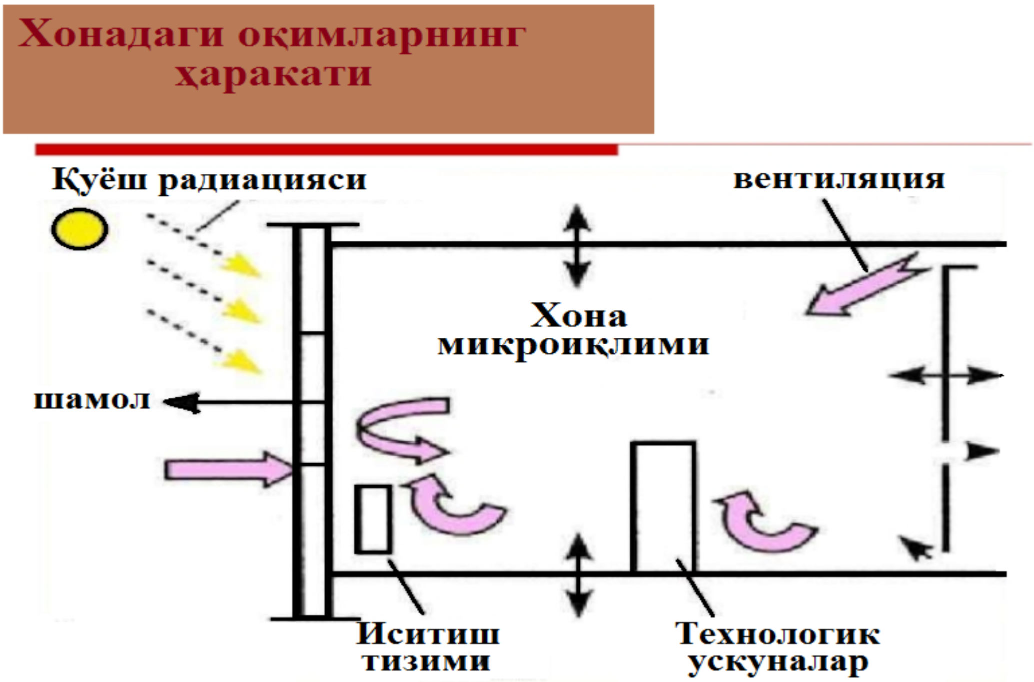

Figure 2. The movement of currents in the room

Since the set of microclimatic indicators of the rooms of residential buildings depends on various factors (season, time of day, type of building, orientation of the building in relation to sunlight, etc.), they can constantly change.

Taking into account the wind loads in low-rise buildings, it is appropriate in the urban planning decision to install residential buildings with a decrease in their floors on the side that protects wind-resistant residential buildings from the wind, which ensures thermal protection of wind-resistant houses. The use of the urban planning method of "closed" courtyards to protect against wind, highways and street noise leads to heat savings [5].

Excessive temperature increase under the influence of sunlight and cooling in the evenings are felt as discomfort. The cause of the phenomenon in both cases is the result of the process of heat exchange through external structures. In the summer, the structure does not accumulate heat when heating the air in the room.

As a planning solution that improves living comfort and allows you to keep heat in the room, we can recommend reasonable proportions of the length and width of the room. It was found that the ability of a rectangular room to resist external heat is reduced by half compared to a deep room. In an expanded (large area) room, the temperature regime and especially the radiation will improve, but at the same time natural lighting and ventilation will deteriorate. Therefore, the appropriate ratio of the depth and width of the rooms of the building can be taken in the range of 1.4-1.6. With this ratio, the temperature regime of the rooms will be more stable.

When studying the effect of low temperature during night sleep on the human body, scientists proved that it is possible to lower the air temperature to 14-15°C [6]. Such temperature control is carried out by introducing room-specific control of heat input to heating devices.

To increase the thermal efficiency of residential buildings, it is recommended to use architectural styles such as the orientation of the building to the root areas, taking into account the dominant direction of the cold wind, the maximum glazing of the southern facades, and the minimum glazing of the northern facades. In the construction of low-rise housing, the specified methods of design and planning should be used. The specified construction techniques and planning solutions should be used in the construction of low-rise housing.

How much the building loses heat depends on the structural structure of the external barriers and what material they are made of, the density of the material and other parameters. Some materials (brick, stone materials) transfer heat more than organic and other polymer materials (wood, polystyrene, felt, asbestos). This difference depends on the type of external barrier constructions, material density, humidity, thermal conductivity and heat transfer coefficient, and the difference between external and internal air temperatures.

Basalt insulation is currently used for thermal insulation of almost all structures, and is also used as a means of fire protection. It is mainly used as heat and sound insulation of walls, roofs, partitions, curtain walls, etc. The installation of the basalt insulation layer on the walls is shown in the figure below (Fig. 3).

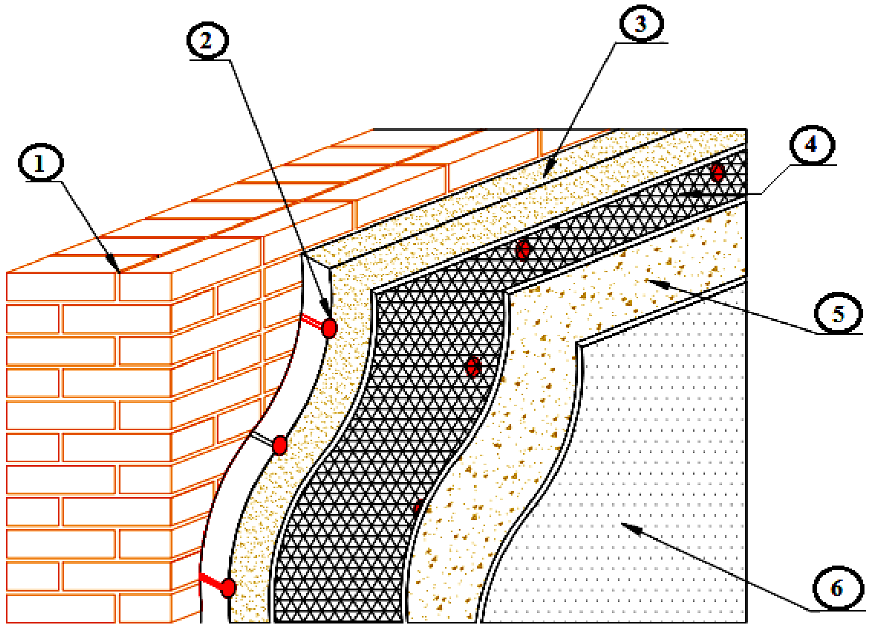

Figure 3. Installation of insulation layer on the outer wall

1-400 mm thick wall; 2- Special hardening dowel nail, step 500×500 mm; 3- 50 mm thick basalt layer; 4- metal string for special basalt coating; 5- 10mm thick layer of calcareous sand; 6- travertine.

Dolomite and marls from basalt, granite, diabase, diorite, trachyte and other volcanic rocks serve as raw materials for mineral cotton and thermal insulation materials based on it.

2.01.04-2018 urban development norms and rules recommended the use of single-layer and multi-layer constructions for external barriers. The coefficient of thermal conductivity of the

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materials in the dry state in the heat-insulating layers of the barrier structures should not normally exceed 0.14 W/(m 0S).

We determine the amount of heat consumed through the external barriers of the building using the following formula [7]:

$$Q = \frac{1}{R} \cdot F(t_i - t_m) \cdot n \cdot \eta$$

Here: Q is the main amount of heat consumed through external barriers, Bt;

F – the surface of the outer barrier, m^2;

t_i - calculated temperature of internal air, ^0C;

t_m- is the calculated temperature of the outside air (temperature value during the coldest five-day period), ^0C;

n - the coefficient that depends on the relationship of the external barrier construction, its external surface to the external air;

η -is the coefficient taking into account additional heat consumption;

R – heat transfer resistance (thermal resistance) of the calculated external barrier, m^2·grad/Bt.

Above, for the formula, we assume that the temperature on both sides of the barriers is constant, and the heat flow passing through the barriers (from the hot side to the cold side) is equally constant (stationary).

In order to ensure the best operational properties when using external barrier structures, it is necessary to place layers with higher thermal conductivity and higher resistance to vapor transmission on their inner side. A heat-retaining layer made of effective heat-insulating materials should be placed on the outside or in the middle of the barrier structure.

In conclusion, it should be noted that in the development of energy-saving buildings using solar energy with effectively protected external barriers of heat consumption, it is important to thoroughly study the effect of volume planning solutions on energy consumption, skillfully using the thermal protection properties of passive solar heating system elements.

Therefore, in order to increase the thermal insulation of the external wall of the buildings in practice, it is advisable to cover the outer surface of the external wall with a layer of basalt and other heat-insulating materials during the current and perfect repair process.

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