



PSYCHROMETRIC CHART FOR HVAC ANALYSIS

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 (ft<sup>3</sup>/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)  
Tons = (GPM x Δt) / 24  
GPM = gallons per minute of chilled water  
t = water temperature

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

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

Total cooling (Btu/hr) = CFM x 4.5 x Δh  
Sensible cooling (Btu/hr) = CFM x 1.085 x Δt  
Latent cooling (Btu/hr) = CFM x 4840 x Δw  
CFM = airflow rate (ft<sup>3</sup>/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

