week4_TPletneva

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Task 1: completing the simplified calculations & finding the total heat transfer through the wall.

	WOOD	INSULATION
Outside air	0.03	0.03
Wood bevel (13*200 (mm))	0.14	0.14
Plywood (13mm)	0.11	0.11
Urethane rigid foam (90mm)	-	3.528
Wood studs (90mm)	0.63	-
Gypsum (13mm)	0.079	0.079
Inside air	0.12	0.12
TOTAL R_unit values (m^2*C)/W:	**1.109**	**4.007**

U= 1/R'

U_wood=1/R'_wood >
U_wood=1/1.109=**0.9017**

U_ins=1/R'_ins >
U_ins=1/4.007=**0.2496**

U_tot=0.25*U_wood+0.75*U_ins >
U_tot=0.25*0.9017+0.75*0.2496= **0.4126 W/(m^2*C)**

Q_tot=U_tot*A_tot*deltaT
Q_tot=0.4126*100*24=**990.24 W**

Task 2: summary about radiation & radiative heat transfer.

Radiation is a transfer of heat (energy) through electromagnetic waves (light, infrared, UV, microwaves, etc.). It does not require any contact in between the source of heat and the object that is being heated, no medium needed either. E.g.: Sun emits radiation that reaches Earth's surface, even though they’re not in contact and there's a vacuum in between them.

Any object above 0 Kelvin or -273 C degrees will emit radiation (everything around us). A visible range of electromagnetic spectrum is light. Different colors have different wavelength ranges.

Solar radiation can be divided into light, infrared and UV. UV-rays is a type of ionizing radiation that lays in the low spectrum between 0.01-0.40 µm. It is strong enough to remove the electron from a molecule, which means it can damage cells. Ultraviolet radiation is harmful for all kinds of living creatures. Earth's ozone layer works as a shield, absorbing the biggest amount of UV-rays coming from the sun.

A black body - is an idealized model that can be used to compare radiative properties of any other existing surfaces. It is at the same time a perfect emitter and absorber of radiation. At a given temperature a black body will emit the maximum possible amount of radiation at all wavelengths, and it will absorb all the radiation falling on it, including the visible one, which is why the body is called "black".

The spectrum of radiation, emitted by a black body is only determined by the temperature and not the shape of it.

The amount of radiation energy emitted by a blackbody at a thermodynamic temperature T per unit time, per unit surface area, and per unit wavelength about the wavelength is shown in the Planck's law:

$$E_{b\lambda}(\lambda, T) = \frac{C_1}{\lambda^5[\exp(C_2/\lambda T) - 1]} \qquad (\mathrm{W/m^2 \cdot \mu m})$$

Basically, as the temperature increases, the amount of emitting radiation will also increase, shifting to a shorter wavelength.

The Sun is considered to be the closest to a black body example in the Solar system. Its radiation reaches the visible spectrum (~5800 K), therefore we can observe it.