

18.17 We are asked to select which of several metals may be used for a 3 mm diameter wire to carry 12 A, and have a voltage drop less than 0.01 V per foot (300 mm). Using Equations 18.3 and 18.4, let us determine the minimum conductivity required, and then select from Table 18.1, those metals that have conductivities greater than this value. Combining Equations 18.3 and 18.4, the minimum conductivity is just

$$\begin{aligned}\sigma &= \frac{Il}{VA} = \frac{Il}{V\pi\left(\frac{d}{2}\right)^2} \\ &= \frac{(12 \text{ A})(300 \times 10^{-3} \text{ m})}{(0.01 \text{ V}) (\pi)\left(\frac{3 \times 10^{-3} \text{ m}}{2}\right)^2} = 5.1 \times 10^7 (\Omega \cdot \text{m})^{-1}\end{aligned}$$

Thus, from Table 18.1, only copper, and silver are candidates.