TECHNICAL ENVIRONMENTAL SYSTEMS: WEEK 1

Heat conduction:

Is a process in which energy passes through direct contact between different materials or through the material itself due to temperature differences when this is true for any state of aggregation.

Thermal conductivity:

Is a property of heat transfer material, with a temperature difference between them, the thermal conductivity is the heat energy transferred per unit time and per unit surface area, divided by the temperature difference. meaning where the heat transfer is the thermal energy transfer in the material, from high energy to low energy.

The two major mechanisms for transmitting heat energy are radiation and convection.

What's the equation for the rate of thermal conduction?

There are four factors (k, A,ΔT, L) that affect the rate at which heat is conducted through a material. These four factors are included in the equation below that was deduced from and is confirmed by experiments.

The defining equation for thermal conductivity is $\dot{Q} = k \cdot A \cdot \frac{\Delta T}{L}$, where

$\dot{Q}$ is the heat flux- the amount of heat transferred in a time t.

k is the thermal conductivity constant for the material.

ΔT is the difference in temperature between one side of the material and the other. and L is the thickness of the material.

A is the cross sectional area of the material transferring heat

thermal conductivity is measured in watts per meter-kelvin $(\frac{W}{m})$.

This is known as **Fourier's Law for heat conduction**.

THERMAL RESISTANCE CONCEPT:

L= 0.4m A=20m^2 ΔT=25 k=0.78 $(\frac{W}{m})$

Rate of the heat transfer through the wall:

$\dot{Q} = k \cdot A \cdot \frac{\Delta T}{L}$ = 0.78x20x$\frac{25}{0.4}$=975W

Rate of the heat loss through the wall:

Rwall=$\frac{L}{kA}$ = $\frac{0.4}{0.78x20}$=0.0256 $(\frac{c^\circ}{W})$

$\dot{Q} = \frac{\Delta T}{Rwall}$ = $\frac{25}{0.0256}$=975W