15.4:

$$A_2 = \frac{0.5479}{\sqrt{2 \times 32.2 \times 1 \left(\frac{844.9}{56.78} - 1\right)}{\left(\frac{0.053}{0.5479 \times 0.663}\right)^2} + 1}}$$

$A_1 = 0.5479\ ft^2$

$Q = 25\ gal/min$

$\hookrightarrow = 0.053\ ft^3/s$

$$A_2 = 0.0027\ ft^2$$

a) $$h = \frac{\left(\frac{Q}{A_1 \times C}\right) \times \left[\left(\frac{A_1}{A_2}\right)^2 - 1\right]}{2g\left(\frac{\gamma_{oil}}{\gamma_{am}} - 1\right)}$$

$$= \frac{\left(\frac{0.053}{0.5479 \times 0.083}\right) \times \left[\left(\frac{0.5479}{0.0027}\right) - 1\right]}{2 \times 32.2 \left(\frac{844.9}{56.78} - 1\right)}$$

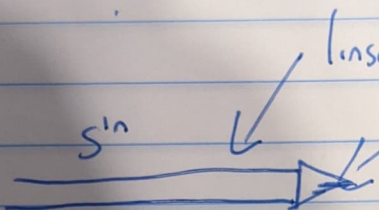
$$= 0.2632\ ft$$

b) $$h = \frac{\left(\frac{0.053}{0.5479 \times 0.58}\right) \times \left[\left(\frac{0.5479}{0.0027}\right) - 1\right]}{2 \times 32.2 \left(\frac{844.9}{56.78} - 1\right)}$$

$$h = 0.0376\ ft$$

Erich Shimp's

15.9



flow rate between 700 gal/min and 1000 gal/min

$Q = 113.63\ ft^3/s$

$D = 5''$

$\varepsilon = 3.84 \times 10^{-4}$

$V = \frac{Q}{A} = \frac{1.55\ ft^3/s}{.1259\ ft^2} = 12.31\ ft/s$ @ max

$\frac{2.22}{.1254} = 17.63\ ft/s$ @ max

~~$h_L = f \frac{L}{D} \cdot \frac{8Q^2}{\pi^2}$~~

$\frac{P_A - P_B}{\gamma} + (Z_A + Z_B) \left(.1 \cdot \frac{5/12}{32.2} \cdot \frac{8 \cdot 12.31}{\pi^2} \right) .12\text{in} = 1.036\text{ in less than } 5''$

$A_A = 0$

$P_B = 8''$ of $Hg = 104$ max

$\frac{O - 104}{586/ft^3} + 0$

$\gamma_{Hg} = P_B$

$13.6 \cdot 8'' = P_B$

$Z_A = 0$

$Z_B = 0$

3.96"

15.15

Pitot - static tube

$T = 50°C$

$V = \sqrt{\frac{2\Delta P}{\rho_{air}}}$

$\Delta P = \rho g h$

ρ ↓ 1000 kg/m³

0.24 in ↓

6.172 mm

$\Delta P = 1000 \cdot 9.81 \cdot 0.006172$

$\Delta = 60.55 \ N/m^2$

ρ air at 50°C
$= 1.246 \ kg/m^3$

$V = \sqrt{\frac{2 \cdot 60.55}{1.246}} = 9.86 \ m/s$

$\frac{N/m^2}{kg/m^3} \rightarrow \frac{\frac{kg \ m/s^2}{m^2}}{\frac{kg}{m^3}} = m/s$ ↑