

16. Let the cross-sectional area of the wire be A and the density of steel be ρ . The tensile stress is given by τ/A where τ is the tension in the wire. Also, $\mu = \rho A$. Thus,

$$\begin{aligned}v_{\max} &= \sqrt{\frac{\tau_{\max}}{\mu}} = \sqrt{\frac{\tau_{\max}/A}{\rho}} \\&= \sqrt{\frac{7.0 \times 10^8 \text{ N/m}^2}{7800 \text{ kg/m}^3}} = 3.0 \times 10^2 \text{ m/s}\end{aligned}$$

which is indeed independent of the diameter of the wire.