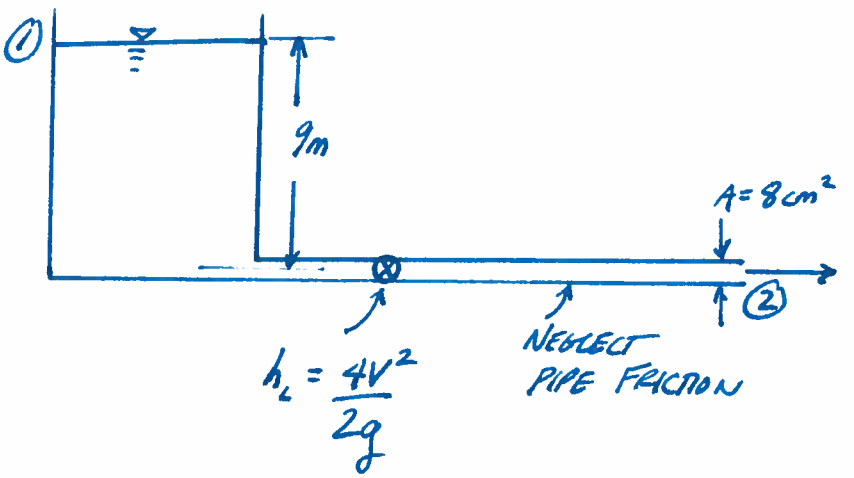
7.34 FIND Q. $C = 1.0$ EVERYWHERE. NEGLECT PIPE FRICTION, BUT INCLUDE VALVE LOSS



EQUATIONS

ENERGY, CONTINUITY.

SOLUTION

ENERGY FROM ① TO ②

$$\frac{p}{\gamma} + \frac{V_1^2}{2g} + z_1 + h_P = \frac{p}{\gamma} + \frac{V_2^2}{2g} + z_2 + h_L + h_T$$

0 gage ≈0 0 gage 0-DATUM

$$z_1 = \frac{V_2^2}{2g} + h_L = \frac{V_2^2}{2g} + \frac{4V_2^2}{2g} = \frac{5V_2^2}{2g}$$

SOLVE FOR V_2

$$\sqrt{\frac{2g\,z_1}{5}} = V_2$$

$$\therefore \sqrt{\frac{2(9.8\,m/s^2)(9m)}{5}} = 5.94\,m/s$$

CONTINUITY TO RECOVER Q

ES-17

7.34 (CONTINUED)

$Q = V \cdot A$

$= (5.94 \text{ m/s})(8 \text{ cm}^2)\left(\frac{1 \text{ m}}{100 \text{ cm}}\right)\left(\frac{1 \text{ m}}{100 \text{ cm}}\right)$

$= 0.00475 \text{ m}^3/\text{s}$ ← Q