

Section TECH-H

Conversion Factors

TECH-H-1 Temperature Conversion Chart {Centigrade (Celsius)-Fahrenheit}

C	F	C	F	C	F	C	F	C	F	C	F
-40	-40.0	+5	+41.0	+40	+104.0	+175	+347	+350	+662	+750	+1382
-38	-36.4	6	42.8	41	105.8	180	356	355	671	800	1472
-36	-32.8	7	44.6	42	107.6	185	365	360	680	850	1562
-34	-29.2	8	46.4	43	109.4	190	374	365	689	900	1652
-32	-25.6	9	48.2	44	111.2	195	383	370	698	950	1742
-30	-22.0	10	50.0	45	113.0	200	392	375	707	1000	1832
-28	-18.4	11	51.8	46	114.8	205	401	380	716	1050	1922
-26	-14.8	12	53.6	47	116.6	210	410	385	725	1100	2012
-24	-11.2	13	55.4	48	118.4	215	419	390	734	1150	2102
-22	-7.6	14	57.2	49	120.2	220	428	395	743	1200	2192
-20	-4.0	15	59.0	50	122.0	225	437	400	752	1250	2282
-19	-2.2	16	60.8	55	131.0	230	446	405	761	1300	2372
-18	-0.4	17	62.6	60	140.0	235	455	410	770	1350	2462
-17	+1.4	18	64.4	65	149.0	240	464	415	779	1400	2552
-16	3.2	19	66.2	70	158.0	245	473	420	788	1450	2642
-15	5.0	20	68.0	75	167.0	250	482	425	797	1500	2732
-14	6.8	21	69.8	80	176.0	255	491	430	806	1550	2822
-13	8.6	22	71.6	85	185.0	260	500	435	815	1600	2912
-12	10.4	23	73.4	90	194.0	265	509	440	824	1650	3002
-11	12.2	24	75.2	95	203.0	270	518	445	833	1700	3092
-10	14.0	25	77.0	100	212.0	275	527	450	842	1750	3182
-9	15.8	26	78.8	105	221.0	280	536	455	851	1800	3272
-8	17.6	27	80.6	110	230.0	285	545	460	860	1850	3362
-7	19.4	28	82.4	115	239.0	290	554	465	869	1900	3452
-6	21.2	29	84.2	120	248.0	295	563	470	878	1950	3542
-5	23.0	30	86.0	125	257.0	300	572	475	887	2000	3632
-4	24.8	31	87.8	130	266.0	305	581	480	896	2050	3722
-3	26.6	32	89.6	135	275.0	310	590	485	905	2100	3812
-2	28.4	33	91.4	140	284.0	315	599	490	914	2150	3902
-1	30.2	34	93.2	145	293.0	320	608	495	923	2200	3992
0	32.0	35	95.0	150	302.0	325	617	500	932	2250	4082
+1	33.8	36	96.8	155	311.0	330	626	550	1022	2300	4172
2	35.6	37	98.6	160	320.0	335	635	600	1112	2350	4262
3	47.4	38	100.4	165	329.0	340	644	650	1202	2400	4352
4	39.2	39	102.2	170	338.0	345	653	700	1292	2450	4442

$$\text{Degrees Celsius} = \frac{(\text{Degrees Fahrenheit} - 32) \times 5}{9}$$

$$\text{Degrees Fahrenheit} = \frac{(\text{Degrees Celsius} \times 9) + 32}{5}$$

$$\text{Degrees Kelvin (K)} = \text{Degrees Celsius} + 273.15$$

$$\text{Degrees Rankine (R)} = \text{Degrees Fahrenheit} + 459.69$$

(0 degrees K or R = absolute zero)

TECH-H-2 A.P.I. and Baumé Gravity Tables and Weight Factors

A.P.I Gravity	Baumé Gravity	Specific Gravity	Lbs. Per U.S. Gal.	U.S. Gals. per Lb.
0	10.247	1.0760	8.962	0.1116
1	9.223	1.0679	8.895	0.1124
2	8.198	1.0599	8.828	0.1133
3	7.173	1.0520	8.762	0.1141
4	6.148	1.0443	8.698	0.1150
5	5.124	1.0366	8.634	0.1158
6	4.099	1.0291	8.571	0.1167
7	3.074	1.0217	8.509	0.1175
8	2.049	1.0143	8.448	0.1184
9	1.025	1.0071	8.388	0.1192
10	10.00	1.0000	8.328	0.1201
11	10.99	0.9930	8.270	0.1209
12	11.98	0.9861	8.212	0.1218
13	12.97	0.9792	8.155	0.1226
14	13.96	0.9725	8.099	0.1235
15	14.95	0.9659	8.044	0.1243
16	15.94	0.9593	7.989	0.1252
17	16.93	0.9529	7.935	0.1260
18	17.92	0.9465	7.882	0.1269
19	18.90	0.9402	7.830	0.1277
20	19.89	0.9340	7.778	0.1286
21	20.88	0.9279	7.727	0.1294
22	21.87	0.9218	7.676	0.1303
23	22.86	0.9159	7.627	0.1311
24	23.85	0.9100	7.578	0.1320
25	24.84	0.9024	7.529	0.1328
26	25.83	0.8984	7.481	0.1337
27	26.82	0.8927	7.434	0.1345
28	27.81	0.8871	7.387	0.1354
29	28.80	0.8816	7.341	0.1362
30	29.79	0.8762	7.296	0.1371
31	30.78	0.8708	7.251	0.1379
32	31.77	0.8654	7.206	0.1388
33	32.76	0.8602	7.163	0.1396
34	33.75	0.8850	7.119	0.1405
35	34.73	0.8498	7.076	0.1413
36	35.72	0.8448	7.034	0.1422
37	36.71	0.8398	6.993	0.1430
38	37.70	0.8348	6.951	0.1439
39	38.69	0.8299	6.910	0.1447
40	39.68	0.8251	6.870	0.1456
41	40.67	0.8203	6.830	0.1464
42	41.66	0.8155	6.790	0.1473
43	42.65	0.8109	6.752	0.1481
44	43.64	0.8063	6.713	0.1490
45	44.63	0.8017	6.675	0.1498
46	45.62	0.7972	6.637	0.1507
47	50.61	0.7927	6.600	0.1515
48	50.60	0.7883	6.563	0.1524
49	50.59	0.7839	6.526	0.1532
50	50.58	0.7796	6.490	0.1541

A.P.I Gravity	Baumé Gravity	Specific Gravity	Lbs. Per U.S. Gal.	U.S. Gals. per Lb.
51	50.57	0.7753	6.455	0.1549
52	51.55	0.7711	6.420	0.1558
53	52.54	0.7669	6.385	0.1566
54	53.53	0.7628	6.350	0.1575
55	54.52	0.7587	6.316	0.1583
56	55.51	0.7547	6.283	0.1592
57	56.50	0.7507	6.249	0.1600
58	57.49	0.7467	6.216	0.1609
59	58.48	0.7428	6.184	0.1617
60	59.47	0.7389	6.151	0.1626
61	60.46	0.7351	6.119	0.1634
62	61.45	0.7313	6.087	0.1643
63	62.44	0.7275	6.056	0.1651
64	63.43	0.7238	6.025	0.1660
65	64.42	0.7201	5.994	0.1668
66	65.41	0.7165	5.964	0.1677
67	66.40	0.7128	5.934	0.1685
68	67.39	0.7093	5.904	0.1694
69	68.37	0.7057	5.874	0.1702
70	69.36	0.7022	5.845	0.1711
71	70.35	0.6988	5.817	0.1719
72	71.34	0.6953	5.788	0.1728
73	72.33	0.6919	5.759	0.1736
74	73.32	0.6886	5.731	0.1745
75	74.31	0.6852	5.703	0.1753
76	75.30	0.6819	5.676	0.1762
77	76.29	0.6787	5.649	0.1770
78	77.28	0.6754	5.622	0.1779
79	78.27	0.6722	5.595	0.1787
80	79.26	0.6690	5.568	0.1796
81	80.25	0.6659	5.542	0.1804
82	81.24	0.6628	5.516	0.1813
83	82.23	0.6597	5.491	0.1821
84	83.22	0.6566	5.465	0.1830
85	84.20	0.6536	5.440	0.1838
86	85.19	0.6506	5.415	0.1847
87	86.18	0.6476	5.390	0.1855
88	87.17	0.6446	5.365	0.1864
89	88.16	0.6417	5.341	0.1872
90	89.15	0.6388	5.316	0.1881
91	90.14	0.6360	5.293	0.1889
92	91.13	0.6331	5.269	0.1898
93	92.12	0.6303	5.246	0.1906
94	93.11	0.6275	5.222	0.1915
95	94.10	0.6247	5.199	0.1924
96	95.09	0.6220	5.176	0.1932
97	96.08	0.6193	5.154	0.1940
98	97.07	0.6166	5.131	0.1949
99	98.06	0.6139	5.109	0.1957
100	99.05	0.6112	5.086	0.1966

The relation of Degrees Baumé or A.P.I. to Specific Gravity is expressed by the following formulas:

For liquids lighter than water:

$$\text{Degrees Baumé} = \frac{140}{G} - 130, \quad G = \frac{140}{130 + \text{Degrees Baumé}}$$

$$\text{Degrees A.P.I.} = \frac{141.5}{G} - 131.5, \quad G = \frac{141.5}{131.5 + \text{Degrees A.P.I.}}$$

For liquids heavier than water:

$$\text{Degrees Baumé} = 145 - \frac{145}{G}, \quad G = \frac{145}{145 - \text{Degrees Baumé}}$$

G = Specific Gravity = ratio of the weight of a given volume of oil at 60° Fahrenheit to the weight of the same volume of water at 60° Fahrenheit.

The above tables are based on the weight of 1 gallon (U.S.) of oil with a volume of 231 cubic inches at 60° Fahrenheit in air at 760 m.m. pressure and 50% humidity. Assumed weight of 1 gallon of water at 60° Fahrenheit in air is 8.32828 pounds.

To determine the resulting gravity by missing oils of different gravities:

$$D = \frac{md_1 - nd_2}{m + n}$$

D = Density or Specific Gravity of mixture

m = Proportion of oil of d₁ density

n = Proportion of oil of d₂ density

d₁ = Specific Gravity of m oil

d₂ = Specific Gravity of n oil

TECH-H-3 Approximate Conversion Table for Hardness Numbers Obtained by Different Methods*

Brinell Number 10 mm. Ball 3000 Kg. Load	Rockwell Number		Shore Scieroscope Number	Vickers Pyramid Number
	C-Scale	B-Scale		
682	61.7		84	737
653	60		81	697
633	59		79	674
614	58		78	654
596	57		77	636
578	56		75	615
560	55		73	596
543	54		72	578
527	53		71	561
500	52		69	544
475	50		67	513
451	48		64	484
432	46		62	458
409	44		58	434
390	42		56	412
371	40		54	392
353	38		51	372
336	36		49	354
319	34		47	336
301	32		44	318
286	30		42	302
271	28		41	286
258	26		38	272
247	24		37	260
237	22	99	35	248
226	20	98	34	238
212	16	95	32	222
194	12	92	29	204
179	8	89	27	188
158	2	83	24	166
141		77	21	141
125		70	18	125
110		62		110
99		55		99
89		47		89

*Compiled from various manufacturers' tables.

TECH-H-4 Conversion Factors

English measures - unless otherwise designated, are those used in the United States, and the units of weight and mass are avoirdupois units.

Gallon - designates the U.S. gallon. To convert into the Imperial gallon, multiply the U.S. gallon by 0.83267. Likewise, the word ton designates a short ton — 2,000 pounds.

Properties of water - it freezes at 32°F., and is at its maximum density at 39.2° F. In the multipliers using the properties of water, calculations are based on water at 39.2° F. in a vacuum, weighing 62.427 pounds per cubic foot, or 8.345 pounds per U.S. gallon.

Multiply	By	To Obtain
Acres	43,560	Square feet
Acres	4047	Square meters
Acres	1.562 x 10 ⁻³	Square miles
Acres	4840	Square yards
Acre-feet	43,560	Cubic feet
Acre-feet	325,851	Gallons
Acre-feet	1233,48	Cubic Meters
Atmospheres	1.0332	Atmospheres (metric)
Atmospheres	1.01325	Bars
Atmospheres	76.0	Cms. of mercury
Atmospheres	29.92	Inches of mercury

Multiply	By	To Obtain
Atmospheres	33.90	Feet of water
Atmospheres	10,332	kgs/sq. ft
Atmospheres	14.70	Lbs./ sq. inch
Atmospheres	1.058	Tons/sq. ft.
Atmospheres (metric)	0.9678	Atmospheres
Atmospheres (metric)	980,665.	Bars
Bars	.98692	Atmospheres
Bars	33.456	Feet H ² O @39°F.
Bars	29.530	In. Hg @ 32° F.
Bars	1.0197	kg/cm ²
Bars	2088.6	Pounds/ ft. ²

Multiply	By	To Obtain
Bars	14.504	Pounds/in. ²
Barrels- oil	42	Gallons- oil
Barrels- beer	31	Gallons- beer
Barrels- whiskey	45	Gallons- whiskey
Barrels/day- oil	0.02917	Gallons/min.- oil
Bags or sacks-cement	94	Pounds/cement
Board feet	144 sq. in. x 1 in.	Cubic inches
British Thermal Units	0.2520	Kilogram- calories
British Thermal Units	777.6	Foot- lbs.
British Thermal Units	3.927 x 10 ⁴	Horsepower- hrs.
British Thermal Units	107.5	Kilogram- meters
British Thermal Units	2.928 x 10 ⁴	Kilowatt- hrs.
B.T.U./min.	12.96	Foot-lbs./sec.
B.T.U./min.	0.02356	Horsepower
B.T.U./min.	0.01757	Kilowatts
B.T.U./min.	17.57	Watts
Centares (Centiares)	1	Square meters
Centigrams	0.01	Grams
Centiliters	0.01	Liters
Centimeters	0.3937	Inches
Centimeters	0.01	Meters
Centimeters	10	Millimeters
Centimeters of mercury	0.01316	Atmosphere
Centimeters of mercury	0.013332	Bars
Centimeters of mercury	0.013595	kg/cm ²
Centimeters of mercury	0.4461	Feet of water
Centimeters of mercury	136.0	kgs/sq. meter
Centimeters of mercury	27.85	Lbs./sq. ft.
Centimeters of mercury	0.1934	Lbs./sq. inch
Centimeters/sec.	1.969	Feet/min.
Centimeters/sec.	0.03281	Feet/sec.
Centimeters/sec.	0.036	Kilometers/hr.
Centimeters/sec.	0.6	Meters/min.
Centimeters/sec.	0.02237	Miles/hr.
Centimeters/sec.	3.728 x 10 ⁻⁴	Miles/min.
Cms./sec./sec.	0.03281	Feet/sec./sec.
Centipoises	0.001	Pascal-second
Centipoises	0.01	Poises
Centistokes	0.01	Sq. cm/sec.
Centistokes	0.01	Stokes
Cubic centimeters	3.531 x 10 ⁻⁵	Cubic feet
Cubic centimeters	6.102 x 10 ⁻²	Cubic inches
Cubic centimeters	10 ⁻⁶	Cubic meters
Cubic centimeters	1.308 x 10 ⁻⁶	Cubic yards
Cubic centimeters	2.642 x 10 ⁻⁴	Gallons
Cubic centimeters	9.999 x 10 ⁻⁴	Liters
Cubic centimeters	2.113 x 10 ⁻³	Pints (liq.)
Cubic centimeters	1.057 x 10 ⁻³	Quarts (liq.)
Cubic cm/sec.	0.0158502	Gallons/minute
Cubic cm/sec.	0.001	Liters/sec.
Cubic feet	0.1781	Barrels (42 US Gal.)
Cubic feet	2.832 x 10 ⁻⁴	Cubic cms.
Cubic feet	1728	Cubic inches
Cubic feet	0.02832	Cubic meters
Cubic feet	0.03704	Cubic yards
Cubic feet	7.48052	Gallons
Cubic feet	28.32	Liters
Cubic feet	59.84	Pints (liq.)
Cubic feet	29.92	Quarts (liq.)
Cubic feet/min.	472.0	Cubic cms./sec.

Multiply	By	To Obtain
Cubic feet/min.	0.1247	Gallons/sec.
Cubic feet/min.	0.4719	Liters/sec.
Cubic feet/min.	62.43	Pounds of water/min.
Cubic feet/sec.	0.646317	Millions gals./day
Cubic feet/sec.	448.831	Gallons/min.
Cubic inches	16.39	Cubic centimeters
Cubic inches	5.787 x 10 ⁻⁴	Cubic feet
Cubic inches	1.639 x 10 ⁻⁵	Cubic meters
Cubic inches	2.143 x 10 ⁻⁵	Cubic yards
Cubic inches	4.329 x 10 ⁻³	Gallons
Cubic inches	1.639 x 10 ⁻²	Liters
Cubic inches	0.03463	Pints (liq.)
Cubic inches	0.01732	Quarts (liq.)
Cubic meters	10 ⁶	Cubic centimeters
Cubic meters	35.31	Cubic feet
Cubic meters	61023	Cubic inches
Cubic meters	1.308	Cubic yards
Cubic meters	264.2	Gallons
Cubic meters	999.97	Liters
Cubic meters	2113	Pints (liq.)
Cubic meters	1057	Quarts (liq.)
Cubic meters/hr.	4.40	Gallons/min.
Cubic yards	4.8089	Barrels (42 U.S. Gal.)
Cubic yards	764,554.86	Cubic centimeters
Cubic yards	27	Cubic feet
Cubic yards	46, 656	Cubic inches
Cubic yards	0.7646	Cubic meters
Cubic yards	202.0	Gallons
Cubic yards	764.5	Liters
Cubic yards	1616	Pints (liq.)
Cubic yards	807.9	Quarts (liq.)
Cubic yards/min.	0.45	Cubic feet/sec.
Cubic yards/min.	202.0	Gallons/min.
Cubic yards/min.	3.366	Gallons/sec.
Cubic yards/min.	12.74	Liters/sec.
Decigrams	0.1	Grams
Deciliters	0.1	Liters
Decimeters	0.1	Meters
Degrees (angle)	60	Minutes
Degrees (angle)	0.01745	Radians
Degrees (angle)	3600	Seconds
Degrees/sec.	0.01745	Radians/sec.
Degrees/sec.	0.1667	Revolutions/min.
Degrees/sec.	0.002778	Revolutions/sec.
Dekagrams	10	Grams
Dekaliters	10	Liters
Dekameters	10	Meters
Drams	27.34375	Grains
Drams	0.0625	Ounces
Drams	1.771845	Grams
Fathoms	6	Feet
Feet	30.48	Centimeters
Feet	0.166667	Fathoms
Feet	3.0480 x 10 ⁻⁴	Kilometers
Feet	304.80	Millimeters
Feet	12	Inches
Feet	0.3048	Meters
Feet	1/3	Yards
Feet of water	0.0295	Atmospheres
Feet of water	0.8826	Inches of mercury

Multiply	By	To Obtain
Feet of water	304.8	kgs./sq. meter
Feet of water	62.43	Lbs./sq. ft.
Feet of water	0.4335	Lbs./sq. inch
Feet/min.	0.5080	Centimeters/sec.
Feet/min.	0.01667	Feet/sec.
Feet/min.	0.01829	Kilometers/hr.
Feet/min.	0.3048	Meters/min.
Feet/min.	0.01136	Miles/hr.
Feet/sec.	30.48	Centimeters/sec.
Feet/sec.	1.09726	Kilometers/hr.
Feet/sec.	0.5924	Knots
Feet/sec.	18.29	Meters/min.
Feet/sec.	0.6818	Miles/hr.
Feet/sec.	0.01136	Miles/min.
Feet/sec./sec.	30.48	Cms./sec./sec.
Feet/sec./sec.	0.3048	Meters/sec./sec.
Feet/sec./sec.	0.0310810	g's (gravity)
Foot- pounds	1.286 x 10 ⁻³	British Thermal Units
Foot- pounds	5.050 x 10 ⁻⁷	Horsepower-hrs.
Foot- pounds	3.240 x 10 ⁻⁴	Kilogram- calories
Foot- pounds	0.1383	Kilogram- meters
Foot- pounds	3.766 x 10 ⁻⁷	Kilowatt- hours
Foot- pounds/min.	2.140 x 10 ⁻⁵	B.T.U./sec.
Foot- pounds/min.	0.01667	Foot-pounds/sec.
Foot- pounds/min.	3.030 x 10 ⁻⁵	Horsepower
Foot- pounds/min.	5.393 x 10 ⁻³	Gm.-calories/sec.
Foot- pounds/min.	2.280 x 10 ⁻⁵	Kilowatts
Foot- pounds/sec.	7.704 x 10 ⁻²	B.T.U./min.
Foot- pounds/sec.	1.818 x 10 ⁻³	Horsepower
Foot- pounds/sec.	1.941 x 10 ⁻²	kg.-calories/min.
Foot- pounds/sec.	1.356 x 10 ⁻³	Kilowatts
G's (Accel. due to grav.)	32.174	Feet/sec. ²
G's (Accel. due to grav.)	35.3034	Km/hr.-sec.
G's (Accel. due to grav.)	9.80665	Meters/sec. ²
G's (Accel. due to grav.)	21.9371	Miles/hr.-sec.
Gallons	3785	Cubic centimeters
Gallons	0.1337	Cubic feet
Gallons	231	Cubic inches
Gallons	3.785 x 10 ⁻³	Cubic meters
Gallons	4.951 x 10 ⁻³	Cubic yards
Gallons	3.785	Liters
Gallons	8	Pints (liq.)
Gallons	4	Quarts (liq.)
Gallons-Imperial	1.20095	US Gallons
Gallons- US	0.83267	Imperial Gallons
Gallons water	8.345	Pounds of water
Gallons per day	9.284 x 10 ⁻⁵	Cubic ft./min.
Gallons per day	1.5472 x 10 ⁻⁶	Cubic ft./sec.
Gallons per day	2.6289 x 10 ⁻⁶	Cubic meters/min.
Gallons per day	0.09284	Liters/min.
Gallons per hour	0.1337	Cubic ft./hr.
Gallons per hour	0.002228	Cubic ft./min.
Gallons per hour	3.71 x 10 ⁻⁵	Cubic ft./sec.
Gallons per hour	6.309 x 10 ⁻⁵	Cubic meters/min.
Gallons per hour	.016667	Gallons/min.
Gallons per hour	2.7778 x 10 ⁻⁴	Gallons/sec.
Gallons per hour	0.06309	Liters/min.
Gallons/min.	34.286	Barrels (42 US Gal.)/day

Multiply	By	To Obtain
Gallons/min.	1.4286	Barrels (42 US Gal.)/hr.
Gallons/min.	0.02381	Barrels (42 USGal.)/min.
Gallons/min.	1440	Gallons/day
Gallons/min.	2.228 x 10 ⁻³	Cubic feet/sec.
Gallons/min.	0.06308	Liters/sec.
Gallons/min.	8.0208	Cu. ft./hr.
Gallons/sec.	60	Gallons/min.
Gallons/sec.	227.12	Liters/min.
Grains (troy)	0.06480	Grams
Grains (troy)	0.04167	Pennyweights (troy)
Grains (troy)	2.0833 x 10 ⁻³	Ounces
Grains/US gal.	17.118	Parts/million
Grains/US gal.	142.86	Lbs./million gal.
Grains/Imp. gal.	14.254	Parts/million
Grams	980.7	Dynes
Grams	15.43	Grains
Grams	.001	Kilograms
Grams	1000	Milligrams
Grams	0.03527	Ounces
Grams	0.03215	Ounces (troy)
Grams	2.205 x 10 ⁻³	Pounds
Grams/cm.	5.600 x 10 ⁻³	Pounds/ inch
Grams/cu. cm.	62.43	Pounds/cubic foot
Grams/cu. cm.	0.03613	Pounds/cubic inch
Grams/liter	58.416	Grains/gal.
Grams/liter	8.345	Pounds/1000 gals.
Grams/liter	0.06242	Pounds/cubic foot
Grams/liter	1000	Parts/million
Hectares	2.471	Acres
Hectares	1.076 x 10 ⁵	Square feet
Hectograms	100	Grams
Hectoliters	100	Liters
Hectometers	100	Meters
Hectowatts	100	Watts
Horsepower	42.44	B.T.U./min.
Horsepower	33,000	Foot-lbs./min.
Horsepower	550	Foot-lbs./sec.
Horsepower	1.014	Horsepower (metric)
Horsepower	10.547	kg.-calories/min.
Horsepower	0.7457	Kilowatts
Horsepower	745.7	Watts
Horsepower (boiler)	33, 493	B.T.U./hr.
Horsepower (boiler)	9.809	Kilowatts
Horsepower (boiler)	9.2994	B.T.U./sec.
Horsepower (boiler)	9809.5	Watts
Horsepower-hours	2546	B.T.U
Horsepower-hours	1.98 x 10 ⁶	Foot-lbs.
Horsepower-hours	641.6	Kilogram-calories
Horsepower-hours	2.737 x 10 ⁵	Kilogram-meters
Horsepower-hours	0.7457	Kilowatt-hours
Inches	2.540	Centimeters
Inches	0.083333	Feet
Inches	0.0254	Meters
Inches	25.4	Millimeters
Inches	0.0277778	Yards
Inches of mercury	0.03342	Atmospheres
Inches of mercury	0.03386	Bars
Inches of mercury	13.6	Inches H ₂ O

Multiply	By	To Obtain
Inches of mercury	0.034531	kg/cm ²
Inches of mercury	3374.1	Pascals
Inches of mercury	70.727	Pounds/ft. ²
Inches of mercury	0.49116	Pounds/in. ²
Inches of mercury	1.133	Feet of water
Inches of mercury	345.3	kgs./sq. meter
Inches of mercury	70.73	Lbs./sq. ft.
Inches of mercury (32° F)	0.491	Lbs./sq. inch
Inches of water	0.002458	Atmospheres
Inches of water	0.07355	Inches of mercury
Inches of water	25.40	kgs./sq. meter
Inches of water	0.578	Ounces/sq. inch
Inches of water	5.202	Lbs./sq. foot
Inches of water	0.03613	Lbs./sq. inch
Joules	9.479 x 10 ⁻⁴	B.T.U
Joules	0.239006	Calories (Thermo)
Joules	0.73756	Foot-lb.f.
Joules	3.725 x 10 ⁻⁷	HP-hr. (US)
Joules	2.7778 x 10 ⁻⁷	Kilowatt-hr.
Joules	1	Newton-m
Joules	2.7778 x 10 ⁻⁴	Watt-hr.
Kilograms	35.274	Ounces (avoir)
Kilograms	32.151	Ounces (troy)
Kilograms	980,665	Dynes
Kilograms	2.205	Lbs.
Kilograms	1.102 x 10 ⁻³	Tons (short)
Kilograms	34.286	Tons (assay)
Kilograms	9.8421 x 10 ⁻⁴	Tons (long)
Kilograms	0.001	Tons (metric)
Kilograms	10 ³	Grams
Kilograms-cal./sec.	3.968	B.T.U./sec.
Kilograms-cal./sec	3086	Foot-lbs./sec.
Kilograms-cal./sec	5.6145	Horsepower
Kilograms-cal./sec	4186.7	Watts
Kilograms/cm	0.96783	Atmospheres
Kilograms/cm	0.980665	Bars
Kilograms/cm	28.959	Inches Hg@ 32° F
Kilograms/cm	14.223	Pounds/in. ²
Kilograms-cal./min.	3085.9	Foot-lbs./min.
Kilograms-cal./min	0.09351	Horsepower
Kilograms-cal./min	69.733	Watts
kgs/meter	0.6720	Lbs./foot
kgs/sq. meter	9.678 x 10 ⁻⁵	Atmospheres
kgs/sq. meter	3.281 x 10 ⁻³	Feet of water
kgs/sq. meter	2.896 x 10 ⁻³	Inches of mercury
kgs/sq. meter	0.2048	Lbs./sq. foot
kgs/sq. meter	1.422 x 10 ⁻³	Lbs./sq. inch
kgs/sq. millimeter	10 ⁶	kgs./sq. meter
Kiloliters	10 ³	Liters
Kilometers	10 ⁵	Centimeters
Kilometers	3281	Feet
Kilometers	10 ³	Meters
Kilometers	0.6214	Miles
Kilometers	1094	Yards
Kilopascal	.145	Pounds/in. ²
Kilometers/hr.	27.78	Centimeters/sec.
Kilometers/hr.	54.68	Feet/min.
Kilometers/hr.	0.9113	Feet/sec.
Kilometers/hr.	.5399	Knots
Kilometers/hr.	16.67	Meters/min.

Multiply	By	To Obtain
Kilometers/hr.	0.6214	Miles/hr.
Kms./hr./sec.	27.78	Cms./sec./sec.
Kms./hr./sec.	0.9113	Ft./sec./sec.
Kms./hr./sec.	0.2778	Meters/sec./sec.
Kilowatts	56.907	B.T.U./min.
Kilowatts	4.425 x 10 ⁴	Foot-lbs./min.
Kilowatts	737.6	Foot-lbs./sec.
Kilowatts	1.341	Horsepower (US)
Kilowatts	1.3597	Horsepower (metric)
Kilowatts	1000	Joules/sec.
Kilowatts	3412.9	B.T.U/hr.
Kilowatts	0.94827	B.T.U./sec.
Kilowatts	14.34	kg.-calories/min.
Kilowatts	10 ³	Watts
Kilowatt-hours	3414.4	B.T.U
Kilowatt-hours	2.655 x 10 ⁶	Foot-lbs.
Kilowatt-hours	1.341	Horsepower-hrs.
Kilowatt-hours	860.4	Kilogram-calories
Kilowatt-hours	3.671 x 10 ⁵	Kilogram-meters
Liters	10 ³	Cubic centimeters
Liters	0.03531	Cubic feet
Liters	61.02	Cubic inches
Liters	10 ⁻³	Cubic meters
Liters	1.308 x 10 ⁻³	Cubic yards
Liters	0.2642	Gallons
Liters	2.113	Pints (liq.)
Liters	1.057	Quarts (liq.)
Liters/min.	5.886 x 10 ⁻⁴	Cubic ft./sec.
Liters/min.	4.403 x 10 ⁻³	Gals./sec.
Lumber width (in) x Thickness (in)	Length (ft.)	Board feet
12		
Meters	100	Centimeters
Meters	3.281	Feet
Meters	39.37	Inches
Meters	10 ⁻³	Kilometers
Meters	10 ³	Millimeters
Meters	1.094	Yards
Meters/min.	1.667	Centimeters/sec.
Meters/min.	3.281	Feet/min.
Meters/min.	0.05468	Feet/sec.
Meters/min.	0.06	Kilometers/hr.
Meters/min.	0.03728	Miles/hr.
Meters/sec.	196.8	Feet/min.
Meters/sec.	3.281	Feet/sec.
Meters/sec.	3.6	Kilometers/hr.
Meters/sec.	0.06	Kilometers/min.
Meters/sec.	2.287	Miles/hr.
Meters/sec.	0.03728	Miles/min.
Meters/sec. ²	3.2808	Feet/sec. ²
Meters/sec. ²	0.101972	G (gravity)
Meters/sec. ²	39.37	Inches/sec. ²
Meters/sec. ²	134.214	Miles/hr.-min.
Meter-kg. (force)	9.8067	Joules
Microns	10 ⁻⁶	Meters
Miles	1.609 x 10 ⁵	Centimeters
Miles	5280	Feet
Miles	1.609	Kilometers
Miles	1760	Yards
Miles/hr.	44.70	Centimeters/sec.

Multiply	By	To Obtain
Miles/hr.	88	Feet/min.
Miles/hr.	1.467	Feet/sec.
Miles/hr.	1.609	Kilometers/hr.
Miles/hr.	0.8689	Knots
Miles/hr.	26.82	Meter/min.
Miles/min.	2682	Meters/min.
Miles/min.	88	Feet/sec.
Miles/min.	1.609	Kilometers/min.
Miles/min.	60	Miles/hr.
Milliers	10 ³	Kilograms
Milligrams	10 ⁻³	Grams
Milliliters	10 ⁻³	Liters
Millimeters	0.1	Centimeters
Millimeters	0.03937	Inches
Milligrams/liter	1	Parts/million
Million Gals./day	1.54723	Cubic ft./sec.
Miner's inches	1.5	Cubic ft./min.
Minutes (angle)	2.90 x 10 ⁻⁴	Radians
Newtons (N)	.225	Pounds-force
Ounces	16	Drams
Ounces	437.5	Grains
Ounces	0.0625	Pounds
Ounces	28.3495	Grams
Ounces	0.9115	Ounces (troy)
Ounces	2.790 x 10 ⁻⁵	Tons (long)
Ounces	2.835 x 10 ⁻⁵	Tons (metric)
Ounces (troy)	480	Grains
Ounces (troy)	20	Pennyweights (troy)
Ounces (troy)	0.08333	Pounds (troy)
Ounces (troy)	31.10348	Grams
Ounces (troy)	1.09714	Ounces (avoir)
Ounces (fluid)	1.805	Cubic inches
Ounces (fluid)	0.02957	Liters
Ounces/sq. inch	0.0625	Lbs./sq. inch
Ounces/gal (US)	7.4892	kg/m ³
Ounces/gal (US)	0.25	Ounces/quart
Ounces/gal (US)	0.46753	Pounds/ft. ³
Ounces/gal (US)	2.7056 x 10 ⁻⁴	Pounds/in. ³
Parts/million	0.0584	Grains/US gal.
Parts/million	0.07015	Grains/imp. gal.
Parts/million	8.345	Lbs./million gal.
Pennyweights (troy)	24	Grains
Pennyweights (troy)	1.55517	Grams
Pennyweights (troy)	0.05	Ounces (troy)
Pennyweights (troy)	4.1667 x 10 ⁻³	Pounds (troy)
Pounds	16	Ounces
Pounds	256	Drams
Pounds	7000	Grains
Pounds	0.0005	Tons (short)
Pounds	453.5924	Grams
Pounds	1.21528	Pounds (troy)
Pounds	14.5833	Ounces (troy)
Pounds (troy)	5760	Grains
Pounds (troy)	240	Pennyweights (troy)
Pounds (troy)	12	Ounces (troy)
Pounds (troy)	373.2417	Grams
Pounds (troy)	0.822857	Pounds (avoir.)
Pounds (troy)	13.1657	Ounces (avoir.)
Pounds (troy)	3.6735 x 10 ⁻⁴	Tons (long)
Pounds (troy)	4.1143 x 10 ⁻⁴	Tons (short)

Multiply	By	To Obtain
Pounds (troy)	3.7324 x 10 ⁻⁴	Tons (metric)
Pounds of water	0.01602	Cubic feet
Pounds of water	27.68	Cubic inches
Pounds of water	0.1198	Gallons
Pounds of water/min.	2.670 x 10 ⁻⁴	Cubic ft./sec
Pounds/cubic foot	0.01602	Grams/cubic cm.
Pounds/cubic foot	16.02	kgs./cubic centimeters
Pounds/cubic foot	5.787 x 10 ⁻⁴	Lbs./cubic inch
Pounds/cubic inch	27.68	Grams/cubic inch
Pounds/cubic inch	2.768 x 10 ⁻⁴	kgs./cubic meter
Pounds/cubic inch	1728	Lbs./cubic foot
Pounds/foot	1.488	kgs/meter
Pounds/inch	1152	Grams/cm.
Pounds/sq. in.	0.06895	Bars
Pounds/sq. in.	5.1715	Cm Hg @ 0° C
Pounds/sq. in.	0.070307	kg/cm ²
Pounds/sq. in.	6895	Newtons/m ²
Pounds/sq. in.	6895	Pascals
Pounds/sq. foot	0.01602	Feet of water
Pounds/sq. foot	4.882	kgs./sq. meter
Pounds/sq. foot	6.944 x 10 ⁻³	Pounds/sq. inch
Pounds/sq. inch	0.06804	Atmospheres
Pounds/sq. inch	2.307	Feet of water
Pounds/sq. inch	2.036	Inches of mercury
Pounds/sq. inch	703.1	kgs./sq. meter
Pounds/sq. foot	4.788 x 10 ⁻⁴	Bars
Pounds/sq. foot	0.035913	Cm Hg @ 0°C
Pounds/sq. foot	0.014139	In Hg @ 32°C
Pounds/sq. foot	4.8824 x 10 ⁻⁴	kg/cm ²
Pounds/sq. foot	47.880	Newtons/m ²
Pounds/sq. foot	47.880	Pascals
Quadrants (angle)	90	Degrees
Quadrants (angle)	5400	Minutes
Quadrants (angle)	1.571	Radians
Quarts (dry)	67.20	Cubic inches
Quarts (liq.)	57.75	Cubic inches
Quintal, Argentine	101.28	Pounds
Quintal, Brazil	129.54	Pounds
Quintal, Castile, Peru	101.43	Pounds
Quintal, Chile	101.41	Pounds
Quintal, Mexico	101.47	Pounds
Quintal, Metric	220.46	Pounds
Quires	25	Sheets
Radians	57.30	Degrees
Radians	3438	Minutes
Radians	0.637	Quadrants
Radians/sec.	57.30	Degrees/sec.
Radians/sec.	0.1592	Revolutions/sec.
Radians/sec.	9.549	Revolutions/min.
Radians/sec./sec.	573.0	Revs./min./min.
Radians/sec./sec.	0.1592	Revs./sec./sec.
Reams	500	Sheets
Revolutions	360	Degrees
Revolutions	4	Quadrants
Revolutions	6.283	Radians
Revolutions/min.	6	Degrees/sec.
Revolutions/min.	0.1047	Radians/sec.
Revolutions/min.	0.01667	Revolutions/sec.
Revolutions/min./min.	1.745 x 10 ⁻³	Rads./sec./sec.
Revolutions/min./min.	2.778 x 10 ⁻⁴	Rev./sec./sec.

Multiply	By	To Obtain
Revolutions/ sec	360	Degrees/ sec.
Revolutions/ sec	6.283	Radians/ sec.
Revolutions/ sec	60	Revolutions/ min.
Revolutions/sec/sec	6,283	Radians/sec./sec
Revolutions/ sec/sec.	3600	Revs. / min/ min
Seconds (angle)	4.848 X 10 ⁻⁶	Radians
Square centimeters	1.076 X10 ⁻³	Square feet
Square centimetera	0.1550	Square inches
Square centimeters	10 ⁴	Square meters
Square centimeters	100	Square millimeters
Square feet	2.296 X 10 ⁻⁵	Acres
Square feet	929.0	Square centimeters
Square feet	144	Square inches
Square feet	0.09290	Square meters
Square feet	3.587 X10 ⁻⁴	Square miles
Square feet	1/9	Square yards
1		
Sq. ft./ gal. Min	8.0208	Overflow rate (ft. / hr.)
Square inches	6.542	Square centimeters
Square inches	6.944 X 10 ⁻³	Square feet
Square inches	645.2	Square millimeters
Square kilometers	247.1	Acres
Square kilometers	10.76 X 10 ⁶	Square feet
Square kilometers	10 ⁶	Square meters
Square kilometers	0.3861	Square miles
Square kilometers	1.196 X 10 ⁶	Square yards
Square meters	2.471 X10 ⁻⁴	Acres
Square meters	10.76	Square feet
Square meters	3.861 X 10 ⁻⁷	Square miles
Square meters	1.196	Square yards
Square miles	640	Acres
Square miles	27.88 x 10 ⁶	Square feet
Square miles	2.590	Square kilometers
Square miles	3.098 x 10 ⁶	Square yards
Square millimeters	0.01	Square centimeters
Square milimeters	1.550 x 10 ⁻³	Square inchea
Square yards	2.066x 10 ⁻⁴	Acres
Square yards	9	Square feet

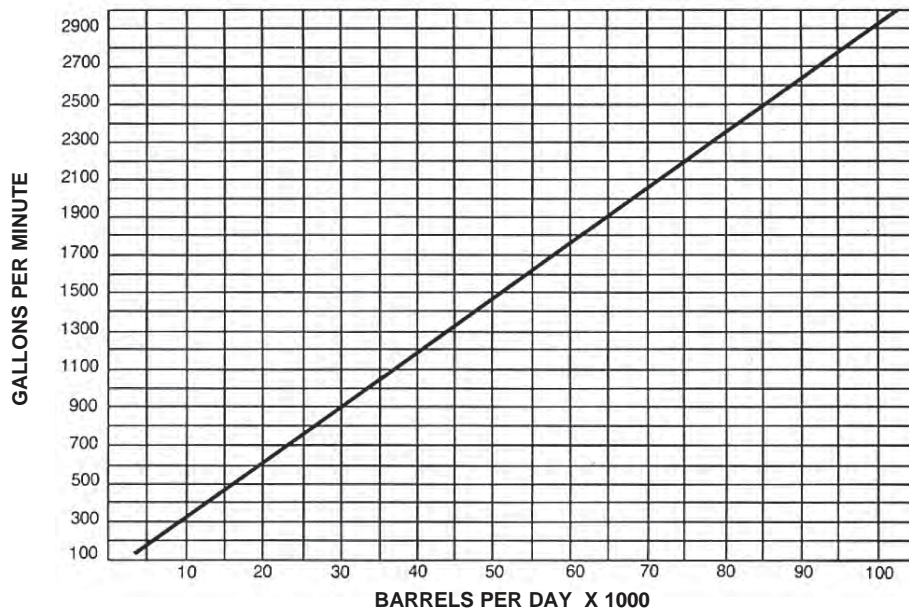
Multiply	By	To Obtain
Square yards	0.8361	Square Meters
Square yards	3.228 X 10 ⁻⁷	Square miles
Temp. (°C.) + 273	1	Abs. Temp. (° C.)
Temp. (° C.) +17.78	1.8	Temp. (° F.)
Temp. (° F.) + 460	1	Abs. Temp (° F.)
Temp (° F.) -32	5/9	Temp. (° C.)
Tons (long)	1016	Kilograms
Tons (long)	2240	Pounds
Tons (long)	1.12000	Tons (short)
Tons (metric)	10 ³	Kilograms
Tons (metric)	2205	Pounds
Tons (short)	2000	Pounds
Tons (short)	32,000	Ounces
Tons (short)	907. 1843	Kilograms
Tons (short)	2430.56	Pounds (troy)
Tons (short)	2430.56	Tons (long)
Tons (short)	29166.66	Ounces (troy)
Tons (short)	0.90718	Tons (metric)
Tons of water/ 24 hrs.	83.333	Pounds water/ hr.
Tons of water/24 hrs	0.16643	Gallons/ min.
Tons of water/ 24 hrs	1.3349	Cu. Ft. / hr.
Watts	0.05686	B.T..U/ min
Watts	44.25	Foot- Lbs. / min.
Watts	0.7376	Foot- Lb/sec.
Watts	1.341 X 10 ⁻³	Horsepower (U .S)
Watts	0.001360	Horsepower(metric)
Watts	1	Joules/ sec
Watts	0.01434	Kg- calories/ min.
Watts	10 ⁻³	Kilowatts
Watt- hours	3.414	B.T.U
Watt- hours	2655	Foot- Lbs
Watt- hours	1.341 X 10 ⁻³	Horsepower- hrs
Watt- hours	0.8604	Kilogram-calories
Watt- hours	367.1	kilogram- meters
Watt- hours	10 ⁻³	Kilowatt- hours
Yards	91.44	Centimeters
Yards	3	Feet
Yards	36	Inches
Yards	0.9144	Meters

TECH-H-5 Quick Convert Tables

AREA		
inch ² x 645.16= mm ² inch ² x 6.4516 = cm ²	mm ² x .00155= inch ² cm ² x 0.1550 = inch ²	cm ² = square centimeter mm ² = square millimeter
BENDING MOMENT (Torque)		
in- lbf x 0.113 = N • m ft- lbf x 1.356 = N • m	N • m x 8.85 = in-lbs	N • m= Newton- meter
CAPACITY (Volume per Unit Time)		
gpm x 0.2271 = m ³ /h gpm x 0.638 = liters per second	m ³ /h x 4.403 = gpm liters/ second x 15.85 = gpm	m ³ /h= cubic meter per hour
FORCE		
lbf x 0.00448 = kN		kN = kilonewton
HEAD (& NPSH)		
foot x 0.3048 = m	m x 3.28084 = foot	m = meter
LENGTH		
foot x 304.8 = mm inch x 25.4 = mm foot x 0.3048 = m	mm x 0.003281 = feet mm 0.03937= inch m x 3.281 = foot	mm= millimeter m = meter
MASS (Weight)		
ounce x 0.02853 = kg pound x 0.4536 = kg ounce x 28.35 = g	kg x 2.205 = pound g x 0.03527 = ounce	kg = kilogram g =gram
POWER		
hp x 0.7457= kW	kW x 1.340483 = hp	kW = kilowatt
PRESSURE		
psi x 0.0703= kg/cm ² psi x 6.895 = kPa kg/cm ² x 98.07 = kPa psi x 0.06895 = Bar	kg/cm ² x 14.233578 = psi kPa x .145= psi kPa x 0.010197=kg/cm ² Bar x 14.50377 = psi	kg/cm ² = kilogram/ square centimeter kPa = kiloascal
TEMPERATURE		
°C= 0.556 (°F -32)	°F = (1.8 x °C) + 32	°C = degrees Celsius
VOLUME		
ft ³ x 0.02832 = m ³ Gallon x 0.003785= m ³ Quart x 0.9464 = L Ounce x 29.57= mL Gallon x 3.7854 = L	m ³ x 35.31 = ft ³ m ³ x 264 .17= gallon L x 1.057 = quart L X 0.26418 = gallon	m ³ = cubic meter L = litre mL = milliliter

TECH-H-6 Conversion Chart—Gallons Per Minute to Barrels Per Day

1 GPM = 34.286 BPD



TECH-H-7 Decimal and Millimeter Equivalents of Fractions

Inches		Millimeters	Inches		Millimeters
Fractions	Decimals		Fractions	Decimals	
$1/64$	.015625	.397	$33/64$	.515625	13.097
$1/32$	.03125	.794	$17/32$	.53125	13.494
$3/64$	.046875	1.191	$35/64$	.546875	13.891
$1/16$	.0625	1.588	$9/16$	.5625	14.288
$5/64$	.078125	1.984	$37/64$	.578125	14.684
$3/32$	.09375	2.381	$19/32$	.59375	15.081
$7/64$	.109375	2.778	$39/64$	.609375	15.487
$1/8$	.125	3.175	$5/8$	.625	15.875
$9/64$	.140625	3.572	$41/64$	.640625	16.272
$5/32$	.15625	3.969	$21/32$	.65625	16.669
$11/64$	.171845	4.366	$43/64$	.671875	17.066
$3/16$	.1875	4.763	$11/16$	.6875	17.463
$13/64$	.203125	5.159	$45/64$	.703125	17.859
$7/32$	.21875	5.556	$22/32$	.71875	18.256
$15/64$	.234375	5.953	$47/64$	.734375	18.653
$1/4$	.250	6.350	$3/4$	.750	19.050
$17/64$	.265625	6.747	$49/64$	.765625	19.447
$9/32$	.28125	7.144	$25/32$	.78125	19.844
$19/64$	.296875	7.541	$51/64$	.796875	20.241
$5/16$	.3125	7.938	$13/16$	.8125	20.638
$21/64$	.328125	8.334	$53/64$	.828125	21.034
$11/32$	.34375	8.731	$27/32$	.84375	21.431
$23/64$	.359375	9.128	$55/64$	.859375	21.828
$3/8$	.375	9.525	$7/8$	.875	22.225
$25/64$	.390625	9.922	$57/64$	.890625	22.622
$13/32$	.40625	10.319	$29/32$	.90625	23.019
$27/64$	.421875	10.716	$59/64$	.921875	23.416
$7/16$	.4375	11.113	$15/16$	.9375	23.813
$29/64$	.453125	11.509	$61/64$	.953125	24.209
$15/32$	.46875	11.906	$31/32$	.96875	24.606
$31/64$	.484375	12.303	$63/64$	.984375	25.003
$1/2$	.500	12.700	1	1.000	25.400

TECH-H-8 Atmospheric Pressures and Barometric Readings at Different Altitudes*

Altitude Below or Above Sea Level (Feet)	Barometer Reading Inches Mercury at 32° F	Atmospheric Pressure (PSI)	Equivalent Head of Water (75°) (Feet)	Boiling Point of Water	
				° F	° C
-1000	31.02	15.2	35.2	213.8	101.0
-500	30.47	15.0	34.7	212.9	100.5
0	29.921	14.7	34.0	212.0	100.0
+500	29.38	14.4	33.4	211.1	99.5
+1000	28.86	14.2	32.8	210.2	99.0
1500	28.33	13.9	32.2	209.3	98.5
2000	27.82	13.7	31.6	208.4	98.0
2500	27.31	13.4	31.0	207.4	97.4
3000	26.81	13.2	30.5	206.5	96.9
3500	26.32	12.9	29.9	205.6	96.4
4000	25.84	12.7	29.4	204.7	95.9
4500	25.36	12.4	28.8	203.8	95.4
5000	24.89	12.2	28.3	202.9	94.9
5500	24.43	12.0	27.8	201.9	94.4
6000	23.98	11.8	27.3	201.0	94.4
6500	23.53	11.5	26.7	200.1	93.9
7000	23.09	11.3	26.2	199.2	92.9
7500	22.65	11.1	25.7	198.3	92.4
8000	22.22	10.9	25.2	197.4	91.9
8500	21.80	10.7	24.8	196.5	91.4
9000	21.38	10.5	24.3	195.5	90.8
9500	20.98	10.3	23.8	194.6	90.3
10,000	20.58	10.1	23.4	193.7	89.8
15,000	16.88	8.3	19.1	184	84.4
20,000	13.75	6.7	15.2	-	-
30,000	8.88	4.4	10.2	-	-
40,000	5.54	2.7	6.3	-	-
50,000	3.44	1.7	3.9	-	-

*Approximate Values