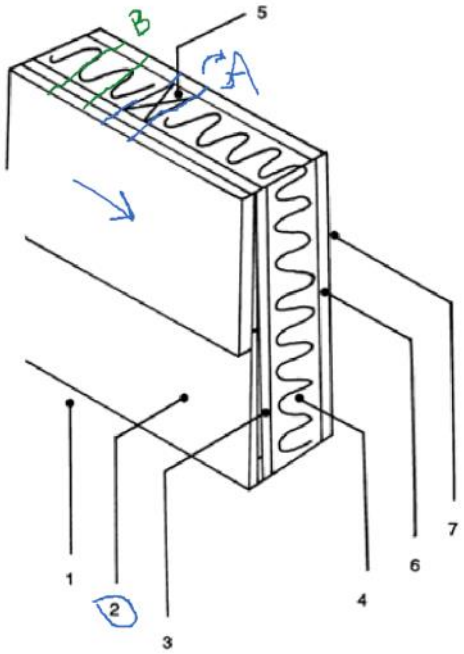
Submission 4

martedì 29 ottobre 2019 11:41

Task 1: you should complete the modified example of simplified wall calculations that you went through in the assignment of week 3 and find the total heat transfer through wall

Task 2 In 2 pages you shoudl write a summary (in your own word!, in your own words !!) of what you have learnt in this session about radiation and radiative heat transfer

- Determine the overall unit thermal resistance (the *R*-value) and the overall heat transfer coefficient (the *U*-factor) of 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 percent 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 (this means 75% of area is insulation and 25% can be considered wood)
Also, determine the rate of heat loss through the walls of a house whose perimeter is 50 m and wall height is 2.5 m in Las Vegas, Nevada, whose winter design temperature is -2 C. Take the indoor design temperature to be 22 C and assume 20 percent of the wall area is occupied by glazing. $A = 50 * 2.5 * 0.8 = 100\ m^2$, $\Delta T = 22 - (-2) = 24°C$



	Section A	Section B
Outside air	0,03	0,03
Wood bevel (13*200mm)	0,14	0,14
Plywood (13mm)	0,11	0,11
Urethane Rigif Foam (90mm)	-	0,98*90/25=3,528
Wood Studs (90mm)	0,63	-
Gypsum board (13mm)	0,079	0,079
Inside surface	0,12	0,12

$$R'_{withWood} = 0.03 + 0.14 + 0.11 + 0.63 + 0.079 + 0.12 = 1.109\ m^2.° \frac{C}{W}$$
$$R'_{withIns} = 0.03 + 0.14 + 0.11 + 3.528 + 0.079 + 0.12 = 4.007 m^2.°C/W$$

$$U_{wood} = \frac{1}{R'_{wood}} = \frac{1}{1.109} = 0.9017\ \frac{W}{m^2°C}$$

$$U_{ins} = \frac{1}{R'_{ins}} = \frac{1}{4.007} = 0.2495 \ \frac{W}{m^2°C}$$

$$A_{tot} = 50 * 2.5 * 0.8 = 100m^2$$

$$U_{tot} = \ U_{wood} \times \frac{A_{wood}}{A_{tot}} + U_{ins} \times \frac{A_{ins}}{A_{tot}} = 0.9017X \frac{25}{100} + 0.2495X \frac{75}{100} =$$

$$= 0.2254 + 0.187 = 0.4125 \frac{W}{m^2°C}$$

$$\Delta T = \ 22 \ - (-2) = 24°C$$

$$Q_{tot} = \ U_{tot} X A_{tot} X \ \Delta T = 0.4125 \ X \ 100 \ X \ 24 = 990W$$