

## DESIGNING ENERGY-EFFICIENT BUILDINGS IN UZBEKISTAN

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Central Asia has a low concentration of ozone in the atmosphere, as a result of which the intensity of UV radiation is particularly high. The distribution of thermal radiation on the territory of Uzbekistan differs in a number of features. In winter, the monthly values of radiation gradually decrease from south to north. Moreover, the average level is only slightly higher than in other regions of the CIS at the same latitudes.

**Key words:** the outer wall, mineral cotton, mineral plates.

**INTRODUCTION**

Uzbekistan is located in a zone with a sharply continental climate. Air temperature fluctuations here reach particularly large values. The location of its territory in the southern latitudes ( $37^{\circ}$  -  $45^{\circ}$ ) is specific to the insolation regime. This territory is characterized by a high altitude of the Sun (in summer, its midday altitude reaches  $72^{\circ}$ ), low cloud cover, transparency of the atmosphere due to a relatively small number of days with precipitation and fog, high intensity of reflected radiation, explained by the predominance of light soils.

In summer, the maximum total radiation is sharply expressed. Heat access to the horizontal surface from direct solar radiation is 2-3 times higher than in the regions of the northern and middle latitudes of the CIS. The large amount of solar heat received in the summer of Central Asia causes high air temperatures, especially in lowland areas - the maximum summer temperatures almost everywhere exceed  $40^{\circ}\text{C}$ , and in some desert areas sometimes reach  $(50-55)^{\circ}\text{C}$  [1].

It should be noted that in summer, for a long time, the daytime temperature is kept approximately at a constant level, and its daily changes are characterized by certain patterns.

In winter, absolute lows range from minus  $15.5^{\circ}\text{C}$  in Surkhandarya region to minus  $40^{\circ}\text{C}$  in Karakalpakstan. In addition, the open location of Uzbekistan from the north and northwest favors the penetration of cold air masses into its territory in winter, as a result of which periods of warm and dry weather alternate with periods of cooling and precipitation. So in winter, during 1-3 days, a sharp change in the weather can occur, and daily temperature fluctuations do not follow a clear pattern [1, 2].

Most buildings designed and built during the years of independence in the Republic of Karakalpakstan do not meet the requirements of building codes for thermal protection.

The work is focused on the thermophysical properties of exterior fences of residential buildings in the Republic of Karakalpakstan. In particular, the calculation of external fences of rural residential buildings in the Republic of Karakalpakstan was carried out. The estimated winter outdoor air temperature in accordance with the initial data adopted in the project is  $21^{\circ}\text{C}$ . The exterior walls are plastered with cement-sand mortar and then painted with facade paint. A variant of thermal insulation

of brick walls is proposed and justified.

Fig. 2. Construction of a facade system with a ventilated air gap

Energy and resource conservation is the general direction of technical policy in the field of construction. According to statistics, 90% of the total energy consumed in the construction complex is spent on heating and air conditioning, 8% - on the production of building materials and products, and 2% - on construction.

Based on these coefficients, the shared energy costs, for example, in multi-storey residential buildings in Uzbekistan are:

- heating and ventilation	– 33.5%;
- hot water supply	– 40.3%;
- gas supply	– 12.2%;
- power consumption	– 14.0%
Total	– 100.0%

The winter period of the year in the Republic of Karakalpakstan is relatively short, rather unstable, but quite cold, especially in the northern regions. The outdoor air temperature used for calculating heating systems (parameters B) ranges from minus 8°C in the Surkhandarya region to minus 20 ... 26°C in the Republic of Karakalpakstan. The duration of the period with an average daily air temperature of  $\leq 8^{\circ}\text{C}$  (the duration of the heating period) varies in the same regions from 80 ... 90 to 163...174 days. The average air temperature ranges from 4.5...5.4°C to minus 2.4°C ... minus 0.6°C, respectively[3].

The distribution of heat losses through external fences is also of interest. For the conditions of Uzbekistan, according to the UNDP GEF report, there is the following percentage distribution of transmission heat losses by type of external fencing (for multi-storey residential buildings):

- walls	– 45%.
- windows	– 35%.
- external doors	– 4%;
- roof	– 8%;
- overlap over the underground	– 8%.
Total	– 100%

One of the factors of indoor microclimate formation, from the point of view of hygienists, is the temperature difference between the room air temperature and the temperature of the inner surface of external enclosing structures. According to [3], for example, for the walls of residential and public buildings, this value should not exceed 5...7°C.

In general, thermal protection of premises from the effects of the external environment is provided through the use of appropriate external enclosing structures that have normalized values of heat transfer resistances. In recent years, it has been customary to specify these values depending on the GSO parameter. This is the product of the estimated duration of the heating period by the difference between the internal air temperature (20°C) and the average temperature of the heating period. The entire territory of the Republic of Uzbekistan is covered by the range of GSP values from 1100 to 3900°C day. [2] Since October 2004, in Uzbekistan, the following values of reduced heat transfer resistances for the exterior walls of residential and public buildings should be taken to ensure the greatest energy efficiency:

Table 1.1

Calculated outdoor air temperatures, °C	GSO, °C day.	Reduced heat transfer resistance, (m <sup>2</sup> · °C)/W
-10	to 2000	2.1

-15 – - 20	from 2000 to 3000	2.4
-25	over 3000	2.8

It should also be noted that for this category of buildings, the temperature difference between the air temperature and the temperature on the inner surface of the outer wall will be equal to or less than 4.5<sup>0</sup>C. With such a temperature difference, according to the research of hygienists, there is a normal loss of heat by the human body.

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