WEEK 2 ASSIGNMENT

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1) Convective Heat Transfer

Convective heat transfer, often referred to simply as convection, is the transfer of heat from one place to another by the movement of fluids. Convection is usually the dominant form in the heat transfers in liquids and gases. For example, boiling water - The heat passes from the burner into the pot, heating the water at the bottom. Then, this hot water rises and cooler water moves down to replace it, causing a circular motion.

Newton's Law of Cooling

Newton's law states that "the rate of heat loss of a body is proportional to the difference in temperatures between the body and its surroundings while under the effects of a breeze." The constant of proportionality is the heat transfer coefficient. The law applies when the coefficient is independent, or relatively independent, of the temperature difference between object and environment

$$\dot{Q} = hA_s(T_s - T_\infty)$$
$$\dot{Q}_{conv} = (T_s - T_\infty)/R_{conv}$$
$$R_{conv} = 1/hA_s$$

Where, h is the heat transfer coefficient

a) When the convection heat transfer coefficient is very large ($h \rightarrow \infty$), the convection resistance becomes *zero* and $T_s \approx T$

b) The surface offers *no resistance to convection*, and thus it does not slow down the heat transfer process.

Increasing the thickness of a single pane glass does not increase the total resistance as the thickness increases the density of the air reduces. Hence, the transfer of heat through this air will be from negligible to zero. There will be a negligible difference total resistance.

2) While solving problems in the class, I had done a careless mistake of not converting mm to m.

3) Problem

L_1 = 13mm, L_2 =6mm, A=0.8x1.5, A=1.2m^2, h_1=20°C, h_2=-10°C

$R_{conv.}$ = 1/ h_1A + L_1/kA + L_a/kA + L2/kA + 1/h_2A

=1/10x1.2 + 0.006/0.78x1.2 + 0.013/0.026x1.2 + 0.006/0.78x1.2 + 1/40x1.2

=0.083+0.0064+0.0138+0.416+0.0208

=**0.54 °C/W**

$\dot{Q}$ = 20 – (-10)/0.54

=30/0.1346

=**55.55 W**

13mm is the optimal range because the resistance is higher between the two panes of glass of the window.