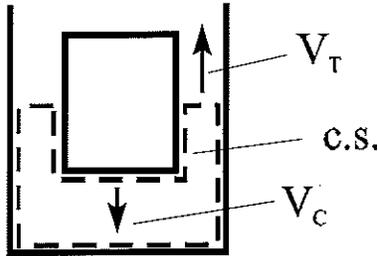


4.65 Information and assumptions

A 6 in. diameter cylinder falls at a speed $V_C = 3$ ft/s. The container diameter is 8 in. provided in problem statement



Find

Mean velocity of the liquid in the space between the cylinder and the wall: V_T

Solution

Apply continuity equation and let the c.s. be fixed except at bottom of cylinder where the c.s. follows the cylinder as it moves down.

$$\begin{aligned}
 0 &= d/dt \int \rho dV + \sum \rho \mathbf{V} \cdot \mathbf{A} \\
 0 &= d/dt(V) + V_T A_A \\
 0 &= V_C A_C + V_T (\pi/4)(8^2 - 6^2) \\
 0 &= -3 \times (\pi/4)6^2 + V_T (\pi/4)(8^2 - 6^2) \\
 V_T &= 108/(64 - 36) = \underline{\underline{3.86 \text{ ft/s}}} \text{ (upward)}
 \end{aligned}$$