Week 2

1-Conviction is a way that heat transfers by movement. Therefore, it can -happen in gas or liquid. The heated gas or liquid has a lower density so it will go up and changes place with the colder parts. In order to have conviction we need enough space which is more than 13 mm then we can say we have conviction. In heat transfer between window and both inside and outside of it one of them most important is conviction which is at both side of the window and the window itself with 1 panel glass is doing conduction. the rezone that if we make the glass pane thinker will not change the total resistance is the glass is not good heat resistant material in other hand the K for glass is much higher than air so if we change with air it has much better effect.

2-

3- Consider a 0.8-m-high and 1.5-m-wide double-pane window consisting of two 6-mm-thick layers of glass (k= 0.78 W/m.°C) separated by a 13-mm-wide stagnant air space (k= 0.026 W/m.°C). Determine the steady rate of heat transfer through this double-pane window and the temperature of its inner surface.

Take the convection heat transfer coefficients on the inner and outer surfaces of the window to be h1= 10 W/m2 · °C and h2=40 W/m2 · °C, which includes the effects of radiation.

$$A = \ 0.8 * 1.5 = 1.2$$

$$R_{g_1} = R_{g_2} = \frac{L_g}{(K_g \times A)} = \frac{0.006}{0.78 * 1.2} = 0.0064\ ° \frac{C}{W}$$

$$R_{airGap} = \frac{L_{airGap}}{(K_{airGap} \times A)} = \frac{0.013}{0.026 * 1.2} = 0.4166\ °C/W$$

$$R_{conv_1} = \frac{1}{\mathrm{h}_1 \times A} = (\frac{1}{10 * 1.2)} = 0.0833\ °C/W$$

$$R_{conv_2} = \frac{1}{\mathrm{h}_2 \times A} = (\frac{1}{40 * 1.2)} = 0.0208 \, ° \frac{C}{W}$$

$$R_{tot} = R_{conv_1} + R_{conv_2} + 2 \times R_g + R_{airGap}$$

$$= 0.0833 + 0.0208 + 2 * 0.0064 + 0.4166 = 0.5501 \, ° \frac{C}{W}$$

$$\dot{Q} = \frac{\Delta T}{R_{Tot}} = \frac{30}{0.5501} = 54.53 \, W$$

$$\dot{Q} = \frac{T_{inff_1} - T_{s_1}}{R_{conv_1}} = \rightarrow 54.53 = \frac{20 - T_{s_1}}{0.0833} \rightarrow T_{S_1 = 15.45°C}$$

If we make the distance higher than 13 mm for the air gap we make the space enough for air conviction and the resistance we have now change to conviction. in this distance and less air cannot make circulation and remain static and no circulation means not conviction and heat transfer as conviction.

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