

Physics 10154 - Quiz 13A

One side of a house contains a large flat wall with a surface area of 23.0 square meters. An additional 1.3 square meters of the wall is taken up by a single-pane glass window. Assume a difference between inside and outside temperature of 25° C.

The wall consists of three layers:

- 6.0 cm thick layer of brick ($k = 0.15 \text{ W/m K}$)
- 15 cm thick insulation ($k = 0.055 \text{ W/m K}$)
- 2.0 cm thick drywall ($k = 0.40 \text{ W/m K}$)

The window is a single layer of glass ($k = 0.80 \text{ W/m K}$), 0.65 cm thick.

Determine what percentage of heat is lost through the window compared to the wall.

Window:

$$P = \frac{(0.80)(1.3)(25)}{0.0065} = \underline{\underline{4000 \text{ W}}}$$

Wall:

$$R\text{-value} = \frac{.060}{.15} + \frac{.15}{.055} + \frac{.020}{.40}$$

$$= 0.4 + 2.73 + .05$$

$$= 3.18$$

$$P = \frac{(23)(25)}{3.18} = \underline{\underline{181 \text{ W}}}$$

$\frac{4000}{4181}$
↓
or 95.7% of total

$$\% = \frac{4000}{181} = 2200\% \text{ window vs wall}$$

$$\text{or } \frac{181}{4000} = 4.5\% \text{ wall vs window}$$