Week 1 homework

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Question 1:

$$R_{conv_1} = \frac{1}{\mathrm{h}_1 \times A} = \frac{1}{10 * (0.015 + 0.22 + 0.015) * 1} = 0.4\ °C/W$$

$$R_{foam} = \frac{L_f}{K_f \times A} = \frac{1}{0.026 * (0.015 + 0.22 + 0.015) * 1} = 4.615\ °C/W$$

$$R_{pluster} = \frac{L_p}{\left(K_p \times A\right)} = \frac{0.32}{0.22 * 0.015 * 1} = 96.97\ °C/W$$

$$R_{brick} = \frac{L_b}{(K_b \times A)} = \frac{0.32}{0.22 * 0.72 * 1} = 2.02\ °C/W$$

$$\frac{1}{R_{total-parallel}} = 2 * \frac{1}{R_{pluster}} + \frac{1}{R_{brick}} = 2 * \frac{1}{96.97} + \frac{1}{2.02} = 0.516\ W/°C$$

$$R_{total-parallel} = 1.94 \circ \frac{C}{W}$$

$$R_{pluster} = \frac{L_p}{(K_p \times A)} = \frac{0.02}{0.022 * (0.015 + 0.22 + 0.015) * 1} = 0.363 \, ^\circ C/W$$

$$R_{conv_2} = \frac{1}{\mathrm{h}_2 \times A} = \frac{1}{40 * (0.015 + 0.22 + 0.015) * 1} = 0.1 \, ^\circ C/W$$

$$R_{wall-total} = 0.4 + 4.615 + 0.363 + 1.94 + 0.363 + 0.1 = 7.781 \, ^\circ C/W$$

$$\dot{Q} = \frac{30}{7.781} = 3.86 \, W$$

Question 2:

	Wood	Insulation
Outside air	0.03	0.03
Wood bevel (13mm*200mm)	0.14	0.14
Polywood (13mm)	0.11	0.11
Urethane Rigif foam Ins (90mm)	No	0.98*90/25=3.528
Wood studs (90mm)	0.63	No
Gypsum board (13mm)	0.079	0.079
Inside surface	0.12	0.12

$$R_{with\ wood} = 0.03 + 0.14 + 0.11 + 0.63 + 0.079 + 0.12$$
$$= 1.109\ m2\ ° \frac{C}{W}$$

$$R_{with\ Ins} = 0.03 + 0.14 + 0.11 + 3.528 + 0.079 + 0.12$$
$$= 4.007\ m2\ ° \frac{C}{W}$$