

$$t_1 := \text{time}(0)$$

$$\mu\text{rad} \equiv 10^{-6} \cdot \text{rad}$$

$$\text{mrad} \equiv 10^{-3} \cdot \text{rad}$$

$$\mu\text{m} \equiv 10^{-6} \text{ m}$$

$$\text{nm} := 10^{-9} \text{ m}$$

$$\text{ms} \equiv 10^{-3} \cdot \text{s}$$

$$\mu\text{s} \equiv 10^{-6} \text{ s}$$

$$\text{ns} \equiv 10^{-9} \cdot \text{s}$$

$$\text{kt} \equiv 1852 \frac{\text{m}}{\text{hr}}$$

$$\text{nmi} := 1852 \cdot \text{m}$$

$$^{\circ}\text{C} \equiv \text{K}$$

$$c \equiv 2.99792458 \cdot 10^8 \frac{\text{m}}{\text{s}}$$

$$h \equiv 6.62606876 \cdot 10^{-34} \text{ J} \cdot \text{s}$$

$$r_e \equiv 6378140 \cdot \text{m}$$

$$\sigma \equiv 5.670400 \cdot 10^{-8} \cdot \frac{\text{watt}}{\text{m}^2 \cdot \text{K}^4}$$

$$\text{mJ} \equiv 10^{-3} \text{ J}$$

$$\text{MW} \equiv 10^6 \text{ W}$$

$$\text{nW} \equiv 10^{-9} \text{ W}$$

$$\mu\text{W} \equiv 10^{-6} \text{ W}$$

$$\text{mW} \equiv 10^{-3} \text{ W}$$

$$\text{time}(0) - t_1 = 0.0940$$

brick

brick

insulation

steel

$$\text{thk}_4 := 270 \text{ mm}$$

$$\text{thk}_3 := 70 \text{ mm}$$

$$\text{thk}_2 := 10 \text{ mm}$$

$$\text{thk}_1 := 15 \text{ mm}$$

$$k_4 := 0.6 \frac{\text{W}}{\text{m} \cdot \text{K}}$$

$$k_3 := 0.6 \frac{\text{W}}{\text{m} \cdot \text{K}}$$

$$k_2 := 0.173 \frac{\text{W}}{\text{m} \cdot \text{K}}$$

$$k_1 := 73 \frac{\text{W}}{\text{m} \cdot \text{K}}$$

$$T_{\text{in}} := 1300 \text{ K}$$

$$T_{12} := 1000 \text{ K}$$

$$T_{23} := 1000 \text{ K}$$

$$T_{34} := 800 \text{ K}$$

$$T_{\text{s}} := 200 \text{ K}$$

$$T_{\text{air}} := 20 \text{ K}$$

given

$$\frac{k_1}{\text{thk}_1} \cdot (T_{\text{in}} - T_{12}) = \frac{k_2}{\text{thk}_2} \cdot (T_{12} - T_{23})$$

$$\frac{k_3}{\text{thk}_3} \cdot (T_{23} - T_{34}) = \frac{k_2}{\text{thk}_2} \cdot (T_{12} - T_{23})$$

$$\frac{k_3}{\text{thk}_4} \cdot (T_{23} - T_{34}) = \frac{k_4}{\text{thk}_4} \cdot (T_{34} - T_{\text{s}})$$

$$2.5 \frac{\text{W}}{\text{m}^2 \cdot \text{K}} \cdot (T_{\text{s}} - T_{\text{air}}) = \frac{k_4}{\text{thk}_4} \cdot (T_{34} - T_{\text{s}})$$

$$\text{find}(T_{12}, T_{23}, T_{34}, T_{\text{s}}) = \begin{pmatrix} 1299.3342 \\ 1112.0435 \\ 734.0285 \\ 356.0134 \end{pmatrix} \text{ K}$$