

36.52 The pressure drop through a chilled water coil at the design flow rate of 25gpm is 8psi . During normal operation, the actual flow rate is 4gpm . What is the pressure drop in normal operation?

- A. 0.2psi
- B. 1.3psi
- C. 4.1psi
- D. 8.0psi

The pressure drop is a function of the physical design of the coil and the velocity pressure from the water. Static pressure in a hydronic system tends to be relatively stable and gravitational effects are likely to be minimal in the vicinity of the coil. The primary driver is the operation of the control valve which allows more or less flow into the coil. Recall $Q = vA$. Since the coil cross-sectional area is constant, the velocity is proportional to the volume flow rate. Since velocity pressure depends on the *square* of the velocity, relate the ratio of the pressure drops to the ratio of the velocities *squared*. Then substitute flow rate for velocity since flow rates are given. Substitute and solve for ΔP_{actual} .

$$\frac{\Delta P_{actual}}{\Delta P_{design}} = \left(\frac{v_2}{v_1}\right)^2 = \left(\frac{Q_2}{Q_1}\right)^2 = \left(\frac{4\text{gpm}}{25\text{gpm}}\right)^2 = 0.0256$$

$$\Delta P_{actual} = 0.0256 (\Delta P_{design}) = 0.0256 (8\text{psi}) = 0.2\text{psi}$$

Answer A