Technical Environmental Solutions/ Submission no.2/ Leyana Altemawy

1- Summery:

Convective, is a heat transfer method between solid and fluid. There are two types of the convection heat transfer; the natural convection and the force convection. Where the natural convection, is the flow of fluid and movement due to density changing.
Example: cold air goes down, and hot air goes up in movement inside the room.
The force convection, is the movement caused by an external force. Example: the wind force that moves the air.
The rate of convection heat transfer depends on the following:

- Temperature difference
- Velocity of liquid or gas
- Kind of liquid or gas

To calculate the convection heat transfer, use the following equation:

$$\dot{Q}\ conv = \frac{(Ts\ - T\ \infty)}{R\ conv}$$

Where:
Ts: the temperature on the surface
T∞: the temperature of homogenius (room)
R conv: resistance

$$R\ conv = \frac{1}{hAs}$$

h: convection coefficient
As: area of the surface

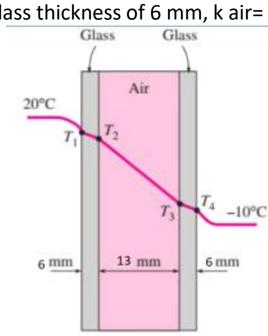
When we do calculations, we should use the worst scenarios (case), lowest temperature and the highest wind speed.
When calculating the heat transfer through a single pane glass window, we will find that the heat transfer through it is the highest. Because the glass resistance is less 10 time than the resistance of wall. Which means it does not have any effect on the heat transfer, even if we increased the thickness, it will not change and will be a waste of money.

2- Summery:

Mistakes I made in the class, mostly because of inaccurate calculations.

3- Example:

Double pane window with the air-gap thickness of 13 mm and glass thickness of 6 mm, k air= 0.026, k glass= 0.78, h1 = 10 w/m2,



h2 = 40 w/m2

A = 0.8 x 1.5 = 1.2 m2

R total = R conv 1 + R glass + R air gab + R glass + R conv 2

R conv 1 = 1 / h1 x A = 1 / (10 x 1.2) = 0.0833
R glass = L / k glass x A = 0.006 / (.78 x 1.2) = 0.0064

R air gab = L / k air gab x A = 0.013/ (0.026 x 1.2) = 0.4167
R glass = L / k glass x A = 0.006 / (.78 x 1.2) = 0.0064
R conv 2 = 1 / h1 x A = 1 / (40 x 1.2) = 0.0208

R total = (0.0833 + 0.0064 + 0.4167 + 0.0064 + 0.0208) = 0.5336

Q conv = Δ T / R total $= 30/\ 0.5336 = 56.2219$ W

The air gab has the highest resistance of heat flow in this case. But we have an optimal range for the air-gap's distance and after it will be inefficient, because the air will be able to move inside this gab, due to changing in density (natural convection).
Instead, having small space will not allow the movement. The standard size of an air gab inside a double glazed window is between 6 mm-13 mm.