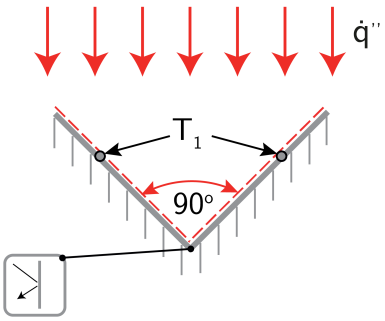
Surface Brightness 37

Determine the surface brightness $\dot{Q}_1$. Use view factors and other surface brightnesses whenever possible.



Definition of the surface brightness:

$$\dot{Q}_1 = \dot{Q}_{1,\epsilon} + \dot{Q}_{1,\rho} + \cancelto{0}{\dot{Q}_{1,\tau}}$$

Defining the emitted, reflected and transmitted radiation:

The emitted radiation of a grey body radiator can be stated as:

$$\dot{Q}_{1,\epsilon} = \epsilon_1 \sigma A_1 T_1^4$$

The reflected radiation can be expressed by the reflection coefficient and the radiation being transferred toward the body:

$$\dot{Q}_{1,\rho} = \rho_1 \left(\dot{Q} + \Phi_{11} \dot{Q}_1 \right) = \rho_1 \left(\dot{q}'' \sin\left(45^\circ\right) A_1 + \Phi_{11} \dot{Q}_1 \right)$$

Inserting and rewriting:

$$\Rightarrow \dot{Q}_1 = \epsilon_1 \sigma A_1 T_1^4 + \rho_1 \left(\frac{\dot{q}''}{\sqrt{2}} A_1 + \Phi_{11} \dot{Q}_1 \right)$$