Answer on Question #39328, Physics, Electric Circuits

The resistivity of steel is 20x10^-8.m What is the electrical resistance of a steel rail 10 km long and having a cross sectional area of 0.81m^2

**Solution:**

The electrical resistance of a wire would be expected to be greater for a longer wire, less for a wire of larger cross sectional area, and would be expected to depend upon the material out of which the wire is made. Experimentally, the dependence upon these properties is a straightforward one for a wide range of conditions, and the resistance of a wire can be expressed as

$$R = \frac{\rho L}{A}$$

where ρ = resistivity = $20x10^{-8}$ ohm·m

L = length = $10\ x10^{3}$ m

A= cross sectional area = 0.81 $m^2$.

$$R = \frac{20 \cdot 10^{-8} \cdot 10 \cdot 10^{3}}{0.81} = 2.47 \cdot 10^{-3}\ \text{Ohm}$$

**Answer.** R = 0.00247 Ohm.