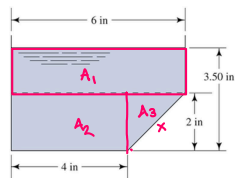


Hw 2.3

quarta-feira, 16 de outubro de 2024 13:34

14.6



$$R = \frac{A}{W_D}$$

$$\left. \begin{aligned} A_1 &= 6 \times 1.5 = 9 \text{ in}^2 \\ A_2 &= 4 \times 2 = 8 \text{ in}^2 \\ A_3 &= \frac{2 \times 2}{2} = 2 \text{ in}^2 \end{aligned} \right\} A = 9 + 8 + 2 = 19 \text{ in}^2$$

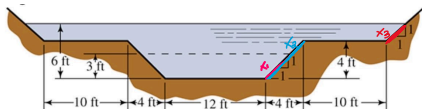
$$x^2 = 2^2 + 2^2 = \sqrt{2^2 + 2^2}$$

$$x^2 = 2\sqrt{2} \approx 2.83 \text{ in}$$

$$W_D = 3.5 + 4 + 2.83 + 1.5 = 11.83$$

$$R = 19 / 11.83 = 1.60$$

14.15



$$\eta_b = 0.04$$

$$S = 0.00015$$

for 3 ft:

$$x_1 = \sqrt{3^2 + 3^2} = 3\sqrt{2} \approx 4.24$$

$$A = 12 \left(\frac{3 \times 3}{2} \right) + (12 \times 3) = 9 + 36 = 45 \text{ ft}^2$$

$$W_D = 4.24 + 12 + 4.24 = 20.48$$

$$R = 45 / 20.48 = 2.197 \text{ ft}$$

$$V = \frac{1.49}{n} S^{1/2} R^{2/3}$$

$$V = \frac{1.49}{0.04} (0.00015)^{1/2} (2.197)^{2/3}$$

$$V = 0.771 \text{ ft/s}$$

for 6 ft :

$$x_2 = \sqrt{4^2 + 4^2} = 4\sqrt{2} \approx 5.65$$

$$x_3 = \sqrt{2^2 + 2^2} = 2\sqrt{2} \approx 2.83$$

$$A = 2 \left(\frac{2 \times 2}{2} \right) + (40 \times 2) + 2 \left(\frac{4 \times 4}{2} \right) + (12 \times 4)$$

$$A = 4 + 80 + 16 + 48 = 148 \text{ ft}^2$$

$$W_D = 2.83 + 10 + 5.65 + 12 + 5.65 + 10 + 2.83 = 48.96$$

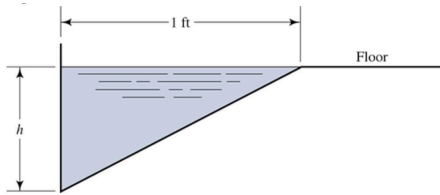
$$R = \frac{148}{48.96} = 3.02$$

$$V = \frac{1.49}{N} S^{1/2} R^{2/3}$$

$$V = \frac{1.49}{0.04} (0.00015)^{1/2} (3.02)^{2/3}$$

$$V = 0.95 \text{ ft/s}$$

14.21



$$Q = 500 \text{ gal/min} \rightarrow 250 \text{ gal/min each sump}$$

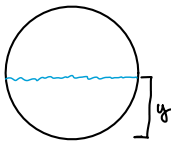
$$S = 0.1$$

$$\rightarrow 0.557 \text{ ft}^2/\text{hr}$$

round clay half full

$$A = \frac{\pi y^2}{2} \rightarrow \text{most efficient sections formulas}$$

$$W_p = \pi y R = \frac{\pi y^2}{2}$$



$$W = 0.013$$

$$\frac{WQ}{1.49 S^{1/2}} = AR^{2/3}$$

$$\frac{0.013 (0.557)}{1.49 (0.1)^{1/2}} = \frac{\pi y^2}{2} \left(\frac{y}{2} \right)^{2/3}$$

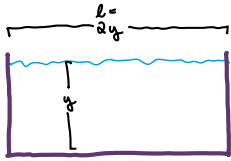
$$y = 0.209 \text{ ft} \approx 0.21 \text{ ft}$$

$$D = 2y = 0.42 \text{ ft}$$

14.36

$$\begin{array}{l} Q = 1.25 \text{ ft}^3/\text{s} \\ V = 2.75 \text{ ft}/\text{s} \end{array} \left| \begin{array}{l} A = Q/V = 1.25/2.75 \\ A = 0.45 \text{ ft}^2 \end{array} \right.$$

→ rectangle



$$\begin{aligned} A &= 2y^2 \\ w_p &= 4y \\ R &= y/2 \end{aligned}$$

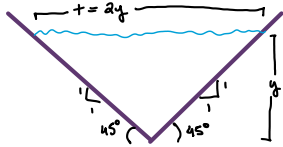
$$0.45 \text{ ft}^2 = 2y^2$$

$$y^2 = 0.225 = \sqrt{0.225}$$

$$y = 0.47 \text{ ft}$$

$$l = 2y = 0.94 \text{ ft}$$

- triangle



$$\begin{aligned} A &= y^2 \\ w_p &= 2.83y \\ R &= 0.354y \end{aligned}$$

$$A = 0.45 \text{ ft}^2$$

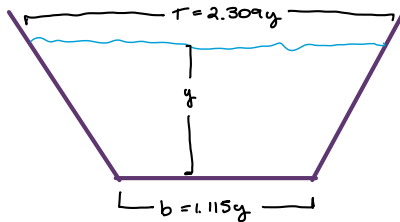
$$0.45 \text{ ft}^2 = y^2$$

$$y = \sqrt{0.45}$$

$$y = 0.67 \text{ ft}$$

$$T = 2y = 2(0.67) = 1.34 \text{ ft}$$

- trapezoid



$$\begin{aligned} A &= 1.73y^2 \\ w_p &= 3.46y \\ R &= y/2 \end{aligned}$$

$$A = 0.45 \text{ ft}^2$$

$$0.45 = 1.73y^2$$

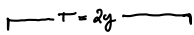
$$y = \sqrt{0.45/1.73}$$

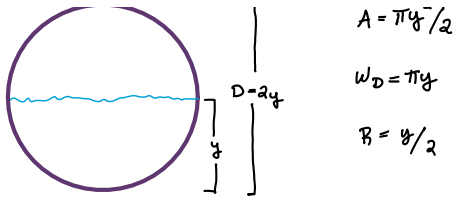
$$y = 0.51 \text{ ft}$$

$$T = 2.309y = 2.309(0.51) = 1.177 \text{ ft}$$

$$b = 1.115y = 1.115(0.51) = 0.569 \text{ ft}$$

- semi-circle





$$A = 0.45$$

$$0.45 = \frac{\pi y^2}{2} \rightarrow 0.90 = \pi y^2$$

$$y = \sqrt{\frac{0.90}{\pi}} = 0.535 \text{ ft}$$

$$T = D = 2y = 2(0.535) = 1.07 \text{ ft}$$