37.65 What is the friction loss per hundred feet for $800gpm$ of $80°F$ water flowing through an 8 inch nominal schedule 40 steel pipe?

A. $1ft$

B. $2ft$

C. $3ft$

D. $4ft$

Start with the Darcy-Weisbach Equation.

$$h_f = \frac{fLv^2}{2gD}$$

Using the Steel Pipe Friction Tables, look up the diameter for a nominal 8 inch pipe and the velocity of $800gpm$ through a pipe of that size.

$$D = 7.981in\left(\frac{1ft}{12in}\right) = 0.6651ft$$

$$v = 5.13\frac{ft}{s}$$

The friction factor is a function of the Reynolds Number, Re, and the Relative Roughness, $\frac{\epsilon}{D}$. Look up the Properties of Water table to find the Kinematic Viscosity at $80°F$.

$$Re = \frac{vD}{\nu} = \frac{\left(5.13\frac{ft}{s}\right)(.6651ft)}{.93 \times 10^{-5}\frac{ft^2}{s}} \approx 370,000$$

$$\frac{\epsilon}{D} = \frac{.0002ft}{.6651ft} \approx .0003$$

Use the Moody Diagram.

$$f = f\left(Re, \frac{\epsilon}{D}\right) \approx .0165$$

Calculate the friction loss by solving the Darcy equation.

$$h_f = \frac{fLv^2}{2gD} = \frac{(.0165)(100ft)\left(5.13\frac{ft}{s}\right)^2}{2(.6651ft)\left(32.2\frac{ft}{s^2}\right)} = 1.01ft$$

Answer A