

PROBLEM 2.4

KNOWN: A brick of known volume and density experiences a given decrease in elevation.

FIND: Determine the change in potential energy.

SCHEMATIC & GIVEN DATA:

ENGR. MODEL: (1) The brick is a closed system. (2) The acceleration of gravity is constant. (3) The density of the body is uniform throughout.

ANALYSIS:

$$V = (2.5 \text{ in})(3.5 \text{ in})(6 \text{ in}) \left| \frac{1 \text{ ft}^3}{12^3 \text{ in}^3} \right| = 0.03038 \text{ ft}^3$$

Based on assumption (3)

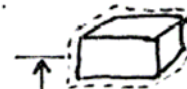
$$m = \rho V = (120 \text{ lb/ft}^3)(0.03038 \text{ ft}^3) = 3.65 \text{ lb}$$

The change in potential energy and the elevation are related by

$$\Delta PE = mg \Delta z$$

$$= (3.65 \text{ lb}) \left(32.0 \frac{\text{ft}}{\text{s}^2} \right) (-69 \text{ ft}) \left| \frac{1 \text{ lbf}}{32.2 \text{ lb} \cdot \text{ft/s}^2} \right| = -250.3 \text{ ft} \cdot \text{lbf}$$

$$V = 2.5 \times 3.5 \times 6 \text{ in}^3$$



$$\rho = 120 \text{ lb/ft}^3$$

$$g = 32.0 \text{ ft/s}^2$$

$$\Delta z = -69 \text{ ft}$$

z

