

Description and technical characteristics of panels

The main advantages of using "sandwich" panels:

●High heat-insulating properties.

The cost of operating buildings with "sandwich" panels, and especially heating, is reduced several times. The thermal insulation itself seems to be "sealed" in a waterproof shell, which eliminates the appearance of fungus or mold. The joints between the panels are hermetically sealed. Buildings made of sandwich panels provide a high degree of comfort in any climatic conditions.

The sandwich panel with a heater from polyurethane foam (PPU) has optimum properties: at a thickness of 100mm it on heat-insulating properties corresponds to 150millimeters and also the panel with a heater from mineral wool or a wall from a usual brick, 900mm thick.

●Construction costs.

The possibility of using thinner panels, the ease of construction makes it possible to lay in the project lighter and cheaper load-bearing structures, lighten the foundation, reduce the cost of transportation and installation of panels. Lightweight and strong "sandwich" panel are much easier to transport than tons of bricks, cement, sand, concrete slabs or boards. The construction time of buildings is reduced by more than 10times. This is achieved both by simplifying the foundation and by replacing, for example, time-consuming brickwork with a simple, fast and convenient installation of "sandwich" panels. At the same time installation can be carried out on a framework from any material (metal, reinforced concrete, wood) or on ready building for the purpose of its warming and simultaneous improvement of appearance. Construction is cheaper and pays off faster. If necessary, the building with "sandwich" panels can be dismantled and moved to another location.

●Strength and durability.

The structure of polyurethane foam with closed pores in combination with the strength of metal sheets provide high mechanical properties of structures. Polyurethane foam panels are significantly superior to traditional building materials in their thermal, hydro and noise insulation properties, energy efficiency, which significantly reduces the thickness of walls and partitions during construction. Two-component polyurethane foam from leading European manufacturers is used to fill the panels.

The use of "sandwich" panels reduces the load on the foundation by 50times or more. This circumstance, as a rule, makes it possible to abandon geological studies of the soil, significantly reduce the cost of laying the foundation, and often almost completely abandon it.

Shell of "sandwich" panels is manufactured of galvanized steel with multilayered protection from corrosion and polymer coating. After undergoing the polymerization process, the required density of polyurethane foam in the panel is 40-45kg/m³. To increase the bearing capacity, it is possible to increase the density to 70kg/m³. The thermal conductivity of polyurethane foam is 0,021W/mK,

moisture absorption is 0,09%. The structures provide high resistance to seasonal temperature changes, do not collapse under the action of solar radiation, wind, precipitation, aggressive industrial environment, and do not decompose. The panels prevent the penetration and spread of mold, fungal infections, so the buildings retain all their properties for at least 25years. Even in case of violation of tightness of connections of "sandwich" panels among themselves moisture absorption of material makes no more than 3%.

●**Floor decoration.**

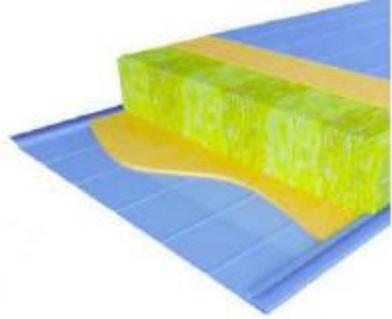
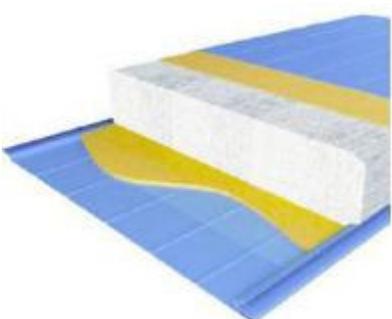
The use of "sandwich" panels does not require any additional surface treatment. Ideal surface of panels is done in the factory, and therefore needs no external or internal treating. The rich color palette of panels can satisfy the tastes of any architect and designer. Any construction of "sandwich" panels will have a modern and prestigious look, provided the use of appropriate selective element.

●**Aesthetics and hygiene.**

High hygienic qualities of "sandwich" panels allow to use them for construction of new production buildings, agricultural buildings and constructions, in particular:

- office buildings.
- trade enterprises, exhibition centers, fast food restaurants.
- sports facilities.
- food industry facilities.
- refrigeration, freezing and drying chambers.
- cargo terminals and ports,
- production of modular, prefabricated mobile buildings.
- warm modules and warm circuits in production facilities.
- gas stations and maintenance services.
- reconstruction of existing buildings, in particular, increase of their heat-protective functions and aesthetic appearance.

Materials used for the production of "sandwich" panels.

	<p>Polyurethane foam is a light and durable waterproofing material that has a unique structure, due to which it has a low thermal conductivity and low water absorption compared to other thermal insulation materials. Polyurethane foam does not mold or rot, does not contain any nutrient base for microorganisms, has high resistance to aging, is chemically and biologically neutral, is not charged by static electricity and does not have capillary absorption.</p>
	<p>Mineral wool is a fibrous material obtained from silicate melts of basalt rocks on synthetic binders. The main property of mineral wool, which distinguishes it from other insulation materials, is non-flammability in combination with high heat and sound insulation, resistance to temperature deformation, non-hygroscopicity, chemical and biological resistance (does not create conditions for the development of microorganisms).</p>
	<p>Styrofoam is an environmentally friendly material derived from natural oil. The main component of the material is styrene, which consists of carbon and hydrogen. Styrofoam is characterized by low thermal conductivity and low density. The strength of expanded polystyrene allows it to be used as a structural element capable of carrying significant loads for a long time. Styrofoam is not hygroscopic.</p>

Brief technical characteristics of the applied fillers:

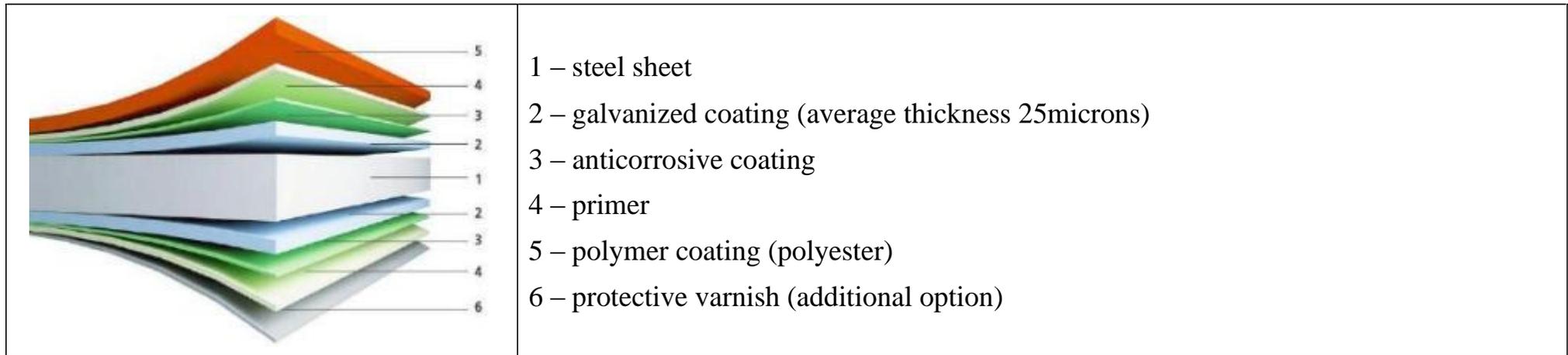
Parameter	Polyurethane foam	Mineral wool	Styrofoam
Density, kg/m ³	42-70	115-140	15-25
Thermal conductivity, W/(m ² K)	0,022-0,026	0,041	0,038
Compressive strength is not less, kPa	200	100	100

Mineral wool provides the limits of fire resistance, which meet fire standards, but the thermal conductivity loses to other fillers. As a filler in 80% of all "sandwich" panels produced by our company, polyurethane foam is used, which has the optimal combination of fire, heat and noise insulation characteristics.

The technology of our production allows to make a product more competitive as in it there are no air cavities, and the technology of cleaning allows to avoid emergence of "cold bridges". Polyurethane foam is guaranteed not to lose its properties for 15years, and in the next 10years the loss of thermal insulation is not more than 3-5%. Insects and rodents do not live in this material, it is not prone to rot and fungus and mold.

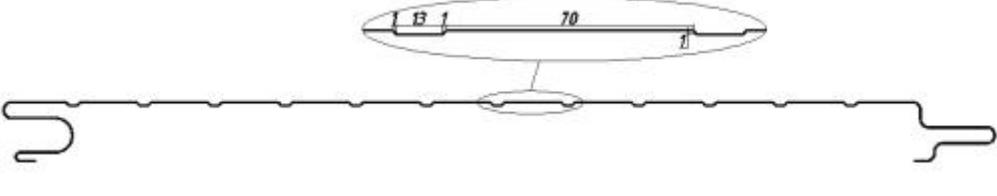
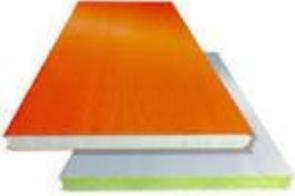
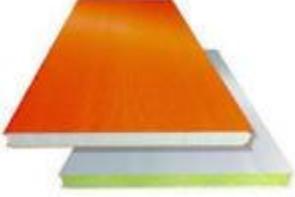
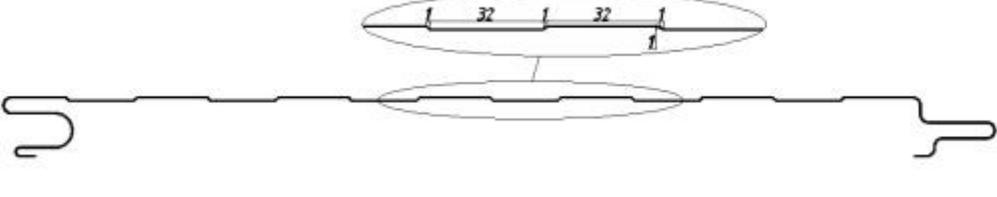
Material for finishing panels and selected elements.

Cold-rolled, hot-dip galvanized sheet steel with a decorative polymer coating, 0,45mm to 0,8mm thick, manufactured by leading European manufacturers, is used as a facing material for the production of "sandwich" panels. If necessary, stainless steel or aluminum sheet can be used as a cladding material for "sandwich" panels.

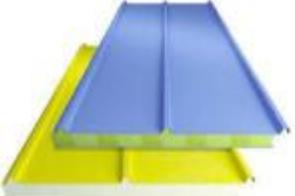
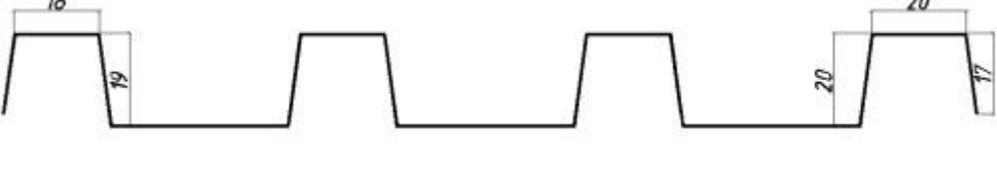


Panel facing profiles:

Panels for wall partitions and false ceilings

	<p>1. Wall panels (WP): – for internal works: ● direct deaf panels, ● corner panels, ● panels with a window.</p>	
	<p>– for external works: ● direct deaf panels, ● panels with a window.</p>	
	<p>2. Ceiling panels (CP): ● direct deaf panels, ● panels with holes.</p>	

Roofing panels

	<p>3. Roofing panels (RP): ● direct deaf panels</p>	
---	---	--

The main project sizes of panels:

Type of panels	Length, mm	Width, mm	Thickness, mm
WP	300 ÷ 6300	300 ÷ 1100	50 ÷ 250
CP	300 ÷ 6300	300 ÷ 1100	50 ÷ 250
RP	300 ÷ 6300	300 ÷ 1100	50 ÷ 250

Values of mass 1m^2 , heat transfer coefficient and thermal conductivity coefficient for two-layer panels with polyurethane foam filler.

Panel thickness, mm	Thickness of a metal sheet, mm	Weight of 1m^2, kg	Heat transfer coefficient, $\text{W}/(\text{m}^2\text{K})$	Thermal conductivity, $\text{W}/(\text{m K})$
50	0.45 – 0.8	6,40	0,46	0.021 – 0.026
60		6,82	0,39	
80		7,66	0,30	
100		8,50	0,24	
120		9,34	0,20	
150		10,60	0,16	
180		11,86	0,13	
200		12,70	0,12	
250		14,80	0,10	

Values of mass 1m^2 , heat transfer coefficient and thermal conductivity coefficient for three-layer panels with polyurethane foam filler.

Panel thickness, mm	Thickness of a metal sheet, mm	Weight 1m^2, kg	Heat transfer coefficient, $\text{W}/(\text{m}^2\text{K})$	Thermal conductivity, $\text{W}/(\text{m K})$
50	0.55 – 0.8	10,68	0,45	0.021 – 0.026
60		11,10	0,38	
80		11,94	0,29	
100		12,78	0,23	
120		13,62	0,19	
150		14,88	0,15	
180		16,14	0,12	
200		16,98	0,11	
250		19,08	0,10	