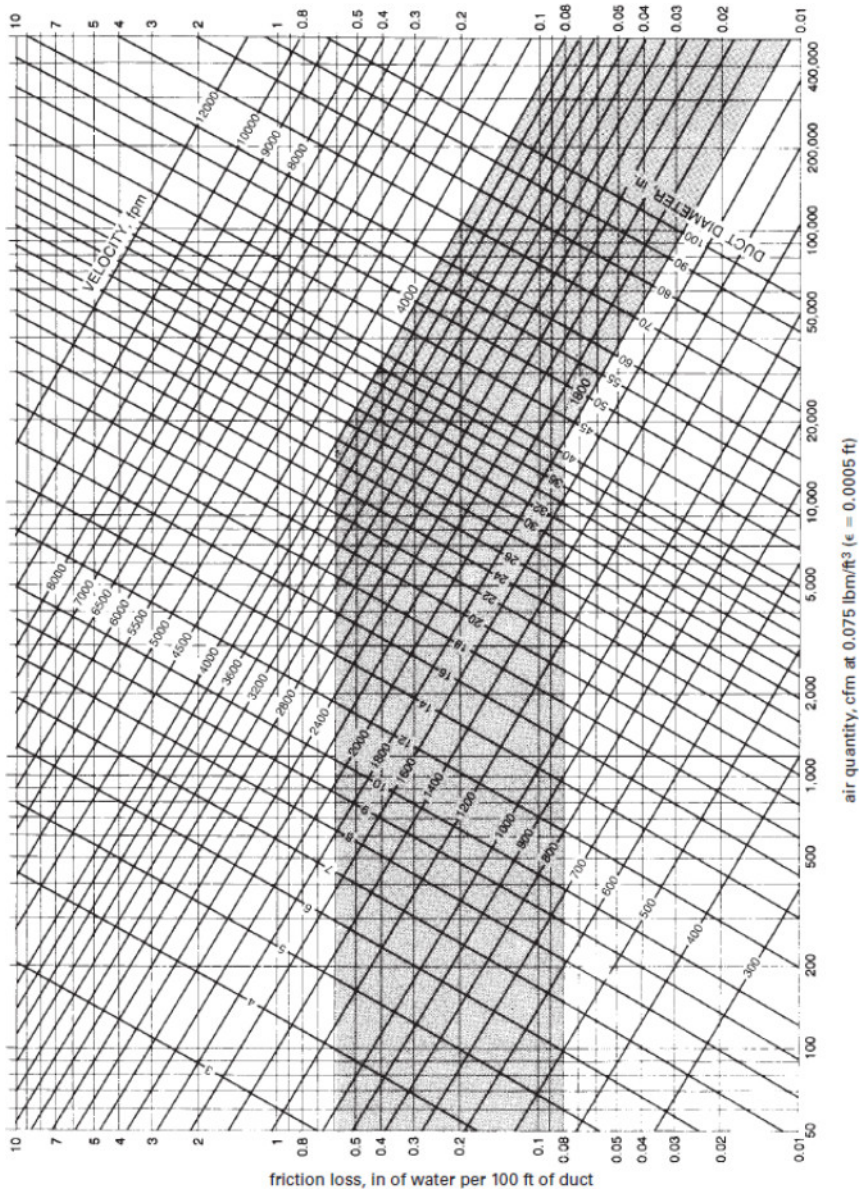
43.14 **A fan in an office delivers $1900cfm$ via a $14in$ main duct which reduces after each branch takeoff to maintain an equal friction loss per unit length throughout the system. The first branch receives $400cfm$ and is located $50ft$ from the fan. Five additional downstream branch outlets are spaced equally at increments of $30ft$ and receive $300cfm$ each. All outlets have a design terminal pressure of $0.3in\,wg$. What is the required total pressure supplied by the fan?**

A. $0.6in\,wg$

B. $0.7in\,wg$

C. $0.9in\,wg$

D. $1.0in\,wg$



The system is designed on the principle of equal friction loss throughout the duct. Determine the friction loss per unit length in the main duct, and this will be the friction loss for the entire length. Use the friction loss chart provided to find the friction loss based on the duct diameter and cfm:

$$Q = 1900cfm$$

$$D = 14in$$

$$\Delta P_{loss} = .3in\,wg/100ft$$

Determine the total length of the run from the main fan to the farthest outlet:

$$L = 50ft + 5\,(30ft) = 200ft$$

The total pressure lost in the ductwork is then:

$$\Delta P_{ductwork} = \left(\frac{.3in\,wg}{100ft}\right)(200ft) = .6in\,wg$$

It is also necessary to include the required terminal pressure at the outlet, since this pressure must also be supplied by the fan.

$$\Delta P_{total} = .6in\,wg + .3in\,wg = .9in\,wg$$

Answer C