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Autoclaved aerated concrete in Ukraine

Given the shortage of financial and energy resources, the use of autoclaved aerated concrete (AAC) products allows to solve housing problems quickly and efficiently. AAC products are notable for their good strength, high heat-insulating ability and significant impact on energy savings, necessary for heating facilities while maintaining a healthy indoor climate. This modern high-tech building material is best suited to the conditions of balanced development, both in the production process and in application.

Nowadays, energy saving is the most relevant for the Ukrainian economy, where more than 40% of energy is consumed by housing and communal sector. One of the most affordable ways to solve this problem is the transition to new designs of exterior walls using materials with improved thermal insulation properties. In the climatic conditions of Ukraine, AAC is practically the only wall material that can be used for construction of single-layer walls. Properties and high economic efficiency of the production as well as use of autoclaved aerated concrete have led to an intensive growth in its production on the world, including Ukraine.

The establishment of higher requirements for thermal insulation of walls and the rise in price of energy carriers in Ukraine, led to the main in the production of AAC – a decrease in the wall products density while maintaining their the strength characteristics. Nowadays in Ukraine there are 16 autoclaved aerated concrete enterprises of different production capacity. A wide range of Ukrainian enterprises produce high-precision AAC masonry units (geometry $\pm (1-2)$ mm) with a width of 75 – 500 mm; reinforced AAC lintels; floor and cover panels. The dry density is 300 – 500 kg/m³; the com-

pressive strength is mainly 2,0 – 3,5 MPa; frost resistance – from F25 to F100, depending on the manufacturer. Compared to 2016, the proportion of AAC blocks with a mark in the average dry density D300 increased significantly. In Ukraine wall blocks of density D600 practically have not been produced since 2016. The proportion of tongue-and-groove wall blocks is about 20%, the rest of the products are with smooth end surfaces. The most common block width is 250 – 300 mm (about 70%). Available are also blocks 350 – 500 mm wide. Among Ukrainian manufacturers of autoclaved aerated concrete, AEROC LLC is the most innovative company. This company actively cooperates with scientific and research organizations in Ukraine and abroad, constantly developing and introducing new technical solutions concerned with installation of energy-efficient exterior walls.

In Ukraine, according to the requirements, thermal resistance for external walls R must be at least 3,3 m²·K/W. As one knows, AAC is a material that makes it possible to erect a homogeneous single-layer wall that will meet this requirements focus on mentioned thermal resistance. The most optimal option from the point of view of the ratio „cost of building a house – saving on heating a house” is usage wall blocks of density 300 kg/m³ and width of only 300 mm – option 1 (Figure 1). The bearing capacity of one running meter of such a wall is up to 16 tons with an eccentric load

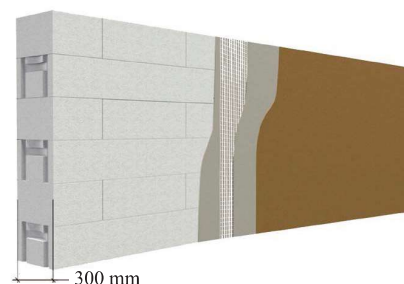
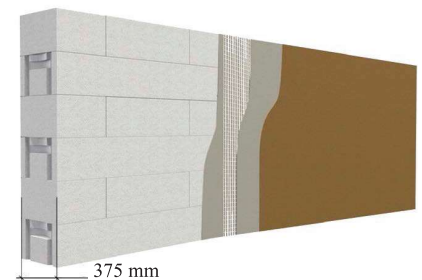


Fig. 1. Option 1 – external wall of aerated concrete D300 and 300 mm wide

[source AEROC LLC]

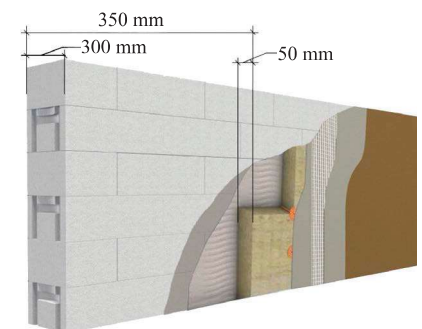
and up to 24 tons with a load in the center of the wall. Scope: the bearing external walls of buildings up to 2 floors high; thermal resistance $R = 3,53$ m²·K/W; cost of the wall is 23,60 €/m². By their heat-insulating properties, walls from block of density 300 kg/m³ and a width of 300 mm are equivalent to aerated concrete walls with a width of 375 mm and density of 400 kg/m³ – option 1,1 (Figure 2). Such a solution is cheaper than alternative options, for example, walls of denser aerated concrete – for instance D500 and 300 mm wide with mineral wool insulation 50 mm thick – option 1,2 (Figure 3) or 400 mm wide without insulation.



wall bearing capacity (1 m):
 – up to 25 tons with an eccentric load;
 – up to 37,5 tons with a load in the center of the wall;
 scope: bearing external walls of buildings up to 3 floors;
 $R = 3,3$ m²·K/W; the cost of the wall is 27,72 €/m²

Fig. 2. Option 1.1 – external wall of aerated concrete D400 and 375 mm wide

[source AEROC LLC]



wall bearing capacity (1 m):
 – up to 20 tons with an eccentric load;
 – up to 30 tons with a load in the center of the wall;
 scope: bearing external walls of buildings up to 3 floors;
 $R = 3,33$ m²·K/W; the cost of the wall is 29,37 €/m²

Fig. 3. Option 1.2 – external aerated concrete wall D500 and 300 mm wide with mineral wool insulation 50 mm thick

[source AEROC LLC]

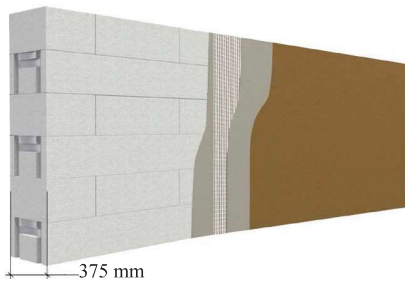
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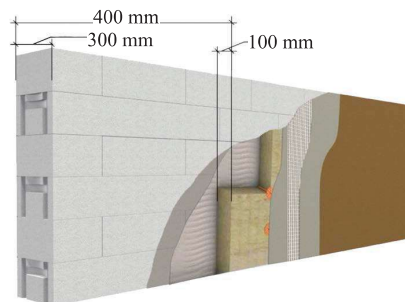
The external walls of blocks of density 300 kg/m³ and 375 mm wide – option 2 (Figure 4) provide high thermal resistance ($R = 4,41 \text{ m}^2\cdot\text{K}/\text{W}$) and are not inferior in this indicator to walls made of denser aerated concrete with a width of 300 mm with mineral wool insulation with a thickness 100 mm – option 2.1 (Figure 5). At the same time, the cost of external wall of AAC blocks of a density 300 kg/m³ is cheaper than the alternative.

The design of the load-bearing walls made of blocks of density 300 kg/m³ and a width of 300 mm with thermal insulation of the facade insulation with a density of 150 kg/m³ and a width of 100 mm



wall bearing capacity (1 m):
 – up to 20 tons with an eccentric load;
 – up to 30 tons with a load in the center of the wall;
 scope: bearing external walls of buildings up to 3 floors; $R = 4,41 \text{ m}^2\cdot\text{K}/\text{W}$; the cost of the wall is 27,71 €/m²

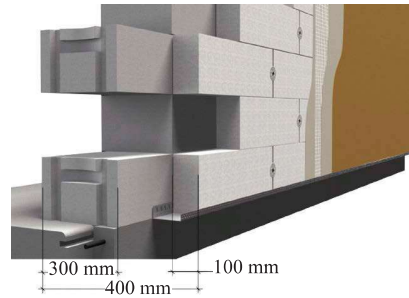
Fig. 4. Option 2 – external wall of D300 blocks with a width of 375 mm
 [source AEROC LLC]



wall bearing capacity (1 m):
 – up to 20 tons under load with eccentricity;
 – up to 30 tons with a load in the center of the wall;
 scope: bearing external walls of buildings up to 3 floors; $R = 4,37 \text{ m}^2\cdot\text{K}/\text{W}$; the cost of the wall is 29,93 €/m²

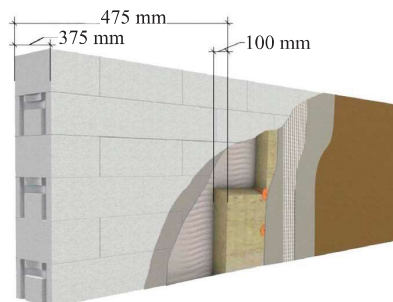
Fig. 5. Option 2.1 – external wall of aerated concrete D500 and 300 mm wide with insulation of mineral wool boards 100 mm thick
 [source AEROC LLC]

– option 3 (Figure 6) provides wall thermal resistance $R = 5,42 \text{ m}^2\cdot\text{K}/\text{W}$, which is equivalent to the thermal performance of aerated concrete walls with a density of 400 kg/m³ and a width of 375 mm, insulated with mineral wool 100 mm thick – option 3.1 (Figure 7). At



wall bearing capacity (1 m):
 – up to 16 tons with an eccentric load;
 – up to 24 tons with a load in the center of the wall;
 scope: bearing external walls of buildings up to 2 floors; $R = 5,42 \text{ m}^2\cdot\text{K}/\text{W}$; the cost of the wall is 28,94 €/m²

Fig. 6. Option 3 – external wall of aerated concrete D300 wall and 300 mm wide with insulation AAC 150 kg/m³ 100 mm thick
 [source AEROC LLC]



wall bearing capacity (1 m):
 – up to 20 tons with an eccentric load;
 – up to 30 tons with a load in the center of the wall;
 scope: bearing external walls of buildings up to 2 floors; $R = 5,29 \text{ m}^2\cdot\text{K}/\text{W}$; the cost of the wall is 34,91 €/m²

Fig. 7. Option 3.1. – external wall of aerated concrete D400 and 375 mm wide with mineral wool insulation 100 mm thick
 [source AEROC LLC]

the same time, the cost of 1 m² of the external wall aerated concrete density 300 kg/m³ is cheaper than the alternative.

Facade thermal insulation AAC density of 150 kg/m³ is characterized by durability comparable to the life of the building as a whole, absolute fire safety and high environmental friendliness.

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