33.20 $1000cfm$ **of air flows in a** $14in$ **round duct. What is the velocity pressure?**

A. $0.05in\,wg$

B. $0.2in\,wg$

C. $0.5in\,wg$

D. $2in\,wg$

Use the diameter to calculate the area of the duct, then use the volume flow rate and area to find the velocity of the air.

$$A = \frac{\pi}{4}\left(\frac{14in}{12\frac{in}{ft}}\right)^2 = 1.07ft^2$$

$$Q = VA$$

$$V = \frac{Q}{A} = \frac{1000\frac{ft^3}{min}}{1.07ft^2} = 935\frac{ft}{min}$$

Calculate the Velocity Pressure. There are two valid formulas, one which assumes standard density and one which allows the density to be specified. In this case, the particular conditions for the air are not given, therefore assuming standard density of $0.075\frac{lb}{ft^3}$ is reasonable. In either of these formulas, velocity must be in units of $\frac{ft}{min}$.

$$p_v = \left(\frac{V}{4005}\right)^2 = \left(\frac{935}{4005}\right)^2 = 0.05in\,wg$$

Alternatively:

$$p_v = \rho\left(\frac{V}{1097}\right)^2 = (0.075)\left(\frac{935}{1097}\right)^2 = 0.05in\,wg$$

Answer A