37.12 **$2000cfm$ of outside air at $95°F$ dry bulb and $78°F$ wet bulb is cooled to $68°F$ and 60% relative humidity. What quantity of latent heat is removed?**

A. $60,000\frac{Btu}{hr}$

B. $70,000\frac{Btu}{hr}$

C. $80,000\frac{Btu}{hr}$

D. $90,000\frac{Btu}{hr}$

Let state 1 be the entering air conditions and state 2 be the leaving air conditions. Use the Psychrometric Chart to find the humidity ratio for both states.

$$T_{1,db} = 95°F$$

$$T_{1,wb} = 78°F$$

$$\omega_1 = 0.0169\frac{lb_{h2o}}{lb_{da}}$$

$$T_2 = 68°F$$

$$\phi_2 = 60\%$$

$$\omega_2 = 0.0088\frac{lb_{h2o}}{lb_{da}}$$

Even though this problem is about calculating the latent heat removed from the air, it is appropriate to use the Latent Heat Gain rule of thumb formula provided the smaller humidity ratio is subtracted from the larger humidity ratio such that that $\Delta\omega$ has a positive value. As long as the correct units are used for all inputs, q_l will be specified in the desired units, $\frac{Btu}{hr}$.

$$q_l = 4840Q_s\Delta\omega = 4840\,(2000)\,(0.0169 - 0.0088) = 78,408\frac{Btu}{hr}$$

Answer C