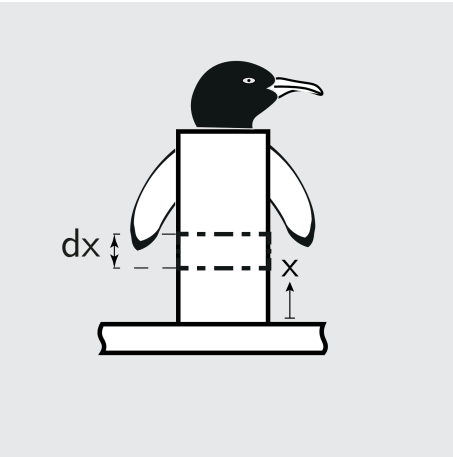
# Control Volume - Cond. - IE 11

**A penguin's body has a circular cross-section. One-dimensional, steady-state heat transfer in the direction from base to tip can be assumed. Pick the correct control volume to derive a homogeneous differential equation to describe the axial temperature distribution. If needed, also define the coordinate system.**




The temperature profile in a body can be determined by solving the heat equation. The heat equation yields from setting up an energy balance of an infinitesimal element inside the relevant body.

The temperature only changes when moving from bottom to top, which we will refer to as the radial direction $x$. As we are dealing with a cylindrical body that changes in the axial direction, a one-dimensional infinitesimal element in cylindrical coordinates is suitable for solving the problem.