3. VÝPOČET NEJNIŽŠÍ VNITŘNÍ POVRCHOVÉ TEPLOTY Θ_{si} A TEPLOTNÍHO FAKTORU f_{Rsi}

A. V PLOŠE KONSTRUKCÍ

D - VNĚJŠÍ STĚNA

$\Theta_{ai} = \Theta_i + \Delta\Theta_{ai} = 20 + 0 = 20°C$ $\quad \Theta_e = -15°C$

$\Theta_{si,min} = \Theta_{ai} - U \cdot R_{si} \cdot (\Theta_{ai} - \Theta_e) = 20 - 0{,}17 \cdot 0{,}25 \cdot (20 - (-15)) = 18{,}51°C$

$f_{Rsi} = \frac{\Theta_{si,min} - \Theta_e}{\Theta_{ai} - \Theta_e} = \frac{18{,}51 - (-15)}{20 - (-15)} = 0{,}96$

$f_{Rsi} = 0{,}96 > f_{Rsi,N} = 0{,}789$ VYHOVÍ

R - PLOCHÁ STŘECHA

$\Theta_{ai} = \Theta_i + \Delta\Theta_{ai} = 20°C$ $\quad \Theta_e = -15°C$

$\Theta_{si,min} = \Theta_{ai} - U \cdot R_{si} \cdot (\Theta_{ai} - \Theta_e) = 20 - 0{,}16 \cdot 0{,}25 \cdot (20 - (-15)) = 18{,}60°C$

$f_{Rsi} = \frac{\Theta_{si,min} - \Theta_e}{\Theta_{ai} - \Theta_e} = \frac{18{,}6 - (-15)}{20 - (-15)} = 0{,}96$

$f_{Rsi} = 0{,}96 > f_{Rsi,N} = 0{,}789$ VYHOVÍ

A, B, C - PODLAHA NA ZEMINĚ

$\Theta_{ai} = \Theta_i + \Delta\Theta_{ai} = 20°C$ $\quad \Theta_e = 5°C$

$\Theta_{si,min} = \Theta_{ai} - U \cdot f_{Rsi} \cdot (\Theta_{ai} - \Theta_e) = 20 - 0{,}18 \cdot 0{,}25 \cdot (20 - 5) = 19{,}33°C$

$f_{Rsi} = \frac{\Theta_{si,min} - \Theta_e}{\Theta_{ai} - \Theta_e} = \frac{19{,}33 - 5}{20 - 5} = 0{,}96$

$f_{Rsi} = 0{,}96 > f_{Rsi,N} = 0{,}789$ VYHOVÍ

B. V KOUTECH

a) D - A,BC

$U_D = 0,17\ W/k \cdot m^2$

$U_{A,B,C} = 0,18\ W/k \cdot m^2$

$f_{Rsi,k} = 1,05 \cdot (u \cdot R_{sik})^{0,69} = 1,05 \cdot (0,18 \cdot 0,25)^{0,69} = 0,12$

$\Theta_{si,min} = 20 - 0,12 \cdot (20 - (-15)) = 15,8°C$

$f_{Rsi} = 1 - f_{Rsi,k} = 1 - 0,12 = 0,88$

$f_{Rsi} = 0,88 > f_{Rsi,N} = 0,489$ VYHOVÍ

b) D - R

$U_D = 0,17\ W/k \cdot m^2$

$U_R = 0,16\ W/k \cdot m^2$

$f_{Rsi,k} = 1,05 \cdot (u \cdot R_{sik})^{0,69} = 1,05 \cdot (0,17 \cdot 0,25)^{0,65} = 0,12$

$\Theta_{si,min} = 20 - 0,12 \cdot (20 - (-15)) = 15,8°C$

$f_{Rsi} = 1 - f_{Rsi,k} = 1 - 0,12 = 0,88$

$f_{Rsi} = 0,88 > f_{Rsi,N} = 0,489$ VYHOVÍ

c) A,B,C - S

$U_{A,B,C} = 0,18\ W/k \cdot m^2$

$U_S = 1,1\ W/k \cdot m^2$

$f_{Rsik} = 0,6 \cdot (U_e \cdot R_{sik})^{0,49} \cdot (U_e/U_i)^{0,21} = 0,6 \cdot (0,18 \cdot 0,25)^{0,49} \cdot (0,18/1,1)^{0,21} = 0,035$

$\Theta_{si,min} = 20 - 0,035 \cdot (20 - (-15)) = 18,48°C$

$f_{Rsi} = 1 - f_{Rsik} = 1 - 0,035 = 0,965$

$f_{Rsi} = 0,965 > f_{Rsi,N} = 0,489$ VYHOVÍ

d) D-S

$U_D = 0{,}17\ W/m^2 \cdot K$

$U_S = 1{,}1\ W/m^2 \cdot K$

$f_{Rsi} = 0{,}6 \cdot (U_e \cdot R_{si,k})^{0{,}49} \cdot (U_e/U_i)^{0{,}21} = 0{,}6 \cdot (0{,}17 \cdot 0{,}25)^{0{,}49} \cdot (0{,}4/1{,}1)^{0{,}21} = 0{,}034$

$\Theta_{si,min} = 20 - 0{,}034 \cdot (20 - (-15)) = 18{,}78°C$

$f_{Rsi} = 1 - f_{Rsi,k} = 1 - 0{,}034 = 0{,}966$

$f_{Rsi} = 0{,}966 > f_{Rsi,N} = 0{,}489$ VYHOVÍ

e) D-P

$U_D = 0{,}17\ W/m^2 \cdot K$

$U_P = 1{,}65\ W/m^2 \cdot K$

$f_{Rsi,k} = 0{,}6 \cdot (U_e \cdot R_{si,k})^{0{,}49} \cdot (U_e/U_i)^{0{,}21} = 0{,}6 \cdot (0{,}17 \cdot 0{,}25)^{0{,}49} \cdot (0{,}17/1{,}65)^{0{,}21} = 0{,}031$

$\Theta_{si,min} = 20 - 0{,}031 \cdot (20 - (-15)) = 18{,}92°C$

$f_{Rsi} = 1 - 0{,}031 = 0{,}969$

$f_{Rsi} = 0{,}969 > f_{Rsi,N} = 0{,}489$ VYHOVÍ

f) E-S

$U_E = 0{,}16\ W/m^2 \cdot K$

$U_S = 1{,}1\ W/m^2 \cdot K$

$f_{Rsi,k} = 0{,}6 \cdot (U_e \cdot R_{si,k})^{0{,}49} \cdot (U_e/U_i)^{0{,}21} = 0{,}6 \cdot (0{,}16 \cdot 0{,}25)^{0{,}49} \cdot (0{,}16/1{,}1)^{0{,}21} = 0{,}031$

$\Theta_{si,min} = 20 - 0{,}031 \cdot (20 - (-15)) = 18{,}92°C$

$f_{Rsi} = 1 - 0{,}031 = 0{,}969$

$f_{Rsi} = 0{,}969 > f_{Rsi,N} = 0{,}489$ VYHOVÍ

2. VÝPOČET PRŮMĚRNÉHO SOUČINITELE PROSTUPU TEPLA

1. OBALOVÉ PLOCHY A [m^2]

A_1 OBVODOVÁ STĚNA $A_1 = 320,4 - 34,51 - 2,73 = 285,89\ m^2$

A_2 STŘECHA $A_2 = 138,3\ m^2$

A_3 PODLAHA $A_3 = 139,4\ m^2$

A_4 OKNA $A_4 = 34,51\ m^2$

A_5 DVEŘE $A_5 = 2,73\ m^2$

$\Sigma A = 600,83\ m^2$

2. SOUČINITELE PROSTUPU TEPLA JEDNOTLIVÝCH KONSTRUKCÍ U [$W/K \cdot m^2$]

$U_1 = 0,17\ W/K \cdot m^2$

$U_2 = 0,16\ W/K \cdot m^2$

$U_3 = 0,18\ W/K \cdot m^2$

$U_4 = 0,6\ W/K \cdot m^2$

$U_5 = 0,9\ W/K \cdot m^2$

3. MĚRNÁ ZTRÁTA PROSTUPEM TEPLA H_T [W/K]

$H_{T1} = A_1 \cdot U_1 \cdot b = 285,89 \cdot 0,17 \cdot 1,0 = 48,60\ W/K$

$H_{T2} = A_2 \cdot U_2 \cdot b = 138,3 \cdot 0,16 \cdot 1,0 = 22,13\ W/K$

$H_{T3} = A_3 \cdot U_3 \cdot b = 139,4 \cdot 0,18 \cdot 0,66 = 16,56\ W/K$

$H_{T4} = A_4 \cdot U_4 \cdot b = 34,51 \cdot 0,6 \cdot 1,15 = 23,81\ W/K$

$H_{T5} = A_5 \cdot U_5 \cdot b = 2,73 \cdot 0,9 \cdot 1,15 = 2,83\ W/K$

$\Sigma H_T = 112,93\ W/K$

$H_T = \sum H_T + \Delta U_{tbm} \cdot A = 112,93 + 0,05 \cdot 600,83 = 142,97\ W/K$

4. PRŮMĚRNÝ SOUČINITEL PROSTUPU TEPLA $U_{em}\ [W/K \cdot m^2]$

$U_{em} = H_T / A = 142,97 / 600,83 = \underline{0,24\ W/m^2K}$

5. VÝPOČET POŽADOVANÉHO SOUČINITELE PROSTUPU TEPLA $U_{em_{IN20}}\ [W/K \cdot m^2]$

$H_{T1} = A_1 \cdot U_{1N20} \cdot b = 285,89 \cdot 0,3 \cdot 1,0 = 85,77\ W/k$

$H_{T2} = A_2 \cdot U_{2N20} \cdot b = 138,3 \cdot 0,24 \cdot 1,0 = 57,19\ W/k$

$H_{T3} = A_3 \cdot U_{N20} \cdot b = 139,4 \cdot 0,45 \cdot 0,66 = 41,40\ W/k$

$H_{T4} = A_4 \cdot U_{N20} \cdot b = 34,51 \cdot 1,5 \cdot 1,15 = 59,53\ W/k$

$H_{T5} = A_5 \cdot U_{N20} \cdot b = 2,73 \cdot 1,7 \cdot 1,15 = 5,34\ W/k$

$\sum H_T = 249,23\ W/k$

$U_{em_{120}} = \left[\frac{U_{Nj} \cdot A_j \cdot b_i}{\sum A_j}\right] + 0,02 = (249,23 / 600,83) + 0,02 = \underline{0,43\ W/m^2K}$