Tatiana Pletneva - TES: Weekly submission 1

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Guidelines for this week's submission:

A short summary about the conductive heat transfer and solving the same exercise with L= 0.4 m, A= 20 m2, DeltaT= 25, and k=0.78 W/m K using both simple method and using the resistance concept

<https://github.com/bnajafi/TES_2019-2020_weeklySubmissions/tree/master/Week%201>

Summary - Conductive heat transfer

Heat transfer through the wall of a house can be modeled as *steady & one-dimensional*, it means, that the *heat transfer is constant* and the distribution of the temperature goes in a *straight line*

Fourier's law of heat conduction:

$$\dot{Q}_{cond,wall} = kA\,\frac{T_1 - T_2}{L} \quad (W)$$

k - Conductivity (Depends on the material)
A - Area of the wall's surface
T_1 - External temperature
T_2 - Internal temperature
L - Thickness of the wall

Thermal Resistance Concept:

Conduction resistance of the wall
Thermal resistance of the wall against heat conduction

$$\dot{Q}_{cond,wall} = \frac{T_1 - T_2}{R_{wall}} \quad (W)$$

$$R_{wall} = \frac{L}{kA} \quad (°C/W)$$

Solving the exercise

1. Simple way:

$$\dot{Q} = kA\frac{\Delta T}{L} = 0.78 * 20 * \frac{25}{0.4} = 975\ W$$

2. Through thermal resistance:

$$R_{wall} = \frac{L}{kA} = \frac{0.4}{0.78 * 20} = 0.0256\ °C/W$$

$$\dot{Q} = \frac{\Delta T}{R_{Wall}} = \frac{25}{0.0256} = 976.5\ W$$