



PSYCHROMETRIC CHART FOR HVAC ANALYSIS (at sea level)

Air-Conditioning Formulas and Conversion Factors

Atmospheric pressure = 29.921" Hg. at sea level

1 BTU = Amount of heat required to raise (or lower) the temperature of one pound of water 1°F

1 ton of refrigeration = 12,000 Btu/hr = 200 Btu/min

1 watt = 3.414 Btu/hr

1 horsepower = 2545.6 Btu/hr

1 ft (head) = 0.433 psi (at 62°F)

1 boiler horsepower = 33,475 Btu/hr

Air changes per hour (N) in a space

$$N = (60 \times \text{CFM}) / \text{space ft}^3$$

CFM = airflow rate (ft³/min)

Water quantity (GPM) required for heating and cooling

$$\text{GPM} = q / (500 \times \Delta t)$$

q = load in Btu/hr

t = water temperature

Chiller capacity (Tons)

$$\text{Tons} = (\text{GPM} \times \Delta t) / 24$$

GPM = gallons per minute of chilled water

t = water temperature

$$\text{Pump hp} = \frac{\text{GPM} \times \text{ft head}}{3960 \times \text{efficiency}} \times \text{specific gravity}$$

$$\text{Fan hp} = \frac{\text{CFM} \times \text{static pressure (in. W.G.)}}{6356 \times \text{efficiency}} \times \frac{\text{density of air}}{\text{density of standard air}}$$

$$\text{Total cooling (Btu/hr)} = \text{CFM} \times 4.5 \times \Delta h$$

$$\text{Sensible cooling (Btu/hr)} = \text{CFM} \times 1.085 \times \Delta t$$

$$\text{Latent cooling (Btu/hr)} = \text{CFM} \times 4840 \times \Delta w$$

CFM = airflow rate (ft³/min)

h = enthalpy (Btu/lb)

t = dry bulb air temperature (°F)

w = humidity ratio (lb water / lb dry air)

Fan Laws

$$\text{CFM}_2 = \text{CFM}_1 \times (\text{RPM}_2 / \text{RPM}_1)$$

$$\text{SP}_2 = \text{SP}_1 \times (\text{RPM}_2 / \text{RPM}_1)^2$$

$$\text{HP}_2 = \text{HP}_1 \times (\text{RPM}_2 / \text{RPM}_1)^3$$

1 = initial; 2 = desired

