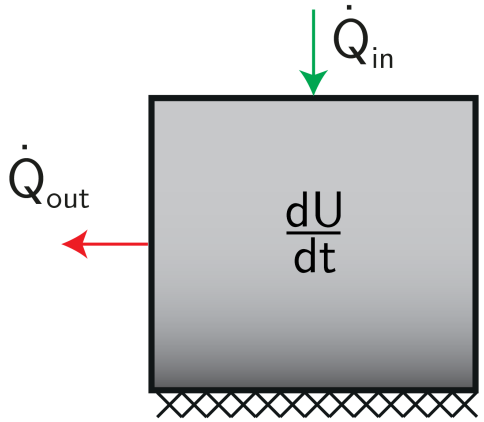
Boundary Conditions - Cond. - Body 10

A steel cube, initially at a homogeneous temperature T_0, is subjected to convection at all sides of a steel cube except the bottom. The bottom side is adiabatic, while the top side is subject to heat flow in addition to convection. Provide the boundary and/or initial conditions required to solve the governing energy equation that describes the time variation of the homogeneous temperature of the cube.



Given the differential equation:

$$\rho c_p L^3 \frac{\partial T_w}{\partial t} = \dot{q}'' L^2 - 5\alpha L^2 (T_w - T_\infty)$$

In order to solve the differential equation, one initial condition is required. This can be seen from the fact that the variable T has been differentiated once with respect to t.

Initial condition:

$$T_w(t = 0) \;=\; T_0$$

The initial condition describes that the body temperature initially at $t = 0$ was at T_0.