STATE OF HEAT CONDUCTIVITY OF WALLS OF RESIDENTIAL BUILDINGS

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***Abstract**. In the article, one of the most important problems of modern construction, the calculation of residential building devoir for the construction of energy-efficient buildings, is shown. Recommendations are given on the thickness of the material for wall heat insulation.*

***Keywords:** Energy-efficient buildings, heat insulation, wall thickness, amorphous bodies, calculated resistance, density, porosity.*

СОСТОЯНИЕ ТЕПЛОПРОВОДНОСТИ СТЕН ЖИЛЫХ ЗДАНИЙ

***Аннотация.** В статье показана одна из важнейших проблем современного строительства расчет удельной мощности жилого дома для возведения энергоэффективных зданий. Даны рекомендации по толщине материала для утепления стен.*

***Ключевые слова:** Энергоэффективные здания, теплоизоляция, толщина стен, аморфные тела, расчетное сопротивление, плотность, пористость.*

INTRODUCTION

Today's modern construction cannot be imagined without new materials. Especially as the industrial sector develops, the types of new construction materials and products are increasing. With the initiatives of the president of our republic, the design and construction of new modern buildings in an energy-efficient manner is being put into practice. There are many types of construction materials used for energy efficient buildings. They are placed depending on the type of construction used. That is, energy-efficient materials used for walls, energy-efficient materials used for floor coverings, energy-efficient materials used for flooring, energy-efficient materials used for flooring, etc. Such energy-saving materials are mainly porous materials. The heat transfer coefficient of such materials is low.

MATEREALS AND METHODS

Energy loss in buildings depends on various factors. One of them is the external barrier structures that surround the rooms, i.e. walls. Heat loss in the walls surrounding the rooms depends on the type of wall material, wall thickness and heat transfer coefficient. The thermal conductivity of any construction material depends on the density of the material. The denser the material, the lower the thermal conductivity.

Thermal conductivity of materials also depends on the chemical composition of the material. Any material contains amorphous and crystalline substances. The higher the percentage of crystalline substances in the material, the better the thermal conductivity of this material. The internal temperature of the material affects its thermal conductivity. Because the higher the internal temperature of the material, the higher the thermal conductivity.

RESULTS

It is not correct to design our walls in one layer in order to increase the thermal conductivity. It is appropriate to design the walls as multi-layered. As an example, let's consider the problem of finding the wall thickness:

We calculate the thickness of the outer wall of the residential building.

Estimated temperature of the five coldest days t_n=-39 ^{0} C

Average temperature of the heating period $t_{o'rt}$=-8,2 ^{0} C

The duration of the heating period – 235 day

Approximate indoor temperature - t_v=20 ^{0} C

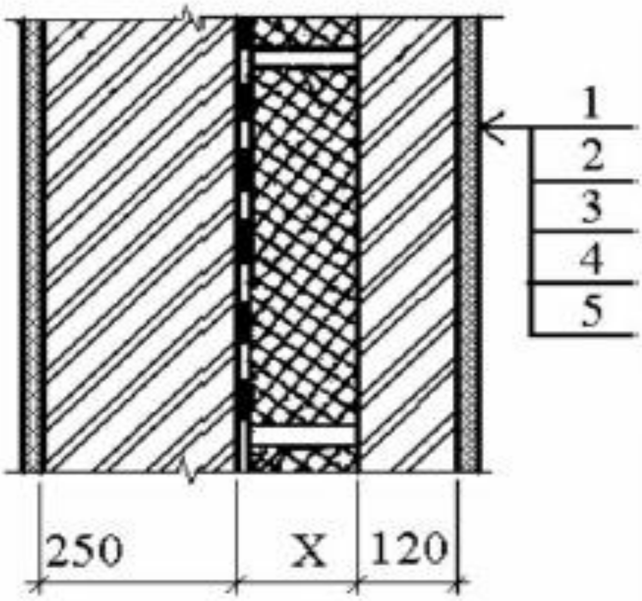
Relative humidity of indoor air; p_h=55%

Humidity mode of the room –normal

Humidity zone of the room – dry

Figure 1.

Sectional sketch of the wall.



Thermal characteristics of materials.

№	Name of material.	Density. Kg/m^3	Thickness, m.	Thermal conductivity,Vt/(m.C)	R=b/l, Vt/(m.C)
1	Cement-sand mixture	1800	0,02	0,76	0,026
2	Ceramic porous brick layer.	1400	0,12	0,52	0,23
№	Name of material.	Density. Kg/m^3	Thickness, m.	Thermal conductivity,Vt/(m.C)	R=b/l, Vt/(m.C)
3	Mineral wool plates	50	b_3	0,052	b/0,052
4	Ceramic porous brick layer.	1400	0,38	0,52	0,73
5	Cement-lime sand mixture.	1600	0,015	0,7	0,021

Based on this information, we will consider the basics of calculation.

The necessary thermal conductivity of the residential building should be determined from the conditions of energy saving depending on the degree-days of the heating period.

GSOP = (*tв- tот.пер.*) *zот.пер*=(20-(-8.2))·235 = 6627

Based on the result, we get $R_н$=3.72 (m2*oC/W) calculated wall resistance for residential buildings from GOST.

We find the total thermal resistance of the building envelope using the following formula:

$R_0=R_B+R_k+R_H=1/a_b+R_1+R_2+R_3+R_4+R_5+1/a_H;$

a_b – internal surface heat transfer coefficient for walls – 8,7 Vt/(m^2*^{0}C);

a_H – heat transfer coefficient for the outer surface of the walls – 23 Vt/(m^2*^{0}C);

$$R_0=1/8,7+0,026+0,23+b_3/0,052+0,73+0,021+1/23=3,72$$

$$b_3=0,13;$$

Accepting brickwork as a module, we accept the thickness of mineral wool plates as 0.14 m. Let's make a check calculation of the total thermal resistance of the structure:

$$R_0 = 1/8,7 + 0,026 + 0,23 + 0,14/0,052 + 0,73 + 0,021 + 1/23 =3,85$$

$$Ro = 3,85 > R_0^{tr} = 3,72.$$

As it can be seen from the result, the thickness of the unknown layer of heat insulation of the wall should be 14 cm.

DISCUSSION

Different materials are used for different types of walls. Above, the room devoir for the residential building was calculated for thermal insulation, as a result, it was seen that the thermal conductivity depends on the thickness of the wall. The thermal conductivity of such materials depends on their composition and density.

CONCLUSION

We have considered the issue of maintaining thermal insulation in the walls, the thickness of the insulating layer has been found according to the previous conclusions and opinions. In order to maintain the internal air temperature of any building, calculating the thermal insulation of each structure is the reason for the effective design of energy-efficient buildings.

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