

## DECIMAL EQUIVALENTS

$\frac{1}{64} = .015625$	$\frac{33}{64} = .515625$
$\frac{1}{32} = .03125$	$\frac{17}{32} = .53125$
$\frac{3}{64} = .046875$	$\frac{35}{64} = .546875$
$\frac{1}{16} = .0625$	$\frac{9}{16} = .5625$
$\frac{5}{64} = .078125$	$\frac{37}{64} = .578125$
$\frac{3}{32} = .09375$	$\frac{19}{32} = .59375$
$\frac{7}{64} = .109375$	$\frac{39}{64} = .609375$
$\frac{1}{8} = .125$	$\frac{5}{8} = .625$
$\frac{9}{64} = .140625$	$\frac{41}{64} = .640625$
$\frac{5}{32} = .15625$	$\frac{21}{32} = .65625$
$\frac{11}{64} = .171875$	$\frac{43}{64} = .671875$
$\frac{3}{16} = .1875$	$\frac{11}{16} = .6875$
$\frac{13}{64} = .203125$	$\frac{45}{64} = .703125$
$\frac{7}{32} = .21875$	$\frac{23}{32} = .71875$
$\frac{15}{64} = .234375$	$\frac{47}{64} = .734375$
$\frac{1}{4} = .25$	$\frac{3}{4} = .75$
$\frac{17}{64} = .265625$	$\frac{49}{64} = .765625$
$\frac{9}{32} = .28125$	$\frac{25}{32} = .78125$
$\frac{19}{64} = .296875$	$\frac{51}{64} = .796875$
$\frac{5}{16} = .3125$	$\frac{13}{16} = .8125$
$\frac{21}{64} = .328125$	$\frac{53}{64} = .828125$
$\frac{11}{32} = .34375$	$\frac{27}{32} = .84375$
$\frac{23}{64} = .359375$	$\frac{55}{64} = .859375$
$\frac{3}{8} = .375$	$\frac{7}{8} = .875$
$\frac{25}{64} = .390625$	$\frac{57}{64} = .890625$
$\frac{13}{32} = .40625$	$\frac{29}{32} = .90625$
$\frac{27}{64} = .421875$	$\frac{59}{64} = .921875$
$\frac{7}{16} = .4375$	$\frac{15}{16} = .9375$
$\frac{29}{64} = .453125$	$\frac{61}{64} = .953125$
$\frac{15}{32} = .46875$	$\frac{31}{32} = .96875$
$\frac{31}{64} = .484375$	$\frac{63}{64} = .984375$
$\frac{1}{2} = .5$	$1 = 1.0$

# DECIMAL EQUIVALENTS OF MILLIMETERS

M.M.	INCHES	M.M.	INCHES	M.M.	INCHES	M.M.	INCHES	M.M.	INCHES
1/100	.00039	26/100	.01024	51/100	.02008	76/100	.02992	2	.07874
2/100	.00079	27/100	.01063	52/100	.02047	77/100	.03032	3	.11811
3/100	.00118	28/100	.01102	53/100	.02087	78/100	.03071	4	.15748
4/100	.00157	29/100	.01142	54/100	.02126	79/100	.03110	5	.19685
5/100	.00197	3/10	.01181	55/100	.02165	8/10	.03150	6	.23622
6/100	.00236	31/100	.01220	56/100	.02205	81/100	.03189	7	.27559
7/100	.00276	32/100	.01260	57/100	.02244	82/100	.03228	8	.31496
8/100	.00315	33/100	.01299	58/100	.02283	83/100	.03268	9	.35433
9/100	.00354	34/100	.01339	59/100	.02323	84/100	.03307	10	.39370
1/10	.00394	35/100	.01378	6/10	.02362	85/100	.03346	11	.43307
11/100	.00433	36/100	.01417	61/100	.02402	86/100	.03386	12	.47244
12/100	.00472	37/100	.01457	62/100	.02441	87/100	.03425	13	.51181
13/100	.00512	38/100	.01496	63/100	.02480	88/100	.03465	14	.55118
14/100	.00551	39/100	.01535	64/100	.02520	89/100	.03504	15	.59055
15/100	.00591	4/10	.01575	65/100	.02559	9/10	.03543	16	.62992
16/100	.00630	41/100	.01614	66/100	.02598	91/100	.03583	17	.66929
17/100	.00669	42/100	.01654	67/100	.02638	92/100	.03622	18	.70866
18/100	.00709	43/100	.01693	68/100	.02677	93/100	.03661	19	.74803
19/100	.00748	44/100	.01732	69/100	.02717	94/100	.03701	20	.78740
2/10	.00787	45/100	.01772	7/10	.02756	95/100	.03740	21	.82677
21/100	.00827	46/100	.01811	71/100	.02795	96/100	.03780	22	.86614
22/100	.00866	47/100	.01850	72/100	.02835	97/100	.03819	23	.90551
23/100	.00906	48/100	.01890	73/100	.02874	98/100	.03858	24	.94488
24/100	.00945	49/100	.01929	74/100	.02913	99/100	.03898	25	.98425
25/100	.00984	5/10	.01969	75/100	.02953	1	.03937	26	1.02362

25 4/10 1 INCH

REF-2

DECIMAL EQUIVALENTS OF MILLIMETERS. (FROM 1/10 TO 100%) TO INCH

0.1	0.004	11.3	0.445	22.4	0.882	33.5	1.319	44.6	1.756	55.7	2.193	66.8	2.630	77.9	3.067	89.0	3.504
0.2	0.008	11.4	0.449	22.5	0.886	33.6	1.323	44.7	1.760	55.8	2.197	66.9	2.634	78.0	3.071	89.1	3.508
0.3	0.012	11.5	0.453	22.6	0.890	33.7	1.327	44.8	1.764	55.9	2.201	67.0	2.638	78.1	3.075	89.2	3.512
0.4	0.016	11.6	0.457	22.7	0.894	33.8	1.331	44.9	1.768	56.0	2.205	67.1	2.642	78.2	3.079	89.3	3.516
0.5	0.020	11.7	0.461	22.8	0.898	33.9	1.335	45.0	1.772	56.1	2.209	67.2	2.646	78.3	3.083	89.4	3.520
0.6	0.024	11.8	0.465	22.9	0.902	34.0	1.339	45.1	1.776	56.2	2.213	67.3	2.650	78.4	3.087	89.5	3.524
0.7	0.028	11.9	0.469	23.0	0.906	34.1	1.343	45.2	1.780	56.3	2.217	67.4	2.654	78.5	3.091	89.6	3.528
0.8	0.032	12.0	0.472	23.1	0.910	34.2	1.346	45.3	1.783	56.4	2.220	67.5	2.658	78.6	3.094	89.7	3.532
0.9	0.035	12.1	0.476	23.2	0.913	34.3	1.350	45.4	1.787	56.5	2.224	67.6	2.661	78.7	3.098	89.8	3.535
1.0	0.039	12.2	0.480	23.3	0.917	34.4	1.354	45.5	1.791	56.6	2.228	67.7	2.665	78.8	3.102	89.9	3.539
1.1	0.043	12.3	0.484	23.4	0.921	34.5	1.358	45.6	1.795	56.7	2.232	67.8	2.669	78.9	3.106	90.0	3.543
1.2	0.047	12.4	0.488	23.5	0.925	34.6	1.362	45.7	1.799	56.8	2.236	67.9	2.673	79.0	3.110	90.1	3.547
1.3	0.051	12.5	0.492	23.6	0.929	34.7	1.366	45.8	1.803	56.9	2.240	68.0	2.677	79.1	3.114	90.2	3.551
1.4	0.055	12.6	0.496	23.7	0.933	34.8	1.370	45.9	1.807	57.0	2.244	68.1	2.681	79.2	3.118	90.3	3.555
1.5	0.059	12.7	0.500	23.8	0.937	34.9	1.374	46.0	1.811	57.1	2.248	68.2	2.685	79.3	3.122	90.4	3.559
1.6	0.063	12.8	0.504	23.9	0.941	35.0	1.378	46.1	1.815	57.2	2.252	68.3	2.689	79.4	3.126	90.5	3.563
1.7	0.067	12.9	0.508	24.0	0.945	35.1	1.382	46.2	1.819	57.3	2.256	68.4	2.693	79.5	3.130	90.6	3.567
1.8	0.071	13.0	0.512	24.1	0.949	35.2	1.386	46.3	1.823	57.4	2.260	68.5	2.697	79.6	3.134	90.7	3.571
1.9	0.075	13.1	0.516	24.2	0.953	35.3	1.390	46.4	1.827	57.5	2.264	68.6	2.701	79.7	3.138	90.8	3.575
2.0	0.079	13.2	0.520	24.3	0.957	35.4	1.394	46.5	1.831	57.6	2.268	68.7	2.705	79.8	3.142	90.9	3.579
2.1	0.083	13.3	0.524	24.4	0.961	35.5	1.398	46.6	1.835	57.7	2.272	68.8	2.709	79.9	3.146	91.0	3.583
2.2	0.087	13.4	0.528	24.5	0.965	35.6	1.402	46.7	1.839	57.8	2.276	68.9	2.713	80.0	3.150	91.1	3.587
2.3	0.091	13.5	0.531	24.6	0.969	35.7	1.406	46.8	1.843	57.9	2.280	69.0	2.717	80.1	3.154	91.2	3.591
2.4	0.094	13.6	0.535	24.7	0.972	35.8	1.409	46.9	1.846	58.0	2.283	69.1	2.720	80.2	3.157	91.3	3.594
2.5	0.098	13.7	0.539	24.8	0.976	35.9	1.413	47.0	1.850	58.1	2.287	69.2	2.724	80.3	3.161	91.4	3.598
2.6	0.102	13.8	0.543	24.9	0.980	36.0	1.417	47.1	1.854	58.2	2.291	69.3	2.728	80.4	3.165	91.5	3.602
2.7	0.106	13.9	0.547	25.0	0.984	36.1	1.421	47.2	1.858	58.3	2.295	69.4	2.732	80.5	3.169	91.6	3.606
2.8	0.110	14.0	0.551	25.1	0.988	36.2	1.425	47.3	1.862	58.4	2.299	69.5	2.736	80.6	3.173	91.7	3.610
2.9	0.114	14.1	0.555	25.2	0.992	36.3	1.429	47.4	1.866	58.5	2.303	69.6	2.740	80.7	3.177	91.8	3.614
3.0	0.118	14.2	0.559	25.3	0.996	36.4	1.433	47.5	1.870	58.6	2.307	69.7	2.744	80.8	3.181	91.9	3.618
3.1	0.122	14.3	0.563	25.4	1.000	36.5	1.437	47.6	1.874	58.7	2.311	69.8	2.748	80.9	3.185	92.0	3.622
3.2	0.126	14.4	0.567	25.5	1.004	36.6	1.441	47.7	1.878	58.8	2.315	69.9	2.752	81.0	3.189	92.1	3.626
3.3	0.130	14.5	0.571	25.6	1.008	36.7	1.445	47.8	1.882	58.9	2.319	70.0	2.756	81.1	3.193	92.2	3.630
3.4	0.134	14.6	0.575	25.7	1.012	36.8	1.449	47.9	1.886	59.0	2.323	70.1	2.760	81.2	3.197	92.3	3.634
3.5	0.138	14.7	0.579	25.8	1.016	36.9	1.453	48.0	1.890	59.1	2.327	70.2	2.764	81.3	3.201	92.4	3.638
3.6	0.142	14.8	0.583	25.9	1.020	37.0	1.457	48.1	1.894	59.2	2.331	70.3	2.768	81.4	3.205	92.5	3.642
3.7	0.146	14.9	0.587	26.0	1.024	37.1	1.461	48.2	1.898	59.3	2.335	70.4	2.772	81.5	3.209	92.6	3.646
3.8	0.150	15.0	0.591	26.1	1.028	37.2	1.465	48.3	1.902	59.4	2.339	70.5	2.776	81.6	3.213	92.7	3.650
3.9	0.154	15.1	0.594	26.2	1.031	37.3	1.469	48.4	1.906	59.5	2.343	70.6	2.780	81.7	3.217	92.8	3.654
4.0	0.157	15.2	0.598	26.3	1.035	37.4	1.472	48.5	1.909	59.6	2.346	70.7	2.783	81.8	3.220	92.9	3.658
4.1	0.161	15.3	0.602	26.4	1.039	37.5	1.476	48.6	1.913	59.7	2.350	70.8	2.787	81.9	3.224	93.0	3.662
4.2	0.165	15.4	0.606	26.5	1.043	37.6	1.480	48.7	1.917	59.8	2.354	70.9	2.791	82.0	3.228	93.1	3.666
4.3	0.169	15.5	0.610	26.6	1.047	37.7	1.484	48.8	1.921	59.9	2.358	71.0	2.795	82.1	3.232	93.2	3.670
4.4	0.173	15.6	0.614	26.7	1.051	37.8	1.488	48.9	1.925	60.0	2.362	71.1	2.799	82.2	3.236	93.3	3.674
4.5	0.177	15.7	0.618	26.8	1.055	37.9	1.492	49.0	1.929	60.1	2.366	71.2	2.803	82.3	3.240	93.4	3.678
4.6	0.181	15.8	0.622	26.9	1.059	38.0	1.496	49.1	1.933	60.2	2.370	71.3	2.807	82.4	3.244	93.5	3.682
4.7	0.185	15.9	0.626	27.0	1.063	38.1	1.500	49.2	1.937	60.3	2.374	71.4	2.811	82.5	3.248	93.6	3.686
4.8	0.189	16.0	0.630	27.1	1.067	38.2	1.504	49.3	1.941	60.4	2.378	71.5	2.815	82.6	3.252	93.7	3.690
4.9	0.193	16.1	0.634	27.2	1.071	38.3	1.508	49.4	1.945	60.5	2.382	71.6	2.819	82.7	3.256	93.8	3.694
5.0	0.197	16.2	0.638	27.3	1.075	38.4	1.512	49.5	1.949	60.6	2.386	71.7	2.823	82.8	3.260	93.9	3.698
5.1	0.201	16.3	0.642	27.4	1.079	38.5	1.516	49.6	1.953	60.7	2.390	71.8	2.827	82.9	3.264	94.0	3.702
5.2	0.205	16.4	0.646	27.5	1.083	38.6	1.520	49.7	1.957	60.8	2.394	71.9	2.831	83.0	3.268	94.1	3.706
5.3	0.209	16.5	0.650	27.6	1.087	38.7	1.524	49.8	1.961	60.9	2.398	72.0	2.835	83.1	3.272	94.2	3.710
5.4	0.213	16.6	0.654	27.7	1.091	38.8	1.528	49.9	1.965	61.0	2.402	72.1	2.839	83.2	3.276	94.3	3.714
5.5	0.217	16.7	0.658	27.8	1.094	38.9	1.531	50.0	1.969	61.1	2.406	72.2	2.843	83.3	3.280	94.4	3.718
5.6	0.221	16.8	0.662	27.9	1.098	39.0	1.535	50.1	1.972	61.2	2.409	72.3	2.846	83.4	3.284	94.5	3.722
5.7	0.225	16.9	0.665	28.0	1.102	39.1	1.539	50.2	1.976	61.3	2.413	72.4	2.850	83.5	3.288	94.6	3.726
5.8	0.228	17.0	0.669	28.1	1.106	39.2	1.543	50.3	1.980	61.4	2.417	72.5	2.854	83.6	3.292	94.7	3.730
5.9	0.232	17.1	0.673	28.2	1.110	39.3	1.547	50.4	1.984	61.5	2.421	72.6	2.858	83.7	3.296	94.8	3.734
6.0	0.236	17.2	0.677	28.3	1.114	39.4	1.551	50.5	1.988	61.6	2.425	72.7	2.862	83.8	3.300	94.9	3.738
6.1	0.240	17.3	0.681	28.4	1.118	39.5	1.555	50.6	1.992	61.7	2.429	72.8	2.866	83.9	3.304	95.0	3.742
6.2	0.244	17.4	0.685	28.5	1.122	39.6	1.559	50.7	1.996	61.8	2.433	72.9	2.870	84.0	3.308	95.1	3.746
6.3	0.248	17.5	0.689	28.6	1.126	39.7	1.563	50.8	2.000	61.9	2.437	73.0	2.874	84.1	3.312	95.2	3.750
6.4	0.252	17.6	0.693	28.7	1.130	39.8	1.567	50.9	2.004	62.0	2.441	73.1	2.878	84.2	3.316	95.3	3.754
6.5	0.256	17.7	0.697	28.8	1.134	39.9	1.571	51.0	2.008	62.1	2.445	73.2	2.882	84.3	3.320	95.4	3.758
6.6	0.260	17.8	0.701	28.9	1.138	40.0	1.575	51.1	2.012	62.2	2.449	73.3	2.886	84.4	3.324	95.5	3.762
6.7	0.264	17.9	0.705	29.0	1.142	40.1	1.579	51.2	2.016	62.3	2.453	73.4	2.890	84.5	3.328	95.6	3.766
6.8	0.268	18.0	0.709	29.1	1.146	40.2	1.583	51.3	2.020	62.4	2.457	73.5	2.894	84.6	3.332	95.7	3.770
6.9	0.272	18.1	0.713	29.2	1.150	40.3	1.587	51.4	2.024	62.5	2.461	73.6	2.898	84.7	3.336	95.8	3.774
7.0	0.276	18.2	0.717	29.3	1.154	40.4	1.591	51.5	2.028	62.6	2.465	73.7	2.902	84.8	3.340	95.9	3.778
7.1	0.280	18.3	0.72														

**MILLIMETER EQUIVALENTS  
OF INCHES AND FRACTIONS OF AN INCH**

INCHES	0"	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"	11"	INCHES
1/64	.397	25.80	51.20	76.60	102.00	127.40	152.80	178.20	203.60	229.00	254.40	279.39	1/64
1/32	.794	26.19	51.59	76.99	102.39	127.79	153.19	178.59	203.99	229.39	254.79	280.18	1/32
3/64	1.191	26.59	51.99	77.39	102.79	128.19	153.59	178.99	204.39	229.79	255.19	280.58	3/64
1/16	1.587	26.99	52.39	77.79	103.19	128.59	153.99	179.39	204.79	230.19	255.59	280.98	1/16
5/64	1.984	27.38	52.78	78.18	103.58	128.98	154.38	179.78	205.18	230.58	255.98	281.37	5/64
3/32	2.381	27.78	53.18	78.58	103.98	129.38	154.78	180.18	205.58	230.98	256.38	281.77	3/32
7/64	2.778	28.18	53.58	78.98	104.38	129.78	155.18	180.58	205.98	231.38	256.78	282.17	7/64
1/8	3.175	28.57	53.97	79.37	104.77	130.17	155.57	180.97	206.37	231.77	257.17	282.57	1/8
9/64	3.572	28.97	54.37	79.77	105.17	130.57	155.97	181.37	206.77	232.17	257.57	282.96	9/64
5/32	3.969	29.37	54.77	80.17	105.57	130.97	156.37	181.77	207.17	232.57	257.97	283.36	5/32
11/64	4.366	29.77	55.17	80.57	105.97	131.37	156.77	182.17	207.57	232.97	258.37	283.76	11/64
3/16	4.762	30.16	55.56	80.96	106.36	131.76	157.16	182.56	207.96	233.36	258.76	284.15	3/16
13/64	5.159	30.56	55.96	81.36	106.76	132.16	157.56	182.96	208.36	233.76	259.16	284.55	13/64
7/32	5.556	30.96	56.36	81.76	107.16	132.56	157.96	183.36	208.76	234.16	259.56	284.95	7/32
15/64	5.953	31.35	56.75	82.15	107.55	132.95	158.35	183.75	209.15	234.55	259.95	285.35	15/64
1/4	6.350	31.75	57.15	82.55	107.95	133.35	158.75	184.15	209.55	234.95	260.35	285.74	1/4
17/64	6.747	32.15	57.55	82.95	108.35	133.75	159.15	184.55	209.95	235.35	260.75	286.14	17/64
9/32	7.144	32.54	57.94	83.34	108.74	134.14	159.54	184.94	210.34	235.74	261.14	286.54	9/32
19/64	7.541	32.94	58.34	83.74	109.14	134.54	159.94	185.34	210.74	236.14	261.54	286.93	19/64
5/16	7.937	33.34	58.74	84.14	109.54	134.94	160.34	185.74	211.14	236.54	261.94	287.33	5/16
21/64	8.334	33.73	59.13	84.53	109.93	135.33	160.73	186.13	211.53	236.93	262.33	287.73	21/64
11/32	8.731	34.13	59.53	84.93	110.33	135.73	161.13	186.53	211.93	237.33	262.73	288.12	11/32
23/64	9.128	34.53	59.93	85.33	110.73	136.13	161.53	186.93	212.33	237.73	263.13	288.52	23/64
3/8	9.525	34.92	60.32	85.72	111.12	136.52	161.92	187.32	212.72	238.12	263.52	288.92	3/8
25/64	9.922	35.32	60.72	86.12	111.52	136.92	162.32	187.72	213.12	238.52	263.92	289.31	25/64
13/32	10.319	35.72	61.12	86.52	111.92	137.32	162.72	188.12	213.52	238.92	264.32	289.71	13/32
27/64	10.716	36.12	61.52	86.92	112.32	137.72	163.12	188.52	213.92	239.32	264.72	290.11	27/64
7/16	11.113	36.51	61.91	87.31	112.71	138.11	163.51	188.91	214.31	239.71	265.11	290.51	7/16
29/64	11.509	36.91	62.31	87.71	113.11	138.51	163.91	189.31	214.71	240.11	265.51	290.90	29/64
15/32	11.906	37.31	62.71	88.11	113.51	138.91	164.31	189.71	215.11	240.51	265.91	291.30	15/32
31/64	12.303	37.70	63.10	88.50	113.90	139.30	164.70	190.10	215.50	240.90	266.30	291.70	31/64
1/2	12.700	38.10	63.50	88.90	114.30	139.70	165.10	190.50	215.90	241.30	266.70	292.09	1/2
33/64	13.097	38.50	63.90	89.30	114.70	140.10	165.50	190.90	216.30	241.70	267.10	292.49	33/64
17/32	13.494	38.89	64.29	89.69	115.09	140.49	165.89	191.29	216.69	242.09	267.49	292.89	17/32
35/64	13.890	39.29	64.69	90.09	115.49	140.89	166.29	191.69	217.09	242.49	267.89	293.28	35/64
9/16	14.287	39.69	65.09	90.49	115.89	141.29	166.69	192.09	217.49	242.89	268.29	293.68	9/16
37/64	14.684	40.08	65.48	90.88	116.28	141.68	167.08	192.48	217.88	243.28	268.68	294.08	37/64
19/32	15.081	40.48	65.88	91.28	116.68	142.08	167.48	192.88	218.28	243.68	269.08	294.47	19/32
39/64	15.478	40.88	66.28	91.68	117.08	142.48	167.88	193.28	218.68	244.08	269.48	294.87	39/64
5/8	15.875	41.27	66.67	92.07	117.47	142.87	168.27	193.67	219.07	244.47	269.87	295.27	5/8
41/64	16.272	41.67	67.07	92.47	117.87	143.27	168.67	194.07	219.47	244.87	270.27	295.67	41/64
21/32	16.669	42.07	67.47	92.87	118.27	143.67	169.07	194.47	219.87	245.27	270.67	296.06	21/32
43/64	17.065	42.47	67.87	93.27	118.67	144.07	169.47	194.87	220.27	245.67	271.07	296.46	43/64
11/16	17.462	42.86	68.26	93.66	119.06	144.46	169.86	195.26	220.66	246.06	271.46	296.86	11/16
45/64	17.859	43.26	68.66	94.06	119.46	144.86	170.26	195.66	221.06	246.46	271.86	297.25	45/64
23/32	18.256	43.66	69.06	94.46	119.86	145.26	170.66	196.06	221.46	246.86	272.26	297.65	23/32
47/64	18.653	44.05	69.45	94.85	120.25	145.65	171.05	196.45	221.85	247.25	272.65	298.05	47/64
3/4	19.050	44.45	69.85	95.25	120.65	146.05	171.45	196.85	222.25	247.65	273.05	298.44	3/4
49/64	19.447	44.85	70.25	95.65	121.05	146.45	171.85	197.25	222.65	248.05	273.45	298.84	49/64
25/32	19.844	45.24	70.64	96.04	121.44	146.84	172.24	197.64	223.04	248.44	273.84	299.24	25/32
51/64	20.240	45.64	71.04	96.44	121.84	147.24	172.64	198.04	223.44	248.84	274.24	299.63	51/64
13/16	20.637	46.04	71.44	96.84	122.24	147.64	173.04	198.44	223.84	249.24	274.64	300.03	13/16
53/64	21.034	46.43	71.83	97.23	122.63	148.03	173.43	198.83	224.23	249.63	275.03	300.43	53/64
27/32	21.431	46.83	72.23	97.63	123.03	148.43	173.83	199.23	224.63	250.03	275.43	300.82	27/32
55/64	21.828	47.23	72.63	98.03	123.43	148.83	174.23	199.63	225.03	250.43	275.83	301.22	55/64
7/8	22.225	47.62	73.02	98.42	123.82	149.22	174.62	200.02	225.42	250.82	276.22	301.62	7/8
57/64	22.622	48.02	73.42	98.82	124.22	149.62	175.02	200.42	225.82	251.22	276.62	302.02	57/64
29/32	23.019	48.42	73.82	99.22	124.62	150.02	175.42	200.82	226.22	251.62	277.02	302.41	29/32
59/64	23.415	48.82	74.22	99.62	125.02	150.42	175.82	201.22	226.62	252.02	277.42	302.81	59/64
15/16	23.812	49.21	74.61	100.01	125.41	150.81	176.21	201.61	227.01	252.41	277.81	303.21	15/16
61/64	24.209	49.61	75.01	100.41	125.81	151.21	176.61	202.01	227.41	252.81	278.21	303.60	61/64
31/32	24.606	50.01	75.41	100.81	126.21	151.61	177.01	202.41	227.81	253.21	278.61	304.00	31/32
63/64	25.003	50.40	75.80	101.20	126.60	152.00	177.40	202.80	228.20	253.60	279.00	304.40	63/64

FOR METERS MOVE DECIMAL POINT THREE FIGURES FORWARD  
EXAMPLE: 3 3/8" = 238.12 MILLIMETERS = 23.812 CENTIMETERS = 2.3812 DECIMETERS = 23812 METERS

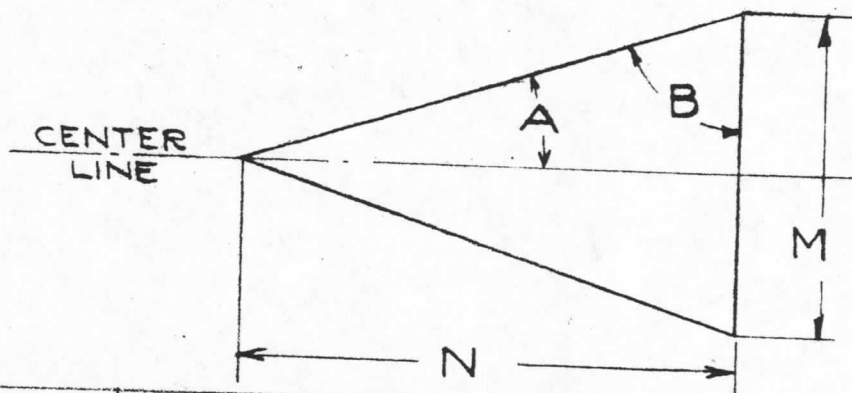
ANT-86-14

# INCH & MILLIMETER EQUIVALENTS OF TWIST DRILL STEEL WIRE GAUGE SIZES AND THEIR AREAS.

AREA IN DEC. OF AN INCH	SIZE IN MILLIMETERS	NO. OF GAUGE	SIZE IN MILLIMETERS	AREA IN DEC. OF AN INCH	NO. OF GAUGE	SIZE IN MILLIMETERS	AREA IN DEC. OF AN INCH	NO. OF GAUGE	SIZE IN MILLIMETERS	AREA IN DEC. OF AN INCH	NO. OF GAUGE	SIZE IN MILLIMETERS	AREA IN DEC. OF AN INCH
.04083	.2280	1	5.79	.00724	41	2.44	4.676						
.03836	.2210	2	5.61	.00687	42	2.37	4.411						
.03563	.2130	3	5.41	.00622	43	2.26	4.011						
.03431	.2090	4	5.31	.00581	44	2.18	3.792						
.03315	.2055	5	5.22	.00528	45	2.08	3.398						
.03301	.2040	6	5.18	.00515	46	2.06	3.333						
.03173	.2010	7	5.10	.00484	47	2.00	3.142						
.03110	.1990	8	5.05	.00453	48	1.93	2.925						
.03017	.1960	9	4.98	.00418	49	1.85	2.688						
.02940	.1935	10	4.91	.00385	50	1.78	2.488						
.02865	.1910	11	4.85	.00352	51	1.70	2.270						
.02805	.1890	12	4.80	.00317	52	1.61	2.036						
.02688	.1850	13	4.70	.00278	53	1.51	1.791						
.02601	.1820	14	4.62	.00238	54	1.40	1.539						
.02545	.1800	15	4.57	.00212	55	1.32	1.368						
.02460	.1770	16	4.49	.00170	56	1.18	1.093						
.02351	.1730	17	4.39	.00145	57	1.09	.933						
.02256	.1695	18	4.30	.00138	58	1.07	.899						
.02164	.1660	19	4.21	.00132	59	1.04	.849						
.02036	.1610	20	4.09	.00126	60	1.02	.817						
.01985	.1590	21	4.03	.00119	61	.99	.770						
.01936	.1570	22	3.99	.00113	62	.96	.724						
.01863	.1540	23	3.91	.00107	63	.94	.694						
.01814	.1520	24	3.86	.00102	64	.91	.650						
.01755	.1495	25	3.80	.00096	65	.89	.622						
.01697	.1470	26	3.73	.00085	66	.84	.554						
.01629	.1440	27	3.66	.00080	67	.81	.515						
.01552	.1405	28	3.57	.00075	68	.79	.490						
.01453	.1360	29	3.45	.00067	69	.74	.430						
.01297	.1285	30	3.26	.00061	70	.71	.396						
.01131	.1200	31	3.05	.00053	71	.66	.342						
.01057	.1160	32	2.95	.00049	72	.63	.312						
.01003	.1130	33	2.87	.00045	73	.61	.292						
.00968	.1110	34	2.82	.00040	74	.57	.255						
.00950	.1100	35	2.79	.00035	75	.53	.221						
.00891	.1065	36	2.70	.00031	76	.51	.204						
.00849	.1040	37	2.64	.00025	77	.46	.166						
.00809	.1015	38	2.58	.00020	78	.41	.132						
.00777	.0995	39	2.53	.00016	79	.37	.107						
.00754	.0980	40	2.50	.00014	80	.35	.087						

MERRILL

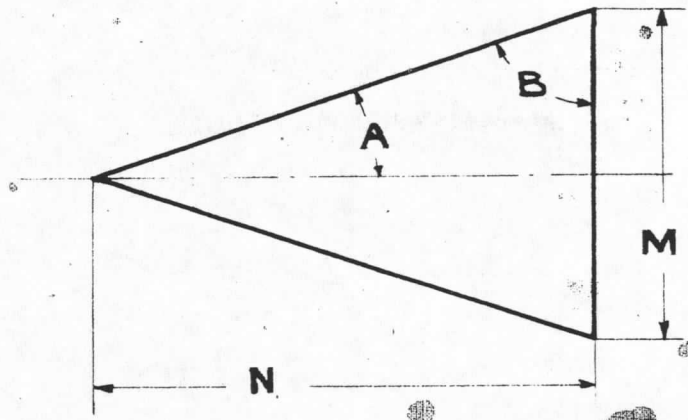
# EQUIVALENT ANGLES OF TAPERS AND TAPER ON LATHE PER FOOT



TAPER M/N	ANGLE A	ANGLE B	ANGLE A	ANGLE B	TAPER ON LATHE-PER FOOT	
					DECIMAL	FRACTION
1/1	26 $\frac{6.8}{12}$	63 $\frac{5.2}{12}$	26° 34'	63° 26'	12.0000"	12"
9/10	24 $\frac{2.8}{12}$	65 $\frac{9.2}{12}$	24° 14'	65° 46'	10.8000"	10 $\frac{51}{64}$ "
7/10	19 $\frac{3.6}{12}$	70 $\frac{8.4}{12}$	19° 18'	70° 42'	8.4000"	8 $\frac{13}{32}$ "
1/2	14 $\frac{0.4}{12}$	75 $\frac{11.6}{12}$	14° 2'	75° 58'	6.0000"	6"
1/3	9 $\frac{5.2}{12}$	80 $\frac{6.8}{12}$	9° 26'	80° 34'	4.0000"	4"
29/100	8 $\frac{3}{12}$	81 $\frac{9}{12}$	8° 15'	81° 45'	3.4800"	3 $\frac{31}{64}$ "
28/100	7 $\frac{11.6}{12}$	82 $\frac{0.4}{12}$	7° 58'	82° 2'	3.3600"	3 $\frac{23}{64}$ "
27/100	7 $\frac{8.2}{12}$	82 $\frac{3.8}{12}$	7° 41'	82° 19'	3.2400"	3 $\frac{15}{64}$ "
1/4	7 $\frac{1.5}{12}$	82 $\frac{10.5}{12}$	7° 7 1/2'	82° 52 1/2'	3.0000"	3"
1/5	5 $\frac{8.5}{12}$	84 $\frac{3.5}{12}$	5° 42 1/2'	84° 17 1/2'	2.4000"	2 $\frac{13}{32}$ "
1/6	4 $\frac{9.2}{12}$	85° $\frac{2.8}{12}$	4° 46'	85° 14'	2.0000"	2"
1/7	4 $\frac{1}{12}$	85 $\frac{11}{12}$	4° 5'	85° 55'	1.7143"	1 $\frac{23}{32}$ "
1/8	3 $\frac{6.9}{12}$	86 $\frac{5.1}{12}$	3° 34 1/2'	86° 25 1/2'	1.5000"	1 1/2"
1/10	2 $\frac{10.4}{12}$	87 $\frac{1.6}{12}$	2° 52'	87° 8'	1.2000"	1 $\frac{13}{64}$ "
1/12	2 $\frac{4.6}{12}$	87 $\frac{7.2}{12}$	2° 23'	87° 37'	1.0000"	1"
1/15	1 $\frac{10.9}{12}$	88 $\frac{1.1}{12}$	1° 54 1/2'	88° 5 1/2'	.8000"	5/16"
1/20	1 $\frac{5.2}{12}$	88 $\frac{6.8}{12}$	1° 26'	88° 34'	.6000"	19/32"
1/30	0 $\frac{11.5}{12}$	89 $\frac{0.5}{12}$	0° 57 1/2'	89° 2 1/2'	.4000"	13/32"
/						
/						

ME REF





TAPER %	ANGLE A	ANGLE B	ANGLE A	ANGLE B
1/1	26 $\frac{6.8}{12}$	63 $\frac{5.3}{12}$	26° 34'	63° 26'
9/10	24 $\frac{2.8}{12}$	65 $\frac{3.3}{12}$	24° 14'	65° 46'
7/10	19 $\frac{3.6}{12}$	70 $\frac{8.9}{12}$	19° 18'	70° 42'
1/2	14 $\frac{0.4}{12}$	75 $\frac{1.2}{12}$	14° 2'	75° 58'
1/3	9 $\frac{5.2}{12}$	80 $\frac{6.8}{12}$	9° 26'	80° 34'
29/100	8 $\frac{3}{12}$	81 $\frac{9}{12}$	8° 15'	81° 45'
27/100	7 $\frac{8.2}{12}$	82 $\frac{3.8}{12}$	7° 41'	82° 19'
1/4	7 $\frac{1.5}{12}$	82 $\frac{10.5}{12}$	7° 7 $\frac{1}{2}$ '	82° 52 $\frac{1}{2}$ '
1/5	5 $\frac{8.5}{12}$	84 $\frac{3.5}{12}$	5° 42 $\frac{1}{2}$ '	84° 17 $\frac{1}{2}$ '
1/6	4 $\frac{3.2}{12}$	85 $\frac{2.8}{12}$	4° 46'	85° 14'
1/7	4 $\frac{1}{12}$	85 $\frac{11}{12}$	4° 5'	85° 55'
1/8	3 $\frac{6.9}{12}$	86 $\frac{5.1}{12}$	3° 34 $\frac{1}{2}$ '	86° 25 $\frac{1}{2}$ '
1/10	2 $\frac{10.4}{12}$	87 $\frac{1.6}{12}$	2° 52'	87° 8'
1/12	2 $\frac{4.6}{12}$	87 $\frac{7.2}{12}$	2° 23'	87° 37'
1/15	1 $\frac{10.9}{12}$	88 $\frac{1.1}{12}$	1° 54 $\frac{1}{2}$ '	88° 5 $\frac{1}{2}$ '
1/20	1 $\frac{5.2}{12}$	88 $\frac{6.8}{12}$	1° 26'	88° 34'
1/30	0 $\frac{11.5}{12}$	89 $\frac{5}{12}$	0° 57 $\frac{1}{2}$ '	89° 2 $\frac{1}{2}$ '
28/100	7° $\frac{11.6}{12}$	82° $\frac{0.4}{12}$	7° 58'	82° 2'

FLAT CUTTER'S

MJ. REF-8



Taper	Angle at which grinding machine is to be set.		
$\frac{1}{1}$	$19 \frac{5.6}{12}^{\circ}$	Taper	
$\frac{1}{2}$	$10 \frac{0.3}{12}^{\circ}$	28/100	$5 \frac{78}{12}^{\circ}$
$\frac{1}{3}$	$6 \frac{8.6}{12}^{\circ}$		
$\frac{1}{4}$	$5 \frac{0.6}{12}^{\circ}$		
$\frac{1}{5}$	$4 \frac{0.5}{12}^{\circ}$		
$\frac{1}{6}$	$3 \frac{4.4}{12}^{\circ}$		
$\frac{1}{7}$	$2 \frac{10.7}{12}^{\circ}$		
$\frac{1}{8}$	$2 \frac{6.3}{12}^{\circ}$		
$\frac{1}{9}$	$2 \frac{2.9}{12}^{\circ}$		
$\frac{1}{10}$	$2 \frac{0.3}{12}^{\circ}$		
$\frac{1}{12}$	$1 \frac{8.2}{12}^{\circ}$		
$\frac{1}{15}$	$1 \frac{4.2}{12}^{\circ}$		
$\frac{1}{20}$	$1 \frac{0.14}{12}^{\circ}$		
$\frac{1}{25}$	$\frac{9.8}{12}^{\circ}$		
$\frac{1}{30}$	$\frac{8.1}{12}^{\circ}$		
$\frac{7}{10}$	$13 \frac{10.8}{12}^{\circ}$		
$\frac{27}{100}$	$5 \frac{5.4}{12}^{\circ}$		
$\frac{29}{100}$	$5 \frac{10.2}{12}^{\circ}$		
$\frac{31}{100}$	$6 \frac{3.1}{12}^{\circ}$		

NI-REF-9

SQUARE REAMERS

### TAPERS PER FOOT AND CORRESPONDING ANGLES

TAPER PER FT.	INCLUDED ANGLE <small>DEG. MIN. SEC.</small>	CENTER ANGLE <small>DEG. MIN. SEC.</small>	TAPER PER FT.	INCLUDED ANGLE <small>DEG. MIN. SEC.</small>	CENTER ANGLE <small>DEG. MIN. SEC.</small>	TAPER PER FT.	INCLUDED ANGLE <small>DEG. MIN. SEC.</small>	CENTER ANGLE <small>DEG. MIN. SEC.</small>	TAPER PER FT.	INCLUDED ANGLE <small>DEG. MIN. SEC.</small>	CENTER ANGLE <small>DEG. MIN. SEC.</small>
$\frac{1}{64}$	0 4 28	0 2 14	1	4 46 18	2 23 9	4	18 55 28	9 27 44	8	36 52 12	18 26 6
$\frac{1}{32}$	0 8 58	0 4 29	$\frac{1}{16}$	5 4 12	2 32 6	$4\frac{1}{8}$	19 30 18	9 45 9	$8\frac{1}{8}$	37 24 22	18 42 11
$\frac{1}{16}$	0 17 54	0 8 57	$\frac{1}{8}$	5 21 44	2 40 52	$4\frac{1}{4}$	20 5 2	10 2 31	$8\frac{1}{4}$	37 56 26	18 58 13
$\frac{3}{32}$	0 26 52	0 13 26	$\frac{3}{16}$	5 39 54	2 49 57	$4\frac{3}{8}$	20 39 44	10 19 52	$8\frac{3}{8}$	38 28 16	19 14 8
$\frac{1}{8}$	0 35 48	0 17 54	$\frac{1}{4}$	5 57 48	2 58 54	$4\frac{1}{2}$	21 14 2	10 37 1	$8\frac{1}{2}$	39 0 16	19 30 8
$\frac{5}{32}$	0 44 44	0 22 22	$1\frac{5}{16}$	6 15 38	3 7 49	$4\frac{5}{8}$	21 48 54	10 54 27	$8\frac{5}{8}$	39 31 52	19 45 56
$\frac{3}{16}$	0 53 44	0 26 52	$1\frac{3}{8}$	6 33 26	3 16 43	$4\frac{3}{4}$	22 23 22	11 11 41	$8\frac{3}{4}$	40 3 42	20 1 51
$\frac{7}{32}$	1 2 34	0 31 17	$1\frac{7}{16}$	6 51 20	3 25 40	$4\frac{7}{8}$	22 57 48	11 28 54	$8\frac{7}{8}$	40 35 16	20 17 38
$\frac{1}{4}$	1 11 36	0 35 48	$1\frac{1}{2}$	7 9 10	3 34 35	5	23 32 12	11 46 6	9	41 6 44	20 33 22
$\frac{9}{32}$	1 20 30	0 40 15	$1\frac{9}{16}$	7 26 58	3 43 29	$5\frac{1}{8}$	24 6 28	12 3 14	$9\frac{1}{8}$	41 38 28	20 49 14
$\frac{5}{16}$	1 29 30	0 44 45	$1\frac{5}{8}$	7 44 48	3 52 24	$5\frac{1}{4}$	24 40 42	12 20 21	$9\frac{1}{4}$	42 9 18	21 4 39
$\frac{11}{32}$	1 38 22	0 49 11	$1\frac{11}{16}$	8 2 38	4 1 19	$5\frac{3}{8}$	25 14 48	12 37 24	$9\frac{3}{8}$	42 40 26	21 20 13
$\frac{3}{8}$	1 47 24	0 53 42	$1\frac{3}{4}$	8 20 26	4 10 13	$5\frac{1}{2}$	25 48 48	12 54 24	$9\frac{1}{2}$	43 11 24	21 35 42
$\frac{13}{32}$	1 56 24	0 58 12	$1\frac{13}{16}$	8 38 16	4 19 8	$5\frac{5}{8}$	26 22 52	13 11 26	$9\frac{5}{8}$	43 42 20	21 51 10
$\frac{7}{16}$	2 5 18	1 2 39	$1\frac{7}{8}$	8 56 2	4 28 1	$5\frac{3}{4}$	26 56 46	13 28 23	$9\frac{3}{4}$	44 13 6	22 6 33
$\frac{15}{32}$	2 14 16	1 7 8	$1\frac{15}{16}$	9 13 50	4 36 55	$5\frac{7}{8}$	27 30 34	13 45 17	$9\frac{7}{8}$	44 43 48	22 21 54
$\frac{1}{2}$	2 23 10	1 11 35	2	9 31 36	4 45 48	6	28 4 2	14 2 1	10	45 14 22	22 37 11
$\frac{17}{32}$	2 32 4	1 16 2	$2\frac{1}{8}$	10 7 10	5 3 35	$6\frac{1}{8}$	28 37 58	14 18 59	$10\frac{1}{8}$	45 44 52	22 52 26
$\frac{9}{16}$	2 41 4	1 20 32	$2\frac{1}{4}$	10 42 42	5 21 21	$6\frac{1}{4}$	29 11 34	14 35 47	$10\frac{1}{4}$	46 15 46	23 7 53
$\frac{19}{32}$	2 50 2	1 25 1	$2\frac{3}{8}$	11 18 10	5 39 5	$6\frac{3}{8}$	29 45 18	14 52 39	$10\frac{3}{8}$	46 45 24	23 22 42
$\frac{5}{8}$	2 59 42	1 29 51	$2\frac{1}{2}$	11 53 36	5 56 48	$6\frac{1}{2}$	30 18 26	15 9 13	$10\frac{1}{2}$	47 15 32	23 37 46
$\frac{21}{32}$	3 7 56	1 33 58	$2\frac{5}{8}$	12 29 2	6 14 31	$6\frac{5}{8}$	30 51 48	15 25 54	$10\frac{5}{8}$	47 45 30	23 52 45
$\frac{11}{16}$	3 16 54	1 38 27	$2\frac{3}{4}$	13 4 24	6 32 12	$6\frac{3}{4}$	31 25 2	15 42 31	$10\frac{3}{4}$	48 15 24	24 7 42
$\frac{23}{32}$	3 25 50	1 42 55	$2\frac{7}{8}$	13 39 42	6 49 51	$6\frac{7}{8}$	31 58 10	15 59 5	$10\frac{7}{8}$	48 45 10	24 22 35
$\frac{3}{4}$	3 34 44	1 47 22	3	14 15 0	7 7 30	7	32 31 12	16 15 36	11	49 14 48	24 37 24
$\frac{25}{32}$	3 43 44	1 51 52	$3\frac{1}{8}$	14 50 14	7 25 7	$7\frac{1}{8}$	33 4 8	16 32 4	$11\frac{1}{8}$	49 44 20	24 52 10
$\frac{13}{16}$	3 52 38	1 56 19	$3\frac{1}{4}$	15 25 24	7 42 42	$7\frac{1}{4}$	33 36 40	16 48 20	$11\frac{1}{4}$	50 13 46	25 6 53
$\frac{27}{32}$	4 1 36	2 0 48	$3\frac{3}{8}$	16 0 34	8 0 17	$7\frac{3}{8}$	34 9 50	17 4 55	$11\frac{3}{8}$	50 43 4	25 21 32
$\frac{7}{8}$	4 10 32	2 5 16	$3\frac{1}{2}$	16 35 40	8 17 50	$7\frac{1}{2}$	34 42 30	17 21 15	$11\frac{1}{2}$	51 12 14	25 36 7
$\frac{29}{32}$	4 19 34	2 9 47	$3\frac{5}{8}$	17 10 40	8 35 20	$7\frac{5}{8}$	35 15 2	17 37 31	$11\frac{5}{8}$	51 41 18	25 50 39
$\frac{15}{16}$	4 28 24	2 14 12	$3\frac{3}{4}$	17 45 40	8 52 50	$7\frac{3}{4}$	35 47 32	17 53 46	$11\frac{3}{4}$	52 10 16	26 5 8
$\frac{31}{32}$	4 37 20	2 18 40	$3\frac{7}{8}$	18 20 34	9 10 17	$7\frac{7}{8}$	36 19 54	18 9 57	$11\frac{7}{8}$	52 39 2	26 19 31

MI-REF-10

## ANGLES AND CORRESPONDING TAPERS PER FOOT

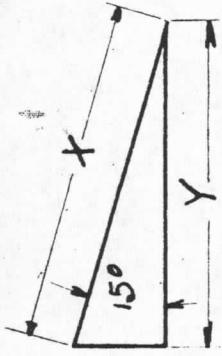
INCLUDED ANGLE OF TAPER	CORRESPONDING TAPER PER FOOT	CENTER ANGLE	CORRESPONDING TAPER PER FOOT	INCLUDED ANGLE OF TAPER	CORRESPONDING TAPER PER FOOT	CENTER ANGLE	CORRESPONDING TAPER PER FOOT
$\frac{1}{4}^\circ$	.0524	$\frac{1}{4}^\circ$	.1048	$24^\circ$	5.1014	$24^\circ$	10.6854
$\frac{1}{2}$	.1048	$\frac{1}{2}$	.2094	25	5.3207	25	11.1914
$\frac{3}{4}$	.1571	$\frac{3}{4}$	.3142	26	5.5408	26	11.7056
1	.2094	1	.4190	27	5.761	27	12.2230
$1\frac{1}{2}$	.3142	$1\frac{1}{2}$	.6284	28	5.9838	28	12.7610
2	.4190	2	.8380	29	6.2068	29	13.3034
$2\frac{1}{2}$	.5237	$2\frac{1}{2}$	1.0478	30	6.4308	30	13.8564
3	.6284	3	1.2578	31	6.6558	31	14.4206
$3\frac{1}{2}$	.7333	$3\frac{1}{2}$	1.4680	32	6.8820	32	14.9968
4	.8380	4	1.6782	33	7.1091	33	15.5858
$4\frac{1}{2}$	.9430	$4\frac{1}{2}$	1.8888	34	7.3676	34	16.1882
5	1.0478	5	2.0998	35	7.5672	35	16.8050
6	1.2578	6	2.5226	36	7.7980	36	17.4370
7	1.4680	7	2.9468	37	8.0303	37	18.0852
8	1.6782	8	3.3730	38	8.2638	38	18.7508
9	1.8888	9	3.8012	39	8.4988	39	19.4348
10	2.0998	10	4.2318	40	8.7352	40	20.1384
11	2.3109	11	4.6652	41	8.9732	41	20.8630
12	2.5226	12	5.1014	42	9.2128	42	21.6096
13	2.7345	13	5.5408	43	9.4538	43	22.3804
14	2.9468	14	5.9838	44	9.6966	44	23.1766
15	3.1579	15	6.4308	45	9.9411	45	24.00
16	3.3730	16	6.8820	46	10.1874	46	
17	3.5868	17	7.3376	47	10.4355	47	
18	3.8012	18	7.7980	48	10.6854	48	
19	4.0162	19	8.2638	49	10.9374	49	
20	4.2318	20	8.7352	50	11.1914	50	
21	4.4481	21	9.2128	51	11.4474	51	
22	4.6652	22	9.6966	52	11.7056	52	
23	4.8829	23	10.1874	53	11.9659	53	

TAPER PER FOOT AND  
CORRESPONDING ANGLES

TABLE FOR DIVIDING CIRCLES OR  
LAYING OUT GEOMETRICAL FIGURES

TAPER PER FT	INCLUDED ANGLE	ANGLE WITH CENTERLINE	N° OF SIDES	INCLUDED ANGLES	ANGLES AT CENTERS OF CIRCLES	ANGLES FOR SIDES OF FIGURES
1/8	0°-36'	0°-18"	3	120°	30°	30°
1/4	1°-12'	0°-36'	4	90°	45°	45°
5/16	1°-30'	0°-45'	5	72°	18°-54°	36°-72°
3/8	1°-47'	0°-59'	6	60°	30°	30°
7/16	2°-05'	1°-02'	8	45°	45°	22°-30'
1/2	2°-23'	1°-12'	10	36°	54°-18°	18°-54°
3/4	3°-35'	1°-47'	12	30°	60°	15°-45°
15/16	4°-28'	2°-14'	14	25°-43'	69°-17'-38'-34' 12°-51'	12°-51'-38'-34' 69°-17'
1	4°-46'	2°-23'	16	22°-30'	67°-30'-45'	11°-15'-33'-45'
1-1/2	7°-09'	3°-35'	18	20°	70°-50°-30° 10°	10°-30°-50° 70°
1-3/4	8°-20'	4°-10'	20	18°	72°-54°	9°-27°-45°
2	9°-31'	4°-46'	24	15°	75°-60°-45°	7°-30'-22°-30' 37°-30'
2-1/2	11°-54'	5°-57'				
3	14°-15'	7°-08'				
3-1/2	16°-36'	8°-18'				
4	18°-55'	9°-28'				

MI-REF-11

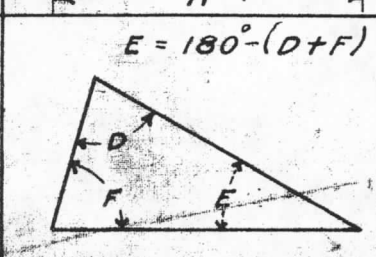
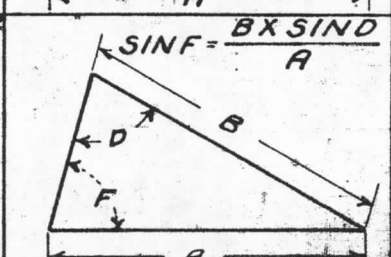
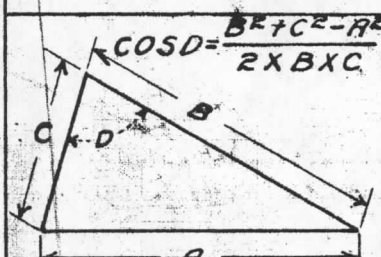
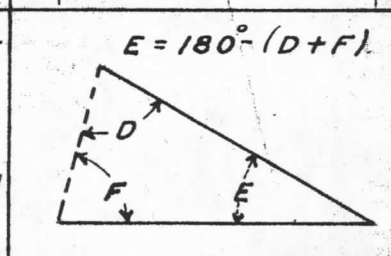
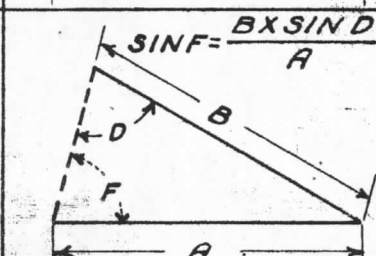
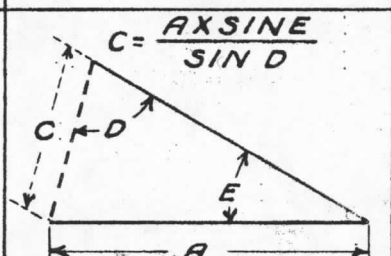
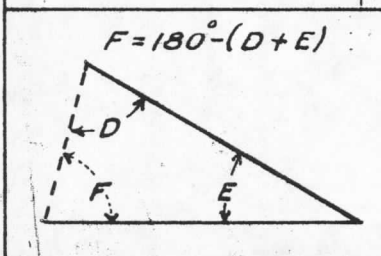
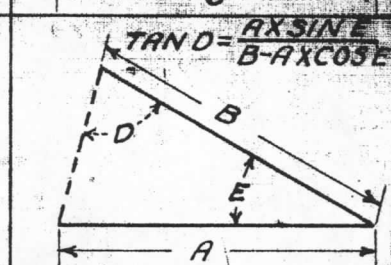
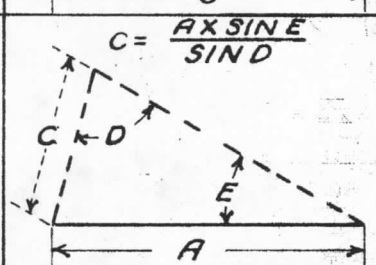
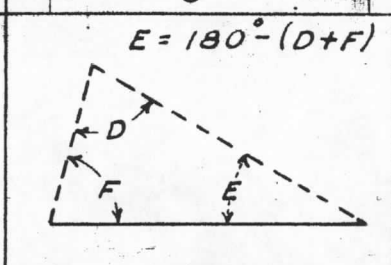
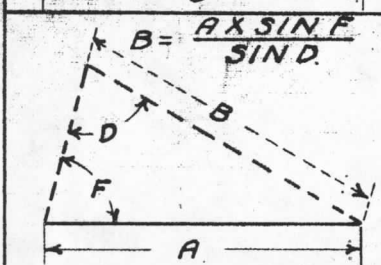
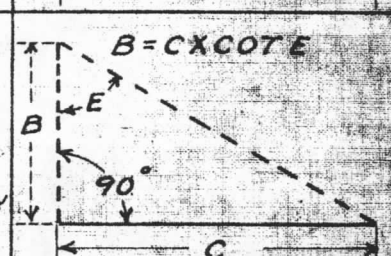
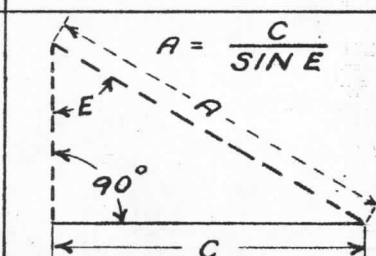
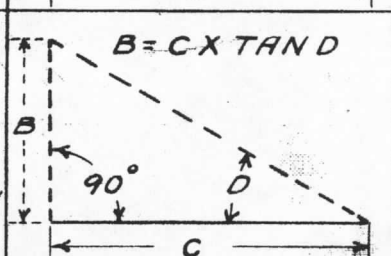
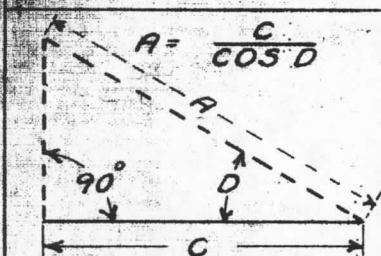
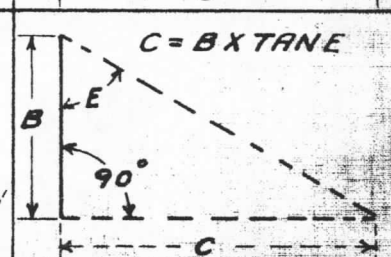
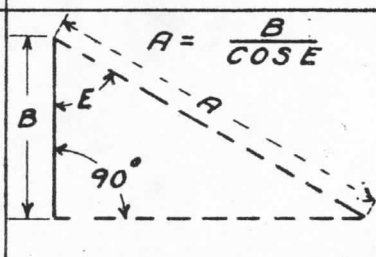
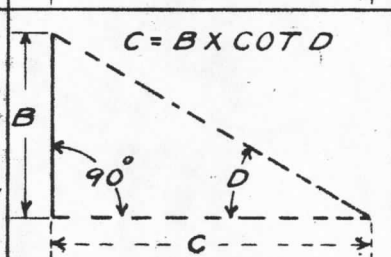
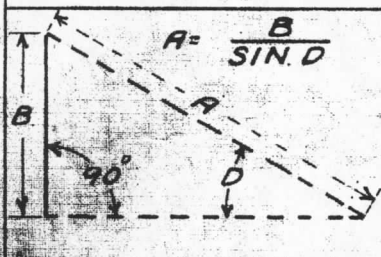
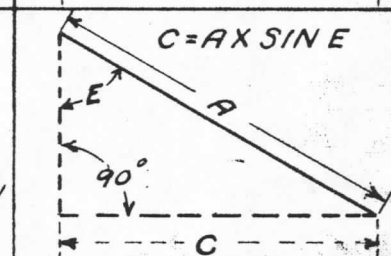
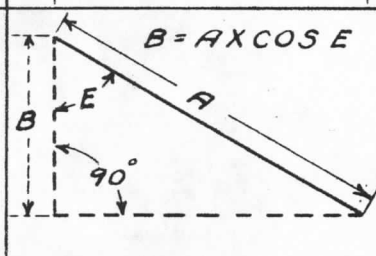
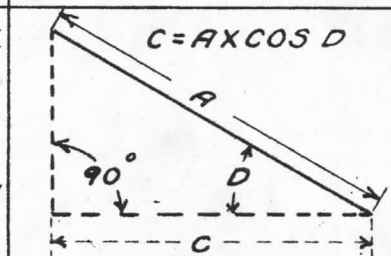
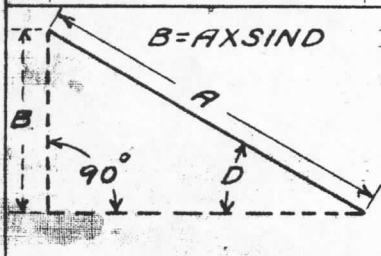
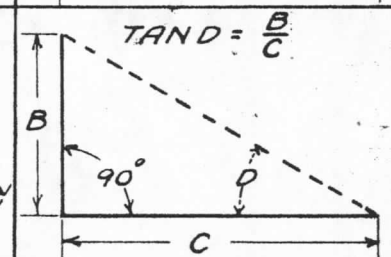
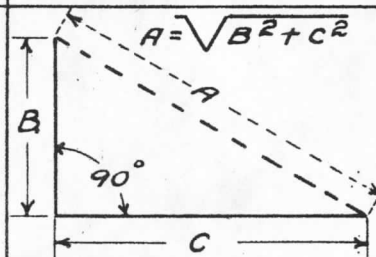
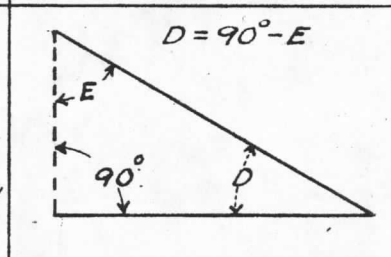
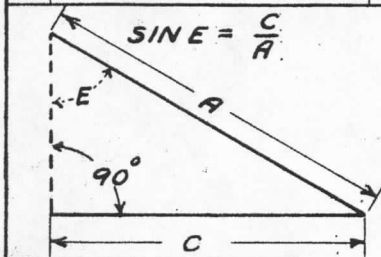
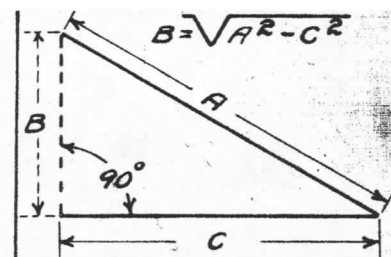
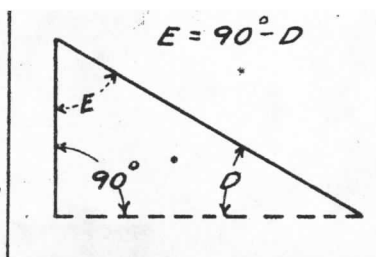
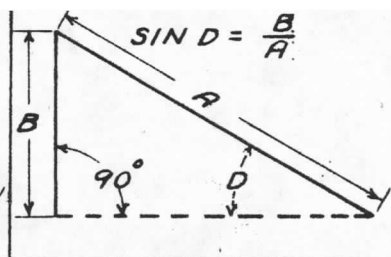
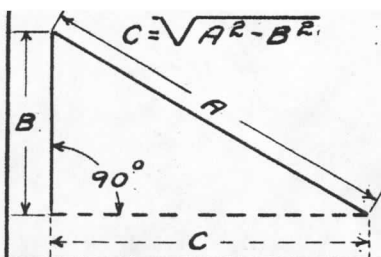


X MM	X INCHES	Y INCHES	X MM	X INCHES	Y INCHES
0.5	.01969	.01901	25.5	1.0039	.9687
1	.0394	.0381	26	1.0236	.9877
1.5	.0590	.0570	26.5	1.0435	1.0091
2	.0787	.0760	27	1.0630	1.0269
2.5	.0984	.09503	27.5	1.0827	1.0460
3	.1181	.1141	28	1.1024	1.0649
3.5	.1378	.1325	28.5	1.122	1.0841
4	.1575	.1521	29	1.1418	1.1030
5	.1969	.1902	29.5	1.1614	1.1222
5.5	.2165	.2091	30	1.1811	1.1410
6	.2362	.2282	30.5	1.2008	1.1601
6.5	.2559	.2472	31	1.2205	1.1790
7	.2755	.2663	31.5	1.2402	1.1970
7.5	.2953	.2852	32	1.2599	1.2171
8	.3150	.3043	32.5	1.2795	1.2350
8.5	.3347	.3233	33	1.2992	1.2550
9	.3543	.3423	33.5	1.3190	1.2743
9.5	.3740	.3613	34	1.3386	1.2931
10	.3937	.3803	34.5	1.3583	1.3210
10.5	.4134	.3993	35	1.3780	1.3311
11	.4331	.4184	35.5	1.3976	1.3490
11.5	.4528	.4373	36	1.4173	1.3691
12	.4724	.4563	36.5	1.4370	1.3880
12.5	.4921	.4753	37	1.4567	1.4072
13	.5118	.4944	37.5	1.4764	1.4261
13.5	.5315	.5133	38	1.4961	1.4452
14	.5512	.5324	38.5	1.5158	1.4631
14.5	.5709	.5514	39	1.5355	1.4833
15	.5906	.5705	39.5	1.5551	1.5022
15.5	.6103	.5892	40	1.5748	1.5213
16	.6294	.6085	40.5	1.5945	1.5400
16.5	.6496	.6273	41	1.6142	1.5593
17	.6693	.6465	41.5	1.6339	1.5770
17.5	.6890	.6654	42	1.6536	1.5974
18	.7087	.6846	42.5	1.6732	1.6161
18.5	.7285	.7035	43	1.6929	1.6353
19	.7480	.7225	43.5	1.7126	1.6552
19.5	.7677	.7413	44	1.7323	1.6734
20	.7874	.7606	44.5	1.7520	1.6910
20.5	.8071	.7795	45	1.7717	1.7115
21	.8268	.7987	45.5	1.7913	1.7301
21.5	.8465	.8176	46	1.8111	1.7495
22	.8661	.8367	46.5	1.8307	1.7682
22.5	.8858	.8555	47	1.8504	1.7875
23	.9055	.8747	47.5	1.8701	1.8052
23.5	.9252	.8936	48	1.8898	1.8255
24	.9449	.9128	48.5	1.9095	1.8441
24.5	.9646	.9316	49	1.9292	1.8636
25	.9843	.9508	49.5	1.9488	1.8820
			50	1.9685	1.9016

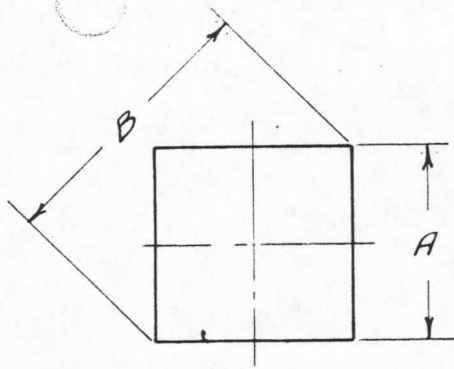
X FRACT	X DECIMAL	Y DECIMAL	Y FRACT	X FRACT	X DECIMAL	Y DECIMAL	Y FRACT
1/64	.01562	.01509	33/64	33/64	.51562	.4980	1
1/32	.03125	.0302	17/32	17/32	.53125	.5132	
3/64	.04687	.04527	35/64	35/64	.54687	.5281	
1/16	.0625	.0604	9/16	9/16	.5625	.5434	
5/64	.07812	.07545	31/64	31/64	.57812	.5584	
3/32	.09375	.0906	19/32	19/32	.59375	.5736	
7/64	.10937	.1002	39/64	39/64	.60937	.5885	
1/8	.125	.1208	5/8	5/8	.625	.6038	
9/64	.14062	.1358	41/64	41/64	.64062	.6187	
5/32	.15625	.1509	21/32	21/32	.65625	.6339	
11/64	.17187	.1659	43/64	43/64	.67187	.6488	
3/16	.1875	.1811	11/16	11/16	.6875	.6641	
13/64	.20312	.1962	45/64	45/64	.70312	.6790	
7/32	.21875	.2113	23/32	23/32	.71875	.6943	
15/64	.23437	.2212	47/64	47/64	.73437	.7093	
1/4	.250	.2415	3/4	3/4	.750	.7245	
17/64	.26562	.2565	49/64	49/64	.76562	.7395	
9/32	.28125	.2717	25/32	25/32	.78125	.7547	
19/64	.29687	.2867	51/64	51/64	.79687	.7695	
5/16	.3125	.3019	13/16	13/16	.8125	.7849	
21/64	.32812	.3169	53/64	53/64	.82812	.7999	
11/32	.34375	.3321	27/32	27/32	.84375	.8151	
23/64	.35937	.3479	55/64	55/64	.85937	.8299	
3/8	.375	.3623	7/8	7/8	.875	.8453	
25/64	.39062	.3772	57/64	57/64	.89062	.8603	
13/32	.40625	.3924	29/32	29/32	.90625	.8754	
27/64	.42187	.4074	59/64	59/64	.92187	.8905	
7/16	.4375	.4226	15/16	15/16	.9375	.9056	
29/64	.45312	.4376	61/64	61/64	.95312	.9205	
15/32	.46875	.4528	31/32	31/32	.96875	.9358	
31/64	.48437	.4677	63/64	63/64	.98437	.9507	
1/2	.500	.4830	1	1	1.000	.9660	

$X \times 96.59 = Y$

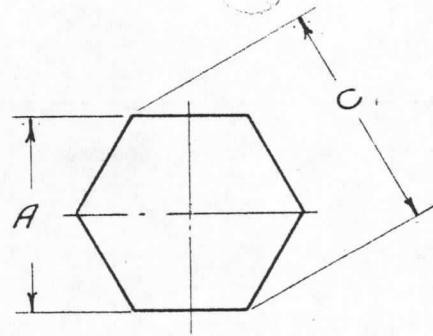
MI-REP-1



NATHAN MFG. CO. N.Y.  
 ANGLE CHART  
 KNOWN SIDES &  
 ANGLES IN FULL  
 UNKNOWN SIDES &  
 ANGLES DOTTED  
 MARCH 3, 1925 JF



$$B = A \times 1.414$$



$$C = A \times 1.155$$

## DIAGONALS OF HEXAGONS AND SQUARES

ACROSS FLATS	ACROSS CORNERS		ACROSS FLATS	ACROSS CORNERS	
	HEXAGONS	SQUARES		HEXAGONS	SQUARES
1/16"	.072"	.088"	2 1/16"	2.381"	2.916"
1/8"	.144"	.177"	2 1/8"	2.453"	3.005"
3/16"	.216"	.265"	2 3/16"	2.525"	3.093"
1/4"	.288"	.353"	2 1/4"	2.598"	3.182"
5/16"	.360"	.441"	2 5/16"	2.670"	3.270"
3/8"	.432"	.530"	2 3/8"	2.742"	3.358"
7/16"	.505"	.618"	2 7/16"	2.814"	3.447"
1/2"	.577"	.707"	2 1/2"	2.886"	3.535"
9/16"	.649"	.795"	2 9/16"	2.958"	3.623"
5/8"	.721"	.883"	2 5/8"	3.031"	3.712"
11/16"	.793"	.972"	2 11/16"	3.103"	3.800"
3/4"	.865"	1.060"	2 3/4"	3.175"	3.889"
13/16"	.938"	1.149"	2 13/16"	3.247"	3.979"
7/8"	1.010"	1.237"	2 7/8"	3.319"	4.065"
15/16"	1.082"	1.325"	2 15/16"	3.391"	4.154"
1"	1.154"	1.414"	3"	3.464"	4.242"
1 1/16"	1.226"	1.502"	3 1/16"	3.536"	4.331"
1 1/8"	1.299"	1.591"	3 1/8"	3.608"	4.419"
1 3/16"	1.371"	1.679"	3 3/16"	3.680"	4.507"
1 1/4"	1.443"	1.767"	3 1/4"	3.752"	4.596"
1 5/16"	1.515"	1.856"	3 5/16"	3.824"	4.684"
1 3/8"	1.587"	1.944"	3 3/8"	3.897"	4.772"
1 7/16"	1.659"	2.032"	3 1/2"	4.041"	4.949"
1 1/2"	1.732"	2.121"	3 5/8"	4.185"	5.126"
1 9/16"	1.804"	2.209"	3 3/4"	4.330"	5.303"
1 5/8"	1.876"	2.298"	3 7/8"	4.474"	5.480"
1 11/16"	1.984"	2.386"	4"	4.618"	5.656"
1 3/4"	2.020"	2.470"	4 1/8"	4.763"	5.833"
1 13/16"	2.092"	2.563"	4 1/4"	4.904"	6.010"
1 7/8"	2.165"	2.651"	4 3/8"	5.051"	6.187"
1 15/16"	2.237"	2.740"	4 1/2"	5.196"	6.363"
2"	2.309"	2.828"			

MI-REP-15

**WEIGHTS OF BRASS AND C.R. ST. RODS  
IN POUNDS PER RUNNING INCH**

DIA. INCH	BRASS			C.R. ST.			DIA. INCH	BRASS			C.R. ST.		
	ROUND	SQUARE	HEXAGON	ROUND	SQUARE	HEXAGON		ROUND	SQUARE	HEXAGON	ROUND	SQUARE	HEXAGON
1/16	.001	.001	.001	.001	.001		3 1/16	2.210	2.814	2.439	1.989	2.533	2.195
1/8	.004	.005	.004	.003	.004	.004	1/8	2.301	2.930	2.539	2.071	2.637	2.285
3/16	.009	.011	.009	.008	.010	.009	3/16	2.394	3.048	2.642	2.155	2.743	2.378
1/4	.015	.019	.017	.014	.017	.015	1/4	2.489	3.169	2.746	2.240	2.852	2.471
5/16	.024	.030	.026	.021	.027	.024	5/16	2.585	3.292	2.853	2.327	2.963	2.568
3/8	.034	.043	.037	.031	.039	.035	3/8	2.684	3.417	2.962	2.416	3.075	2.666
7/16	.046	.059	.051	.042	.053	.047	7/16	2.784	3.545	3.072	2.506	3.191	2.765
1/2	.060	.077	.067	.055	.069	.061	1/2	2.886	3.675	3.185	2.597	3.308	2.867
9/16	.076	.097	.084	.069	.088	.078	9/16	2.990	3.807	3.300	2.691	3.426	2.970
5/8	.094	.120	.104	.085	.109	.096	5/8	3.096	3.942	3.417	2.786	3.548	3.075
11/16	.114	.145	.126	.103	.131	.116	11/16	3.204	4.079	3.535	2.884	3.671	3.182
3/4	.136	.173	.150	.123	.156	.138	3/4	3.314	4.219	3.656	2.983	3.797	3.290
13/16	.160	.203	.176	.144	.183	.162	13/16	3.425	4.361	3.779	3.083	3.925	3.401
7/8	.185	.235	.204	.165	.213	.188	7/8	3.538	4.505	3.904	3.184	4.055	3.514
15/16	.212	.270	.234	.192	.244	.216	15/16	3.653	4.651	4.031	3.288	4.186	3.628
1	.241	.307	.266	.218	.278	.245	4	3.770	4.800	4.160	3.393	4.320	3.744
1 1/16	.273	.347	.301	.246	.314	.277	1 1/16	3.889	4.951	4.291	3.500	4.456	3.862
1 1/8	.306	.389	.337	.276	.352	.311	1 1/8	4.009	5.105	4.424	3.608	4.595	3.982
1 3/16	.341	.434	.375	.308	.392	.346	1 3/16	4.132	5.261	4.559	3.719	4.735	4.103
1 1/4	.377	.480	.416	.341	.434	.383	1 1/4	4.256	5.419	4.696	3.830	4.877	4.226
1 5/16	.416	.529	.459	.376	.479	.423	1 5/16	4.382	5.579	4.835	3.944	5.021	4.352
1 3/8	.457	.581	.503	.413	.525	.464	1 3/8	4.510	5.742	4.977	4.059	5.168	4.479
1 7/16	.499	.635	.550	.451	.574	.507	1 7/16	4.640	5.907	5.120	4.176	5.316	4.608
1 1/2	.543	.692	.599	.491	.625	.552	1 1/2	4.771	6.075	5.265	4.294	5.468	4.739
1 9/16	.589	.751	.650	.533	.678	.599	1 9/16	4.905	6.245	5.412	4.415	5.621	4.871
1 5/8	.638	.812	.703	.576	.734	.648	1 5/8	5.040	6.417	5.562	4.536	5.775	5.006
1 11/16	.688	.875	.758	.621	.827	.699	1 11/16	5.177	6.592	5.713	4.659	5.933	5.142
1 3/4	.739	.942	.815	.668	.851	.752	1 3/4	5.316	6.769	5.866	4.784	6.092	5.279
1 13/16	.793	1.010	.875	.717	.913	.806	1 13/16	5.457	6.948	6.022	4.911	6.253	5.420
1 7/8	.849	1.081	.936	.767	.977	.863	1 7/8	5.600	7.130	6.179	5.040	6.417	5.561
1 15/16	.908	1.154	.999	.819	1.043	.921	1 15/16	5.744	7.314	6.339	5.170	6.583	5.705
2	.966	1.230	1.065	.873	1.111	.982	5	5.891	7.500	6.500	5.302	6.750	5.850
2 1/16	1.002	1.276	1.105	.902	1.148	.995	2 1/16	6.039	7.689	6.664	5.435	6.920	5.998
2 1/8	1.064	1.354	1.174	.958	1.219	1.057	2 1/8	6.189	7.880	6.829	5.570	7.092	6.146
2 3/16	1.127	1.435	1.244	1.014	1.292	1.120	2 3/16	6.341	8.073	7.027	5.706	7.266	6.324
2 1/4	1.193	1.519	1.296	1.074	1.367	1.166	2 1/4	6.494	8.269	7.166	5.845	7.442	6.449
2 5/16	1.260	1.604	1.390	1.134	1.444	1.251	2 5/16	6.650	8.467	7.338	5.985	7.620	6.604
2 3/8	1.329	1.693	1.467	1.196	1.524	1.320	2 3/8	6.807	8.667	7.512	6.126	7.800	6.761
2 7/16	1.400	1.782	1.545	1.260	1.604	1.390	2 7/16	6.966	8.870	7.687	6.269	7.983	6.918
2 1/2	1.473	1.875	1.625	1.326	1.688	1.463	2 1/2	7.127	9.075	7.865	6.414	8.168	7.079
2 9/16	1.547	1.970	1.707	1.392	1.773	1.536	2 9/16	7.290	9.282	8.045	6.561	8.354	7.241
2 5/8	1.624	2.067	1.792	1.462	1.860	1.613	2 5/8	7.455	9.492	8.227	6.710	8.543	7.404
2 11/16	1.702	2.167	1.878	1.532	1.950	1.690	2 11/16	7.622	9.704	8.410	6.860	8.734	7.569
2 3/4	1.782	2.269	1.966	1.604	2.042	1.769	2 3/4	7.790	9.919	8.596	7.011	8.927	7.736
2 13/16	1.864	2.373	2.057	1.678	2.136	1.851	2 13/16	7.961	10.136	8.784	7.165	9.122	7.906
2 7/8	1.948	2.483	2.149	1.753	2.235	1.934	2 7/8	8.132	10.355	8.974	7.319	9.320	8.077
2 15/16	2.033	2.589	2.244	1.830	2.330	2.020	2 15/16	8.306	10.576	9.166	7.475	9.518	8.249
3	2.121	2.700	2.340	1.909	2.430	2.106	6	8.482	10.800	9.360	7.634	9.720	8.424
DIA. INCH	BRASS			C.R. ST.			DIA. INCH	BRASS			C.R. ST.		
ROUND	SQUARE	HEXAGON	ROUND	SQUARE	HEXAGON	ROUND	SQUARE	HEXAGON	ROUND	SQUARE	HEXAGON		



WIRE AND SHEET METAL GAGES IN APPROXIMATE DECIMALS OF AN INCH

NO OF WIRE GAGE	AMERICAN OR BROWN & SHARPE	BIRMINGHAM OR STUBS IRON WIRE	WASHBURN & MOEN AM. STEEL & WIRE CO. AND ROEBLING	STUBS STEEL WIRE	TRENTON IRON CO.	BRITISH IMPERIAL WIRE	U. S. STANDARD FOR PLATE	NO OF WIRE GAGE	STUBS STEEL WIRE (CONTINUED)
000000			0.4900			0.5000	0.5000	51	0.066
000000	0.5800		0.4615			0.4640	0.4688	52	0.063
00000	0.5165	0.500	0.4305		0.4500	0.4320	0.4375	53	0.058
0000	0.4600	0.454	0.3938		0.4000	0.4000	0.4063	54	0.055
000	0.4096	0.425	0.3625		0.3600	0.3720	0.3750	55	0.050
00	0.3648	0.380	0.3310		0.3300	0.3480	0.3438	56	0.045
0	0.3249	0.340	0.3065		0.3050	0.3240	0.3125	57	0.042
1	0.2893	0.300	0.2830	0.227	0.2850	0.3000	0.2813	58	0.041
2	0.2576	0.284	0.2625	0.219	0.2650	0.2760	0.2656	59	0.040
3	0.2294	0.259	0.2437	0.212	0.2450	0.2520	0.2500	60	0.039
4	0.2043	0.238	0.2253	0.207	0.2250	0.2320	0.2344	61	0.038
5	0.1819	0.220	0.2070	0.204	0.2050	0.2120	0.2188	62	0.037
6	0.1620	0.203	0.1920	0.201	0.1900	0.1920	0.2031	63	0.036
7	0.1443	0.180	0.1770	0.199	0.1750	0.1760	0.1875	64	0.035
8	0.1285	0.165	0.1620	0.197	0.1600	0.1600	0.1719	65	0.033
9	0.1144	0.148	0.1483	0.194	0.1450	0.1440	0.1563	66	0.032
10	0.1019	0.134	0.1350	0.191	0.1300	0.1280	0.1406	67	0.031
11	0.0907	0.120	0.1205	0.188	0.1175	0.1160	0.1250	68	0.030
12	0.0808	0.109	0.1055	0.185	0.1050	0.1040	0.1094	69	0.029
13	0.0720	0.095	0.0915	0.182	0.0925	0.0920	0.0938	70	0.027
14	0.0641	0.083	0.0800	0.180	0.0800	0.0800	0.0781	71	0.026
15	0.0571	0.072	0.0720	0.178	0.0700	0.0720	0.0703	72	0.024
16	0.0508	0.065	0.0625	0.175	0.0610	0.0640	0.0625	73	0.023
17	0.0453	0.058	0.0540	0.172	0.0525	0.0560	0.0563	74	0.022
18	0.0403	0.049	0.0475	0.168	0.0450	0.0480	0.0500	75	0.020
19	0.0359	0.042	0.0410	0.164	0.0400	0.0400	0.0438	76	0.018
20	0.0320	0.035	0.0348	0.161	0.0350	0.0360	0.0375	77	0.016
21	0.0285	0.032	0.0317	0.157	0.0310	0.0320	0.0344	78	0.015
22	0.0253	0.028	0.0286	0.155	0.0280	0.0280	0.0313	79	0.014
23	0.0226	0.025	0.0258	0.153	0.0250	0.0240	0.0281	80	0.013
24	0.0201	0.022	0.0230	0.151	0.0225	0.0220	0.0250		
25	0.0179	0.020	0.0204	0.148	0.0200	0.0200	0.0219		
26	0.0159	0.018	0.0181	0.146	0.0180	0.0180	0.0188		
27	0.0142	0.016	0.0173	0.143	0.0170	0.0164	0.0172		
28	0.0126	0.014	0.0162	0.139	0.0160	0.0148	0.0156		
29	0.0113	0.013	0.0150	0.134	0.0150	0.0136	0.0141		
30	0.0100	0.012	0.0140	0.127	0.0140	0.0124	0.0125		
31	0.0089	0.010	0.0132	0.120	0.0130	0.0116	0.0109		
32	0.0080	0.009	0.0128	0.115	0.0120	0.0108	0.0102		
33	0.0071	0.008	0.0118	0.112	0.0110	0.0100	0.0094		
34	0.0063	0.007	0.0104	0.110	0.0100	0.0092	0.0086		
35	0.0056	0.005	0.0095	0.108	0.0095	0.0084	0.0078		
36	0.0050	0.004	0.0090	0.106	0.0090	0.0076	0.0070		
37	0.0045		0.0085	0.103	0.0085	0.0068	0.0066		
38	0.0040		0.0080	0.101	0.0080	0.0060	0.0063		
39	0.0035		0.0075	0.099	0.0075	0.0052			
40	0.0031		0.0070	0.097	0.0070	0.0048			
41	0.0028		0.0066	0.095		0.0044			
42	0.0025		0.0062	0.092		0.0040			
43	0.0022		0.0060	0.088		0.0036			
44	0.0020		0.0058	0.085		0.0032			
45	0.00176		0.0055	0.081		0.0028			
46	0.00157		0.0052	0.079		0.0024			
47	0.00140		0.0050	0.077		0.0020			
48	0.00124		0.0048	0.075		0.0016			
49	0.00099		0.0046	0.072		0.0012			
50	0.00088		0.0044	0.069		0.0010			

(CONTINUED)

MI-REC-17

## STANDARD SIZES AND DIMENSIONS FOR IRON PIPES

TOTAL LENGTH OF THREAD ON PIPE	TAP DRILL	OUTSIDE DIAMETER IN NEAREST FRACTION OF INCH	ACTUAL OUTSIDE DIAMETER	ACTUAL INSIDE DIAMETER	THICKNESS	INTERNAL CIRCUM-FERENCE	EXTERNAL CIRCUM-FERENCE	LENGTH OF PIPE PER SQ. FOOT OF INSIDE SURFACE	LENGTH OF PIPE PER SQ. FOOT OF OUTSIDE SURFACE	INTERNAL AREA	EXTERNAL AREA	LENGTH OF PIPE CONTAINING ONE CUBIC FOOT	NOMINAL WEIGHT PER FOOT OF LENGTH	CONTENTS OF ONE FOOT IN LENGTH	MEASUREMENTS OF SOCKETS OR PIPE	
															ACTUAL OUTSIDE DIAMETER	LENGTH INCHES
.412	R(339)	13/32	.40	.27	.07	.84	1.27	14.15	9.44	.06	.12	2500.	.24	.002	60	.81
.624	7/16	9/16	.54	.36	.08	1.14	1.69	10.50	7.07	.10	.22	1385.	.42	.002	78	1.00
.630	37/64	11/16	.67	.49	.09	1.55	2.12	7.67	5.65	.19	.35	751.5	.56	.005	91	1.10
.819	23/32	27/32	.84	.62	.10	1.95	2.65	6.13	4.50	.30	.55	472.4	.84	.010	110	1.31
.831	59/64	1 1/16	1.05	.82	.11	2.58	3.29	4.63	3.63	.53	.80	270.	1.12	.023	134	1.50
1.03	1 5/32	1 5/16	1.31	1.04	.13	3.29	4.13	3.67	2.90	.86	1.35	166.9	1.67	.040	166	1.75
1.06	1 1/2	1 1/8	1.66	1.38	.14	4.33	5.21	2.76	2.30	1.49	2.16	96.25	2.24	.063	200	1.94
1.07	1 17/64	1 29/32	1.9	1.61	.14	5.06	5.96	2.37	2.01	2.03	2.83	70.65	2.68	.091	228	2.19
1.10	27/32	2 3/8	2.37	2.06	.15	6.49	7.46	1.84	1.61	3.35	4.43	42.36	3.61	.103	281	2.31
1.64	2 5/8	2 7/8	2.87	2.46	.20	7.75	9.03	1.54	1.32	4.78	6.49	30.11	5.74	.255	328	2.72
1.70	3 1/4	3 1/2	3.5	3.06	.21	9.63	10.96	1.24	1.09	7.38	9.62	19.49	7.54	.367	402	3.04
1.75	3 3/4	4	4	3.56	.22	11.14	12.56	1.07	.95	9.83	12.56	14.56	9.00	.500	450	3.16
1.80	4 1/4		4.5	4.02	.23	12.64	14.13	.94	.84	12.73	15.90	11.31	10.66	.652	510	3.12
1.85			5	4.50	.24	14.15	15.70	.84	.76	15.93	19.63	9.03	12.34	.826	559	3.22

NOMINAL DIAMETER OF PIPE	APPROXIMATE OUTSIDE DIA. OF PIPE	GAGE DIAMETER TOP OF TH'D.	DOUBLE DEPTH OF THREAD	BOTTOM DIA. OF TH'D AT GAGE POINT	NO. OF THREADS PER INCH	DISTANCE OF GAGE DIA. FROM END OF PIPE.			OUTSIDE DIA. OF TH'DS AT END OF PIPE	INSIDE DIA. OF TH'DS AT END OF PIPE	NOMINAL DIAMETER OF PIPE
						ST'D.	MAXIMUM	MINIMUM			
1/8	13/32	0.383	0.046	0.337	28	5/32	0.18	0.13	0.373	0.327	1/8
1/4	17/32	0.518	0.067	0.451	19	3/16	0.22	0.16	0.506	0.439	1/4
3/8	11/16	0.656	0.067	0.589	19	1/4	0.29	0.21	0.640	0.573	3/8
1/2	27/32	0.825	0.091	0.734	14	1/4	0.29	0.21	0.809	0.718	1/2
3/4	1 1/16	1.041	0.091	0.950	14	3/8	0.44	0.31	1.018	0.927	3/4
1	1 1/32	1.309	0.116	1.193	11	3/8	0.44	0.31	1.286	1.170	1
1 1/4	1 1/16	1.650	0.116	1.534	11	1/2	0.58	0.42	1.619	1.503	1 1/4
1 1/2	1 29/32	1.882	0.116	1.766	11	1/2	0.58	0.42	1.851	1.735	1 1/2
2	2 3/8	2.347	0.116	2.231	11	5/8	0.73	0.52	2.308	2.192	2
2 1/2	3	2.960	0.116	2.844	11	1 1/16	0.80	0.57	2.917	3.043	2 1/2
3	3 1/2	3.460	0.116	3.344	11	1 3/16	0.95	0.68	3.409	3.293	3
3 1/2	4	3.950	0.116	3.834	11	7/8	1.02	0.73	3.895	3.779	3 1/2
4	4 1/2	4.450	0.116	4.334	11	1	1.17	0.83	4.387	4.271	4

TAPER OF PIPE ENDS = 1/16" TO 1". WHITWORTH STANDARD THREADS.

NATHAN M'FG CO. N.Y. GENERAL INFORMATION											
MAT'L	FINISH	PAINT	NICKEL	POLISH	DIPPED	WOOD	MET				
SUPERSEEDING DRUG											
DRAWN	3-20-15	A.S.									
TRACED	3-20-15	A.S.									
CHECKED	"	c/p									
APPROVED	"	"									
<b>BRITISH ST'D PIPE TH'DS</b>											
MAR. 20, 1915											

MIRK 19

## WHITWORTH STANDARD THREAD FOR GAS AND WATER PIPING.

NOMINAL SIZE OF TUBE	ACTUAL SIZE OF TUBE	N° OF THREADS PER INCH	DEPTH OF THREAD	RADIUS	DOUBLE DEPTH OF THREAD
$\frac{1}{8}$	0.385	28	0.0229	0.0049	0.0457
$\frac{1}{4}$	0.520	19	0.0337	0.0072	0.0674
$\frac{3}{8}$	0.665	19	0.0337	0.0072	0.0674
$\frac{1}{2}$	0.822	14	0.0457	0.0098	0.0915
$\frac{5}{8}$	0.902	14	0.0457	0.0098	0.0915
$\frac{3}{4}$	1.034	14	0.0457	0.0098	0.0915
$\frac{7}{8}$	1.189	14	0.0457	0.0098	0.0915
1	1.302	11	0.0582	0.0125	0.1164
1 $\frac{1}{8}$	1.492	11	0.0582	0.0125	0.1164
1 $\frac{1}{4}$	1.650	11	0.0582	0.0125	0.1164
1 $\frac{3}{8}$	1.745	11	0.0582	0.0125	0.1164
1 $\frac{1}{2}$	1.882	11	0.0582	0.0125	0.1164
1 $\frac{5}{8}$	2.021	11	0.0582	0.0125	0.1164
1 $\frac{3}{4}$	2.160	11	0.0582	0.0125	0.1164
1 $\frac{7}{8}$	2.245	11	0.0582	0.0125	0.1164
2	2.347	11	0.0582	0.0125	0.1164
2 $\frac{1}{8}$	2.467	11	0.0582	0.0125	0.1164
2 $\frac{1}{4}$	2.587	11	0.0582	0.0125	0.1164
2 $\frac{3}{8}$	2.794	11	0.0582	0.0125	0.1164
2 $\frac{1}{2}$	3.001	11	0.0582	0.0125	0.1164
2 $\frac{5}{8}$	3.124	11	0.0582	0.0125	0.1164
2 $\frac{3}{4}$	3.247	11	0.0582	0.0125	0.1164
2 $\frac{7}{8}$	3.367	11	0.0582	0.0125	0.1164
3	3.485	11	0.0582	0.0125	0.1164
3 $\frac{1}{4}$	3.698	11	0.0582	0.0125	0.1164
3 $\frac{1}{2}$	3.912	11	0.0582	0.0125	0.1164
3 $\frac{3}{4}$	4.125	11	0.0582	0.0125	0.1164
4	4.339	11	0.0582	0.0125	0.1164

STANDARD TAPER  $\frac{3}{4}$ " IN 12"

MI-REF-20

## BRITISH STANDARD PIPE THREADS FOR GAS, WATER & STEAM.

NOMINAL INSIDE DIAM. "	APPROX. OUTSIDE DIAM. "	DIAM. AT TOP OF THREAD		DIAM. AT BOTTOM OF THREAD		THREADS PER INCH
		BRITISH STD. "	WHITWORTH "	BRITISH STD. "	WHITWORTH "	
1/8	13/32	.383	.3825	.337	.3367	28
1/4	17/32	.518	.518	.451	.4506	19
3/8	1 1/16	.656	.6563	.589	.5889	19
1/2	27/32	.825	.8257	.734	.7342	14
5/8	15/16	.902	.9022	.811	.8107	14
3/4	1 1/16	1.041	1.041	.950	.9495	14
7/8	1 7/32	1.189	1.189	1.098	1.0975	14
1	1 11/32	1.309	1.309	1.193	1.1925	11
1 1/4	1 11/16	1.650	1.650	1.534	1.5335	11
1 1/2	1 29/32	1.882	1.882	1.766	1.766	11
1 3/4	2 5/32	2.116	2.116	2.000	2.000	11
2	2 3/8	2.347	2.347	2.231	2.2305	11
2 1/4	2 5/8	2.587	2.587	2.471	2.471	11
2 1/2	3	2.960	3.001	2.844	2.8848	11
2 3/4	3 1/4	3.210	3.247	3.094	3.1305	11
3	3 1/2	3.460	3.485	3.344	3.3685	11
3 1/4	3 3/4	3.700	3.698	3.584	3.582	11
3 1/2	4	3.950	3.912	3.834	3.7955	11
3 3/4	4 1/4	4.200	4.125	4.084	4.009	11
4	4 1/2	4.450	4.339	4.334	4.225	11
4 1/2	5	4.950		4.834		11
5	5 1/2	5.450		5.334		11
5 1/2	6	5.950		5.834		11
6	6 1/2	6.450		6.334		11
7	7 1/2	7.450		7.322		10
8	8 1/2	8.450		8.322		10
9	9 1/2	9.450		9.322		10
10	10 1/2	10.450		10.322		10
11	11 1/2	11.450		11.290		8
12	12 1/2	12.450		12.290		8
13	13 3/4	13.680		13.520		8
14	14 3/4	14.680		14.520		8
15	15 3/4	15.680		15.520		8
16	16 3/4	16.680		16.520		8
17	17 3/4	17.680		17.520		8
18	18 3/4	18.680		18.520		8

THE ABOVE FIGURES ARE PUBLISHED BY MESSRS. ARMSTRONG, WHITWORTH & CO  
 THE "BRITISH STANDARD" ARE THE SIZES ESTABLISHED BY "THE ENGINEERING STANDARDS  
 COMMITTEE FOR BRITISH STANDARD PIPE THREADS" IN 1905. THE ORIGINAL WHITWORTH  
 FIGURES (WHICH DO NOT GO ABOVE 4") ARE GIVEN SIDE BY SIDE WITH THEM.  
 ALL BRITISH PIPE THREADS ARE STRAIGHT UNLESS OTHERWISE ORDERED. M.T. REC.

# SIZES OF STEEL TAPER PINS

## PRATT & WHITNEY STANDARD

NUMBER	0	1	2	3	4	5	6	7	8	9	10
DIAMETER LARGE END.	0.156"	0.172"	0.193"	0.219"	0.250"	0.289"	0.341"	0.409"	0.492"	0.591"	0.706"
APPROXIMATE FRACTIONAL SIZE	$\frac{5}{32}$	$\frac{11}{64}$	$\frac{3}{16}$	$\frac{7}{32}$	$\frac{1}{4}$	$\frac{19}{64}$	$\frac{11}{32}$	$\frac{13}{32}$	$\frac{1}{2}$	$\frac{19}{32}$	$\frac{23}{32}$
MINIMUM LENGTH.	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	1"	$1\frac{1}{4}$ "	$1\frac{1}{2}$ "	$1\frac{1}{2}$ "
MAXIMUM LENGTH.	1"	$1\frac{1}{4}$ "	$1\frac{1}{2}$ "	$1\frac{3}{4}$ "	2"	$2\frac{1}{4}$ "	$3\frac{1}{4}$ "	$3\frac{3}{4}$ "	$4\frac{1}{2}$ "	$5\frac{1}{4}$ "	6"
DIA. SMALL END OF ST'D. REAMER $\frac{1}{2}$ " FROM EXTREME END	0.135"	0.146"	0.162"	0.183"	0.208"	0.240"	0.279"	0.331"	0.398"	0.482"	0.581"

**NOTE:** STANDARD TAPER IS  $\frac{1}{4}$ " IN 12".

LENGTHS OF TAPER PINS ADVANCE BY  $\frac{1}{4}$ " FROM MINIMUM TO MAXIMUM.

# PRESSURES & CORRESPONDING VELOCITIES OF AIR CURRENTS.

TABLE SHOWING THE NUMBER OF MILES PER HOUR, AND PRESSURE IN POUNDS PER SQ. FT., AT VELOCITIES IN FT. PER MINUTE.

VELOCITIES IN FEET PER MINUTE	VELOCITIES IN MILES PER HOUR		PRESSURE IN LBS. PER SQUARE FOOT	
	VELOCITIES IN FEET PER MINUTE	MILES PER HOUR	PRESSURE IN LBS. PER SQUARE FOOT	PRESSURE IN LBS. PER SQUARE FOOT
10	.113	.0000	550	.1930
20	.227	.0002	600	.2300
25	.284	.0004	650	.2968
30	.340	.0006	700	.3125
35	.394	.0008	750	.3593
40	.454	.0010	800	.4087
45	.511	.0013	850	.4616
50	.568	.0016	900	.5175
55	.625	.0019	950	.5763
60	.681	.0023	1000	.6384
65	.738	.0027	1500	1.4375
70	.795	.0031	2000	2.5553
75	.852	.0036	2500	3.9918
80	.909	.0041	3000	5.7500
85	.966	.0046	3500	7.8255
90	1.022	.0051	4000	10.2202
95	1.079	.0057	4500	12.9375
100	1.136	.0063	5000	15.9709
125	1.420	.0100	5500	19.2982
150	1.704	.0143	6000	22.9954
175	1.988	.0195	6500	26.9764
200	2.272	.0255	7000	31.3020
250	2.840	.0398	7500	35.9375
300	3.409	.0575	8000	40.8868
350	3.977	.0781	8500	46.1554
400	4.545	.1021	9000	51.7500
450	5.113	.1294	9500	57.7447
500	5.681	.1596	10000	63.8837

## FORMULA

The pressure varies as the square of the velocity or  $P \propto V^2$ . The square of the velocity in miles per hour, multiplied by .005 gives the pressure in lbs. per sq. ft., or  $V^2 \times .005 = P$ . The square root of 200 times the pressure equals the velocity, or  $\sqrt{200 \times P} = V$ .

To find rate at which air is moving, divide the velocity in feet per minute by 88, the answer will be in miles per hour.

Example - 420 feet per minute =  $420 \div 88 = 4.77$ , or say,  $4 \frac{3}{4}$  miles per hour.

To find pressure in lbs. per square foot, multiply the square of the velocity in feet per second by .0023, the result will be in lbs. per square foot. Example - 50 feet per minute = .83 per second, and  $.83 \times .83 \times .0023 = .00158447$ , or say, .0016 lbs.

# HOW LEAKS RUN UP COSTS

SIZE OF OPENING INCHES	ACTUAL SIZE	AIR		STEAM		WATER	
		100 LBS. WASTED MONTHLY	PRESSURE COST AT 10¢ PER M.	100 LBS. WASTED MONTHLY	PRESSURE COST AT 60¢ PER M.	40 LBS. WASTED MONTHLY	PRESSURE COST AT 10¢ PER M.
1/2	●	17,798,400	\$1,779.84	805,000	\$483.00	1,231,000	\$123.10
3/8	●	9,979,200	997.92	460,000	276.00	692,400	69.24
1/4	●	4,449,600	444.96	203,000	121.80	307,700	30.77
1/8	●	1,114,560	111.46	50,500	30.30	76,900	7.69
1/16	●	278,640	27.86	12,750	7.65	19,200	1.92
1/32	●	69,552	6.96	3,175	1.91	4,800	0.48

REPORT ALL LEAKS TO DEPARTMENTAL FOREMAN FOR CORRECTION

MAY 10, 1957. A 28758

MI 85-214

1-10



