ENERGY EFFICIENCY OF RENEWABLE ENERGY FOR RESIDENTIAL BUILDINGS

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Abstract: The common aspiration to minimize energy consumption for creation and maintenance of comfortable microclimate parameters in buildings determines the necessity of more reliable methods of assessment of thermal qualities of technical solutions of external enclosing structures accepted in design documentation in order to increase the quality of design. In accordance with the Decree of the President of the Republic of Uzbekistan dated 21.02.2022, PP-139 "On additional measures to support housing construction and construction materials industry" in order to reduce time and cost of housing construction through wide implementation of energy saving materials in construction, special attention in the process of SUE "Expertise of Urban Development Documentation" and its branches in the expertise of design estimates of multi-storey residential buildings should be provided to use in the construction of buildings.

Key words: water heating systems, solar energy, solar collectors, energy consumption

Basic text the use of solar energy for hot water and, to a lesser extent, for heating, can save large quantities of fossil fuels and improve the social and domestic well-being of the rural population. For example, in Israel, in accordance with a law that requires every home to be equipped with solar water heating systems, some 800,000 solar collectors were installed as of 1996. These produce an estimated 15 million GJ of energy [1], and supply 70% of the population with hot water.

In addition to solar collectors, passive methods based on architectural and planning optimizations are also used to utilize solar heat for home heating. In addition, there is interest in the development of so-called transparent insulation for house walls, selective films for windows, etc.

Electricity from solar energy can be obtained either in thermal power plants or in direct energy conversion plants based on the use of semiconductor photoelectric converters (PECs). At present there is increasing interest worldwide in systems that directly convert solar radiation into electricity using PECs.

Solar collectors are devices that can use solar energy to heat the heat transfer medium, thereby heating rooms and/or heating water for domestic use. They can be used as the main source of heat or as an auxiliary source in conjunction with another heater. They can operate in both clear and cloudy weather.

For the example, we determine the calculated heat output of a 5-storey, 20-apartment building with 2 and 3-bedroom flats:

Calculate the calculated heat production

Qmc=qmc x Amc ; where :

qmc - domestic heat release per 1m2 floor area of rooms and kitchens equal to 10

Amc - sum of room and kitchen areas =749.41m2

$$Qmc=qmc \times Amc = 10 \times 749.41 = 7494.10$$

Determine infiltration rate

$$Qinf = (Vc \times 1.2 \times 0.24 \times (tv-tn) \times 1.163$$

where: Vv is the volume of air equal to 3 m3 per 1 m2 of the floor area of the rooms and kitchens
S=749.41 m2 Vv=749.41 x 3=2248.23

Qinf.23 x 1.2 x 0.24 x 40 x 1.163=30121.24

The heat transfer coefficient of the building

K tr/m=(Aw/Row+Al/Rol+Ad1/Red+0.8 Ar/Ror+0.7 Ag/Rog)/Aesum=
(970.614/3.07+122.586/0.6+2.41/0.6+0.8
235.54/3.435+0.4 205.5/1.44)/1095.61=0.58 Bm/m2^o C

Determine specific heat consumption for heating

Qsh=(Qio+Qinf.-Qmc)

The specific heat consumption for heating in this building is - 47.38 W/m3

Normative specific heat consumption for heating according to Table 1* KMMK 2.01.18-2000* for 5-storey residential buildings is 78 W/m3.

The deviation of the calculated specific heat consumption from the normative:

ΔQsh=(Qsh-Qnor)/Qnor x100=(47.38-78)/78 x100=-39.25

Conclusion: The calculation shows that a 5 storey, 20-apartment block with 2 and 3-bedroom flats (brickwork variant) corresponds to the highest energy efficiency class A after thermal insulation.

Homes with the highest-class A use minimal energy for heating, ventilation and hot water.

The energy consumption is also reduced by using high quality special building materials, insulating the building envelope, sealing the windows, automatically regulating the room temperature, etc.

However, this level of energy consumption in the building lasts for 3 to 5 years, and then begins to increase. An energy survey should be carried out to determine the reasons for this decrease in energy efficiency. This will also help to determine the level of relevant greenhouse gas emissions and the costs for the residents to pay for their energy consumption. The data obtained will help to compare these buildings with typical rural houses built under a government programme in 2018 in similar climatic conditions.

Under the UNDP/Global Environment Facility and Ministry of Construction project "Support to Energy Efficient Rural Housing Development in Uzbekistan", 800 energy-efficient houses were built: 176 houses in Samarkand region, 185 houses in Surkhandarya region, 206 houses in Ferghana region, 112 houses in Khorezm region and 121 houses in Bukhara region. Of these, the energy audit will cover 60 houses in the five pilot oblasts, as well as ordinary model houses built under the State Programme in 2018. This approach will allow comparing energy efficient houses with ordinary houses and analysing the effectiveness of energy efficient and low-carbon technologies in reducing heat and electricity consumption in rural houses.

The widespread introduction of energy audits and the use of renewable energy sources is one of the important yet-to-be-utilised reserves, which in the future will serve as a solution to the natural gas and oil shortages and could double consumers' energy bills, according to experts.

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