

1.

$$\dot{Q} = \frac{\Delta T}{R_{Tot}} = \frac{30}{6.81} = 4.40 \text{ W}$$

2.

$$R_i = \frac{1}{h_i \times A} = \frac{1}{10 * 0.25} = 0.4 \text{ } ^\circ \frac{C}{W}$$

$$R_f = \frac{L_f}{(K_f \times A)} = \frac{0.03}{0.026 * 0.25} = 4.615 \text{ } ^\circ \frac{C}{W}$$

$$R_{P_1} = R_{P_2} = \frac{L_{p_1}}{k_p \times A_{p_1}} = \frac{0.02}{(0.22 * 0.25)} = 0.363 \text{ } ^\circ \frac{C}{W}$$

$$R_{p_{c_1}} = R_{p_{c_2}} = \frac{L_{p_{c_1}}}{k_p \times A_{p_{c_1}}} = \frac{0.32}{0.22 * 0.015} = 96.9696 \text{ } ^\circ \frac{C}{W}$$

$$R_b = \frac{L_b}{k_b \times A_b} = \frac{0.32}{0.72 * 0.22} = 2.0202 \text{ } ^\circ \frac{C}{W}$$

$$\frac{1}{R_{totparallel}} = \frac{1}{R_b} + \frac{1}{R_{p_{c_1}}} + \frac{1}{R_{p_{c_2}}} = \frac{1}{2.02} + 2 * \left(\frac{1}{96.96} \right)$$

$$= 0.51 \text{ } ^\circ \frac{C}{W}$$

$$\rightarrow \frac{1}{R_{totparallel}} = 0.51 \frac{W}{^\circ C} \rightarrow R_{totparallel} = \frac{1}{0.51} = 1.96 \text{ } ^\circ \frac{C}{W}$$

$$R_{o\Box} = \frac{1}{h_o \times A} = \frac{1}{40 * 0.25} = 0.1 \text{ } ^\circ \frac{C}{W}$$

$$R_{total} = R_i + R_o + 2 * R_{P_1} + R_{tot_{parallel}} + R_{foam}$$

$$= 0.4 + 4.615 + 0.363 + 0.363 + 1.96 + 0.1 = 7.801$$

$$\dot{Q} = \frac{\Delta T}{R_{Tot}} = \frac{30}{7.801} = 3.84 \text{ w}$$

The increase of brick thickness didn't considerably affect the rate of heat transfer.

3.	wood	insulation
Outside Air	0.03	0.03
Wood bevel l.	0.14	0.14
Plywood(13mm)	0.11	0.11
Urethane rigif foam	No	$0.98 * 90 / 25 = 3.528$
Wood studs	0.63	No
Gypsum board	0.079	0.079
Inside surface	0.12	0.12

$$R'_{withWood} = 0.03 + 0.14 + 0.11 + 0.63 + 0.079 + 0.12$$

$$= 1.109 \text{ m}^2 \cdot ^\circ \frac{C}{W}$$

$$R'_{withIns} = 0.03 + 0.14 + 0.11 + 3.528 + 0.079 + 0.12$$

$$= 4.007 \text{ m}^2 \cdot ^\circ C / W$$