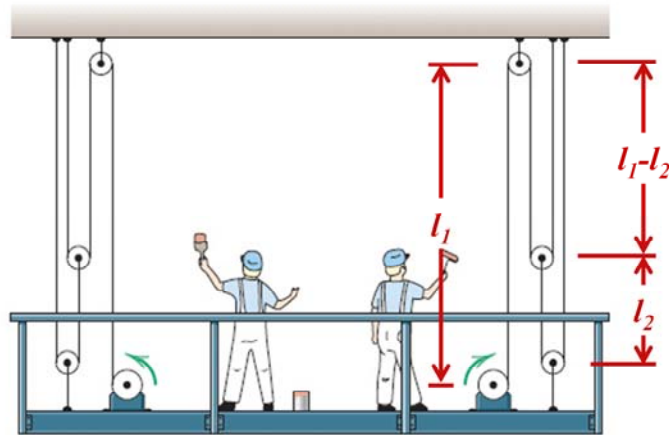


One Degree of Freedom: Another Exercise



The scaffold is being raised. Each winch drum has a diameter of 200 mm and turns at the rate of 40 rpm.

Determine the upward **velocity** of the scaffold.

ME 231: Dynamics

2/225

$$\text{Length } l_1 = l_1 + 2(l_1 - l_2) + \text{const.}$$

$$\dot{l}_1 = -r\omega = 3\dot{l}_1 - 2\dot{l}_2$$

$$\text{Length } l_2 = l_2 + l_1 + \text{const.}$$

$$\dot{l}_2 = 0 = \dot{l}_2 + \dot{l}_1, \quad -\dot{l}_1 = \dot{l}_2$$

$$\text{But } v = -\dot{l}_1, \text{ so}$$

$$-r\omega = 3(-v) - 2v \quad r\omega = 5v$$

$$v = \frac{r\omega}{5} = \frac{0.1(40)\left(\frac{2\pi}{60}\right)}{5} = 0.0838 \frac{\text{m}}{\text{s}}$$

$$\text{or } \underline{v = 83.8 \text{ mm/s}}$$

