

Week 4 Exercise:

- A wood frame wall that is built around 38-mm 90-mm wood studs with a center-to-center distance of 400 mm. The 90 mm wide cavity between the studs is filled with glass fiber insulation. The inside is finished with 13-mm gypsum wallboard and the outside with 13-mm wood fiberboard and 13-mm 200-mm wood bevel lapped siding. The insulated cavity constitutes 75% of the heat transmission area while the studs, plates, and sills constitute 21 percent. The headers constitute 4 percent of the area, and they can be treated as studs.

(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)

	Wood	insulation
Outside Air	0.03	0.03
Wood Bevel 13x200mm	0.14	0.14
Plywood 13mm	0.11	0.11
Urethane Rigid Foam 90mm	-	$0.98 \times \left(\frac{90}{25}\right) = 3.53$
Wood Studs 90mm	0.63	-
Gypsum Board 13mm	0.079	0.079
Inside Surface	0.12	0.12

$$R_{\text{with Wood}} = 1.11 \text{ m}^2 \text{ } ^\circ\text{C/W}$$

$$R_{\text{with Insulation}} = 4.01 \text{ m}^2 \text{ } ^\circ\text{C/W}$$

$$U_{\text{wood}} = \frac{1}{1.11} = 0.90 \text{ W/ m}^2 \text{ } ^\circ\text{C}$$

$$U_{\text{insulation}} = \frac{1}{4.01} = 0.25 \text{ W/ m}^2 \text{ } ^\circ\text{C}$$

$$U_{\text{overall}} = (0.90 * 0.25) + (0.25 * 0.75) = 0.4125 \text{ W/ m}^2 \text{ } ^\circ\text{C}$$

$$\Delta T = 22 - (-2) = 24 \text{ } ^\circ\text{C}$$

$$Q_{\text{overall}} = 0.4125 * (50 * 2.5) * 0.8 * 24 = 990 \text{ W}$$

- In 2 pages you should write a summary (in your own words! in your own words !!) of what you have learnt in this session about radiation and radiative heat transfer.

Radiation is energy that is emitted from an object or a source and has the ability to transfer to/through different elements or materials without the concept of conduction and convection does not exist because there isn't a need for any object contact which might change or effect their characteristics through thermal conduction. Some examples of radiation are the sun which radiates its light to earth warming it up without any direct contact between them.

The form of radiation where heat is a factor is called thermal radiation, and its strength value is measured as temperature, which is emitted by anything that has a temperature above absolute zero. Heat or thermal radiation can be felt, while other forms of radiation can be seen such as light which is visible to us when it exists.

Radiation can be both transmitted or absorbed by an object, as an example two different objects with different temperatures will be radiating heat and both of them will have an effect on the surrounding object or environment creating of somewhat a micro climate which we can feel nowadays because of how the amount of concrete that exists in today's world, which absorbs the solar radiation and radiates it back at night when the temperature becomes colder affecting the overall temperature.

Blackbodies tend to absorb radiation, and to give this some understanding when you point a source of high light radiation such as lasers at a black object (where true black still doesn't exist) the light tends to somewhat fade or almost disappear but it will end up heating the black object changing it into thermal radiation produced by the blackbody.