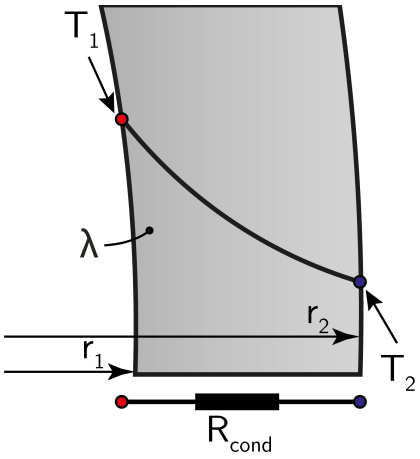
Conduction - Thermal Resistance 02

Define the heat transfer resistance R_{cond} for a pipe of length L and radii r_1 and r_2:



The standard expression for thermal resistance is:

$$R_{\text{cond}} = \frac{\Delta T}{\dot{Q}_{\text{cond}}}$$

The temperature difference can be expressed as:

$$\Delta T = T_1 - T_2$$

Where the rate of heat transfer for a plane wall can be stated as follows:

$$\dot{Q}_{\text{cond}} = -\lambda A \frac{\partial T}{\partial r} = \lambda 2\pi\lambda L \frac{T_1 - T_2}{\ln\left(r_2/r_1\right)}$$

Substitution yields:

$$\rightarrow R_{\text{cond}} = \frac{1}{2\pi L\lambda} \ln\left(r_2/r_1\right)$$