Summary about the convective heat transfer

Convection is heat transfer by mass motion of a fluid such as air or water when the heated fluid is caused to move away from the source of heat, carrying energy with it. Convection above a hot surface occurs because hot air expands, becomes less dense, and rises. Hot water is likewise less dense than cold water and rises, causing convection currents which transport energy. For example: In liquids and gases, convection is usually the most efficient way to transfer heat. Convection occurs when warmer areas of a liquid or gas rise to cooler areas in the liquid or gas. As this happens, cooler liquid or gas takes the place of the warmer areas which have risen higher. This cycle results in a continuous circulation pattern and heat is transferred to cooler areas. You see convection when you boil water in a pan. The bubbles of water that rise are the hotter parts of the water rising to the cooler area of water at the top of the pan. You have probably heard the expression "Hot air rises and cool air falls to take its place" - this is a description of convection in our atmosphere. Heat energy is transferred by the circulation of the air.

Why increasing the thickness of a single pane glass does not increase the total resistance?

The thermal resistance of glass is a quite small value compared to the thermal resistance of convection between glass and air. Increasing the thickness of a single glass can increase the thermal resistance of the glass, but it does not significantly increase the total thermal resistance.

Question

A = 0.8∗1.5 = 1.2

$Rg1 = Rg2 = Lg/\ (Kg \times A)$= 0.006/ 0.78∗1.2= 0.0064 $°C\ W$

$RairGap$ = $LairGap$/ ($KairGap$ ×A) = 0.013 /0.026∗1.2 = 0.4166 °C/W

$Rconv$1 =1/ h1 ×A= 1/ (10∗1.2) = 0.0833 °C/W

$Rconv$2 =1 /h2 ×A= 1/ (40∗1.2) = 0.0208 °$C\ W$

$Rtot$ = $Rconv$1 +$Rconv$2 +2×Rg +$RairGap$ = 0.0833+0.0208+2∗0.0064+0.4166 = 0.5501 °$C\ W$

Q = ΔT/ $RTot$

=30 /0.5501= 54.53 W

Q =$Tinff$1 −Ts1/ $Rconv$1

54.53 =20−Ts1 /0.0833

TS1=15.45°C

If we make the distance higher than 13 mm for the air gap we make the space enough for air conviction and the resistances we have now change to conviction. In this distance and less air cannot make circulation and remain static and no circulation means not conviction and heat transfer as conviction .