# Assignment 2

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1)Convection is a way in which heat penetrate from fluids and solid surface . It occurs when heat is transferred by the movement of liquids or gases. The other methods of heat transfer are conduction and radiation.

There are two types of convection: natural convection and forced convection.

Natural convection occurs when fluids are heated. When the fluid molecules are heated, the fluid becomes larger and lighter. The heated molecules take up more space and rise to the top, while the cooler molecules goes to the bottom. These cooler molecules then become…

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In forced convection, there is external source that affect the convention , for example a cold strong wind is forcing more heat transfer into a house wall

Increasing the thickness of a glass does not increase the total resistance because the thermal resistance is too small compared to KxA . thus making the window bigger with few cm will not affect he resistance what leads us to negligible change in Q convection between air and glass. So increasing the thickness of the glass will slightly affect the resistance of glass

2) I forgot to change the unit.

3)Area of the surface: A*glass* = 0.8\*1.5 = 1.2m²

Thermal resistance of the material (glass 6mm thick) : R*glass* = = = 0.0064 ˚C/W

L𝑔K𝑙∗𝑎A𝑠𝑠 0.07.80∗016.2

Both layers of glass are of the same thickness so R*glass1* = R*glass2* = 0.0064 ˚C/W

Thermal resistance of convection between inner surface and air: R*conv1* = = = 0.0833 ˚C/W

h11∗A 10∗11.2

Thermal resistance of the convection between outer surface and air: R*conv2* = = = 0.0208 ˚C/W

h21∗A 40∗11.2

Thermal resistance of air space (13mm wide): R*air* = = = 0.4167 ˚C/W

KL𝑎𝑎𝑖𝑟𝑖𝑟∗A 0.002.061∗31.2

Total thermal resistance of the window: R*total* = R*conv1* + R*glass1* + R*air* + R*glass2* + R*conv2* R*total* = 0.0833 + 0.0064 + 0.4167 + 0.0064 + 0.0208

R*total* = 0.5333 ˚C/W

Steady rate of heat transfer through the double layer window: Q = R𝑡𝑜𝑡𝑎𝑙 = R𝑐𝑜𝑛𝑣1 = 0.5333 = 56.2535W

∆T T∞1−T∞2 20−(−10)

Q = T∞1−T1

R𝑐𝑜𝑛𝑣1

T*1* = T*∞1* – Q\*R*conv1* = 20 – 56.2535\*0.0833 = 15.3 ˚C/W

So the temperature of the inner surface of the window is 15.3 ˚C/W