37.64 $900gpm$ **of water flows through an 8 inch pipe with a relative roughness of 0.0004 and a Reynolds number of 400,000. What is the pressure loss per hundred feet of pipe?**

A. $0.1ft$

B. $0.2ft$

C. $1.2ft$

D. $1.4ft$

Pressure loss can be calculated using the Darcy-Weisbach Equation equation, where f is the friction factor, L is the length of pipe, v is the velocity, D is the inside diameter, and g is acceleration due to gravity.

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

Start by looking up the diameter for a nominal 8 inch pipe in the reference handbook using the Steel Pipe Friction Tables. For convenience, convert from inches to feet.

$$D = \frac{7.981in}{12\frac{in}{ft}} = 0.6651ft$$

The velocity may also be looked up from the same table for a given GPM and pipe size. If the flow or size are non-standard, it may be necessary to calculate the velocity using $v = \frac{Q}{A}$, but that is not required in this case.

$$v = 5.77\frac{ft}{s}$$

Use the Moody Diagram to look up the friction factor which is a function of the Reynolds number, Re, and the relative roughness, $\frac{\varepsilon}{D}$. Both the Reynolds number and relative roughness were given.

$$f = f\left(Re, \frac{\varepsilon}{D}\right) \approx 0.0175$$

Substitute into the Darcy Equation and solve for the friction loss:

$$h_f = \frac{fLv^2}{2Dg} = \frac{(.0175)\,(100ft)\left(5.77\frac{ft}{s}\right)^2}{2\,(.6651ft)\left(32.2\frac{ft}{s^2}\right)} = 1.36ft$$

Answer D