Summary about the convective heat transfer

Heat convection is a mode of heat transfer by the mass motion of a fluid such as air. Heat convection occurs to the surface of an object where the surrounding fluid of object is heated and moved energy away from the source of heat. Convective heat transfer occurs when the surface temperature differs from that of surrounding fluid. 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 $°C\ W$

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

$Rconv1$ =1/ h1 ×A= 1/ (10∗1.2) = 0.0833 °C/W

$Rconv2$ =1 /h2 ×A= 1/ (40∗1.2) = 0.0208 °$C\ W$

$Rtot$ = $Rconv1$ +$Rconv2$ +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 =$Tinff1$ −$Ts1$/ $Rconv1$

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 .