EXAMPLE 1

$$Q=\frac{T_{\infty 1}-T_{\infty 2}}{R_{total}}=4.3848\ W$$

EXAMPLE 2

A 3 m high and 5 m wide wall consists of long 32 cm and 22 cm cross section horizontal brick with k= 0,72 W/m°C, divided by 3 cm of plaster layers with k= 0,22 W/m°C) There are also a layers of plaster on each side of the brick and a 3 cm thick rigid foam on the inner side of the wall with k= 0,026 W/m°C. The indoor and the outdoor temperature are respectively 20 and - 10 degrees and the convection heat transfer coefficients are h_1 = 10 W/m^2 (inner surface) and h_2 = 40 W/m^2 (external surface). Assuming one dimensional heat transfer and disregarding radiation, determine the rate of heat transfer through the wall.

$$Q=\frac{T_{\infty 1}-T_{\infty 2}}{R_{total}}$$

R_i =0.4

R_f=4.615

$R_{plaster}$ =0.3636

$R_{parallel}$=1.999

R_o =0.1

R_{total} =R_i+R_f+R_p+$R_{parallel}$+R_p+ R_o=7.8412 °C/W

R_{total} =7.8412 °C/W

$$Q=\frac{T_{\infty 1}-T_{\infty 2}}{R_{total}}=3.8259\ W$$

It can be noticed that by increasing the thickness of the brick there is not a great difference in the total heat transfer. Hence it can be noticed that the thermal resistance is not affected greatly by the thickness of the material.

EXAMPLE 3

A wood frame wall that is built around 38-mm 90-mm wood studs with a center-to-center distance of 400 mm. The 90 mm wide cavity between the studs is filled with glass fiber insulation. The inside is finished with 13-mm gypsum wallboard and the outside with 13-mm wood fiberboard and 13-mm 200-mm wood bevel lapped siding. The insulated cavity constitutes 75 % of the heat transmission area while the studs, plates, and sills constitute 21 percent. The headers constitute 4 percent of the area, and they can be treated as studs.

....	Wood	Insulation
Outside air	0.03	0.03
Wood bevel (13*200mm)	0.14	0.14
Plywood (13mm)	0.11	0.11
Urethane Rigif Foam (90mm)	—	0,98x90/25=3.528
Wood Studs (90mm)	0.63	—
Gypsum board (13mm)	79	79
Inside surface	0.12	0.12

$R_{\text{with wood}} = (0.03+0.14+0.11+0.63+0.079+0.12) = 1.109\ m^2°C/W$

$R_{\text{with insulation}} = (0.03+0.14+0.11+3.528+0.079+0.12) = 4.007\ m^2°C/W$