WEEK 2 :

1. Summary

Convection : natural and forced
Convection heat transfer : heat transfer in liquids and gases.
Rate of convection depends on :

- The difference of temperature
- Kind of liquids and gases
- Velocity of liquids and gases

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$Q_{conv} = (T_{surface} - T_{inf})/R_{conv}$; $R_{conv} = 1/(h*A_{surface})$

- When the convection heat transfer coefficient h is very large, R becomes 0
- h doesn't depend on the material of the material of the wall

Heat through a single pane window :
The resistance of glass is week so the thickness doesn't effect much, incresing it is useless because the difference is negligeable. We increase thickness only for mechanical aspects (to avoid breaking) and not for heat transfer
The ultimate solution is double pane windows with an air gap respecting an optimal range for the distance in between.

3. Heat loss through a double pane window

A= 0,8*1,5= 1,2

$R_{conv1} = 1/(h_1*A) = 1/(10*1,2) = 0,0833$ °C/W

$R_{glass1}=R_{glass2} = L_1/(k_1*A) = 0,006/(0,78*1,2) = 0,0064$ °C/W

$R_{airgap} = L/(k*A) = 0,013/(0,026*1,2) = 0,4166$ °C/W

$R_{conv2} = 1/(h_2*A) = 1/(40*1,2) = 0,0208$ °C/W

$R_{total} = R_{conv1} + R_{glass1} + R_{glass2} + R_{airgap} + R_{conv2}$

= 0,0833+0,0064+0,0064+0,4166+0,0208
= 0,5335 °C/W

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$Q_{conv} = deltaT/R_{total}$

= 30/0,5335
= 56,2324 W

The heat transfer slowly decreases. The thermal transmittance tends to bottom out at around 13 mm and slowly decrease after this range.