LOW TEMPERATURE PSYCHROMETRIC CHART

FREQUENTLY USED CONVERSION FACTORS

LENGTH
1 Meter = 3.28 Feet
1 Inch = 2.54 cm
1 Mile = 1.61 Km
1 Micron = 1 x 10^{-6} M

AREA
1 M^2 = 10.76 Ft^2
1 Acre = 43,560 Ft^2

VOLUME
1 M^3 = 35.31 Ft^3
1 Ft^3 = 7.49 Gals
1 Gal = 231 In^3
1 Gal = 3.78 Liters

LATENT HEAT
1 BTU/lb = 2326 J/Kg
1 Kg Cal/Kg = 1.8 BTU/lb

SPECIFIC HEAT
1 BTU/lb - °F = 1 Kg Cal/Kg - °K
1 BTU/lb - °F = 4,184 J/Kg - °K

VOLUME FLOW
1 CFM = 1.70 M^3/Hr
1 Liter/Sec = 15.9 GPM
1 M^3/Hr = 4.41 GPM

ENERGY & WORK
1 BTU = 1,055 Joules
1 Watt-Hr = 3.413 BTU
1 Kg Cal = 3.97 BTU
1 BTU = 778 Ft-lbs

POWER
1 KW = 3,413 BTU/Hr
1 KW = 1.34 HP
1 HP = 2,545 BTU/Hr
1 HP = 550 Ft-lb/Sec

WEIGHT
1 Kg = 2.205 lbs
1 Metric Ton = 2,205 lbs
1 lb = 7,000 Grains
1 lb = 454 Grams

PRESSURE
1 ATM = 14.696 PSI
1 ATM = 29.92 In Hg
1 Kg/cm^2 = 14.2 PSI
1 PSI = 6.895 KPa
1 PSI = 27.7 In WC

ENERGY FLUX
1 BTU/Hr-Ft^2 = 3.15 W/M^2

THERMAL CONDUCTIVITY
1 W/M °K = 6.93 $\frac{\text{BTU-In}}{\text{Hr-Ft}^2\text{ - °F}}$

THERMAL CONDUCTANCE
1 BTU/Hr-Ft^2 - °F = 5.68 W/M^2 - °K

ENERGY EQUATIONS

$Q_{Total} = Q_{Sensible} + Q_{Latent}$
$Q_{Total} = 4.5 \times CFM \times \triangle h$ (BTU/Hr)
$Q_{Sensible} = 1.08 \times CFM \times \triangle T_{db}$ (BTU/Hr)
$Q_{Latent} = 0.68 \times CFM \times \triangle Grains/lb$ (BTU/Hr)
$Q_{Latent} = 4,840 \times CFM \times \triangle T_{wb}$ (BTU/Hr)
$MR = CFM/1,000 \times .642 \times \triangle Grains$ (lb_{Water}/Hr)
$SHR = Q_{Sensible} / (Q_{Sensible} + Q_{Latent})$

Q = Energy (BTU/Hr)
h = Enthalpy of air (BTU/lb_{Air})
T_{db} = Sensible temperature of air (°F)
T_{wb} = Wet-bulb temperature of air (°F)
MR = Moisture removal rate from air (lb_{water}/Hr)
SHR = Sensible Heat Ratio

DEFINITIONS OF STANDARD AIR FLOW

English Units: Standard air is air at 70°F, bone dry, and 29.92 in. Hg barometric pressure. Its density is 0.075 lb/ft^3.

Airflow in Standard CFM (SCFM) = Airflow in actual CFM (ACFM) x $\frac{13.34}{\text{Sp. Vol.}}$
(Airflow in SCFM) x 4.5 = (Airflow in lbs. dry air/hr)

Metric Units: Normal air is air at 0°C, bone dry, and 29.92 in. Hg barometric pressure. Its density is 1.293 Kg/m^3.

Airflow in Normal M^3/Min (nM^3/Min) = Airflow in actual M^3/Min x $\frac{0.773}{\text{Sp. Vol.}}$
(Airflow in nM^3/Min) x 77.58 = (Airflow in Kg. dry air/hr)

FAN LAWS

If fan speed is changed in a given system, with no other system modifications:

$CFM_2 = CFM_1 \times \frac{RPM_2}{RPM_1}$

$TP_2 = TP_1 \times \left(\frac{RPM_2}{RPM_1}\right)^2$

$HP_2 = HP_1 \times \left(\frac{RPM_2}{RPM_1}\right)^3$

To estimate fan horsepower:

$HP = \frac{CFM \times TP}{6,356 \times EFF}$

$HP = \frac{HP \times 2,310}{CFM}$

CFM = Airflow, Ft^3/Min
RPM = Fan Speed, Revs/Min
HP = Power Input, Horsepower
TP = Air Total Pressure, Inches Water
TR = Air Temp. Rise, °F
EFF = Fan Efficiency

Typical fan efficiencies:
Forward Curved - .65 to .75
Backward Curved - .75 x .85
Axial Flow - .80 to .90

PUMP LAWS

If pump speed is changed in a given system, with no other system modifications:

$GPM_2 = GPM_1 \times \frac{RPM_2}{RPM_1}$

$H_2 = H_1 \times \left(\frac{RPM_2}{RPM_1}\right)^2$

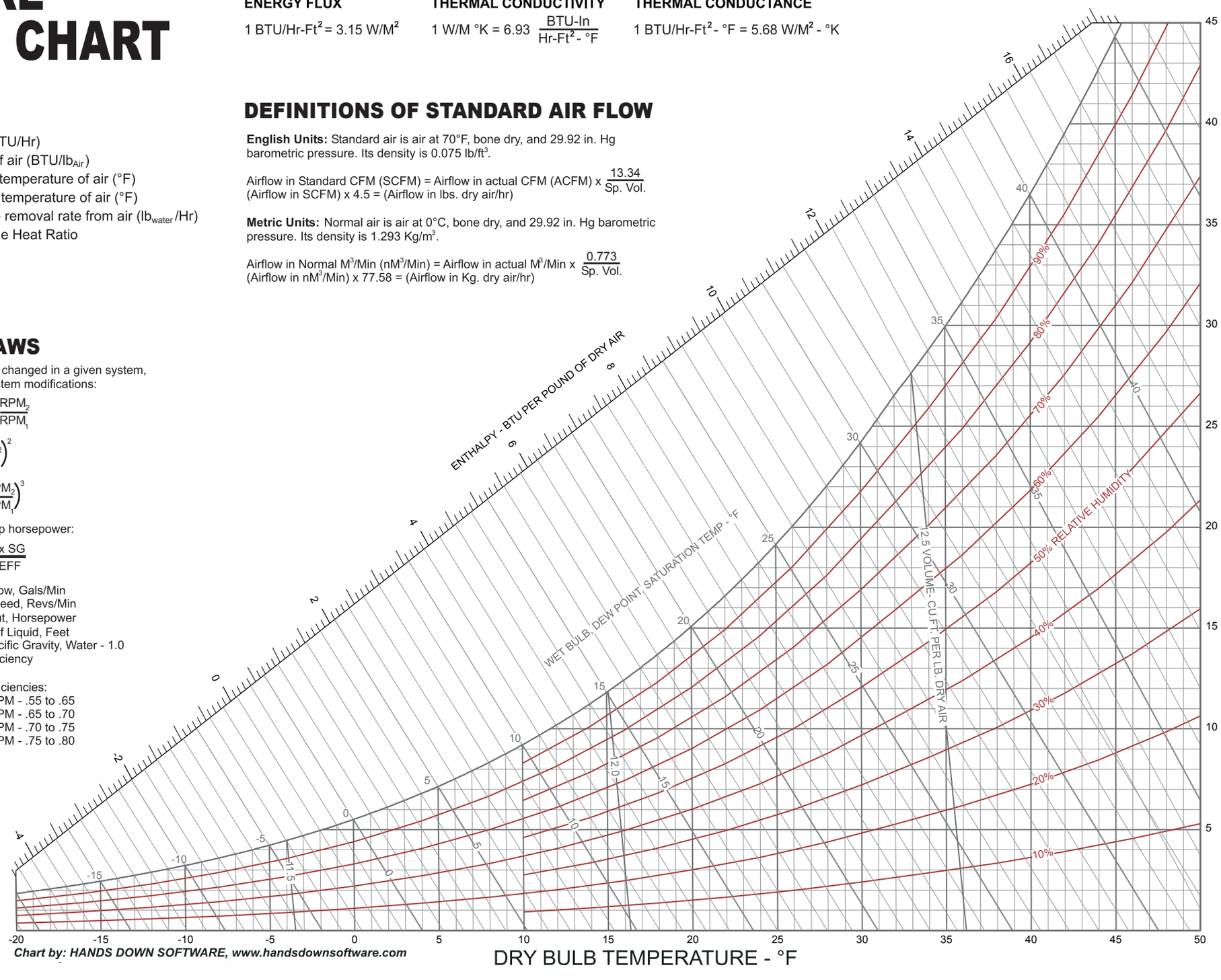
$HP_2 = HP_1 \times \left(\frac{RPM_2}{RPM_1}\right)^3$

To estimate pump horsepower:

$HP = \frac{GPM \times H \times SG}{3,960 \times EFF}$

GPM = Liquid Flow, Gals/Min
RPM = Pump Speed, Revs/Min
HP = Power Input, Horsepower
H = Total Head of Liquid, Feet
SG = Liquid Specific Gravity, Water - 1.0
EFF = Pump Efficiency

Typical pump efficiencies:
100 GPM - .55 to .65
200 GPM - .65 to .70
500 GPM - .70 to .75
1000 GPM - .75 to .80



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