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Research Article

Energy Saving Technologies in Engineering Communications

Umida Khaidarovna Tursunova[1]

Abstract In this research paper provides an overview of the main methods for improving the energy efficiency of buildings. The main causes of heat loss of the building are identified. Shown are ways to solve the issues of reducing energy consumption of new facilities: installing alternative energy sources, improving the thermal insulation of building envelopes, installing highly efficient ventilation with heat recovery, using energy-saving windows. The legislative framework and government programs stimulating energy-efficient construction in our country are considered. A study of modern methods of building buildings, allowing to reduce energy costs and resources.

Key words: energy-efficient buildings, energy resources, thermal insulation, heat losses, geothermal heating, solar collector, energy-saving windows

[1]Doctor of Technical Sciences (Tashkent institute of architecture and construction)

Prerequisite for a comfortable life for people is fuel and energy resources. A decrease in

world reserves of resources, population growth and, as a consequence, an increase in the consumption of fuel and energy resources, can lead to their deficit. In this regard, the problem of building energy-efficient buildings is the most relevant today. In addition, the deterioration of the environmental situation and rising prices for utilities also contribute to the development of interest in the introduction of energy-saving technologies and materials [1].

The concept of energy-efficient construction is to create a building that does not need external resources, it is able to generate its own electricity without causing damage to the environment.

For the first time on the construction of energy-efficient buildings began to think in Europe. After the analysis, Western experts found that heating requires a large part of the electricity, a significant amount is also spent on lighting, household appliances, water heating and cooking.

The costs of foreign countries for heating make up about 45% of the total electricity, in Uzbekistan this figure reaches 61%.

In Uzbekistan, the introduction of energy-saving technologies was promoted by "On Energy Saving and Energy Efficiency Improvement", on the basis of which all buildings must meet energy efficiency requirements and be equipped with resource metering devices.

Also, the government of Uzbekistan has developed a long-term target program for energy conservation and energy efficiency, according to which by 2030 provides: reduction of energy intensity.

To achieve maximum energy efficiency of buildings, special construction standards have been developed, according to which already at the design stage it is necessary to take into account all the criteria that can achieve energy efficiency. This is achieved by observing the specific annual consumption of energy resources for heating and ventilation of all types of buildings, structures, structures; electric energy for common needs and thermal energy for hot water supply of apartment buildings (*State Standard*-54862- 2011.) Energy efficiency of buildings.

To achieve maximum energy efficiency of buildings, it is necessary to reduce their heat loss, which occurs due to losses through the ventilation system, roof, walls, window and door openings, and ground floor *(Fig. 1).*

An important criterion is also the climatic conditions at the construction site and the location of the building relative to the cardinal points. The correct choice of the location of the structure will allow the use of solar and wind energy to generate its own electricity.

An important criterion is also the climatic conditions at the construction site and the location

of the building relative to the cardinal points. The correct choice of location of the structure will allow you to use:

Heat loss through the roof - 25%

Losses through the system-15%

Heat loss through windows -35%

Heat loss through a goal on the ground - 15%

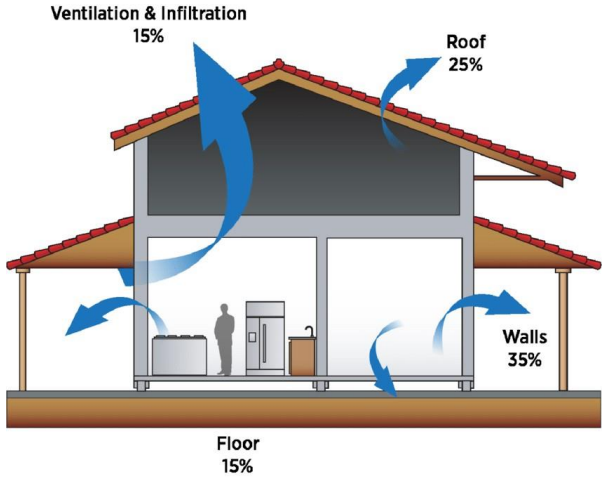

Fig. 1. Heat losses through building envelopes

The main methods for achieving energy efficiency of buildings are: installation of alternative energy sources; improvement of thermal insulation of all building envelopes; installation of highly efficient ventilation with heat recovery; the use of energy-efficient windows.

The need to save resources has pushed for the development of modern devices that can produce alternative energy sources. For example, devices such as geothermal heating and solar collectors are known today.

The principle of geothermal heating is based on the fact that inside the earth is heated by hot magma, and the thickness of the soil does not allow it to cool. Thanks to this, objects located on the surface of the earth can be heated. The system works due to the presence of a heat exchanger, which is located underground or in water. A heat pump is installed on the surface, which heats the ground water passing through it. The heat generated in this case is used for heating buildings [4.5,6].

At present, when choosing alternative heating methods, solar collectors or solar systems are increasingly preferred. The advantage of such systems is that their use does not damage the environment, and the energy of the sun is endless. The system consists of a solar panel and a

reservoir in which heated water is located. Principle of work: the conversion of heat from the sun into energy. In this case, solar systems can absorb solar energy even in cloudy weather, through the clouds. Therefore, in the summer, you can completely switch to heating water using this unit, the rest of the time it will reduce energy costs by half.

But no matter how effective the heating system, to preserve heat, it is necessary to provide thermal insulation of the room. An important factor here is the thermal insulation of all building envelopes. Internal and external insulation can be improved by modern environmentally friendly insulation. Outside the house, a continuous thermal insulation shell is created.

Heat loss can also occur due to the fact that ventilation, drawing air, takes part of the heat. This can be avoided thanks to modern ventilation systems with heat recovery. Such a system, taking heat, returns it back. A recuperator is a device that provides heating of the incoming air from the outside by means of heat obtained by cooling warm air masses before being released to the outside. That is, on the technical side, recovery is a heat exchange process.

By installing a modern ventilation system and providing thermal insulation of the walls, it is also necessary to eliminate heat loss through window structures that occur due to: losses through window frames, binders and window unit; thermal radiation; convective flows between glasses, when constructing an energy-efficient house, modern energy-saving windows with selective glass are used. The energy- saving properties of this glass are achieved by applying a thin metal coating on it that contains free electrons. At the same time, layers of metal oxide, silver, metal are alternately applied to the glass and finally another layer of metal oxide.

Due to this, such glasses in the cold season reflect heat (infrared) radiation from the heating devices back to the room, thereby reducing heating costs *(Fig.2).* In summer time energy-saving glass reflects solar radiation, while maintaining a comfortable room temperature, saving energy spent on ventilation and air conditioning *(Fig. 3).*

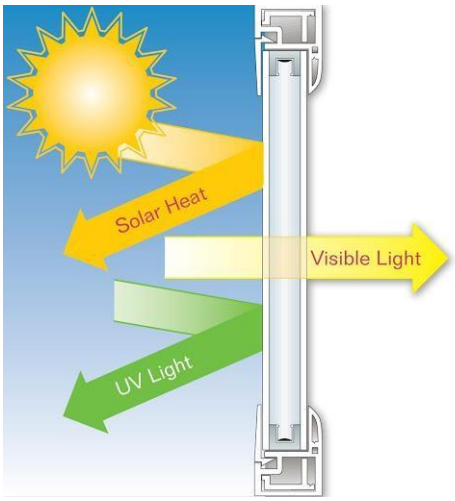

Fig. 2. Scheme action of energy saving glass

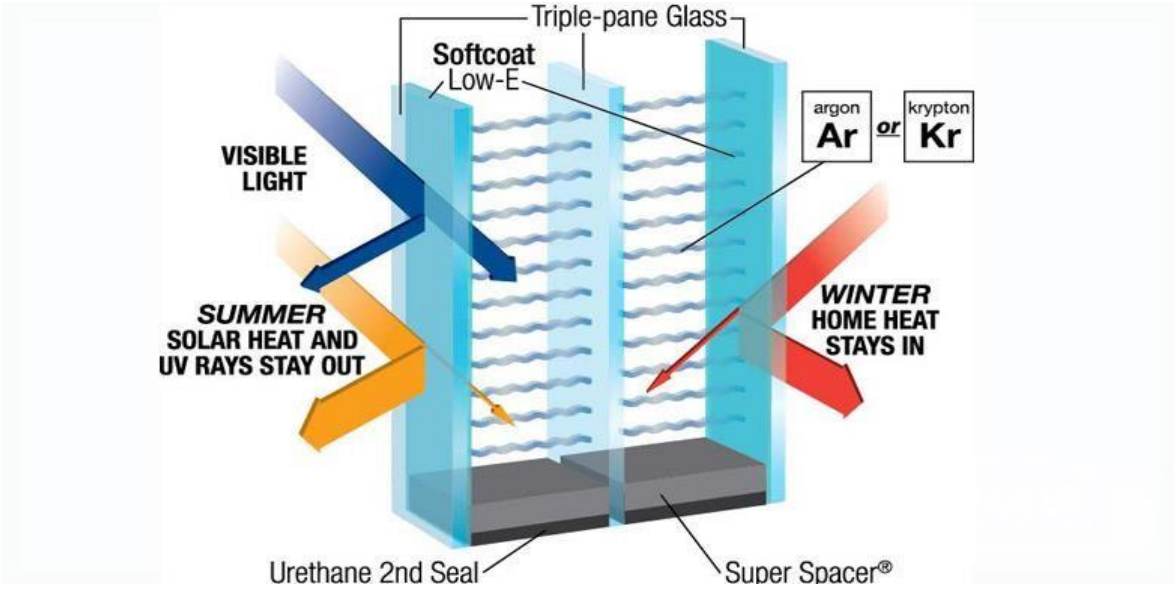

Fig. 3. The action scheme of energy-saving glass in the winter. glass in the summer

Energy-saving glass is so effective that even when installing a single-chamber double-glazed window, it can save 25% more heat than a conventional 2-chamber metal-plastic window. An advantage is that a single-chamber, energy-saving window transmits light approximately 10% better than a conventional 2- chamber, while retaining harmful ultraviolet radiation.

To create energy-saving windows, two types of glasses are used: *K*-glass with a pyrolytic (hard)

coating;

I-glass with magnetron (soft) coating.

K-glass externally is an ordinary transparent glass. Its coating consists of various components, mainly metals.

K-glass can be installed both as an outer and an inner glass. The first way reduces the heat flux from the street to the room (suitable for countries with hot climates), the second - saves heat indoors (allows you to reduce heating costs, suitable for harsh climatic zones of Uzbekistan). The installation of *K*-glass significantly improves glass insulation performance indicators.

I-glass is produced by electromagnetic sputtering, in which particles of metal oxides are deposited on glass in a vacuum environment. In this case, a uniform heat-saving layer is formed on the glass. *I*-glass, unlike *K*-glass, has a low abrasion resistance, which creates some inconvenience during storage and transportation. This is undoubtedly its drawback. The advantage of glass is that it has better thermal insulation than *K*-glass, and its cost, on the contrary, is lower.

Thus, the level of scientific and technological development of modern society allows us to develop and introduce new materials, systems and devices that contribute to a significant reduction in utility costs, savings on organic fuels and reduction of harmful emissions into the atmosphere. The concept of energy- efficient construction involves an integrated approach. It includes not only compliance with all standards at the construction stage. Strict control of energy intake and energy consumption in an already operating building is required, creating a microclimate depending on the climatic conditions of the building.

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