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## ENERGY EFFICIENT TECHNOLOGIES IN CONSTRUCTION

In connection with the use of natural resources, energy sources are beginning to play an increasingly important role in construction and in the development of the economy all over the world. The first projects of energy-efficient houses were used in the USA. Currently, the most successful work on the construction of energy efficient buildings in Europe. The experience of European countries suggests that even in residential buildings built according to old standards, energy losses can be reduced. Energy saving in construction requires not small costs - from 5% to 10% of the cost of the construction object. Use of energy-saving technologies not only increase the level of convenience in the building, but will gradually save energy resources and reduce the cost of their use in the future. However, a detailed economic calculation shows that the costs incurred at the stage pay off within 5-8 years. This happens due to savings during the exploitation of houses and payment of utilities.

Today, energy-efficient technologies are used in the following building elements: foundation, walls, roof, windows, doors, heat supply, water supply, lighting, ventilation.

According to building experts, one of the most effective ways to achieve energy efficiency is to use the right types of foundations. The most promising option in terms of energy efficiency in construction for low-rise buildings is the use of shallow slab-type foundations or "insulated Swedish plate" (ISP). Currently, ISP is actively used in construction in Europe. And it is increasingly used in our country.

This type of foundation consists of the following elements: reinforced concrete base, which plays the role of a supporting structure; insulation that reduces the thermal conductivity of the material; a network of communications, including a water floor heating system.

Using ISP allows you to build a foundation in the shortest possible time and you don't need to waste time on alignment the floor. The insulated Swedish plate, in comparison with other types of foundations, can reduce concrete consumption by 30% and labor costs by 40%. As a heater, it is recommended to use extruded polystyrene foam, which is both durable and has a low thermal conductivity.

Walls are the element of the house that is in contact with the outside air. The energy efficiency of a building depends on the ability to keep heat. This is visible in winter, when heating devices are working inside, and in summer, when the air in the rooms is cooled by air conditioners.

Energy-saving technologies in the construction of walls can be realized in two ways:

- 1) Using building materials with low thermal conductivity. Such materials include logs, planed and glued beams, aerated concrete and foam blocks. Their use allows you to make relatively thin walls. At the same time, they will keep the heat inside well. The use of silicate bricks and reinforced concrete for such purposes is impractical due to the high thermal conductivity;

- 2) Use of heaters. This is a universal option for all types of construction. To reduce heat loss through the walls, insulation materials are used - ordinary and extruded polystyrene foam, polyurethane foam and stone cotton. When choosing a suitable heat insulator, need to consider his breathability. In case of using materials with low breathability, you will need high-quality ventilation. Otherwise, a large amount of moisture will accumulate inside the premises.

One of the perspective energy saving technologies is the use of pipes embedded in the wall. In winter, heated water flows through them which heat the air in the room. Because of the large area of the enclosing structures, the area of contact with air increases. Therefore, the heating will work better. In summer, pre-cooled water is passed through the pipes. Then this engineering system acts as an air conditioner. In that way, there is no need to use a large number of split systems or chillers. And, as you know, such devices can harm the environment because of the presence of freon in them.

The roof is the biggest source of heat loss in a home. The fact is that the heated air rises and contacts with it. Various insulating materials are used to reduce losses. But in order to increase the efficiency of their work, it is necessary to use the roof correctly. Hydro and vapor membranes are used on the roof to prevent the insulation from getting wet. A ventilation gap allows remove condensation.

When using the attic, you can make large windows on the roof. They allow you to reduce the amount of electricity for lighting during daylight hours. And also make heating more efficient by heating with sunlight.

However, other energy-saving technologies are developing now: rooftop installations for generating electricity, powered by sunlight and wind; systems that collect and purify rainwater and use it for technical needs.

Compared to other building protecting structures, windows are the largest source of heat loss from the room. As a rule, the use of energy-saving technologies in their manufacture can significantly increase the energy efficiency of the whole building.

One of the opportunities to increase the energy efficiency of windows is the use of plastic profiles with air channels. Air itself is a good thermal insulator. Therefore, if the frame of a plastic window has a large number of voids inside, it will conduct heat less. This will reduce the amount of energy for heating.

The use of double-glazed windows with three panes allows you to reduce the loss of thermal energy in a temperate climate zone. However, in more northern regions with a low average annual air temperature, it is desirable to increase the number of glasses in the package. Although this significantly increases the cost of windows, savings on coolant are subsequently achieved.

Now the industry produces a special energy-efficient glass with a low radiation coefficient coating. It lets solar heat into the room, but at the same time prevents the dissipation of thermal energy from inside the room. For greater energy efficiency of glass, double-glazed windows can be filled not with dried air, but with an inert gas - argon. Because of special properties, it acts as a more effective heat insulator.

The combined use of these measures gives a double effect: heat does not dissipate through the windows in winter; in the summer, protection from infrared rays helps to avoid overheating of the room and reduces the cost of air conditioning.

To achieve a complex effect from measures to improve the energy efficiency of the building, it is necessary to take care of the doors. A metal door is especially in need Thermal insulation. Various materials can be used as a heat insulator, but stone cotton is most often used. At the same time, it acts as a fire protection, as it has a high melting point. The use of seals on the contour of the door avoids the formation of "cold bridges" and drafts, due to which heat losses

occur. It is need to reduce heat loss when people pass through the front doors, it is recommended to equip all door panels with closers. These are levers that return the door to a closed state without human participation. Thanks to them, you will not encounter a situation when someone forgot to close the door to the house or entrance. In addition, the closers will eliminate the noise when slamming the sash. It is recommended to use double doors or make vestibules. This way you can protect yourself from heat loss and heat penetration into the room. In this case, an air layer is formed between the two doors, which is also a heat insulator.

In the next two or three decades, at the junction of the periods of exhaustion of traditional and insufficient development of new energy sources, there will be a deficit of energy resources and their sharp rise in price, and the task of saving energy resources will become a priority. New technical solutions are constantly appearing on the market to reduce energy consumption, increase energy efficiency of buildings, and save on energy use. The use of energy-saving technologies during construction will give you the opportunity to significantly reduce the cost of maintaining houses, buildings and structures right now.

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## **VEHICLE EXHAUST GASES AS AN ENERGY RESOURCE**

The number of non-renewable resources decreases during human exploitation. There's a chance to exhaust their reserves in a few decades. Humanity, un-