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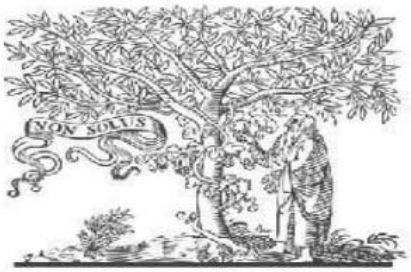

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PERSPECTIVE CONSTRUCTIVE SOLUTIONS OF MODERN COMPOSITE EXTERNAL WALLS OF SANDWICH TYPE

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ABSTRACT: Currently, in all developed countries of the world, the main direction of the program to increase the energy efficiency of heated buildings is to increase the level of thermal protection of buildings and their external barrier structures. Due to the fact that almost half of the mined fuel and energy resources are used for the heating of buildings, the price of these products is increasing day by day, and their reserves are decreasing, the problem of increasing energy efficiency remains urgent for all countries.

Keywords: Barrier, construction, energy, resource, economical, reserve, panel, mineral vata, penopolistirol, penopoliuretan.

INTRODUCTION

During the years of independence, in order to ensure the use of energy-efficient solutions in the design of external barrier structures of buildings, they were revised twice in the direction of raising the requirements of the relevant regulatory documents to the level of world standards. The main goal was to increase the level of heat protection of buildings and their external barrier structures.

MAIN PART

"Sandwich" type panels are usually called three-layer wall panels (Fig. 1). In them, the thermal insulation layer is covered with sheet materials from both sides. Aluminum, galvanized steel sheets or OSB plates are used as covering. Materials such as mineral wool, expanded polystyrene, expanded polyurethane are recommended as thermal insulation. The thermal protection level of such walls is high.

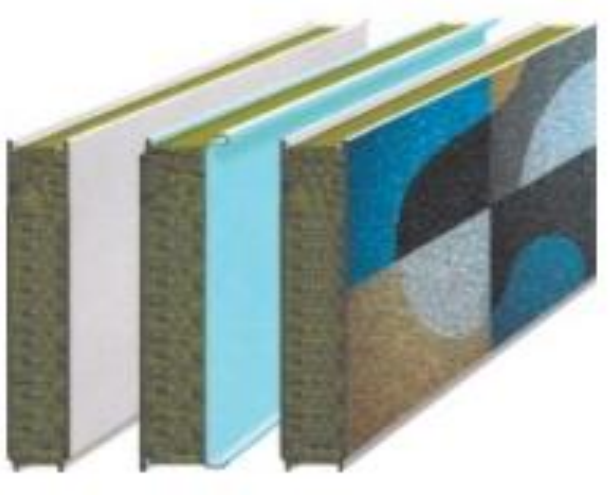

Figure 1. Appearance of sandwich panels.

There are several types of mineral wool used as thermal insulation in sandwich panels, namely:

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• glass wool (glass wool) - produced from melted glass;

• stone wool (kamennaya vata) - produced on the basis of molten rocks;

• slag fluff (slakovata) is produced on the basis of melted blast furnace slag.

Basalt wata belongs to the second type of these, and the chemical composition is obtained on the basis of basalt, basanite, amphibolite, gabbrodiabase or their mixture. Basalt fiber is widely used in sandwich panels because it is non-combustible and has good sound and heat insulation properties.

The disadvantage of mineral wool is its resistance to moisture and its weight compared to other materials.

Styrofoam is a lightweight, long-lasting (long-lasting), environmentally friendly insulating material. Due to the lower fire safety, it is recommended not to use sandwich panels with steel sheets in residential buildings.

Polyurethane foam is also a material that can be widely used as a filling material in sandwich panels. Because it is light, long-lasting, environmentally safe, non-flammable, but combustible, heat and waterproofing material.

The following materials can be used as a coating for sandwich panels and for surface treatment.

PVC sheets (Fig. 2) are light, resistant to chemical effects, do not burn in air, and have thermoplastic properties. But due to low resistance to freezing (up to -15 0C) and heating (+up to 65 0C) and mechanical impact, it is used only in closed rooms.

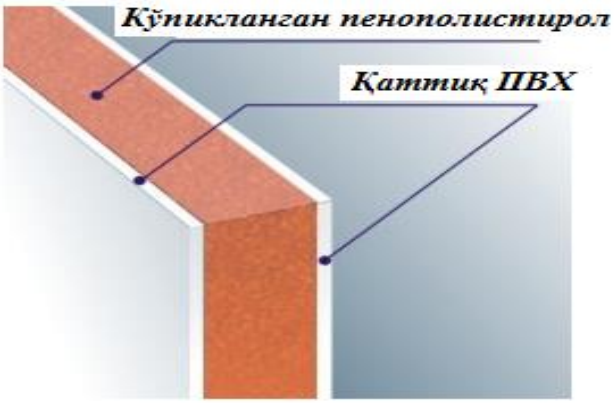

Figure 2. Sandwich panel made of rigid PVC

Due to the fact that fiberboard or fiberboard boards are not moisture resistant, fragile, resistant to stress, they cannot be used as the outer covering of sandwich panels.

Magnesite boards are resistant to changes in temperature and humidity, they are non-combustible, resistant to biological and chemical influences, and are environmentally friendly materials.

Galvanized steel sheets are an economical material, their corrosion resistance depends on the thickness of the zinc deposited on them.

When steel sheets are coated with aluminum and zinc (55% aluminum and 1.6% silicon), resistance to mechanical stress and corrosion increases.

Steel sheets are the best coating for sandwich panels when processed with polymers (plastisol, polyester, pural, PVDF). At the same time, the resistance of steel sheets to corrosion increases sharply, and, depending on the specific type of selected polymer, to mechanical, chemical, temperature and ultraviolet rays of the environment. Steel sheets can be polished in different colors. Sheets are smooth, but if technically necessary, they can be corrugated (folded in layers), profiled in various ways.

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In order to increase the fire resistance of sandwich panels, a layer of plasterboard is placed between the thermal insulation and the steel sheet. In this way, the fire resistance limit of the wall can be increased up to REI 60.

Self-supporting or hanging walls are mainly made of three-layer sandwich panels. The sizes of sandwich panels made of steel sheets are different from different manufacturers, depending on their technological capabilities: length up to 12 m, width up to 1.2 m, thickness from 50 mm to 300 mm.

The thickness of the outer walls made of sandwich panels is determined depending on the wind pressure for specific conditions, the distance between the elements of the load-bearing frame (prolot) and the value of the required resistance to heat transfer. Often, manufacturers of sandwich panels have specially designed tables that facilitate the selection of panels by consumers.

Various methods have been developed for fastening wall panels to the frame (Fig. 3), including the "Lock" method. The main requirements for such methods are mainly related to the fact that the seam firmly connects the structure, that "cold bridges" do not form in the seam, which can transfer a lot of heat, that water vapor does not pass through the seam to the thermal insulation layer, and that it can accept the stretching and compression deformations that occur in the panels under the influence of temperature changes. .

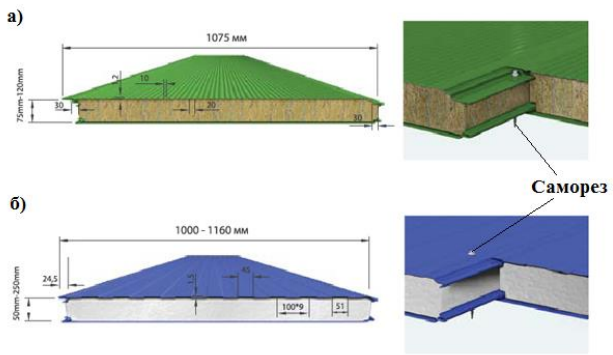

Figure 3. Methods of fixing sandwich panels:

a – hidden attachment method; b - open attachment method.

Installation of sandwich panels is carried out from the bottom up. The plinth part of the wall can be made of bricks, blocks, but effective thermal insulation should be added to their composition. Therefore, it is recommended to make the plinth part from three-layer reinforced concrete panels.

In order to reduce the vibration of the wall panels and ensure a tight connection to the frame element, a self-adhesive tape is applied. Sandwich panels can be installed in a horizontal or vertical position in a single or multi-layer scheme. It is only necessary to pay attention to the correct location of the panels to ensure that water does not enter the seams during operation.

It is recommended to use a special self-tapping screw (samorez) with a washer made of stainless steel and a synthetic rubber thickener for fixing sandwich-type wall panels (Fig. 3). When the panels are placed horizontally, they are fixed to the columns or beams, and when they are placed vertically, they are fixed to the plinth and the crossbars.

The seams between the surfaces of the short sides of the wall panels or the seams

between such a surface and the plinth are compacted with the help of mounting foam and closed with special hole closers (nashchelniks) with a polymer coating made of galvanized steel with a thickness of 0.6 mm. The geometric shape (profile) of the hole cover is developed by the manufacturers of each type of sandwich panels. Their length is usually 3000 mm. They are fixed to the frame with stainless steel washers and special self-tapping screws with synthetic rubber sealant, at least every 500 mm, by placing them on self-adhesive sealing tape.

The width of the part of the sandwich panels resting on the columns or crossbars should be at least 60 mm.

SIP's (Structural Insulated panels systems) - structural insulating panels (SIP-panel) technology of wall panels is widely used in the USA and Canada. Such panels differ from ordinary sandwich panels, they are a new composite material with two physical properties resulting from the combination of different materials. The strength of the SIP-panel depends on the oriented strand board (OSB) and the frame made of plywood placed on it. Polystyrene foam performs the function of heat and sound insulation. These materials are glued together under pressure. OSB-plates are made of relatively large and long strips. Therefore, it is not difficult to distinguish it from plates made of other slags (for example, fibrolite).

In addition, the shards are oriented in a certain direction on such a plate. SIP-panels fully comply with ES requirements (maximum 50 kW/m2 per year), which came into force in 2015. In addition, SIP-panels retain the aesthetic appeal of wood, even if not the entire massif, the ideal smoothness of the panel frees up additional finishing work.

High insulating properties of expanded polystyrene can be explained by the fact that 98% of its composition consists of air. In addition, it is resistant to the effects of moisture, has an appropriate stiffness and mechanical strength. Styrofoam is not dangerous for the human body, it is resistant to mold, fungi and bacteria. It almost does not burn. If it is exposed to fire, the fire will wash around the affected area, but will not burn, so the fire will not spread.

Even when the maximum length of the finished SIP-panel is 3 m and the width is 1.25 m, its weight is not too big. Its installation does not require special specialists. A 160 mm thick SIP panel replaces a 2.1 m brick wall in terms of heat transfer resistance. In vain, according to international norms, this technology was not awarded the highest energy efficiency class - Energy Star.

Within the framework of the state program of rural development, which is still being carried out at a high pace, the production of cement sandwich panels for the first time in our Republic by the Uzbek-Russian joint enterprise "SAM ROS KHOLOD" LLC for the construction of low-rise residential buildings in the Samarkand district. launched. Such panels are a multi-layer structure, the outer layers of which are made of cement coating based on fiberglass mesh, and the inner layer of thermal insulation is made of expanded polystyrene (Fig. 4).

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Figure 4. Cement sandwich panels produced by "SAM ROS KHOLOD" LLC in Samarkand.

Cement sandwich panels are 3000 mm long, 950 and 1150 mm wide, and 90 mm to 150 mm thick. These panels are intended for the construction of residential buildings, kindergartens and nurseries, schools and other social and household buildings.

CONCLUSION

The technology of housing construction with the help of sandwich-panels, which is considered a light structure, allows to build warm, durable, ecologically safe and comfortable residential buildings quickly and with high accuracy. Only in this case, all materials included in the sandwich panel must have appropriate certificates and sanitary-epidemiological conclusions.

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