

In-Class Exercises n°04

Exercise 4.1

Consider a person standing in a room maintained at 22°C at all times. The inner surfaces of the walls, floors, and the ceiling of the house are observed to be at an average temperature of 10°C in winter and 25°C in summer. Determine the rate of radiation heat transfer between this person and the surrounding surfaces if the exposed surface area and the average outer surface temperature of the person are 1.4 m^2 and 30°C , respectively (Fig. 1–4).

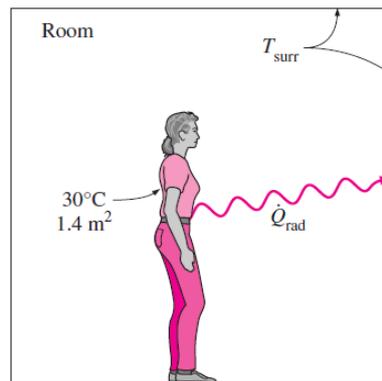


Fig. 1–4

Exercise 4.2

The inner and outer surfaces of a **25-cm-thick** wall in summer are at 27°C and 44°C , respectively. The outer surface of the wall exchanges heat by radiation with surrounding surfaces at 40°C , and convection with ambient air also at 40°C with a convection heat transfer coefficient of $8\text{ W/m}^2\cdot^{\circ}\text{C}$. Solar radiation is incident on the surface at a rate of 150 W/m^2 .

If both the emissivity and the solar absorptivity of the outer surface are **0.8**, determine the effective thermal conductivity of the wall.

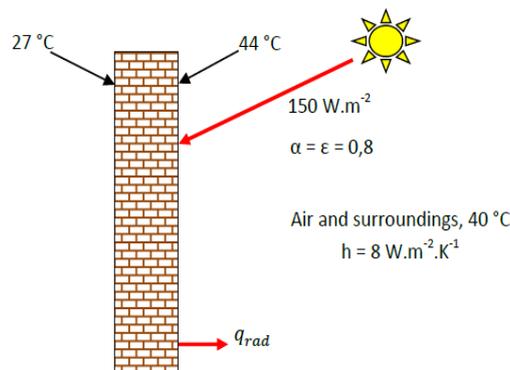


Fig. 1–5