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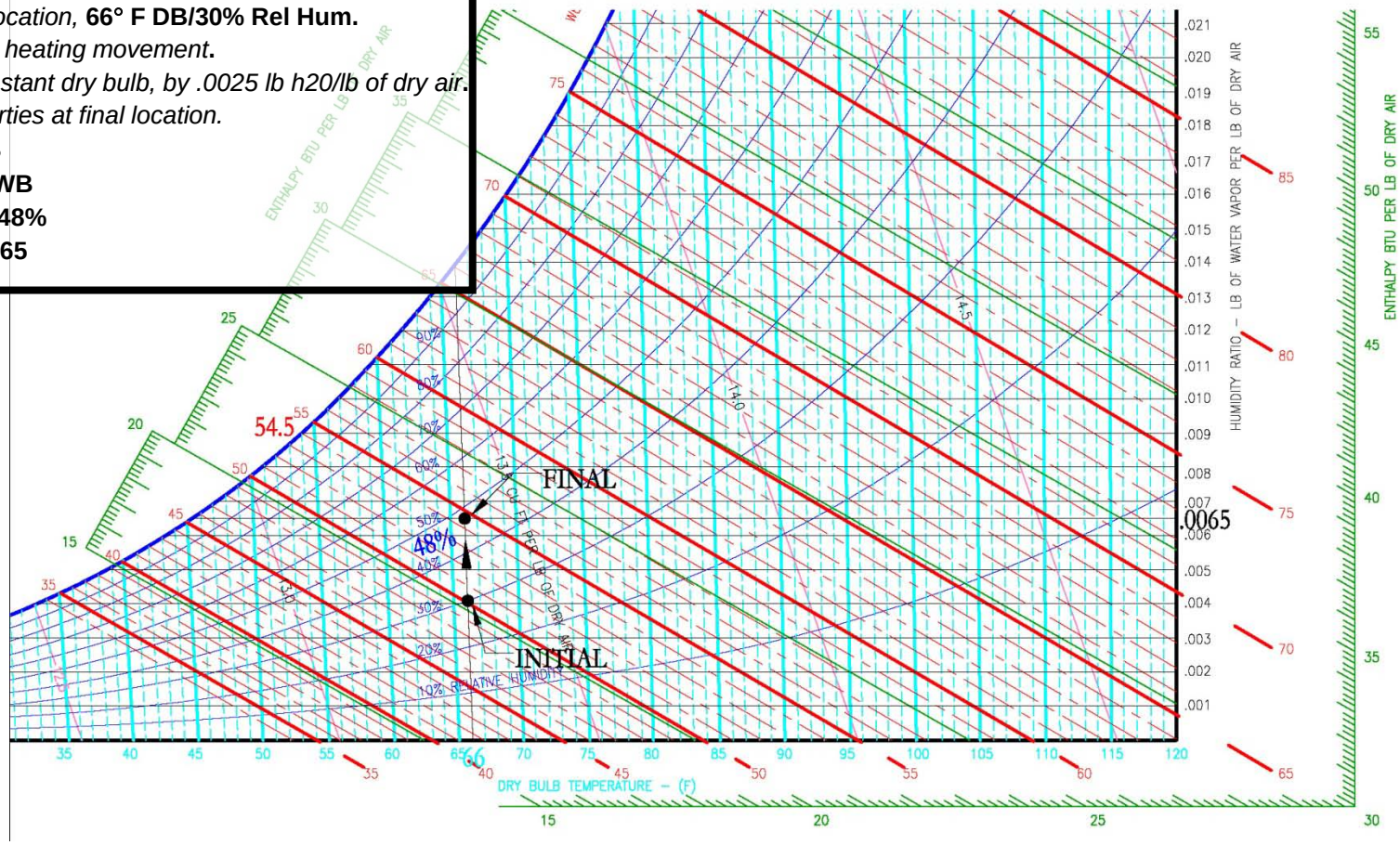
$$w_{final}\left[\frac{lb\ of\ H20}{lb\ of\ dry\ air}\right] = .0065$$

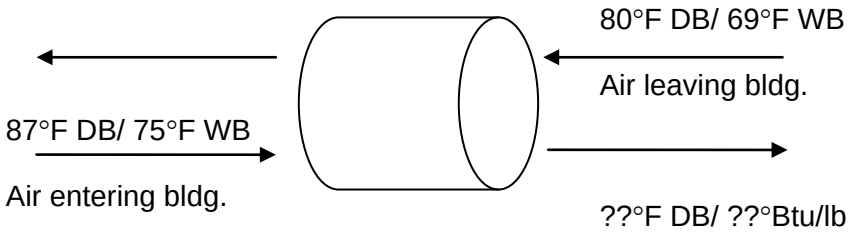
We now know the final humidity ratio and since the air has only undergone latent heating, there is no change in dry bulb temperature, dry bulbs are equal $T_{db,final} = T_{db,initial}$. In order to get the final conditions of the air, the psychrometric chart must be used. Knowing two values allows the other 5 properties to be determined, see below.

Step 1: Find initial location, **66° F DB/30% Rel Hum.**
Step 2: Show latent heating movement.
Movement up at constant dry bulb, by .0025 lb h20/lb of dry air.
Step 3: Read properties at final location.
Dry Bulb = **66° F DB**
Wet Bulb = **54.5° F WB**
Relative Humidity = **48%**
Humidity Ratio = **.0065**



Problem 9 - Enthalpy Wheel

Background: An enthalpy wheel is used to transfer energy (enthalpy) from one air stream to another. 2,000 CFM of air leaving a building at 80°F DB/69°F WB is used to pre-cool and pre-dehumidify 2,000 CFM of air at 87°F DB/75°F WB prior to the air entering the building HVAC system. Assume the enthalpy wheel is 80% effective. What is the resulting temperature of the air entering the building HVAC system after the enthalpy wheel?



(a) 80°F DB/32.5 Btu/lb

(b) 81.4°F DB/34.2 Btu/lb

(c) 85.6°F DB/35.8 Btu/lb

(d) 87°F DB/37.1 Btu/lb

Solution 9 - Enthalpy Wheel

The enthalpy wheel will be able to transfer the enthalpy from one air stream to the other.

$$\boldsymbol{h_{entering} = 38.5 \frac{Btu}{lb\ of\ dry\ air}};\ \boldsymbol{h_{leaving} = 33.1 \frac{Btu}{lb\ of\ dry\ air}};\ \text{from psych. Chart.}$$

$$\boldsymbol{h_{entering,after} = h_{entering} - E\left(h_{entering} - h_{leaving}\right); where\ E = effecitiveness}$$

$$\boldsymbol{h_{entering,after} = 38.5 - 0.8(38.5 - 33.1)}$$

$$\boldsymbol{h_{entering,after} = 34.2 \frac{Btu}{lb\ of\ dry\ air}}$$

$$\boldsymbol{T_{entering,after} = T_{entering} - E\left(T_{entering} - T_{leaving}\right); where\ E = effecitiveness}$$

$$\boldsymbol{T_{entering,after} = 87°F\ DB - 0.8(87°F\ DB - 80°F\ DB)}$$

$$\boldsymbol{T_{entering,after} = 81.4\ °F\ DB}$$