35.28 On a day with outside conditions of $80°F$ dry bulb and 50% relative humidity, a cooling tower operates with an effectiveness of 70%. The return condenser water enters the tower at $96°F$. What is the approach?

A. $9°F$

B. $15°F$

C. $21°F$

D. $29°F$

Use the outside conditions and the Psychrometric Chart in the Reference Handbook to obtain the wet bulb temperature.

$$T_{OA,db} = 80°F$$

$$\phi_{OA} = 50\%$$

$$T_{OA,wb} = 66.6°F$$

Use the cooling tower effectiveness to solve for the leaving water temperature (condenser water supply).

$$\varepsilon = \frac{EWT - LWT}{EWT - T_{wb}}$$

$$.7 = \frac{96°F - LWT}{96°F - 66.6°F}$$

$$LWT = 75.4°F$$

Look up Cooling Tower Approach, which is defined as the difference between the cooling tower leaving water temperature and the entering air wet bulb temperature. Apply this definition to find the approach.

$$Approach = LWT - T_{wb} = 75.4°F - 66.6°F = 8.8°F$$

Note, another term worth knowing is the range of a cooling tower which is the difference between the entering and leaving water temperatures. In this case, $Range = EWT - LWT = 96°F - 75.4°F = 10.6°F$.

Answer A