
SPAR-Marathon Roofing Supplies is proud to share the commitment of Education, Safety Awareness and the overall betterment of the Roofing Industry, through our active support and participation in the following professional associations:



SERVICE IS OUR SPECIALTY • SPAR-Marathon

Conversion Table English to Metric

Inches		m/m	Inches		m/m
Fraction	Decimal		Fraction	Decimal	
1/64	0.015625	0.3969	33/64	0.515625	13.0969
1/32	0.031250	0.7938	17/32	0.531250	13.4938
3/64	0.046875	1.1906	35/64	0.546875	13.8906
1/16	0.062500	1.5875	9/16	0.562500	14.2875
5/64	0.078125	1.9844	37/64	0.578125	14.6844
3/32	0.093750	2.3812	19/32	0.593750	15.0812
7/64	0.109375	2.7781	39/64	0.609375	15.4781
1/8	0.125000	3.1750	5/8	0.625000	15.8750
9/64	0.140625	3.5719	41/64	0.640625	16.2719
5/32	0.156250	3.9688	21/32	0.656250	16.6688
11/64	0.171875	4.3656	43/64	0.671875	17.0656
3/16	0.187500	4.7625	11/16	0.687500	17.4625
13/64	0.203125	5.1594	45/64	0.703125	17.8594
7/32	0.218750	5.5562	23/32	0.718750	18.2562
15/64	0.234275	5.9531	47/64	0.734375	28.6531
1/4	0.250000	6.3500	3/4	0.750000	19.0500
17/64	0.265625	6.7469	49/64	0.765625	19.4469
9/32	0.228125	7.1438	25/32	0.781250	19.8437
19/64	0.296875	7.5406	51/64	0.796875	20.2406
5/16	0.312500	7.9375	13/16	0.812500	20.6375
21/64	0.328125	8.3344	53/64	0.828125	21.0344
11/32	0.343750	8.7312	27/32	0.843750	21.4312
23/64	0.359375	9.1281	55/64	0.859375	21.8281
3/8	0.375000	9.5250	7/8	0.875000	22.2250
25/64	0.390625	9.9219	57/64	0.890625	22.6219
13/32	0.406250	10.3188	29/32	0.906250	23.0188
27/64	0.421875	10.7156	59/64	0.921875	23.4156
7/16	0.437500	11.1125	15/16	0.937500	23.8125
29/64	0.453125	11.5094	61/64	0.953125	24.2094
15/32	0.468750	11.9062	31/32	0.968750	24.6062
31/64	0.484375	12.3031	63/64	0.984375	25.0031
1/2	0.000000	12.7000	1	1.000000	25.4000

Conversion Table English to Metric

Inches		Inches		Inches	
Decimal	m/m	Decimal	m/m	Decimal	m/m
0.01	0.2540	0.34	8.6360	0.68	17.2720
0.02	0.5080	0.35	8.8900	0.69	17.5260
0.03	0.7620	0.36	9.1440	0.70	17.7800
0.04	1.0160	0.37	9.3980	0.71	18.0340
0.05	1.2700	0.38	9.6520	0.72	18.2880
0.06	1.5240	0.39	9.9060	0.73	18.5420
0.07	1.7780	0.40	10.1600	0.74	18.7960
0.08	2.0320	0.41	10.4140	0.75	19.0500
0.09	2.2860	0.42	10.6680	0.76	19.3040
0.10	2.5400	0.43	10.9220	0.77	19.5580
0.11	2.7940	0.44	11.1760	0.78	19.8120
0.12	3.0480	0.45	11.4300	0.79	20.0660
0.13	3.3020	0.46	11.6840	0.80	20.3200
0.14	3.5560	0.47	11.9380	0.81	20.5740
0.15	3.8100	0.48	12.1920	0.82	20.8280
0.16	4.0640	0.49	12.4460	0.83	21.0820
0.17	4.3180	0.50	12.7000	0.84	21.3360
0.18	4.5720	0.51	12.9540	0.85	21.5900
0.19	4.8260	0.52	13.2080	0.86	21.8440
0.20	5.0800	0.53	13.4620	0.87	22.0980
0.21	5.3340	0.54	13.7160	0.88	22.3520
0.22	5.5880	0.55	13.9700	0.89	22.6060
0.23	5.8420	0.56	14.2240	0.90	22.8600
0.24	6.0960	0.57	14.4780	0.91	23.1140
0.25	6.3500	0.58	14.7320	0.92	23.3680
0.26	6.6040	0.59	14.9860	0.93	23.6220
0.27	6.8580	0.60	15.2400	0.94	23.8760
0.28	7.1120	0.61	15.4940	0.95	24.1300
0.29	7.3660	0.62	15.7480	0.96	24.3840
0.30	7.6200	0.63	16.0020	0.97	24.6380
0.31	7.8740	0.64	16.2560	0.98	24.8920
0.32	8.1280	0.65	16.5100	0.99	25.1460
0.33	8.3820	0.66	16.7640	1.00	25.4000
		0.67	17.0180		

Metric-English Conversion Table

m/m	Inches	m/m	Inches	m/m	Inches	m/m	Inches
1	0.0394	41	1.6142	81	3.1890	121	4.7638
2	0.0787	42	1.6535	82	3.2283	122	4.8031
3	0.1181	43	1.6929	83	3.2677	123	4.8425
4	0.1575	44	1.7323	84	3.3071	124	4.8819
5	0.1969	45	1.7717	85	3.3465	125	4.9213
6	0.2362	46	1.8110	86	3.3858	126	4.9606
7	0.2756	47	1.8504	87	3.4252	127	5.0000
8	0.3150	48	1.8898	88	3.4646	128	5.0394
9	0.3543	49	1.9291	89	3.5039	129	5.0787
10	0.3937	50	1.9685	90	3.5433	130	5.1181
11	0.4331	51	2.0079	91	3.5827	131	5.1575
12	0.4724	52	2.0472	92	3.6220	132	5.1968
13	0.5118	53	2.0866	93	3.6614	133	5.2362
14	0.5512	54	2.1260	94	3.7008	134	5.2756
15	0.5906	55	2.1654	95	3.7402	135	5.3150
16	0.6299	56	2.2047	96	3.7795	136	5.3543
17	0.6693	57	2.2441	97	3.8189	137	5.3937
18	0.7087	58	2.2835	98	3.8583	138	5.4331
19	0.7480	59	2.3228	99	3.8976	139	5.4724
20	0.7874	60	2.3622	100	3.9370	140	5.5118
21	0.8268	61	2.4016	101	3.9764	141	5.5512
22	0.8661	62	2.4409	102	4.0157	142	5.5905
23	0.9055	63	2.4803	103	4.0551	143	5.6299
24	0.9449	64	2.5197	104	4.0945	144	5.6693
25	0.9843	65	2.5591	105	4.1339	145	5.7087
26	1.0236	66	2.5984	106	4.1732	146	5.7480
27	1.0630	67	2.6378	107	4.2126	147	5.7874
28	1.1024	68	2.6772	108	4.2520	148	5.8268
29	1.1417	69	2.7165	109	4.2913	149	5.8661
30	1.1811	70	2.7559	110	4.3307	150	5.9055
31	1.2205	71	2.7953	111	4.3701	151	5.9449
32	1.2598	72	2.8346	112	4.4094	152	5.9842
33	1.2992	73	2.8740	113	4.4488	153	6.0236
34	1.3386	74	2.9134	114	4.4882	154	6.0630
35	1.3780	75	2.9528	115	4.5276	155	6.1024
36	1.4173	76	2.9921	116	4.5669	156	6.1417
37	1.4567	77	3.0315	117	4.6063	157	6.1811
38	1.4961	78	3.0709	118	4.6457	158	6.2205
39	1.5354	79	3.1102	119	4.6850	159	6.2598
40	1.5748	80	3.1496	120	4.7244	160	6.2992

Approximate Conversions English to Metric

When You Know	Multiply by	To Find	Symbol
LENGTH			
Inches	2.54	centimeters	cm
feet	30	centimeters	cm
yards	0.9	meters	m
miles	1.6	kilometers	km
AREA			
square inches	6.5	sq. centimeters	cm ²
square feet	0.09	sq. meters	m ²
square yards	0.8	sq. meters	m ²
square miles	2.6	sq. kilometers	km ²
acres	0.4	hectares	ha
MASS (weight)			
ounces	28	grams	g
pounds	0.45	kilograms	kg
short tons (2000 lb.)	0.9	tonnes	t
VOLUME			
teaspoons	5	milliliters	ml
tablespoons	15	milliliters	ml
fluid ounces	30	milliliters	ml
cups	0.24	liters	l
pints	0.47	liters	l
quarts	0.95	liters	l
gallons	3.8	liters	l
cubic feet	0.03	cubic meters	m ³
cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)			
Fahrenheit °F temperature	5/9 (after subtracting 32)	Centigrade (Celsius) °C temperature	

Approximate Conversions Metric to English

When You Know		Multiply By	To Find
LENGTH			
mm	millimeters	0.04	inches
cm	centimeters	0.4	inches
m	meters	3.3	feet
m	meters	1.1	yards
km	kilometers	0.6	miles
AREA			
cm ²	sq. centimeters	0.16	sq. inches
m ²	sq. meters	1.2	sq. yards
km ²	sq. kilometers	0.4	sq. miles
ha	hectares (10,000 m ²)	2.5	acres
MASS (weight)			
g	grams	0.035	ounces
kg	kilograms	2.2	pounds
t	tonnes (1000 kg)	1.1	short tons
VOLUME			
ml	milliliters	0.03	fluid ounces
l	liters	2.1	pints
l	liters	1.06	quarts
l	liters	0.26	gallons
m ³	cubic meters	35	cubic feet
m ³	cubic meters	1.3	cubic yards
TEMPERATURE (exact)			
°C	Centigrade (Celsius) temperature	9/5 (then add 32)	Fahrenheit °F temperature

Metric Equivalents

LINEAR

1 millimeter (mm)	.....	= .0394 in.
1 centimeter (cm)	.....	= .3937 in.
1 decimeter (dm)	.....	= 3.937 in.
1 meter (m)	.....	= 39.37 in. = 1.1 yd.
1 decameter	.....	= 393.7 in. = 10 yd. 2.8 ft.
1 hectometer	.....	= 328 ft. 1 in.
1 kilometer	.....	= 3,280 ft. 1 in.

SQUARE

1 square millimeter	.....	= .00155 sq. in.
1 square centimeter	.....	= .155 sq. in.
1 square meter	.....	= 10.764 sq. ft. or 1.196 sq. yd.
1 square kilometer	.....	= .3861 sq. mile
1 acre	.....	= 100 sq. meters = 119.6 sq. yd. = basic unit in measuring land

CUBIC

1 cubic millimeter	.....	= .000061 cubic inches
1 cubic centimeter	.....	= .0610 cubic inches
1 cubic meter	.....	.....
.....	.....	= 35.314 cubic feet = 1.3079 cubic yards

METRIC EQUIVALENTS, LIQUID OR FLUID MEASURE

	Dry	Liquid
1 centiliter (cl)	..... = .6102 cu. in.	= .338 oz.
1 deciliter (dl) (10 cl) ...	= 6.102 cu. in.	= .845 gill
1 liter (l) (10 dl)	..... = .908 qt.	= 1.0567 qt.
1 decaliter (dal) (10 l)	..... = 9.08 qt.	= 2.64 gal.

MEASURES OF LENGTH or LINEAR MEASURE

- 12 inches (in.) = 1 foot (ft.)
 3 feet = 1 yard (yd.)
 5½ yards or 16½ feet = 1 rod (rd.)
 320 rods or 5280 feet = 1 mile (mi.)

MEASURES OF SURFACE or SQUARE MEASURE

- 144 square inches (sq.in.) = 1 square foot (sq.ft.)
 9 square feet = 1 square yard (sq.yd.)
 30¼ square yards = 1 square rod (sq.rd.)
 160 square rods = 1 acre (a.)
 640 acres = 1 square mile (sq.mi.)

MEASURES OF VOLUME or CUBIC MEASURE

- 1728 cubic inches (cu.in.) = 1 cubic foot (cu.ft.)
 27 cubic feet = 1 cubic yard (cu.yd.)

LIQUID MEASURE

- 4 gills (gi.) = 1 pint (pt.)
 2 pints = 1 quart (qt.)
 4 quarts = 1 gallon (gal.)

DRY MEASURE

- 2 pints (pt.) = 1 quart (qt.)
 8 quarts = 1 peck (pk.)
 4 pecks = 1 bushel (bu.)

MEASURES OF WEIGHT (Avoirdupois)

- 16 ounces (oz.) = 1 pound (lb.)
 100 pounds = 1 hundredweight (cwt.)
 2000 pounds = 1 ton (t.)

MISCELLANEOUS MEASURES

- 1 gallon occupies 231 cubic inches
 1 cubic foot contains about 7.5 gallons
 1 cubic foot of water weighs about 62 pounds
 1 bushel occupies 2150.4 cubic inches (approx 1¼ cubic feet)
 1 barrel contains about 31½ gallons

MEASURES OF ANGLES AND ARCS

- 60 seconds (") = 1 minute (')
 60 minutes = 1 degree (°)
 90 degrees = 1 right angle or quadrant
 360 degrees of arc = a circle

METRIC MEASURES OF LENGTH

- 10 millimeters (mm.) = 1 centimeter (cm.)
 10 centimeters = 1 decimeter (dm.)
 10 decimeters = 1 meter (m.)
 1000 meters = 1 kilometer (km.)
 1 meter = 39.37 in. - 1 km. = .62137 mi. - 1 inch = 2.54 cm.

Square Feet to Square Metres

SQ. FT.	SQ. METRES	SQ. FT.	SQ. METRES
10	0.929	300	27.871
20	1.858	310	28.800
30	2.787	320	29.729
40	3.716	330	30.658
50	4.645	340	31.587
60	5.574	350	32.516
70	6.503	360	33.445
80	7.432	370	34.374
90	8.361	380	35.303
100	9.290	390	36.232
110	10.219	400	37.161
120	11.148	410	38.090
130	12.077	420	39.019
140	13.006	430	39.948
150	13.935	440	40.877
160	14.864	450	41.806
170	15.794	460	42.735
180	16.723	470	43.664
190	17.652	480	44.593
200	18.581	490	45.522
210	19.510	500	46.452
220	20.439		
230	21.368	600	55.742
240	22.297		
		700	65.032
250	23.226		
260	24.155	800	74.322
270	25.084		
280	26.013	900	83.613
290	26.942		
		1000	92.903

Fraction and Decimal Equivalents

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

Conversion Tables					
Length			Volume		
centimetres (cm)	inches (cm)	inches	litres	litres UK gallons	UK gallons
2.54	1	0.394	4.546	1	0.220
5.08	2	0.787	9.092	2	0.440
7.62	3	1.181	13.638	3	0.660
10.16	4	1.575	18.184	4	0.880
12.70	5	1.969	22.730	5	1.100
15.24	6	2.362	27.276	6	1.320
17.78	7	2.756	31.822	7	1.540
20.32	8	3.150	36.368	8	1.760
22.86	9	3.543	40.914	9	1.980
25.40	10	3.937	45.460	10	2.200
50.80	20	7.874	90.919	20	4.399
kilometres (km)	miles (km)	miles	litres	litres US gallons	US gallons
1.609	1	0.621	3.785	1	0.264
3.219	2	1.243	7.571	2	0.528
4.828	3	1.864	11.356	3	0.793
6.437	4	2.485	15.142	4	1.057
8.047	5	3.107	18.927	5	1.321
9.656	6	3.728	22.712	6	1.585
11.265	7	4.350	26.498	7	1.849
12.875	8	4.971	30.293	8	2.113
14.484	9	5.592	34.069	9	2.378
16.093	10	6.214	37.854	10	2.642
32.187	20	12.427	75.708	20	5.283
Area/Surfaces			Weight		
hectares (ha)	ha acres	acres	kilograms (kg)	pounds (kg)	pounds
0.405	1	2.471	0.454	1	2.205
0.809	2	4.942	0.907	2	4.409
1.214	3	7.413	1.361	3	6.614
1.619	4	9.884	1.814	4	8.819
2.023	5	12.355	2.268	5	11.023
2.428	6	14.826	2.722	6	13.228
2.833	7	17.297	3.175	7	15.432
3.237	8	19.769	3.629	8	17.637
3.642	9	22.240	4.082	9	19.842
4.047	10	24.711	4.536	10	22.046

Circumferences and Areas of Circles

Diameter (Inches)	Circumference (Inches)	Area (Sq.In.)
2-1/2"	7.8540	4.9087
2-5/8"	8.2467	5.4119
2-3/4"	8.6394	5.9396
2-7/8"	9.0321	6.4918
3"	9.4248	7.6860
3-1/8"	9.8175	7.6990
3-1/4"	10.2102	8.2958
3-3/8"	10.6029	8.9462
3-1/2"	10.9956	9.6211
3-5/8"	11.3883	10.3206
3-3/4"	11.7810	11.0447
3-7/8"	12.1737	11.7933
4"	12.5664	12.5664
4-1/2"	14.1372	15.9043
5"	15.7080	19.6850
5-1/2"	17.2788	23.7583
6"	18.8496	28.2744
6-1/2"	20.4204	33.1831

Standard U.S. Gauge of Sheet Steel Cold Rolled Steel

No. of Gauge	Thickness in Fraction	Thickness in Decimal	Wgt. Per Sq. Ft.
10	9/64	.1345	5.625
11	1/8	.1196	5.
12	7/64	.1046	4.375
13	3/32	.0897	3.75
14	5/64	.0747	3.125
15	9/128	.0673	2.8125
16	1/16	.0598	2.5
17	9/160	.0538	2.25
18	1/20	.0478	2.
19	7/160	.0418	1.75
20	3/80	.0359	1.50
21	11/320	.0329	1.375
22	1/32	.0299	1.25
23	9/320	.0269	1.125
24	1/40	.0239	1.
25	7/320	.0209	.875
26	3/160	.0179	.75
27	11/640	.0164	.6875
28	1/64	.0149	.625
29	9/640	.0135	.5625
30	1/80	.0120	.5

GALVANIZED STEEL

10	.1382	5.781
11	.1233	5.156
12	.1084	4.531
13	.0934	3.906
14	.0785	3.281
15	.071	2.969
16	.0635	2.656
17	.0575	2.406
18	.0516	2.156
19	.0456	1.906
20	.0396	1.656
21	.0366	1.531
22	.0336	1.406
23	.0306	1.281
24	.0276	1.156
25	.0247	1.031
26	.0217	.906
27	.0202	.844
28	.0187	.781
29	.0172	.719
30	.0157	.656

Capacity of Round Pipes

Dia. of Pipe	Circum. in In.	Area in Sq. In.
1"	3.14	0.79
2"	6.28	3.14
3"	9.42	7.07
4"	12.57	12.7
5"	15.7	19.6
6"	18.85	28.3
7"	21.99	38.5
8"	25.13	50.27
9"	28.27	63.62
10"	31.41	78.5
11"	34.55	95.0
12"	37.70	113
13"	40.84	133
14"	43.98	154
15"	47.12	176
16"	50.26	201
17"	53.41	227
18"	56.54	254
19"	59.69	283
20"	62.83	314
21"	65.97	346
22"	69.12	380
23"	72.25	415
24"	75.40	452
25"	78.54	490
26"	81.68	530
27"	84.81	572
28"	87.96	615
29"	91.11	660
30"	94.25	707

To find circumference of circle multiply diameter by 3.1416.

To find diameter of circle, multiply circumference by .31831.

To find area of circle, multiply square of diameter by .7854.

Galvanized and Pre-Painted Sheet Metal

Thickness Gauge	Size Inches	Approx Weight per Sheet (lbs)
30 gauge	.016" (.656 Lbs/Sq Ft)	
	30x120	16.40
	36x 96	15.74
	36x120	19.58
28 gauge	.019" (.781 Lbs/Sq Ft)	
	30x 96	15.62
	30x120	19.53
	36x 96	18.75
	36x120	23.44
	48x 96	25.00
	48x120	31.24
26 gauge	.022" (.906 Lbs/Sq Ft)	
	30x 96	18.12
	30x120	22.66
	36x 96	21.75
	36x120	27.19
	48x 96	29.00
	48x120	36.20
24 gauge	.028" (1.156 Lbs/Sq Ft)	
	30x 96	23.12
	30x120	28.91
	36x 96	27.75
	36x120	34.69
	48x 96	37.00
	48x120	46.22
	60x120	57.80

Gauge #	Thickness	
	Inches	MM
8	0.1681	4.2697
9	0.1532	3.8913
10	0.1328	3.3731
11	0.1233	3.1318
12	0.1084	2.7534
13	0.0934	2.3724
14	0.0785	1.9939
15	0.0710	1.8034
16	0.0635	1.6129
17	0.0575	1.4605
18	0.0516	1.3106
19	0.0456	1.1582
20	0.0396	1.0058
21	0.0366	0.9296
22	0.0336	0.8534
23	0.0306	0.7772
24	0.0276	0.7010
25	0.0247	0.6274
26	0.0217	0.5512
27	0.0202	0.5131
28	0.0187	0.4750
29	0.0172	0.4369
30	0.0157	0.3988

Flat Rolled Products							
	Hot Rolled, HR P & O, Cold Rolled				Galvanized		
MSG No.	Thick Equiv.	Toler. HR, P&O	Range CR	Lbs. per Sq. Ft.	Thick. Equiv.	Toler. Range	Lbs. per Sq. Ft.
7	.179	.187 .171	.187 .171	7.500			
8	.164	.172 .156	.172 .156	6.875	.168	.177 .159	7.031
9	.149	.157 .141	.157 .141	6.250	.153	.162 .144	6.406
10	.134	.142 .126	.140 .128	5.625	.138	.147 .129	5.781
11	.120	.128 .112	.126 .114	5.000	.123	.132 .114	5.156
12	.105	.113 .097	.111 .099	4.375	.108	.117 .099	4.531
13	.090	.097 .083	.095 .085	3.750	.093	.101 .085	3.906
14	.075	.082 .068	.080 .070	3.125	.079	.087 .071	3.281
15	.067	.074 .060	.072 .062	2.812	.071	.077 .065	2.969
16	.060	.067 .053	.065 .055	2.500	.064	.070 .058	2.656
17	.054	.060 .048	.058 .050	2.250	.058	.063 .053	2.406
18	.048	.054 .042	.052 .044	2.000	.052	.057 .047	2.156
19	.042		.046 .038	1.750	.046	.051 .041	1.906
20	.036		.039 .033	1.500	.040	.044 .036	1.656
21	.033		.036 .030	1.375	.037	.041 .033	1.531
22	.030		.033 .027	1.250	.034	.038 .030	1.406
23	.027		.030 .024	1.125	.031	.035 .027	1.281
24	.024		.027 .021	1.000	.028	.032 .024	1.156
25	.021		.024 .018	.875	.025	.029 .021	1.031
26	.018		.020 .016	.750	.022	.025 .019	.906
27	.016		.018 .014	.688	.020	.023 .017	.844
28	.015		.017 .013	.625	.019	.022 .016	.781
29	.014		.016 .012	.562	.017	.020 .014	.719
30	.012		.014 .010	.500	.016	.019 .013	.656

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METAL JOINING

GALVANIC ACTIVITY

Aluminum
Zinc
Galvanized Iron
Tin Plate
Lead
Stainless Steel
Copper
Monel

Metals far apart in table should
not come in contact with each other

THERMAL EXPANSION FACTORS

Metals	Inches per Deg.
Aluminum (wrought)	0.0000128
Bronze	0.0000101
Copper	0.0000098
Lead	0.0000159
Monel	0.0000078
Steel	0.0000067
Tin	0.0000825
Zinc	0.0000178

Total expansion (E) equals the span (S) in inches
of material TIMES avg. temperature difference between
winter and summer (100 degrees F) TIMES factor (F)

$$E = S \times 100 \times F$$

Example: Find the expansion allowance for a
20 foot length of copper flashing

$$E = 20 \times .0000098 \times 100 = .0196"$$

METAL JOINING

**ARC WELDING - LIGHT GAUGE MILD STEEL
E6013 - ALL POSITION - AC & DC POLARITY**

Thickness of Metal to be Welded	Diameter of Electrode	Bare Electrodes		Coated Electrodes	
		Voltage Across Arc	Welding Cur.(Amps)	Voltage Across Arc	Welding Cur.(Amps)
22-18 gauge	1/16"	15-17	25-30	16-18	30-35
18-16 gauge	3/32"	15-17	35-80	16-18	40-90
1/16"-1/8"	1/8"	17-20	90-135	20-22	90-140
1/8"-5/16"	5/32"	18-20	115-175	20-25	115-220

METAL JOINING

SOLDERING

FLUXES	METALS
Muriatic Acid (Raw Acid)	Galvanized Iron Dull Brass Dull Copper
Zinc Chloride (Cut Acid) Zinc added to Muriatic Acid until boiling stops	Black Iron Copper Brass Iron Zinc Monel Tarnished Tin Plate
Rosin	Tin Plate Lead Bright Copper Terne Plate
Dipping solution 1/2 oz. Sal Ammoniac to 1 quart water	

Gutters and Downspouts

Recommendations:

- 1) Gutter slope = 1" to 16' minimum.
- 2) Gutters under 4" wide should be avoided.
- 3) Leaders spaced less than 20 ft. apart will take same size gutter as leader.
- 4) Leaders spaced over 20 ft. apart add 1" to leader dia. for each 30 ft. of peak roof, or each 40 ft. of flat roof.
- 5) Corrugated downspouts in freezing climates.
- 6) Expansion slip joints set 30 ft. apart.
- 7) General rule: 1 sq. in. of leader for each 100 sq. ft. of roof area.

LEADER & GUTTER SIZE REQUIREMENTS

Inches per 5-Minute Rainfall Intensity	Roof Area (Sq. Ft.)	Leader Size Rd. Rct.	Gutter Size (D/W = .75) Distance Between Leaders 20 Ft.
.30	0 to 2000	3" 2" x 3"	5"
	0 to 2100	3" 2" x 3"	6"
	0 to 3850	4" 3" x 4"	7"
	0 to 6195	5" 3" x 4"	8"
.35	0 to 1700	3" 2" x 3"	5"
	0 to 1800	3" 2" x 3"	6"
	0 to 3300	4" 3" x 4"	7"
	0 to 5310	5" 3" x 4"	8"
.40	0 to 800	3" 2" x 3"	4"
	0 to 1500	3" 2" x 3"	5"
	0 to 2750	4" 3" x 4"	7"
	0 to 4425	5" 3" x 4"	8"
.45	0 to 1320	3" 2" x 3"	5"
	0 to 2420	4" 3" x 4"	7"
	0 to 3894	5" 3" x 4"	8"
.50	0 to 1200	3" 2" x 3"	5"
	0 to 2200	4" 3" x 4"	7"
	0 to 3540	5" 3" x 4"	8"
.55	0 to 1080	3" 2" x 3"	5"
	0 to 1980	4" 3" x 4"	7"
	0 to 3186	5" 3" x 4"	8"
.60	0 to 1020	3" 2" x 3"	5"
	0 to 1870	4" 3" x 4"	7"
	0 to 3009	5" 3" x 4"	8"
.65	0 to 900	3" 2" x 3"	5"
	0 to 1650	4" 3" x 4"	7"
	0 to 2755	5" 3" x 4"	8"
.70	0 to 840	3" 2" x 3"	5"
	0 to 1540	4" 3" x 4"	7"
	0 to 2478	5" 3" x 4"	8"
.75	0 to 780	3" 2" x 3"	5"
	0 to 1470	4" 3" x 4"	7"
	0 to 2300	5" 3" x 4"	8"
.80	0 to 720	3" 2" x 3"	5"
	0 to 1320	4" 3" x 4"	7"
	0 to 2124	5" 3" x 4"	8"

**Square Inches of Free Area Required for Adequate Ventilation of Attic Space
Width of Space to be Ventilated (in feet)**

(Feet)	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
12	58	69	81	92	104	115	127	138	150	162	173	185	196	208	219	231	242	254	265	277	288
14	67	81	94	108	121	135	148	162	175	188	202	215	229	242	256	269	283	296	310	323	337
16	77	92	108	123	138	154	169	185	200	215	231	246	262	277	292	308	323	338	354	369	385
18	87	104	121	138	156	173	190	208	225	242	260	277	294	312	329	346	363	381	398	415	433
20	96	115	135	154	173	192	212	231	250	269	288	308	327	346	365	385	404	423	442	462	481
22	106	127	148	169	190	212	233	254	275	296	317	338	360	381	402	423	444	465	487	508	529
24	115	138	162	185	208	231	254	277	300	323	346	369	392	415	438	462	485	508	531	554	577
26	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625
27	130	156	182	208	234	260	286	312	338	363	389	415	441	467	493	519	545	571	597	623	649
30	144	173	202	231	260	288	317	346	375	404	433	462	490	519	548	577	606	635	663	692	721
32	154	185	215	246	277	308	338	369	400	431	462	492	523	554	585	615	646	677	708	738	769
34	163	196	229	262	294	327	360	392	425	458	490	523	556	588	621	654	687	719	752	785	817
36	173	208	242	277	312	346	381	415	450	485	519	554	588	623	658	692	727	762	796	831	865
38	183	219	256	292	329	365	402	438	475	512	548	585	621	658	694	731	767	804	840	877	913
40	192	231	269	308	346	385	423	462	500	538	577	615	654	692	731	769	808	846	885	923	962
42	202	242	283	323	363	404	444	485	525	565	606	646	687	727	767	808	848	888	929	969	1010
44	212	254	296	338	381	423	465	508	550	592	635	677	719	762	804	846	888	931	973	1015	1058
46	221	265	310	354	398	442	487	531	575	619	663	708	752	796	840	885	929	973	1017	1062	1106
48	231	277	323	369	415	462	508	554	600	646	692	738	785	831	877	923	969	1015	1062	1108	1154
50	240	288	337	385	433	481	529	577	625	673	721	769	817	865	913	962	1010	1058	1106	1154	1202

Calculation for Total Girth of Flashing

Fraction	Decimal	Fraction	Decimal
1/8	0.12500	1/16	0.06250
2/8	0.25000	2/16	0.12500
3/8	0.37500	3/16	0.18750
4/8	0.50000	4/16	0.25000
5/8	0.62500	5/16	0.31250
6/8	0.75000	6/16	0.37500
7/8	0.87500	7/16	0.43750
8/8	1.00000	8/16	0.50000
		9/16	0.56250
Fraction	Decimal	10/16	0.62500
1/4	0.25000	11/16	0.68750
2/4	0.50000	12/16	0.75000
3/4	0.75000	13/16	0.81250
4/4	1.00000	14/16	0.87500
		15/16	0.93750
Fraction	Decimal	16/16	1.00000
1/2	0.50000		
2/2	1.00000		

Fraction	Decimal
1/16	0.06250
1/8	0.12500
3/16	0.18750
1/4	0.25000
5/16	0.31250
3/8	0.37500
6/16	0.37500
7/16	0.43750
1/2	0.50000
9/16	0.56250
5/8	0.62500
11/16	0.68750
3/4	0.75000
13/16	0.81250
7/8	0.87500
15/16	0.93750

You can use the above chart to help calculate custom metal orders. By using the decimals on a calculator you can easily add any measurements E.G. The following profile would be calculated on a calculator as follows:

$$1-1/8 + 1-1/4 + 1-5/8 + 2-1/16 + 1/2$$

$$1.125 + 1.25 + 1.625 + 2.0625 + .5 = 6.5625$$

Total Girth of Flashing 6-9/16