

Mohammad javad mollaiyan Week2

1-conviction is cycle of heat travel as gas or liquid and we can explain that as round cycle that warmed gas or liquid goes up and on the way to top lose heat and become cold and again it travel back down .this heat transfer is part of making wind system which in large scale it can make natural wind .for 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 out side 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 have much better effect . the formula is  $L/KA$  as much as K rise it means less resistance and as much as K become smaller number it means the resistance become more .

2- my mistake was changing millimeter to meter but instead of writing 0.008 I wrote 0.08 and it changed my answer but was changing unite mistake .

3-part 3 next page

3-Consider a 0.8-m-high and 1.5-m-wide double-pane window consisting of two 6-mm-thick layers of glass ( $k = 0.78 \text{ W/m} \cdot ^\circ\text{C}$ ) separated by a 13-mm-wide stagnant air space ( $k = 0.026 \text{ W/m} \cdot ^\circ\text{C}$ ). 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  $h_1 = 10 \text{ W/m}^2 \cdot ^\circ\text{C}$  and  $h_2 = 40 \text{ W/m}^2 \cdot ^\circ\text{C}$ , which includes the effects of radiation.

$$A = 0.8 \times 1.5 = 1.2$$

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

$$R_{\text{airGap}} = \frac{L_{\text{airGap}}}{(K_{\text{airGap}} \times A)} = \frac{0.013}{0.026 \times 1.2} = 0.4166 \frac{^\circ\text{C}}{\text{W}}$$

$$R_{\text{conv}_1} = \frac{1}{h_1 \times A} = \left( \frac{1}{10 \times 1.2} \right) = 0.0833 \frac{^\circ\text{C}}{\text{W}}$$

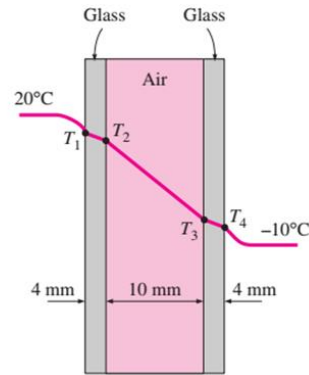
$$R_{\text{conv}_2} = \frac{1}{h_2 \times A} = \left( \frac{1}{40 \times 1.2} \right) = 0.0208 \frac{^\circ\text{C}}{\text{W}}$$

$$R_{\text{tot}} = R_{\text{conv}_1} + R_{\text{conv}_2} + 2 \times R_g + R_{\text{airGap}}$$

$$= 0.0833 + 0.0208 + 2 \times 0.0064 + 0.4166 = 0.5501 \frac{^\circ\text{C}}{\text{W}}$$

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

$$\dot{Q} = \frac{T_{\text{inf}_1} - T_{s_1}}{R_{\text{conv}_1}} \Rightarrow 54.53 = \frac{20 - T_{s_1}}{0.0833} \rightarrow T_{s_1} = 15.45^\circ\text{C}$$



If we make the distance higher than 13 mm for the air gap we make the space enough for air convection and the resistance we have now change to convection. In this distance and less air can not make circulation and remain static and no circulation means not convection and heat transfer as convection. So instead of making it more we can do another pane of glass with same distance from other two with air gap which make 3 pane glass with 2 air gap that is mostly used in cold country.