

36.30 Steam at 40psia has a quality of 75%. What is the density?

- A. $0.13 \frac{lb_m}{ft^3}$
- B. $0.17 \frac{lb_m}{ft^3}$
- C. $0.19 \frac{lb_m}{ft^3}$
- D. $0.38 \frac{lb_m}{ft^3}$

Density is the inverse of specific volume. Use the [Properties of Saturated Water and Steam](#) table (by Pressure) to look up the specific volume for saturated liquid water, h_f , and the change in specific volume associated with heating to a saturated vapor at constant pressure, h_{fg} . The formula/property for specific volume based on quality is best memorized rather than looked up, but can be found in the Reference Handbook by searching: [Specific Volume of a Two-phase System](#).

$$v = v_f + \chi v_{fg}$$

$$v = .0171 \frac{ft^3}{lb} + (.75) \left(10.49 \frac{ft^3}{lb} \right) = 7.88 \frac{ft^3}{lb}$$

Calculate the density:

$$\rho = \frac{1}{v} = \frac{1}{7.88 \frac{ft^3}{lb}} = .127 \frac{lb}{ft^3}$$

Answer A