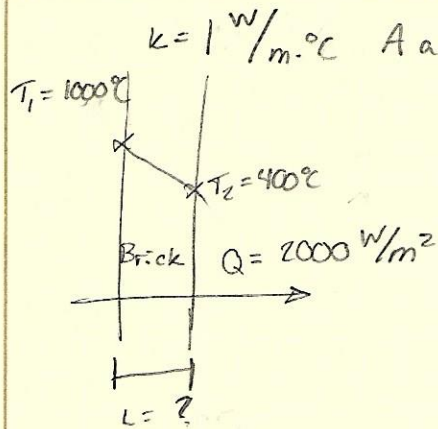


4-3)



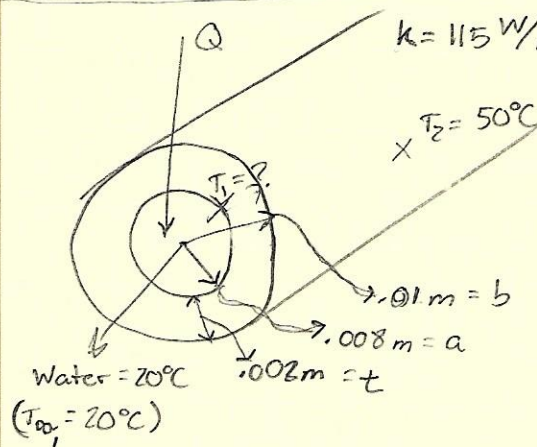
$$Q = \frac{\Delta T}{R_{\text{slab}}} = \frac{\Delta T}{\left(\frac{L}{Ak}\right)} = \frac{\Delta T (Ak)}{L}$$

$$2000 \text{ W/m}^2 = \frac{(1000 - 400)(1)(1)}{L}$$

$$2000 L = (600^\circ\text{C})(1 \text{ m}^2)(1 \text{ W/m} \cdot ^\circ\text{C})$$

$$L = \frac{600 \text{ W/m}}{2000 \text{ W/m}^2} \quad \boxed{L = .3 \text{ m}}$$

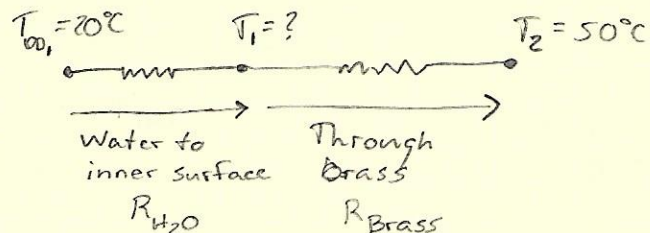
4-10)



$$Q = \frac{T_2 - T_{\infty 1}}{R_{H_2O} + R_{\text{Brass}}}$$

$$Q = \frac{50^\circ\text{C} - 20^\circ\text{C}}{R_{\text{cyl}} + R_{H_2O}}$$

$$\boxed{Q = 7.53 \text{ W/m}}$$

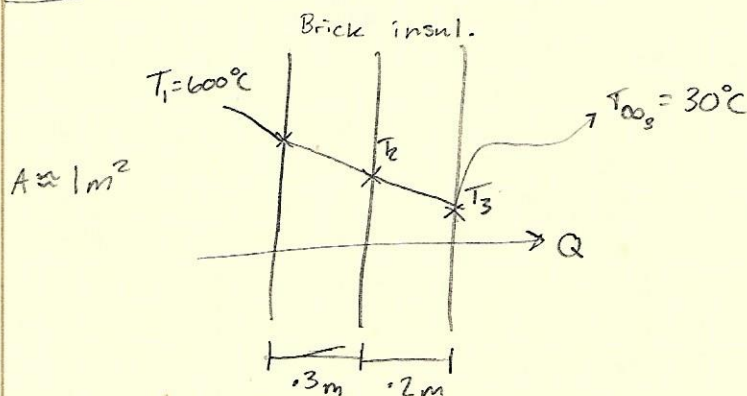


$$R_{H_2O} = \frac{1}{A_a h_{\infty 1}} = \frac{1}{\left(\frac{\pi (.008)^2}{4}\right) (5000 \text{ W/m}^2 \cdot ^\circ\text{C})} = (.251 \text{ W/m} \cdot ^\circ\text{C})$$

$$R_{\text{cyl}} = \frac{\ln(b/a)}{2\pi k H_2} = \frac{\ln(.01/.008)}{2\pi (115 \text{ W/m} \cdot ^\circ\text{C}) (2000 \text{ W/m}^2 \cdot ^\circ\text{C})}$$

$$R_{\text{cyl}} = 1.544 \times 10^{-7}$$

4-17)



$$R_{\text{Brick}} = \frac{L}{Ak} = \frac{.3 \text{ m}}{(1 \text{ m}^2)(1.5 \text{ W/m} \cdot ^\circ\text{C})} = .2 \text{ W/}^\circ\text{C}$$

$$R_{\text{insul}} = \frac{.2 \text{ m}}{(1 \text{ m}^2)(.01 \text{ W/m} \cdot ^\circ\text{C})} = 20 \text{ W/}^\circ\text{C}$$

$$R_{\infty 3} = \frac{1}{Ah_{\infty 3}} = \frac{1}{(1 \text{ m}^2)(15 \text{ W/m}^2 \cdot ^\circ\text{C})} = .0667 \text{ W/}^\circ\text{C}$$

$$k_1 = 1.5 \text{ W/m} \cdot ^\circ\text{C}$$

$$k_2 = .01 \text{ W/m} \cdot ^\circ\text{C}$$

$$h_{\infty 3} = 15 \text{ W/m}^2 \cdot ^\circ\text{C}$$

$$Q = \frac{T_1 - T_{\infty 3}}{R_{\text{Brick}} + R_{\text{insul}} + R_{\text{air}}}$$

$$Q = \frac{600^\circ\text{C} - 30^\circ\text{C}}{(.2 \text{ W/}^\circ\text{C}) + (20 \text{ W/}^\circ\text{C}) + (.0667)}$$

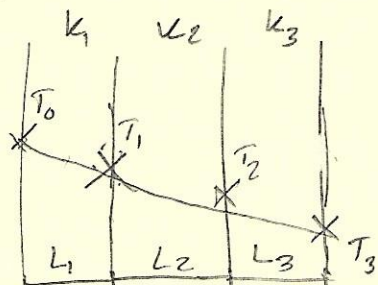
$$\boxed{Q = 28.125 \text{ W}}$$

$$T_3 = -Q(R_{\text{Brick}} + R_{\text{slab}}) + T_1$$

$$\boxed{T_3 = 31.88^\circ\text{C}}$$

4-23 *No Values given*

$$A = 1 \text{ m}^2$$



$$R_1 = \frac{L_1}{k_1(1)}$$

$$R_2 = \frac{L_2}{k_2}$$

$$R_3 = \frac{L_3}{k_3}$$

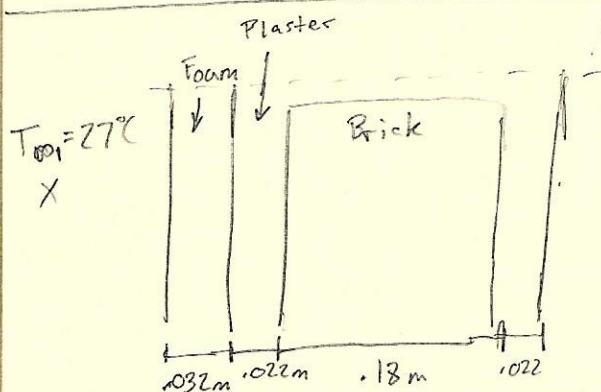
$$R_{eq} = R_1 + R_2 + R_3$$

$$Q = \frac{T_0 - T_3}{R_{eq}}$$

$$Q = \frac{T_0 - T_1}{R_1}$$

$$\rightarrow \begin{cases} T_1 = T_0 - Q(R_1) \\ T_2 = T_0 - Q(R_1 + R_2) \end{cases}$$

4-35



$$T_{02} = 10^\circ\text{C}$$

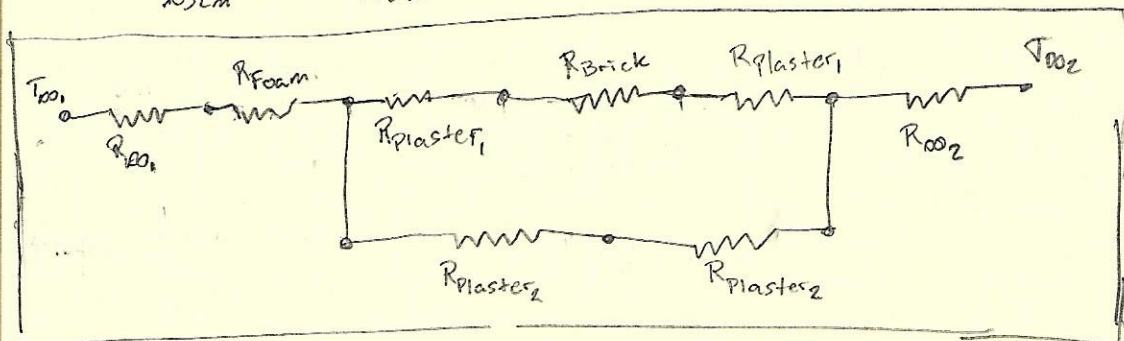
$$h_{001} = 10 \text{ W/m}^2 \cdot ^\circ\text{C}$$

$$h_{002} = 30 \text{ W/m}^2 \cdot ^\circ\text{C}$$

$$k_{\text{Brick}} = .6 \text{ W/m} \cdot ^\circ\text{C}$$

$$k_{\text{Plaster}} = .22 \text{ W/m} \cdot ^\circ\text{C}$$

$$k_{\text{Foam}} = .2 \text{ W/m} \cdot ^\circ\text{C}$$



$$A_{\text{total}} = 21 \text{ m}^2$$

$$R_{001} = \frac{1}{(21 \text{ m}^2)(10 \text{ W/m}^2 \cdot ^\circ\text{C})} = .00476 \text{ W/}^\circ\text{C}$$

$$R_{\text{foam}} = \frac{.032 \text{ m}}{(21 \text{ m}^2)(.2)} = .00762$$

$$R_{\text{Plaster}_1} = \frac{.22}{(21)(.22)} = .0476$$

$$R_{\text{Plaster}_2} = \frac{.224}{(21)(.2)} = 5.3$$

$$R_{002} = \frac{1}{(21)(30)} = .00159$$

$$R_{\text{Brick}} = \frac{.18}{(21)(.6)} = .0143$$

4-35) Cont.

$$R_{\text{eq}} = \frac{1}{2R_{\text{plaster}_1} + R_{\text{brick}}} + \frac{1}{R_{\text{plaster}_2}} = \frac{1}{2(.0476) + .0143} + \frac{1}{2(.0533)}$$

$$R_{\text{eq}} = 18.513 \text{ W/}^\circ\text{C}$$

$$R_{\text{Total}} = 18.513 + .00476 + .00762 + .00159 = \underline{18.527 \text{ W/}^\circ\text{C}}$$

$$Q = \frac{\Delta T}{R_{\text{Total}}} = \frac{27^\circ - 10^\circ}{18.527} = \boxed{.918 \text{ W} = Q}$$