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ADAPTATION OF THE EXTERIOR WALL CONSTRUCTION OF A MULTI-STORY RESIDENTIAL BUILDING MADE OF REINFORCED CONCRETE PANELS TO HEAT - PHYSICAL REQUIREMENTS.

ABSTRACT

In this article, thermal and physical calculations based on Building Code for the winter season of the external wall structure of a 9-story residential building built of reinforced concrete panels, located in the Zargarlik massif of the city of Jizzakh, are presented.

KEY WORD:

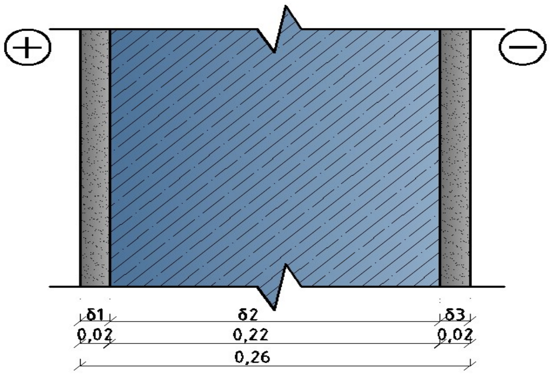
9 – floor, winter season, temperate climate, energy efficient, thermal insulation, penoplex, 1st level of thermal protection.

INTRODUCTION

49% of all energy consumed in 1 year in the Republic of Uzbekistan is accounted for by oil equivalent buildings. This indicator leads to spending a lot of energy and money not only for the state, but also for people. Energy loss in buildings. The loss of heat energy through external barrier constructions differs depending on the number of floors in buildings, the material of the surrounding walls, the year of construction, service life, and the quality of construction works. We consider energy loss in buildings in relation to the total percentage depending on the number of floors in residential buildings: Through external walls: it is 30 – 35% in one and two – floor buildings; up to 42% in five- floor buildings; and in nine- floor buildings it is up to 49%. Through the window: in one – two – floor buildings, it is 25%; five – floor makes up 32%; 35% in nine – floor buildings;10 to 20% of heat is lost through the foundation of the building, the basement covering and the roof construction. Also, residential buildings in operation in the territory of the Republic and our regions make up 50-60% of the total buildings. Thermal protection of such buildings does not fully meet current modern requirements. This leads to excessive consumption of electricity and gas in buildings that are being operated. This is one of the urgent problems of today.

MAIN PART

Thermal-physical calculation of external wall construction of 9 floor residential buildings located in Zargarlik Square of Jizzakh city. The external wall structure of the building is made of reinforced concrete panels, and when calculating its total heat transfer resistance, we determine the necessary information for thermal-physical calculations in Building Code 2.01.01-22 and 2.01.04-18. The city of Jizzah is located in the dry zone in terms of humidity; The calculated outdoor air temperature of the city of Jizzah has an average temperature of 0.98 with the provision of the coldest day: t_o^1= - 22 °C; average temperature when it is 0,92: t_o^1= -19°C; the average temperature of the coldest five days is 0,92: t_o^5= - 19 °C; the average temperature of the coldest three days is 0,92: t_o^3=t_o^1+t_o^5/2= -19-19/2= - 19°C; average temperature of July: t_o=+28,6°C; maximum amplitude of daily fluctuations of outdoor air temperature in July: $A_{t.o}$=24,9 °C; maximum and average solar radiation: J_{max} = 746 vt/m^2, J_{med} = 172 *vt/m*^{2}; The minimum value of the average wind speed for July with a repeatability of 16% and more in terms of directions: V=2,6m/s; the relative temperature and relative humidity of the indoor air of the living room: $t_{¿}$ = 18 °C; $\varphi_{¿}$ = 55 %; humidity mode of the room - moderate; condition of operation of the wall - A; the thickness of the reinforced concrete panel is 220 mm, it is plastered with a 20 mm thick lime-sand plaster from the inside, and from the outside with a 20 mm thick sand-cement plaster. We determine their volumetric weight, heat transfer coefficient and heat absorption coefficient. Reinforced concrete panel: $\gamma=2500\,kg/m^3$, $\lambda=1{,}92\,Vt/(m\cdot°C)$, S $=17{,}98$ $Vt/(m^2\cdot°C)$; lime - sand plaster: $\gamma=1600\,kg/m^3$, $\lambda=0{,}7\,Vt/(m\cdot°C)$, S $=8{,}69\,Vt/(m^2\cdot°C)$; sand - cement plaster: $\gamma=1800\,kg/m^3$,$\lambda=0{,}76\,Vt/(m\cdot°C)$, S=9,60 $Vt/(m^2\cdot°C)$;



1- figure. Calculation scheme of the wall construction made of reinforced concrete panel. 1st layer (δ_1) Plaster made of lime-sand mixture, 2nd layer (δ_2) reinforced concrete panel, 3rd layer (δ_3) plaster made of cement-sand mixture.

Normative temperature difference according to the function and type of construction of the furnace: $\Delta t_o=4°C$; heat transfer coefficient of internal and external surfaces of the structure: $\alpha_{¿}=8{,}7\frac{Vt}{m^2}*°C$ and $\alpha_o=23\frac{Vt}{m^2}*°C$; a coefficient that takes into account the position of the outer surface of the barrier structure in relation to the outside air: $\rho=0{,}4$.

Thermal-physical calculation of reinforced concrete outer wall construction for winter.

We determine the total heat transfer resistance of the reinforced concrete panel structure: $R_{tot}=R_{¿}+R_c+R_o=\frac{1}{\alpha_{¿}}+\frac{\delta_1}{\lambda_1}+\frac{\delta_2}{\lambda_2}+\frac{\delta_3}{\lambda_3}+\frac{1}{\alpha_o}=0{,}325\,m^2\cdot°C\,/Vt$.

We determine the thermal inertia of the structure: $D=\frac{\delta_1}{\lambda_1}\cdot S_1+\frac{\delta_2}{\lambda_2}\cdot S_2+\frac{\delta_3}{\lambda_3}S_3==\frac{0,02}{0,7}\cdot 8,69+\frac{0,22}{1,92}\cdot 17,98+\frac{0,02}{0,76}\cdot 9,60=2,55$ 4>D=2,55

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calculated temperature of the outside air $t_o^1=-19,0{}^0$C we accept. The required value of resistance to heat transfer for the structure: $R_{tot}^R=\frac{(t_{in}-t_o)\cdot n}{\Delta t^o\cdot\alpha_{in}}=\frac{(18-(-19)\cdot 1}{4\cdot 8,7}=1,06\,m^2\cdot{}^\circ C/Vt$. $R_{tot}\geq R_{tot}^R$ we check that the condition is fulfilled: $R_{tot}=0,325\,¿\,R_{tot}^R=1,06\,m^2\cdot{}^\circ C/Vt$ the condition was not met. Therefore, it is necessary to increase the thermal protection of the external wall structure of the residential building made of reinforced concrete panels. It should correspond to the heat transfer resistance given in table 2 – a of Building Code 2.01.04-18. First of all, the heating period and its degree day should be determined: $D_d=(t_i-t_{med.t})\cdot Z_{h.p}$. Average daily temperature during the heating period: $t_{med.t}=\frac{1,7+3,6+9,1+8,3+3,0}{5}=5,14\,{}^\circ\mathrm{C}$; We determine the degree day for the heating period: $D_d=(18\,{}^\circ\mathrm{C}-5,14\,{}^\circ\mathrm{C})\cdot 143,5=1414,9\,{}^\circ day$. So, according to Building Code 2.01.04-18, the heat transfer resistance given for the 9-floor residential building operated by Jizzakh city Zargarlik Square according to the first level of thermal protection: $R_{tot}^R=1,5\,m^2\cdot{}^o C/Vt$. We will check the fulfillment of the condition stated in Building Code 2.01.04-18: $R_{tot}=0,325>R_{tot}^R=1,5\,m^2\cdot{}^o C/vt$ the condition was not met. Therefore, the density of the wall of the residential building from the outside: $\gamma=45\,kg/m^3$, thickness 40 mm, $\lambda=0,031\,Vt/(m\cdot{}^\circ\mathrm{C})$, S = 0,36 $Vt/(m^2\cdot{}^\circ\mathrm{C})$ basalt slab covering, density over it $\gamma=600\,kg/m^3$, thickness 30 mm, $\lambda=0,26\,Vt/(m\cdot{}^\circ\mathrm{C})$, S = 3,24 $Vt/(м^2\cdot{}^\circ\mathrm{C})$ We increase its heat protection by plastering with cement-perlite plaster: $R_{tot}=R_¿+R_c+R_o=\frac{1}{\alpha_¿}+\frac{\delta_1}{\lambda_1}+\frac{\delta_2}{\lambda_2}+\frac{\delta_3}{\lambda_3}+\frac{\delta_4}{\lambda_4}+\frac{1}{\alpha_o}=1,7\,m^2\cdot{}^\circ\mathrm{C}/Vt$. We will check whether the

1st level of the condition specified in Building Code 2.01.04-18 is fulfilled: $R_{tot} = 1,7 > R_{tot}^{R} = 1,5 m^{2} \cdot {}^{o}C / vt$ condition is fulfilled.

IN CONCLUSION

From the results of the above-mentioned theoretical thermal-physical calculations, it can be concluded that the external wall structure of the 9-floor reinforced concrete panel residential buildings in operation in Zargarlik Square, Jizzah city, by covering it with a 40 mm thick penoplex plate from the outside, increasing its overall heat transfer resistance While fully meeting the requirement of level 1 of heat protection specified in Building Code 2.01.04-18.

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