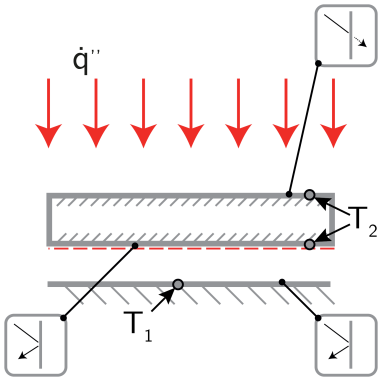
Surface Brightness 32

Determine the surface brightness $\dot{Q}_{2,\text{bottom}}$. Use surface brightnesses whenever possible.



Definition of the surface brightness:

$$\dot{Q}_{2,\text{bottom}} = \dot{Q}_{2,\text{bottom},\epsilon} + \dot{Q}_{2,\text{bottom},\rho} + \dot{Q}_{2,\text{bottom},\tau}$$

Defining the emitted, reflected and transmitted radiation:

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

$$\dot{Q}_{2,\text{bottom},\epsilon} = \epsilon_{2\text{b}} \sigma A_2 T_2^4$$

The reflected radiation can be expressed by the transmission coefficient and the radiation being transferred toward the bottom of the body:

$$\dot{Q}_{2,\text{bottom},\rho} = \rho_{2\text{b}} \Phi_{12} \dot{Q}_1$$

The transmitted radiation can be expressed by the transmission coefficient and the radiation being transferred toward the top of the body:

$$\dot{Q}_{2,\text{bottom},\tau} = \tau_{2\text{t}} \dot{Q} = \tau_{2\text{t}} \dot{q}'' A_2$$

Inserting and rewriting:

$$\Rightarrow \dot{Q}_{2,\text{bottom}} = \epsilon_{2\text{b}} \sigma A_2 T_2^4 + \rho_{2\text{b}} \dot{Q}_1 + \tau_{2\text{t}} \dot{q}'' A_2$$

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