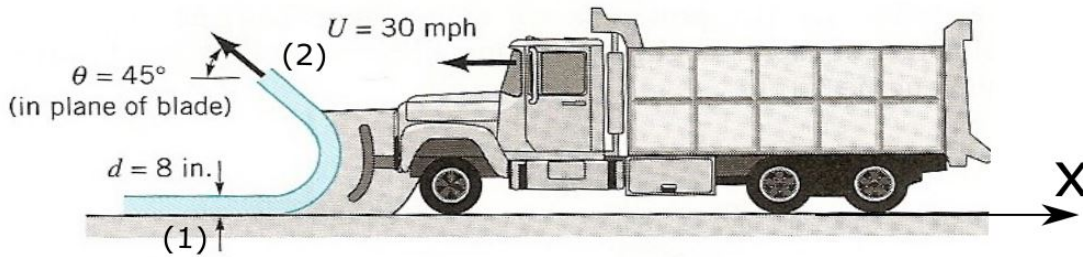


5.80 A snowplow mounted on a truck clears a path 12 ft through heavy wet snow, as shown in Figure P5.83. The snow is 8 in. deep and its density is 10 lbm/ft^3 . The truck travels at 30 mph. The snow is discharged from the plow at an angle of 45° from the direction of travel and 45° above the horizontal, as shown in Figure P5.70. Estimate the force required to push the plow.



$$-\dot{m}_1 + \dot{m}_2 = 0$$

$$\rho A_1 V_{R1} = \rho A_2 V_{R2}$$

$$V_{R2} = V - V_2 = -V_2 = U$$

$$\frac{V_1^2}{2g} + \frac{P_1}{\gamma} + z_1 = \frac{V_2^2}{2g} + \frac{P_2}{\gamma} + z_2$$

$$P_1 = P_2 = 0$$

$$z_1 = z_2$$

$$V_{R1} = V_{R2} = V_R$$

$$A_1 = A_2 = A$$

$$\Sigma F_x = -F_x = -\dot{m}_1 V_{R1} + \dot{m}_2 (-V_{R2} \cos 45^\circ)$$

$$F_x = \rho A V_R^2 (1 + \cos 45^\circ)$$

$$F_x = \frac{10 \times \frac{8}{12} \times 12}{32.2} \times \left(30 \times \frac{5280}{3600} \right)^2 (1 + 0.707)$$

$$= 8220 \text{ lb}$$