

$$\sigma = \frac{P}{A}$$

$$P_{\max} = (150 \text{ kg} \cdot 10 \text{ m/s}^2) \cdot \frac{4}{3} = 1500 \text{ N} \cdot \frac{4}{3}$$

margin of safety

$$P_{\max} = 2000 \text{ N} = 2 \times 10^3 \text{ N}$$

$$\sigma_{\max \text{ steel}} = 200 \text{ MPa} = 200 \times 10^6 \text{ Pa} = 2 \times 10^8 \text{ Pa}$$

$$\sigma_{\max \text{ nylon}} = 40 \text{ MPa} = 40 \times 10^6 \text{ Pa} = 4 \times 10^7 \text{ Pa}$$

$$A_{\min} = \frac{P_{\max}}{\sigma_{\max}}$$

$$A_{\min \text{ steel}} = \frac{2 \times 10^3 \text{ N}}{2 \times 10^8 \text{ Pa}} = 10^{-5} \text{ m}^2$$

$$A_{\min \text{ nylon}} = \frac{2 \times 10^3 \text{ N}}{4 \times 10^7 \text{ Pa}} = \frac{1}{2} \times 10^{-4} \text{ m}^2 = 5 \times 10^{-5} \text{ m}^2$$

$$V = AL$$