

$$h = 0.17 \left[ \frac{18.6}{1.026} - 1 \right]$$

$$h = 2.083 \text{ m}$$

$$v = \sqrt{2gh}$$

$$v = \sqrt{2 \times 9.81 \times 2.083}$$

$$v = 6.89 \text{ m/s}$$

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ABIOYE FOLANHO ABDUL-AZEEM  
 CIVIL ENGINEERING  
 18/ENG05/002  
 ENG 214 < FLUID MECH >

1)  $L = 2.0m$   
 $V_1$  (smaller end) = 5m/s  
 $V_2$  (lower end) = 2m/s  
 $h = 0.85 \sqrt{V_1 - V_2}^2$

2)  $P_1$  at smaller head = 2.5m  
 $\frac{P_2}{w} = \frac{P_1}{w} + \frac{\rho}{2g} (V_1^2 + V_2^2) + (Z_1 - Z_2)h$   
 $= \frac{2.5 \times 9.81}{9.81} + \frac{2 \times 9.81}{2 \times 9.81} + 2 - \frac{0.85 \times (5-2)^2}{2}$   
 $= 2.5 + 1.07 + 2 - 0.16055$   
 Pressure at lower head  
 $= 5.4096 \text{ bar} \approx 5.41 \text{ bar}$

3) inlet diameter = 0.2m  
 Throat diameter = 0.1m  
 $C_d = 0.98$   
 $A_1 = \frac{\pi d^2}{4} = \frac{\pi \times 0.2^2}{4} = 0.0314 \text{ m}^2$   
 $A_2 = \frac{\pi d^2}{4} = \frac{\pi \times 0.1^2}{4} = 7.85 \times 10^{-3} \text{ m}^2$   
 $h = \frac{P_1}{w} - \frac{P_2}{w}$

$\frac{P_1}{w} = \frac{1.765 \times 10^{-2} \text{ N/m}}{9.81}$   
 $= 1.799 \times 10^{-3}$   
 $\frac{P_2}{w} = 0.8 \times 13.6 = -4.08$

$h = \frac{P_1}{w} - \frac{P_2}{w} = 1.799 \times 10^{-3} - (-4.08)$   
 $= 4.082 \text{ m}$

1)  $Q = 0.98 \times 0.0314 \times 7.85 \times 10^3$   
 $= \sqrt{2gh} \times \frac{\pi (0.0514)^2 - (7.85 \times 10^3)^2}{4}$   
 $Q = \frac{0.0002415 \times 8.949}{\sqrt{0.00072}}$

$Q = \frac{0.000216}{0.0303}$   
 $= 0.0713 \text{ m}^3/\text{s}$

3)  $D_1 = 0.15 \text{ m}, D_2 = 0.3 \text{ m}$   
 $C_d = 0.7, C_c = 0.64$

$A_1 = \frac{\pi d^2}{4} = \frac{\pi \times 0.15^2}{4} = 0.0176 \text{ m}^2$   
 $A_2 = \frac{\pi d^2}{4} = \frac{\pi \times 0.3^2}{4} = 0.07069 \text{ m}^2$

$h = 0.5 \left[ \frac{13.6}{0.9} - 1 \right]$   
 $= 7.05 \text{ m}$

$Q = \frac{C_d A_1 A_2}{\sqrt{A_1^2 - A_2^2}} \times \sqrt{2gh}$   
 $= \frac{0.64 \times 0.0176 \times 0.07069}{\sqrt{(0.0176)^2 - (0.07069)^2}} \times \sqrt{2 \times 9.81 \times 7.05}$   
 $= \frac{0.000796 \times 11.7609}{\sqrt{0.000507 - 0.00499}}$

4) Axis = 15m  
 170mm of mercury < 0.17m >  
 5g of mercury 13.6  
 5g of sea water = 1.02C