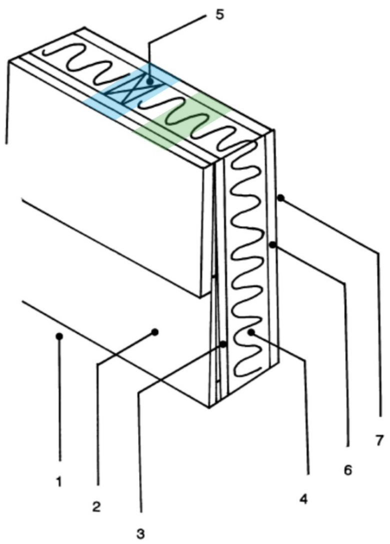
WEEK 4 SUBMISSION **PAOLA GOBBI - 926210**

1. **You should complete the modified example of simplified wall calculations that you went through in the assignment of week 3 and find the total heat transfer through wall.**



	A	B
1. OUTSIDE AIR	0,03	0,03
2. WOOD BEVEL L	0,14	0,14
3. PLYWOOD	0,11	0,11
4. URATHANE RIGID FOAM	–	0,98
5. WOOD STUDS	0,63	–
6. GYPSUN BOARD	0,079	0,079
7. INSIDE SURFACE	0,12	0,12

$$A_{TOT} = 50 \cdot 2{,}5 \cdot 0{,}8 = 100\, m^2$$

$$\Delta T = 22 - (-2) = 24°C$$

$$R'_{\text{URATHANE RIGID FOAM}} = 0{,}98 \cdot \frac{90}{25} = 3{,}528\, m^2 \cdot {}^{\circ}C/_{W}$$

$$R'_{WITH\,WOOD} = 0{,}03 + 0{,}14 + 0{,}11 + 0{,}63 + 0{,}079 + 0{,}12$$
$$= 1{,}109\, m^2 \cdot {}^{\circ}C/_{W}$$

$$R'_{INSULATION} = 0{,}03 + 0{,}14 + 0{,}11 + 3{,}528 + 0{,}079 + 0{,}12$$
$$= 4{,}007\, m^2 \cdot {}^{\circ}C/_{W}$$

$$U_{\text{WOOD}} = \frac{1}{R'_{WOOD}} = \frac{1}{1{,}109\,\frac{m^2 \cdot °C}{W}} = 0{,}9017\,\frac{W}{m^2 \cdot °C}$$

$$U_{\text{INS}} = \frac{1}{R'_{INS}} = \frac{1}{4{,}007\,\frac{m^2 \cdot °C}{W}} = 0{,}2495\,\frac{W}{m^2 \cdot °C}$$

Heat transfer coefficient:

$$U_{\mathrm{TOT}} = U_{WOOD} \cdot \frac{A_{WOOD}}{A_{TOT}} + U_{INS} \cdot \frac{A_{INS}}{A_{TOT}}$$
$$= 0{,}9017 \frac{W}{m^2 \cdot °C} \cdot 0{,}25 + 0{,}2495 \frac{W}{m^2 \cdot °C} \cdot 0{,}75 = 0{,}4125 \frac{W}{m^2 \cdot °C}$$

Heat loss through the walls:

$$Q_{\mathrm{TOT}} = U_{TOT} \cdot A_{TOT} \cdot \Delta T = 0{,}4125 \frac{W}{m^2 \cdot °C} \cdot 100\, m^2 \cdot 24°C = 990\, W$$

2. Write a summary about radiation and radiative heat transfer complete.

RADIATION

It is the emission or transmission of energy in the form of waves or particles through space or through a material medium. Radiation differs by conduction and convection because it does not require the presence of a material medium to occur and it can happen in solids, liquids and gases.

Electromagnetic waves | electromagnetic radiation:

they are moving electric fields generated by accelerated charges or changing electrical currents. these are the energy emitted by matter as a result of changes in the electronic configurations of atoms or molecules. They are characterized by:

- frequency ν
- wavelength λ

$$\lambda = \frac{c}{v}$$

$c =$ the speed of propagation of a wave

Photon | Quanta:

it a particle representing a quantum of light or other electromagnetic radiation.

$$e = h \cdot v = \frac{hc}{\lambda}$$

Thermal radiation:

it is the type of radiation relating to heat transfer.

Thermal radiation is continuously emitted by all matter whose temperature is above absolute zero and with the increasing of temperature increases also the thermal emission speed of the radiation.

LIGHT

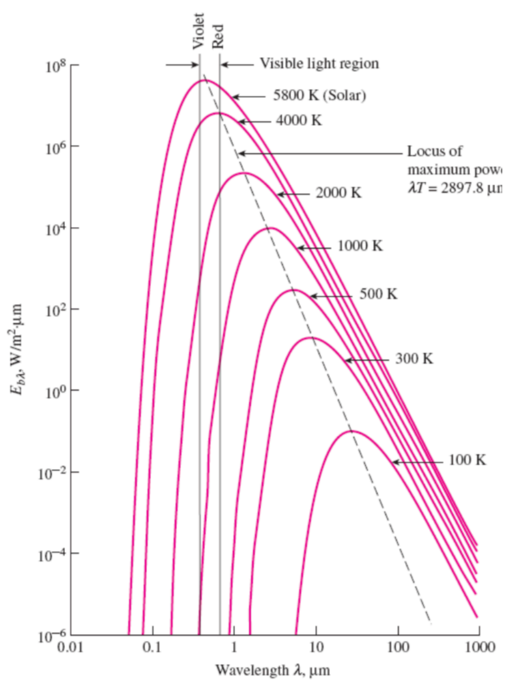
is the visible part of the electromagnetic spectrum positioned between 0,40 – 0,76 μm. The sun is our primary light source. Its electromagnetic radiation emitted is called as solar radiation, half of this it is light and the other part are ultraviolet and infrared.

Black body radiation:

it is an ideal body used as a standard to have a comparison with the radiative properties of other real surfaces. It is a perfect emitter and absorber of radiation.

The radiation energy emitted by a blackbody is:

$$E_b(T) = \sigma T^4$$



- the emitted radiation is a continuous function of the wavelength.
- the amount of radiation emitted increases with increasing temperature.
- as temperature increases, the curves shift to the left to the shorter wavelength region.
- The wavelength at which the peak occurs for a specified temperature is given by Wien's displacement law:

$$(\lambda T)_{\max power} = 2897{,}8\ \mu m \cdot K$$

Radiation intensity (I):

it is the quantity that defines the magnitude of radiation emitted in a specified direction in the space. It is necessary because the radiation is emitted by all parts of a plane surface in all directions and is not uniform.

Diffusely emitting surface:

$$E = \pi I_e$$

Incident radiation (G)

All surfaces emit radiation, and also receive radiation emitted or reflected by other surfaces. The radiation flux incident on a surface is called irradiation.

Diffusely incident radiation:

$$G = \pi I_i \qquad (W/m^2)$$

Radiosity (J)

it is the quantity that represents the speed that the radiation energy has to leave a surface.

Diffusely emitter and reflector:

$$J = \pi I_{e+r} \qquad (W/m^2)$$