AbsolutAire, Inc.

Engineering Information, Standards & Guidelines

100 cu ft natural gas = 1 therm; 1 therm/hr = 100,000 BTU/hr = 100 MBH

Natural gas cost (Oct 2008 Kalamazoo) = $1.15/therm

Electricity cost (Oct 2008 Kalamazoo) = $0.105/KWH (10.5 cents/KWH)

Electric units - Coil sizing requirements: Kwh = (CFM x 1.08 x ΔT)/3415

BTUH = CFM x 1.08 x ΔT (closest to actual) <-> **BTUH =** CFM x 1.14 x ΔT (includes safety)

BTUH = (P x Cp x CFM x 60 x ΔT)/0.92 (Actual). Where P = Air Density at fan, Cp = 0.241 (constant)

Natural Gas: 27.71" w.c. = 1 PSI = 16 ounces/in^2 Gas Pressure
DF burners add humidity at a rate of 11.69grains/lb/100° F temp rise

LP Gas: 93,000 BTU per gallon. LPG cost: approx. $2.50 per therm

DX Cooling: MBH/12 = Tons of Cooling

Mixed Air: DB mixed air = (DB_1 x $\%_1$) + (DB_2 x $\%_2$) $_1$ = Air Stream 1
Grains/lb (G) mixed air = (G_1 x $\%_1$) + (G_2 x $\%_2$) $_2$ = Air Stream 2

Evap Cooling (87% eff): LATdb = EATdb – 0.87(EATdb – EATwb)

ANSI Stds: 100% OA: ANSI Z83.4a, CSA 3.7 (2001) Recirc 80/20 & 85/15: ANSI Z83.18a (2001)
Spray Bake: ANSI Z83.4 and UL795 Bake Only (Process) & APD90: UL795

Burners: **AA-Series and V-Series Model Units**

		Natural Gas		LP Gas	
	MBH/ft	ΔT°F 100% OA	ΔT°F 80/20	ΔT°F 100% OA	ΔT°F 80/20
Maxon NP-LE	750	131	100	95	95
Midco HMA2	650	131	100	95	90
Eclipse	700	143	110	100	95

Burners: **R-Series Model Units**

		Natural Gas		LP Gas	
	MBH/ft	ΔT°F 100% OA	ΔT°F 80/20	ΔT°F 100% OA	ΔT°F 85/15
Maxon NP-LE	750	125	100	95	90
Midco HMA2	650	125	100	95	90
Eclipse	700	125	110	95	90

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Motor Drive Losses*:

Up to 1-1/2 HP:	10%	
2 HP to 25 HP:	5%	
30 HP + higher:	3.5%	

*Fan manufacturers may provide specific values to use in place of these which will supersede these values.

Power used by electric motors: Watts = Motor Efficiency % x Voltage x Amps
Motor HP = Watts/746 or Kw/0.746 = 2545 BTU
Motor run cost per hour = [(HP x 0.746)/Motor Efficiency] x Electricity Cost per KWH
BHP (approximate) = (Volts x Amps x Power Factor x Efficiency x √3)/746

Above based on measured electrical data

Velocity Standards:

	Max fpm		Max fpm
Inlet Hoods	600	Steam/HW Coils	1000
Evap Media	500	HiE Filters	500
Inlet Plenums	900	30% Pleated Filters	500
Legs	600	DustLok Filters	450
Cooling Coils	500	Alum Filters (2")	600 (0.10"pd @ 520 fpm)
		Alum Filters (1")	600 (0.09"pd @ 520 fpm)

Fan Laws: $CFM_n = CFM_o (RPM_n/RPM_o)$
$SP_n = SP_o (RPM_n/RPM_o)^2$ or $SP_n = SP_o (CFM_n/CFM_o)^2$
$BHP_n = BHP_o (RPM_n/RPM_o)^3$

Friction Losses: Duct: $H_f = 0.0307 \times (V^{0.533}/Q^{0.612})$ x Length of Duct in feet
Elbows: Mitered elbow w/o turning vanes = 1.2 V_p
Mitered elbow w/ turning vanes = 0.6 V_p

Velocity: $V_{(fpm)} = 4005 \times \sqrt{V_p}$ (in. w.c.)

Metric Conversions:

m^3/S = CFM x 0.000471947	mm = inches x 25.4
W = BTUH x 0.2931	kw = HP/0.7457
Pa = in wc x 248.84	L/s = CFM x 0.4719
KW = (BTUH x 0.2931)/1000	°C = (°F – 32) x 5/9
kPa = (in wc x 248.84)/1000	°F = (1.8 x °C) + 32
kPa = 6.895 X PSI	

Also see: www.engineeringtoolbox.com for other formulas and tools