Given: Re-entrant orifice in the side of a large tank. Pressure along the tank walls is essentially hydrostatic.

Find: the contraction coefficient, 
\[ C_c = \frac{A_1}{A_0} \]

**Solution:**

Apply the \( x \)-component of the momentum equation to the cylinder:
\[ F_{x_1} - F_{x_2} = \int \rho \frac{dV}{dt} \ n \cdot \Delta \vec{v} + \rho \mathbf{v} \cdot \mathbf{n} \ dA \]

**Assumptions:**
1. steady flow
2. uniform flow at jet exit
3. hydrostatic pressure variation across \( A_1 \) to \( A_2 \)
4. momentum flux across horizontal portion of \( A_2 \) is negligible.

Then
\[ \int \rho \mathbf{n} \cdot \mathbf{v} \ dA = m \mathbf{v} = \rho A_2 \mathbf{v}_2 \]
\[ \rho A_2 \mathbf{v}_2 = \rho A_1 \mathbf{v}_1 \]
\[ \mathbf{v}_2 = \frac{A_1}{A_2} \mathbf{v}_1 \]

Apply the Bernoulli equation along the central streamline from \( 1 \) to the jet exit:
\[ p_1 + \frac{1}{2} \rho \mathbf{v}_1^2 + \rho g z_1 = p_2 + \frac{1}{2} \rho \mathbf{v}_2^2 + \rho g z_2 \]

**Assumptions:**
1. frictionless flow
2. \( \rho \) constant

And
\[ \frac{p_1 - p_2}{\rho g} = \frac{1}{2} \mathbf{v}_1^2 - \frac{1}{2} \mathbf{v}_2^2 \]

\[ \therefore C_c = \frac{A_1}{A_0} = \frac{p_1}{p_2} \]