

## Week 2 Assignment

### **Question 1: What is the convective heat transfer, and why increasing the thickness of a single pane glass does not increase the total resistance.**

Heat transfers through mediums and materials in different ways, one of them is convection; which is basically the transfer of heat through liquids or gases (fluids). When a specific fluid is heated; it expands and lightens its density and moves away from heat source carrying heat energy. This is the simple definition of 'convection heat transfer'. Glass is a fragile material that allows for heat to transfer easily. Its tendency to resist heat transfer is low due to its characteristics.

### **Question 2: Write an explanation about what mistakes you made in the class that resulted in wrong answers.**

The main mistake was converting units and getting the right formula to start calculating, it gets a bit confusing which and where to start from.

### **Question 3: Solve the same problem as that of double pane window with the air-gap thickness of 13 mm and glass thickness of 6 mm, comment on your results and explain why we have an optimal range for the air-gap's distance.**

$$A = 0.8 * 1.5 = 1.2 \text{ m}^2$$

$$R_g = \frac{L}{k_g A} = \frac{0.006}{0.78 * 1.2} = \frac{0.006}{0.936} = 0.0064 \frac{^\circ\text{C}}{\text{W}}$$

$$R_{conv.1} = \frac{1}{h_1 A} = \frac{1}{10 * 1.2} = \frac{1}{12} = 0.0833 \frac{^\circ\text{C}}{\text{W}}$$

$$R_{conv.2} = \frac{1}{h_2 A} = \frac{1}{40 * 1.2} = \frac{1}{48} = 0.0208 \frac{^\circ\text{C}}{\text{W}}$$

$$R_{air \text{ gap}} = \frac{L_{air \text{ gap}}}{k_{air \text{ gap}} * A} = \frac{0.013}{0.026 * 1.2} = \frac{0.013}{0.0312} = 0.4166 \frac{^\circ\text{C}}{\text{W}}$$

$$R_{total} = 2 * 0.0064 + 0.0833 + 0.0208 + 0.4166 = 0.5335 \frac{^\circ\text{C}}{\text{W}}$$

$$Q = \frac{\Delta T}{R_{total}} = \frac{30}{0.5335} = 56.23 \text{ W}$$

From the previous two examples we can conclude that the bigger the air gap between glass panels the less heat transfers through the panels. I think in order to have a good or high energy efficiency there must be an optimal range for air gap's distance, as the filling of the gap isolates between the two glass panels and reduces heat transfer between the two sides.