



• assume pipe flows 1/2 full?

$$A = \frac{\pi d^2}{4} \times \frac{1}{2} = \frac{\pi}{4} \left(\frac{19.25}{12} \right)^2 \times \frac{1}{2} = 1.011 \text{ ft}^2$$

$$Q = \frac{1.49}{n} A R_h^{2/3} \sqrt{S}$$

$$= \frac{1.49}{.012} (1.011) (.4012)^{2/3} \sqrt{.416}$$

$$= 44.0 \text{ ft}^3/\text{s}$$

$$P_w = \frac{\pi d}{2} = \frac{\pi (19.25)}{2} = 2.520 \text{ ft}$$

$$R_h = \frac{A}{P_w} = .4012'$$

$$n = .012 \text{ (smooth steel)}$$

$$S = .416$$

$$\Rightarrow 19,766 \text{ gpm} > 2(6356 \text{ gpm}) = 12,712 \text{ gpm}$$