

Work and Fluid Forces

Constant force formula for work

Variable force formula for work

Hooke's Law

The pressure-depth equation

**Stretching a spring** A spring has a natural length of 10 in. An 800-lb force stretches the spring to 14in.

- a. Find the force constant.
- b. How much work is done in stretching the spring from 10 in. to 12 in.?
- c. How far beyond its natural length will a 1600-lb force stretch the spring

**Leaky sandbag** A bag of sand originally weighing 144 lb was lifted at a constant rate. As it rose, sand also leaked out at a constant rate. The sand was half gone by the time the bag had been lifted to 18 ft. How much work was done lifting the sand this far? (Neglect the weight of the bag and lifting equipment.)

**Emptying a cistern** The rectangular cistern (storage tank for rainwater) shown has its top 10 ft below ground level. The cistern, currently full, is to be emptied for inspection by pumping its contents to ground level.

- How much work will it take to empty the cistern?
- How long will it take a  $\frac{1}{2}$ -hp pump, rated at 275 ft-lb/sec, to pump the tank dry?
- How long will it take the pump in part (b) to empty the tank halfway? (It will be less than half the time required to empty the tank completely.)
- The weight of water** What are the answers to parts (a) through (c) in a location where water weights  $62.26 \text{ lb} / \text{ft}^3$ ?

