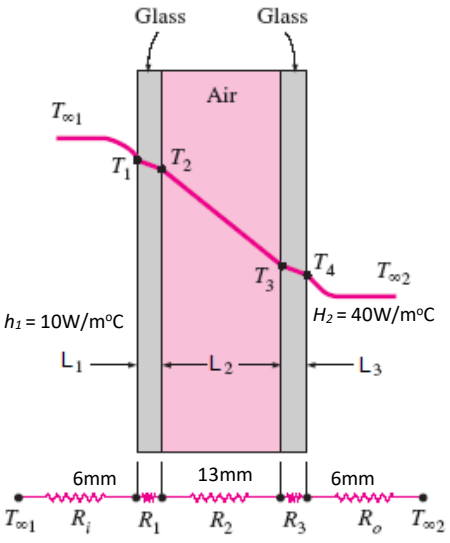
Week 2 Exercise:

-What is Convective Heat Transfer, and why does Increasing the thickness of a single pane glass does not increase the total resistance?

Convective heat transfer is the natural movement of the heat gained through materials of different elements, which can also happen in an open space such as a room where the heat gained will start moving through the whole space distributing it creating a thermal climate (temperature) in the room. For example if a window heats up it will start passing through solar radiation to the other side where the amount of the heat transferred will depend on the resistance of the window itself, but some heat will be transferred to the other side, and inside the room there will be (Natural Convection).

The reasoning behind why increasing the thickness of the glass panel has no effect on the heat resistance is the fact that increasing the amount of a glass you have in a single pane does not change the panels thermal properties as the material will heat up and eventually pass the outside heat to the other side (Solar Heat Gain), and it's going to make it way more expensive because you will have more material to work with. While adding an air gap between a double-glazed window or a triple glazing will, because the air gap will lock in the heat gained and have some kind of a natural convection within the air gap increasing the resistance of the window. The air gaps between the glass panels can also be filled with gasses to help with the resistance.

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



R_{Glass} 1&2: 0.006/(0.78x1.2) = 0.00641^{o}C/W

R_{air} = 0.013/(0.026x1.2)= 0.417 ^{o}C/W

R_{conv1} = 1/(10x1.2) = 0.083 ^{o}C/W

R_{conv2} = 1/(40x1.2) = 0.0208 ^{o}C/W

R_{total} = 0.0641+0.0641+0.417+0.083+0.0208 = 0.527^{o}C/W

Q = ΔT/0.527 = 56.92 W