

Hw4 Kufei Xia

1. $V_s = 0.7 \text{ cm/s}$

$V_o = 0.8 \text{ cm/s}$

$V_s < V_o$

$$R = \frac{V_s}{V_o} = \frac{0.7 \text{ cm/s}}{0.8 \text{ cm/s}} = 0.875$$

2. $V_s = 0.3 \text{ cm/s}$

$V_o = 0.25 \text{ cm/s}$

$V_s > V_o$

$R = 1.2$

3. $Q_{all} = 0.1 \text{ m}^3/\text{s}$ $H = 2 \text{ m}$

$T = 4 \text{ h} = 14400 \text{ s}$

$Q_{each} = \frac{Q_{all}}{2} = 0.05 \text{ m}^3/\text{s}$

$\nabla = QT = 0.05 \text{ m}^3/\text{s} (14400 \text{ s}) = 720 \text{ m}^3$

$A_p = \frac{\nabla}{H} = \frac{720 \text{ m}^3}{2 \text{ m}}$

$= 360 \text{ m}^2$

$V_o = \frac{Q}{A_p} = \frac{0.05 \text{ m}^3/\text{s}}{360 \text{ m}^2}$

$= 1.2 \text{ m}^3/\text{d-m}^2$

4. $Q = 10 \text{ MGD}$ $V_o = 750 \text{ gal/(day-ft}^2)$ $T = b \text{ hr}$

$\nabla = QT = 10 \text{ MGD} (b \text{ hr}) \left(\frac{1 \text{ day}}{24 \text{ hr}} \right)$

$= 2.5 \text{ Mft}^3 = 333333 \text{ ft}^3$

$A_p = \frac{Q}{V_o} = \frac{10 \text{ MGD}}{750 \text{ gal/(day-ft}^2)} = 13333 \text{ ft}^2$

$A_p = 11.2 \text{ W}$ $13333 = 2 \text{ W}^2$

$H = \frac{\nabla}{A_p} = \frac{333333 \text{ ft}^3}{13333 \text{ ft}^2} = 25 \text{ ft}$ $W = 31.65 \text{ ft}$ $L = 163.3 \text{ ft}$

5. (a) $T = 20^\circ\text{C}$ $s_c = 1.002$
 $\rho = 0.99821 \text{ g/cm}^3$

$V_o = 4240 \text{ gal/day} \cdot \text{ft}^2 = 0.2 \text{ cm/s}$
guess $d = 0.12 \text{ cm}$ $\rho_s = 1.000206 \text{ g/cm}^3$

$N_{Re} = \frac{\rho V_o d}{\mu} = 3.9846$

$C_D = \frac{24}{N_{Re}} + \frac{3}{\sqrt{N_{Re}}} + 0.34$
 $= 7.866$

$V_s = \sqrt{\frac{4g}{3C_D} \frac{e_s - e}{e} d} = 0.2578 \text{ cm/s}$

(b) $V_s = \frac{g(e_s - e)d_p^2}{18M}$

$0.2578 = \frac{9.81 \cdot (1.000206 - 0.99821) d_p^2}{18 (0.01002)}$

$d = 0.154 \text{ cm}$

$35/50$

Excel calculation sheets??