8.18

8.18 A fluid flows through a horizontal 0.1-in.-diameter pipe. When the Reynolds number is 1500, the head loss over a 20-ft length of the pipe is 6.4 ft. Determine the fluid velocity.

$h_L = f \frac{l}{D} \frac{V^2}{2g}$, where since $Re = 1500 < 2100$ the flow is laminar.

Thus, $f = 64/Re = 64/1500 = 0.0427$ so that

$$6.4\,ft = 0.0427 \frac{20\,ft}{(0.1/12\,ft)} \frac{V^2}{2(32.2\,ft/s^2)}$$

or

$$V = \underline{\underline{2.01\,\frac{ft}{s}}}$$