36.24 Air enters a compressor at $80°F$ and $14.7psia$ and exits at $180psia$. What is the change in enthalpy during the compression process?

A. $115\frac{Btu}{lb}$

B. $135\frac{Btu}{lb}$

C. $155\frac{Btu}{lb}$

D. $175\frac{Btu}{lb}$

Consider the entering conditions as State 1 and the leaving conditions as State 2. Use the Air at Low Pressure tables to obtain the enthalpy at State 1. The air tables assume that for low pressure air, enthalpy is a function of temperature only. Also obtain the relative pressure at State 1.

$$T_1 = 80°F$$

$$h_1 \approx 129\frac{Btu}{lb}$$

$$p_{r,1} = 1.386$$

Use the ratio of the pressures to find the relative pressure at State 2.

$$\frac{p_{r,2}}{p_{r,1}} = \frac{P_2}{P_1} = \frac{180psia}{14.7psia} = 12.24$$

$$p_{r,2} = (12.24)(1.386) = 16.97$$

Use the air tables again to obtain the enthalpy at State 2 using the relative pressure at State 2.

$$h_2 \approx 264\frac{Btu}{lb}$$

Calculate the change in enthalpy.

$$\Delta h = h_2 - h_1 = 264\frac{Btu}{lb} - 129\frac{Btu}{lb} = 135\frac{Btu}{lb}$$

Answer B