

37.53 A water main is required to transport 8000gpm of water. What is the smallest diameter of pipe that should be used?

- A. 12in
- B. 18in
- C. 24in
- D. 32in

Start by checking the **Steel Pipe Friction Tables**. The largest diameter provided is 12in and the maximum volume flow rate is 4000gpm. Eliminate choice A.

Since there is no additional information aside from the flow rate, use a rule of thumb. One handy option is to divide gpm by 20 and take the square root. This is only for getting a ballpark answer.

$$D_{[in]} \approx \sqrt{\frac{Q_{[gpm]}}{20}} = \sqrt{\frac{8000}{20}} = 20in$$

Eliminate choice D as 32in is likely excessive. Since 20in is only slightly larger than 18in, answer B is still worth considering.

Another approach is to assume a typical maximum velocity, such as $5\frac{ft}{s}$, and solve for the required area.

$$Q = vA$$

$$A = \frac{Q}{v} = \frac{\left(8000\frac{gal}{min}\right)\left(\frac{1ft^3}{7.48gal}\right)\left(\frac{1min}{60s}\right)}{5\frac{ft}{s}} = 3.56ft^2$$

Solve for the diameter.

$$A = \frac{\pi}{4}D^2$$

$$D = \sqrt{\frac{4A}{\pi}} = \sqrt{\frac{4(3.56ft^2)}{\pi}} = 2.13ft \left(\frac{12in}{1ft}\right) = 25.6in$$

Since the diameter is only slightly larger than 24in, and the first rule of thumb gave a 20% smaller answer, choose 24in.

Answer C