TECHNOLOGIES USED IN THE PROTECTION OF LOAD-BEARING STRUCTURES TO IMPROVE THE ENERGY EFFICIENCY OF BUILDINGS

Norov Nusiratjon Nuralievich [1]
Khudainazarova Yulduz Dzhumanazarovna [1]
Bobakulov Akmal Azamatovich [2]
[1] Tashkent University of Architecture and Civil Engineering
[2] Design organization Zamin-poydevor city of Tashkent
https://doi.org/10.5281/zenodo.10069233

Abstract: This article describes the technologies, their types and applications used in load-bearing structures to improve the energy efficiency of buildings, which is one of the urgent problems.

Keywords: thermal insulation, thermal insulation materials, enclosing structure, freezing, waterproofing, formwork, thermal energy, efficiency.

In recent years, the issues of improving the energy efficiency of buildings have become a priority in the policy of the Government of the Republic of Uzbekistan. Thus, the Decree of the President of the Republic of Uzbekistan PP-4422 dated August 22, 2019 "On accelerated measures to improve the energy efficiency of economic and social sectors, the introduction of energy-saving technologies and the development of renewable energy sources" approved the target parameters for the further development of renewable energy sources with bringing their share to more than 25% of the total generation by 2030 electrical energy; it is planned to reduce energy consumption due to the phased installation of modern solar photovoltaic plants and solar water heaters (with the exception of facilities connected to centralized heat supply systems) to provide hot water and electric energy, as well as energy-efficient heating systems, including bivalent, including the introduction of modern heat pumps and recuperators; work will be carried out to improve the thermal protection system of buildings by installing two-chamber and energy-efficient window units, sensor sensors combined with LED sources, as well as air recuperators and other systems[6].

Y Presidential Decree PP-4779 of July 10, 2020, it was instructed to develop a program for the installation of solar systems for the generation of thermal and electric energy in standard houses and social facilities, as well as energy efficiency in public buildings; to introduce a control system for the use of modern energy-saving materials, energy-efficient technologies and the use of renewable energy sources in the design and construction of multi-storey buildings. houses; to develop a targeted program to reduce energy consumption in multi-storey residential buildings for heating and cooling needs in all regions of the republic by increasing the thermal protection of buildings, the introduction of energy-efficient technologies.

One of the main tasks facing specialists is to increase the efficiency of the applied structures of buildings and structures through the development and implementation of energy-efficient structural and technological solutions in the practice of construction.

World experience shows that it is possible to increase the energy efficiency of buildings only if integrated architectural and construction solutions are used.

The operational energy efficiency of a building is formed primarily by its thermal energy efficiency, which, in turn, depends on the heat-protective properties of the blind and translucent parts of the building's enclosing structures.

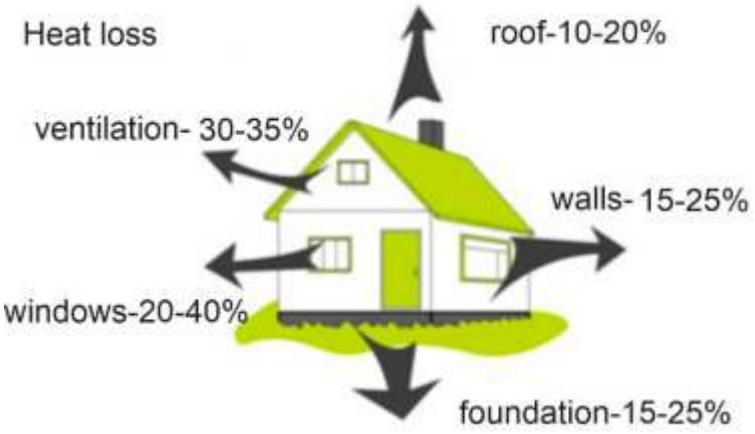

Fig-1. Distribution of heat losses in the house.

To reduce the loss of thermal energy in construction, various planning solutions, thermal insulation materials and structures, energy-efficient facade systems, technologies for the construction of monolithic houses with permanent formwork, energy-efficient translucent structures are used today.

According to some estimates, competent integrated insulation of enclosing structures can reduce the cost of heating the building by 30-70%. This article discusses the insulation of enclosing structures and foundations of buildings. When designing new and reconstructing existing buildings, two methods of insulation are distinguished – from the outside and inside [5].

The best option for insulation of the enclosing structure from the point of view of moisture exchange is insulation from the outside of the fence. In this case, most of the enclosing structure will have a positive temperature. In addition, the external insulation system will protect the enclosing structure from precipitation, wind, temperature changes, water condensate. Wall insulation can be carried out not only during the construction of a new building, but also during the reconstruction of existing buildings and structures to improve the thermal protection characteristics of the walls.

Insulation of the buried parts of buildings and structures allows to reduce heat losses, protect the foundation structure from freezing, avoid condensation of water vapor and prevent the appearance of dampness, as well as the development of mold. In the case of laying foundations above the depth of freezing of the depths of dry soils or in the case when the foundation plate was not insulated during construction in winter, normal forces of frost heaving may occur in the soil base under its sole. In addition, thermal insulation protection is an important component of the waterproofing system protects the waterproofing coating from destruction and temperature aging [3].

Proper insulation of the building foundation will not only reduce heat loss, but also protect the foundation from freezing and thawing cycles.

Insulation of the foundation from the outside is the most rational and provides a low level of heat loss. Insulation of the ground under the blind area around the perimeter of the house will reduce the depth of soil freezing along the walls and under the foundation, as well

as keep the freezing boundary in a layer of non–porous soil - sand or gravel cushion, backfill soils. At the same time, extruded polystyrene foam should be laid with a given blind slope ≥ 2% of the building.

When warming the vertical part of the foundation of the building, the insulation (for example, extruded polystyrene foam) is installed at the depth of freezing of the soil, determined for the region of construction. The thickness of the horizontal thermal insulation should not be less than the thickness of the vertical thermal insulation of the foundation. The insulation efficiency decreases sharply with a deeper installation. (fig. 2).

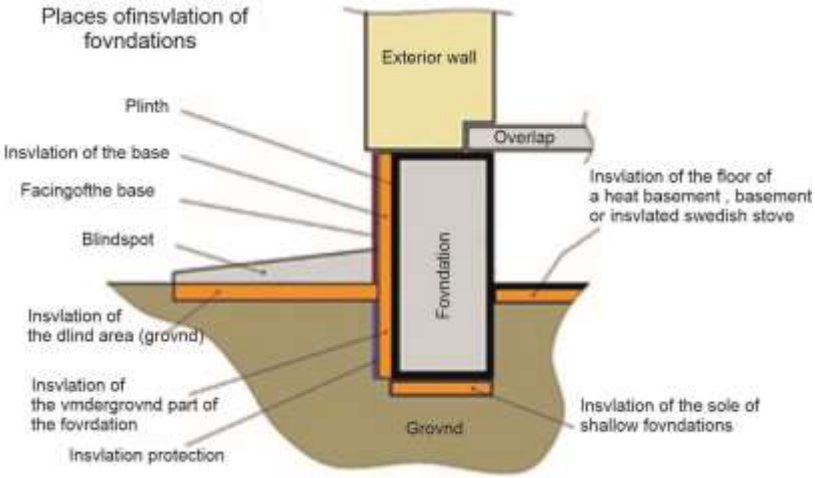

Fig-2. The scheme of insulation of the foundation.

Why do I need to insulate the foundation? For some reason, some customers come to the conclusion that it is much easier and more financially profitable to insulate the base from the inside. However, this is an erroneous decision that will perform a protective function only for the inside, and the outside will collapse under the influence of moisture and cold. Under such conditions, the foundation will gradually begin to lose its bearing capacity, there will be cold floors in the building and dampness will appear inside. To avoid such troubles, it is necessary to insulate a private house from the outside. This solution will allow you to shift the dew point to the insulation area, and the concrete will be insulated and retain its properties.

The following requirements are imposed on the materials used to insulate the foundation from the outside: low water absorption; low thermal conductivity; high compressive strength; resistance to aggressive groundwater; non-susceptibility to rot and rodent exposure.

Insulation of the foundation from the inside is allowed if it is impossible to insulate the foundation from the outside. The need for thermal insulation from the inside arises when installing non-insulated basements, as well as freezing the outer walls and corners of panel houses, loggias. Additional insulation can be made in bathrooms. Calculations of the wall structure with insulation from the inside with extruded polystyrene foam for the accumulation of moisture indicate that such a design is permissible. The advantages of this type of insulation are the absence of restrictions on external weather conditions, the absence of complex technological processes, the absence of a large number of component materials and a room with internal thermal insulation warms up faster than with external thermal

insulation. When is it necessary to insulate the foundation of the house from the inside? (Fig-3).

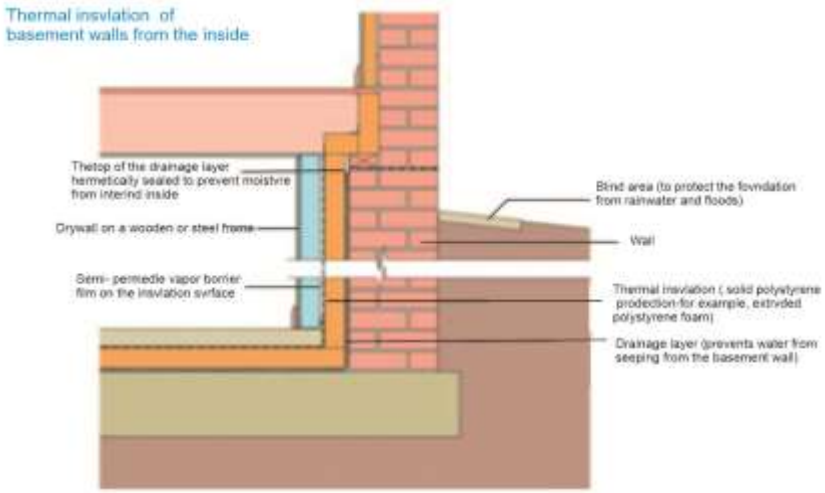

Fig-3. Thermal insulation of basement walls from the inside.

The interior decoration of the cottage, performed above the level of the concrete base, does not imply additional insulation. However, if we are talking about ground floors located at the level of this mark, the situation is the opposite. To create a comfortable temperature in the basement, two-sided installation of insulation is necessary, both from the outside and inside. The types of heat insulators are used the same, and in order to avoid the appearance of moisture and subsequent mold on the walls, additional installation of a vapor barrier is required.

An example of the device of thermal insulation and waterproofing of the foundation is shown in Fig. 4.

Fig - 4. Thermal insulation and waterproofing of the foundation.

In conclusion, it should be noted that for the development of energy-efficient buildings, a more in-depth study of the issue of the influence of space-planning solutions on energy consumption with the skillful use of heat-shielding properties is of decisive importance.

References:

1.Норов, Нусиратжон, and Юлдуз Худайназарова. "ПОВЫШЕНИЕ ЭНЕРГОЭФФЕКТИВНОСТИ ЗДАНИЙ С ИСПОЛЬЗОВАНИЕМ СОВРЕМЕННЫХ КОНСТРУКЦИОННЫХ ТЕПЛОИЗОЛЯЦИОННЫХ СТРОИТЕЛЬНЫХ МАТЕРИАЛОВ В

УСЛОВИЯХ УЗБЕКИСТАНА. " International Bulletin of Applied Science and Technology 3.9 (2023): 217-222.
2. Norov, Nusiratjon Nuraliyevich, and Yulduz Xudoynazarova. "TURAR-JOY BINOLARIDA ENERGIYA ISTE'MOLI HOLATI VA ENERGIYA TEJAMKORLIKNI TA'MINLASH MASALALARI." GOLDEN BRAIN 1.1 (2023): 157-159.
3. Nuralievich, Norov Nusratjon, et al. "DESIGN OF RESIDENTIAL BUILDINGS TAKING INTO ACCOUNT THE CONSEQUENCES OF CLIMATE CHANGE IN UZBEKISTAN." Spectrum Journal of Innovation, Reforms and Development 3 (2022): 204-208.
4. Norov, Nusratillo, et al. "Use Of Solar Heating Systems AS An Element Of A Passive House." Academicia Globe 2.09 (2021): 38-43.
5. Nuraliyevich, Norov Nusratjon, and Khudaynazarova Yulduz Djumanazarovna. "Development of volume-planning and constructive solution of houses with solar heat supply." European science review 5-6 (2018): 313-315.
6. Зохидов, М. М., and Н. Н. Норов. "Энергоэкономичное здание." Жилищное строительство 5 (2003): 29-29.
7. Маракаев, Р. Ю., and Н. Н. Норов. "Узбекистон шароитида энергия самарали биноларни лойих, алаш/Укув кулланма." Ўқув-услубий қўлланма.
Т., ТАҚИ (2009).
8. Норов, Н. Н., and У. Р. Абдуллаев. "ЭНЕРГОЭФФЕКТИВНЫХ ТЕХНОЛОГИЙ С СОЛНЕЧНЫМИ СИСТЕМАМИ ТЕПЛОСНАБЖЕНИЯ В СЕЛЬСКОМ КОМПЛЕКСЕ." Ta'lim fidoyilari 3.2 (2023): 48-50.