CONVERSION FACTORS

Multiply	By	To Obtain
BHP	33,479	Btu / hr
BHP	34.5	Lb / hr
BHP	0.069	GPM
BHP	139	EDR
EDR	0.000496	GPM
Lb / hr Steam	0.002	GPM
Lb / hr Condensate	960	Btu / hr
Lb / hr Condensate	4	EDR
PSI	2.31	Feet of Water (TDH)
Gallon of Water	8.345	Lbs. of Water
Ft^3	7.48	Gallons of Water
GPM	12,000	Tons of Refrigeration
To Obtain	By	Divide

METRIC CONVERSION FACTORS

Multiply	By	To Obtain
Inches	2.54	Centimeters
Feet of Water	2.24165	Centimeters of Mercury
Ft^3	28.32	Liters
In^3	16.39	Cm^3
Gallons	3.7853	Liters
GPM	0.06308	Liters / sec
Btu / hr	.252	Kilo-calories / hr
PSI	.0703	Kilogram / cm^2
To Obtain	By	Divide

USEFUL FORMULAS

Fluid Flow Calculation

GPM = Btu / hr ÷ (ΔT x 500 x Specific Gravity of Fluid)

Brake Horsepower Calculation

BHP = (GPM x TDH) ÷ (3960 x Motor Efficiency)

Power Calculation

Watts = Volts x Amps x Power Factor

PROPERTIES OF SATURATED STEAM (APPROXIMATE)

Gauge Pressure At Sea Level	Temperature, °F	Heat in H_2O, BTU/lb	Latent Heat in Steam (Vaporization), BTU/lb	Volume of 1lb. Steam, Ft^3	Weight of H_2O, Lb/ft^3
29.7	32	0.0	1076	3306	62.4
29.4	59	27.0	1061	1248	62.3
28.9	79	47.0	1049	653	62.2
28	101	69	1037	341	62.0
26	125	93	1023	179	61.7
24	141	109	1014	120	61.4
22	152	120	1007	93	61.1
20	161	129	1002	75	60.9
18	169	137	997	63	60.8
16	176	144	993	55	60.6
14	182	150	989	48	60.5
12	187	155	986	43	60.4
10	192	160	983	39	60.3
8	197	165	980	36	60.2
6	201	169	977	33	60.1
4	205	173	975	31	60.0
2	209	177	972	29	59.9
1	210	178	971	28	59.9
0	212	180	970	27	59.8
0	212	180	970	27	59.8
1	216	184	968	25	59.8
2	219	187	966	24	59.7
3	222	190	964	22	59.6
4	225	193	962	21	59.5
5	227	195	960	20	59.4
6	230	198	958	19	59.4
7	232	200	957	19	59.3
8	235	203	955	18	59.2
9	237	205	954	17	59.2
10	240	208	952	16	59.2
15	250	219	945	14	58.8
20	259	228	939	12	58.5
25	267	236	934	10	58.3
30	274	243	929	9	58.1
35	281	250	924	8	57.9
40	287	256	920	8	57.7
45	293	262	915	7	57.5
50	298	268	912	7	57.4
55	303	273	908	6	57.2
60	308	277	905	6	57.0
70	316	286	898	5	56.8
80	324	294	892	5	56.5
90	332	302	886	4	56.3
100	338	309	881	4	56.0
125	353	325	868	3	55.5

Vacuum – inches of Mercury

Pressure – PSI

HOT WATER PIPING - RESIDENTIAL

Pipe Capacity in MBH
at 500 Milinches Restriction Per Foot of Pipe

Pipe Size (inches)	MBH	+ Friction Head Feet per 100'	GPM at 20° T.D.	Velocity Flow of Water	
				Inches per Section	Feet per Min.
1/2	17	4.2'	1.7	23	115
3/4	39	4.2'	3.9	27	135
1	71	4.2'	7.1	34	170
1-1/4	160	4.2'	16.0	40	200
1-1/2	240	4.2'	24.0	*45	225
2	450	4.2'	45.0	*54	270
2-1/2	750	4.2'	75.0	*62	310
3	1400	4.2'	140.0	*72	360
4	2900	4.2'	290.0	*80	400

* - Maximum velocity flow

+ - In order for a pump to move the G.P.M. listed, the pump must overcome a friction head of 4.2 feet per 100' of pipe travers.
(Total Equivalent Length)

Example:
If one wants to carry 16 gpm in a 1-¼" pipe through a pipe circuit of 300' (T.E.L.), the pump must overcome a friction head of 4.2' x 3 or 12.6 ft. In other words, the pump specification would be to pump 16 gpm against a 12.6 friction head.

MISCELLANEOUS

CONVERSION FACTORS

WATER

U.S. Gallons	x	8.34	=	Pounds
U.S. Gallons	x	0.13368	=	Cubic Feet
U.S. Gallons	x	231.00	=	Cubic Inches
U.S. Gallons	x	3.78	=	Liters
Imperial Gallons	x	277.3 Cubic Inches		
Imperial Gallons at 62°F	=	10.0 Pounds		
Cubic In. of Water (39.2°)	x	0.036130	=	Pounds
Cubic In. of Water (39.2°)	x	0.004329	=	U.S. Gallons
Cubic In. of Water (39.2°)	x	0.576384	=	Ounces
Cubic Feet of Water (39.2°)	x	62.427	=	Pounds
Cubic Feet of Water (39.2°)	x	7.48	=	U.S. Gallons
Cubic Feet of Water (39.2°)	x	0.028	=	Tons
Pounds of Water	x	27.72	=	Cubic Inches
Pounds of Water	x	0.01602	=	Cubic Feet
Pounds of Water	x	0.12	=	U.S. Gallons

PRESSURE

1 Pound Per Square Inch	=	144 Pounds Per Square Foot
		2.0355 Inches of Mercury at 32°F.
		2.0416 Inches of Mercury at 62°F.
		2.309 Feet of Water at 62°F.
		27.71 Inches of Water at 62°F
		6.895 kPA (kilopascal)
1 Ounce Per Square Inch	=	0.1276 Inches of Mercury at 62°F.
		1.732 Inches of Water at 62°F.
1 Atmosphere	=	2116.3 Pounds Per Square Foot
(14.7 Lbs. Per Sq. In.)		33.947 Feet of Water at 62°F.
		30 Inches of Mercury at 62°F.
		29.922 Inches of Mercury at 32°F.
		760 Millimeters of Mercury at 32°F.
		101.3 kilopascal
	=	235.1 ounces per sq. in.
1 Inch Water	=	0.03609 Lbs. or 0.5774 oz Per Sq. In.
(at 62°F.)		5.196 Pounds Per Square Foot
		0.248 kilopascal
	=	235.1 oz/in^2
1 Foot Water	=	0.433 Pounds Per Square Inch
(at 62°F.)		62.355 Pounds Per Square Foot
1 Inch Mercury	=	0.491 Lbs. or 7.86 oz. Per Sq. In
(at 62°F.)		1.132 Feet Water at 62°F.
		13.58 Inches Water at 62°F.

MISCELLANEOUS

EQUIVALENT VALUE IN DIFFERENT UNITS

1 H.P.	=	746 watts .746 K.W. 33,000 ft.-lbs. per minute 550 ft.-lbs. per second
1 H.P.	= =	33.475 BTU/hr 34.5 lb steam/hr from and at 212°F
1 Kilowatt	=	1,000 watts 1.34 H.P. 3.53 lbs. water evaporated per hour f rom and at 212°F.
1 Watt	=	.00134 H.P. .0035 lb. water evaporated per hour
1 K.W. Hour	=	1,000 watt hours 1.34 H.P. Hours 3,600,000 joules 3.53 lbs. water evaporated from and at 212°F. 22.75 lbs. of water raised from 62°F to 212°F
1 Joule	=	1 watt second .000000278 K.W. hour
MJ = Megajoule	=	1,000,000 Joule = 948 BTU 239 Kcal

EQUIVALENTS OF ELECTRICAL UNITS

1 Kilowatt	=	1.34 H.P. 0.955 BTU per second 57.3 BTU per minute 3438 BTU per hour
1 Horse Power	=	746 watts 42.746 BTU per minute 2564.76 BTU per hour
1 BTU	=	17.452 watt minutes 0.2909 watt hour