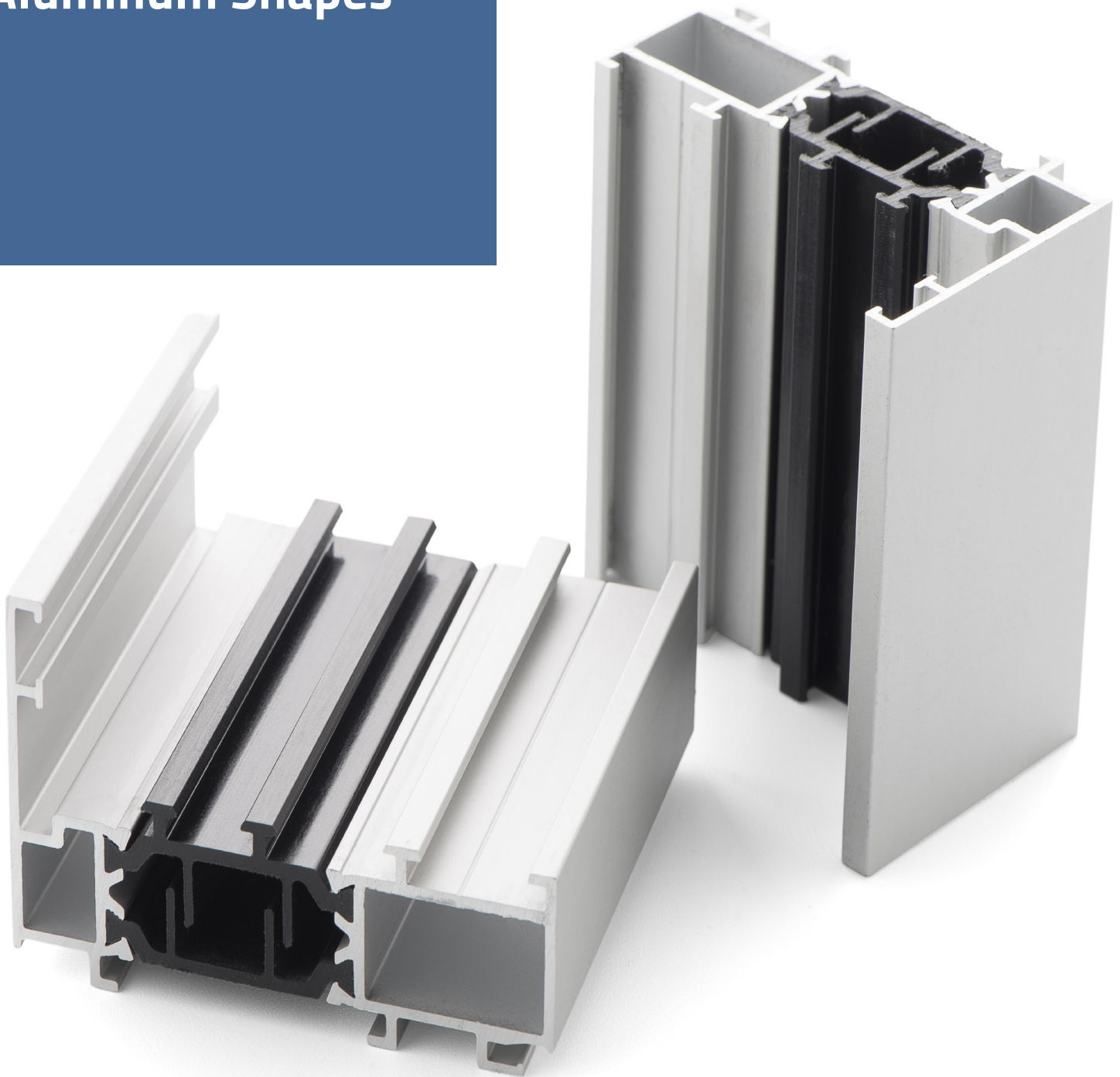


# STANDARD

Aluminum Shapes



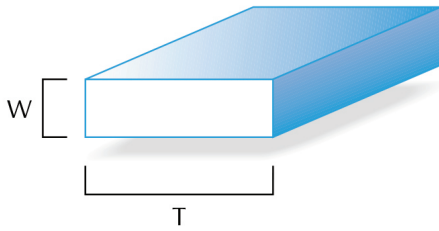
Thousands of Standard Dies Available

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### STANDARD DIE DATA

- (a) .015 RadII All Corners • (b) .030 RadII All Corners  
 (c) .062 RadII All Corners • (d) .125 RadII All Corners  
 (e) .187 RadII All Corners

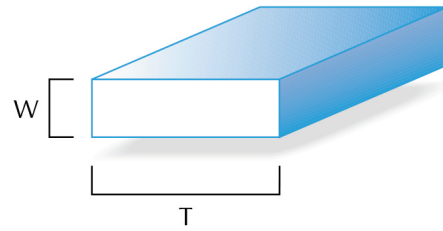


### FLAT BAR

Thickness	Width	Est Wt Lbs/Ft	NNE DIE#
.090	2.000	.216	11119
.093	2.625	.293	11120
.093	3.250	.363	11121
.125	.375	.056	731
.125	.500	.076	351
.125	.625	.094	750
.125	.688	.103	5072
.125	.750	.113	529
.125	.875	.121	4015 (b)
.125	1.000	.150	528
.125	1.125	.169	517
.125	1.250	.187	748
.125	1.500	.226	790
.125	1.750	.262	753
.125	2.000	.300	754
.125	2.250	.337	13400*
.125	2.500	.374	S-2052
.125	2.750	.412	14993*
.125	3.000	.450	975
.125	3.250	.487	14480*
.125	3.500	.524	681
.125	3.750	.562	14481*
.125	4.000	.600	982
.125	4.250	.637	13404*
.125	4.500	.674	S-340
.125	4.750	.713	5780
.125	5.000	.750	2589
.125	5.250	.787	14716*
.125	5.500	.824	682
.125	5.750	.862	14789
.125	6.000	.900	2590
.187	.500	.112	406
.187	.750	.169	15827
.187	1.000	.224	352
.187	1.250	.282	4284
.187	1.375	.308	3455
.187	1.437	.323	11161
.187	1.500	.338	411
.187	1.750	.395	5368

### STANDARD DIE DATA

- (a) .015 RadII All Corners • (b) .030 RadII All Corners  
 (c) .062 RadII All Corners • (d) .125 RadII All Corners  
 (e) .187 RadII All Corners



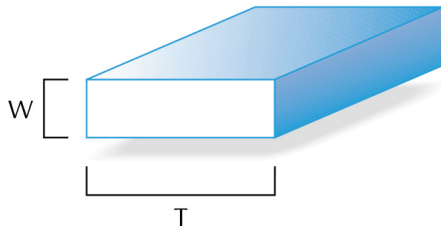
### FLAT BAR

Thickness	Width	Est Wt Lbs/Ft	NNE DIE#
.187	2.000	.449	438
.187	2.500	.562	S-571
.187	3.000	.673	2051
.187	4.000	.902	7462
.187	6.000	1.346	S-1010
.210	6.000	1.511	15670 (b)
.250	.500	.150	6909
.250	.750	.226	572
.250	1.000	.283	11879 (d)
.250	1.000	.300	1769
.250	1.250	.375	6310 (c)
.250	1.250	.375	4283
.250	1.281	.384	5074
.250	1.375	.413	5198
.250	1.500	.450	1627
.250	1.750	.526	2651
.250	1.875	.562	7170
.250	2.000	.600	S-511
.250	2.250	.675	14998*
.250	2.500	.750	2201/S-1069
.250	2.750	.825	13408*
.250	3.000	.900	788
.250	3.250	.980	8819
.250	3.500	1.050	6969
.250	3.750	1.125	13409
.250	4.000	1.200	1225
.250	4.250	1.275	13410*
.250	4.500	1.350	12641
.250	5.000	1.500	983
.250	5.250	1.575	13412*
.250	5.500	1.650	2231
.250	5.750	1.725	2200
.250	6.000	1.800	984/S-1014
.250	6.500	1.950	14990*
.250	7.000	2.100	14991*
.312	.750	.281	2665
.312	1.500	.561	6719
.312	2.000	.748	5202
.312	3.000	1.123	13414

\* Die may not be available. Check with a customer service representative

### STANDARD DIE DATA

- (a) .015 RadII All Corners • (b) .030 RadII All Corners  
 (c) .062 RadII All Corners • (d) .125 RadII All Corners  
 (e) .187 RadII All Corners

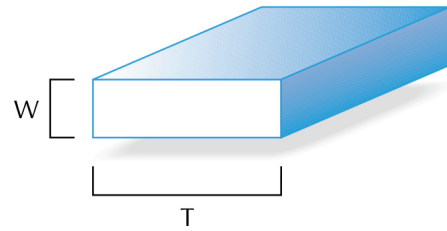


### FLAT BAR

Thickness	Width	Est Wt Lbs/Ft	NNE DIE#
.312	4.000	1.498	13415
.312	5.000	1.872	S-764
.312	5.500	2.059	S-1059 (c)
.312	6.000	2.246	10503
.375	.500	.224	762
.375	.625	.281	S-759
.375	.750	.338	758
.375	1.000	.450	S-777
.375	1.250	.563	314
.375	1.375	.630	S-1117 (e)
.375	1.500	.676	1179
.375	1.750	.787	2050
.375	2.000	.900	777
.375	2.250	1.012	13417*
.375	2.500	1.126	318
.375	2.750	1.237	13418*
.375	3.000	1.350	S-717
.375	3.250	1.462	13419*
.375	3.500	1.576	2049
.375	3.750	1.687	13420
.375	4.000	1.800	2048
.375	4.250	1.912	13421*
.375	4.500	2.030	13422
.375	4.750	2.138	13423*
.375	5.000	2.250	6830
.375	5.500	2.475	14992*
.375	6.000	2.700	14903
.375	6.500	2.925	14994*
.375	7.000	3.150	14995*
.375	8.000	3.600	14996
.500	.750	.450	778
.500	1.000	.584	524 (d)
.500	1.000	.595	642
.500	1.250	.750	671
.500	1.500	.900	289
.500	1.750	1.050	1768
.500	2.000	1.200	287
.500	2.500	1.500	776
.500	3.000	1.800	S-1054

### STANDARD DIE DATA

- (a) .015 RadII All Corners • (b) .030 RadII All Corners  
 (c) .062 RadII All Corners • (d) .125 RadII All Corners  
 (e) .187 RadII All Corners



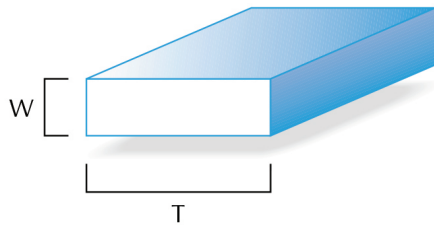
### FLAT BAR

Thickness	Width	Est Wt Lbs/Ft	NNE DIE#
.500	3.500	2.100	6858
.500	4.000	2.400	2047
.500	5.000	3.000	S-1156
.500	6.000	3.600	8617
.500	7.000	4.200	2182
.500	8.000	4.800	14997
.562	3.000	2.018	304 (e)
.625	1.000	.750	592
.625	1.750	1.313	831
.625	2.000	1.500	980
.625	3.000	2.250	981
.625	3.250	3.900	1438
.630	9.00	5.803	15758
.750	1.000	.900	593
.750	1.250	1.125	2043
.750	1.500	1.350	315
.750	1.750	1.576	1817
.750	2.000	1.800	775
.750	2.500	2.250	317
.750	2.500	2.214	1321 (e)
.750	2.750	2.474	1176
.750	3.000	2.700	15001*
.750	3.500	3.150	6600
.750	4.000	3.600	2657
.750	5.000	4.500	S-783
.750	6.000	5.400	15044
.750	7.000	6.300	14999*
.750	8.000	7.200	15000
.750	9.310	8.379	14971
.780	9.000	8.424	14724
.860	1.360	1.365	5325
.860	1.860	1.854	5326 (c)
1.000	1.250	1.400	4822
1.000	1.500	1.800	316
1.000	1.750	2.100	2307
1.000	2.000	2.400	766
1.000	2.500	3.000	767
1.000	3.000	3.600	319
1.000	3.000	3.600	3439 (d)

\* Die may not be available. Check with a customer service representative

### STANDARD DIE DATA

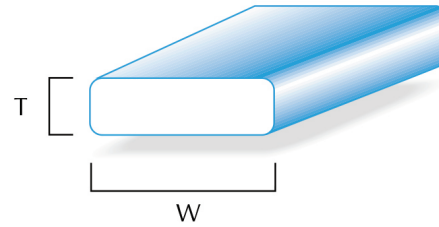
- (a) .015 RadII All Corners • (b) .030 RadII All Corners  
 (c) .062 RadII All Corners • (d) .125 RadII All Corners  
 (e) .187 RadII All Corners



### FLAT BAR

Thickness	Width	Est Wt Lbs/Ft	NNE DIE#
1.000	3.250	3.900	2308
1.000	4.000	4.800	2223
1.000	5.000	6.000	15614
1.000	5.500	6.600	2340
1.000	6.000	7.200	15060
1.000	7.000	8.400	15002*
1.000	8.000	9.600	15847
1.125	2.500	3.375	7653
1.250	2.000	3.000	9335
1.250	2.500	3.750	S-13427
1.250	2.750	4.124	1450 (e)
1.250	3.000	4.500	336
1.500	4.000	7.200	15278
2.000	2.500	6.000	15846
2.000	3.000	7.200	13164
2.000	3.250	7.800	15673
2.000	4.000	9.600	15277
2.500	3.000	9.000	15845

### STANDARD DIE DATA



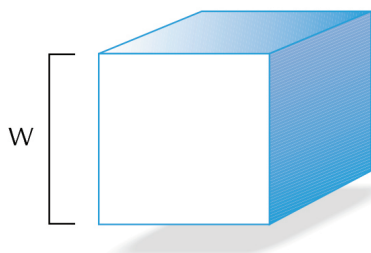
### FLAT BAR RADIUS CORNER

Thickness	Width	Radius	Est Wt Lbs/Ft	NNE DIE#
.250	1.000	.125	.125	11879
.250	2.000	.125	.584	3740
.250	3.000	.125	.884	3739
.250	4.000	.125	1.184	3738
.250	5.000	.125	1.484	3737
.312	5.500	.062	2.059	S-1059
.500	.000	.250	1.138	S-827
.750	4.000	.062	3.600	S-1058
.375	1.375	.188	.590	S-1117

\* Die may not be available. Check with a customer service representative

## STANDARD DIE DATA

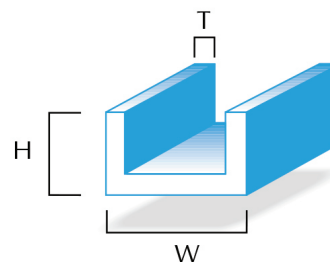
(a) .093 RadII All Corners •(b) .125 RadII All Corners  
(c) .062 RadII All Corners



### SQUARE BAR

Width	Est Wt Lbs/Ft	NNE DIE#
.250	.075	6182
.312	.116	1199
.375	.169	661
.500	.300	1180
.562	.379	8363
.625	.469	979
.750	.674	1181
.875	.918	7498
1.000	1.200	1182
1.000	1.200	4052 (b)
1.250	1.876	920 (a)
1.250	1.876	S-1200
1.375	2.269	15185
1.500	2.700	885
1.750	3.676	12692
1.750	3.674	S-1057 (c)
2.000	4.800	2224
2.250	6.075	15003
2.500	7.500	15004
2.750	9.075	15005*
3.000	10.800	15059
3.500	15.000	15844

## STANDARD DIE DATA

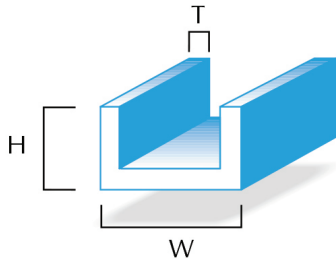


### CHANNELS

Width	Heights	Thickness	Est Wt Lbs/Ft	NNE DIE#
.432	.500	.060	.094	137
.500	.375	.125	.148	6449
.500	.500	.093	.146	S-662
.500	.500	.125	.187	4156
.500	.750	.125	.262	S-2313
.500	1.000	.093	.244	3746
.543	.625	.125	.232	2577
.565	.625	.125	.235	2578
.625	.500	.125	.206	530
.625	.625	.064	.134	439
.625	.625	.125	.244	477
.625	.750	.094	.217	4155
.625	1.000	.125	.356	1373
.687	.422	.093	.148	10292
.750	.375	.125	.187	6939
.750	.500	.062	.121	268
.750	.500	.125	.226	531
.750	.750	.125	.300	478
.750	.875	.125	.337	4998
.875	1.000	.125	.393	7275
1.000	.500	.125	.263	508
1.000	.625	.125	.300	2233
1.000	.750	.093	.259	2727
1.000	.750	.125	.337	2053
1.000	1.000	.125	.413	446
1.000	2.000	.125	.713	S-1037
1.031	.625	.062	.161	S-323
1.250	.375	.125	.263	507
1.250	.500	.125	.300	340
1.250	.500	.250	.413	S-796
1.250	.625	.125	.337	506
1.250	.750	.125	.376	S-1583
1.250	1.250	.125	.526	663
1.312	1.750	.125	.682	8859
1.375	.750	.062	.205	924
1.375	.875	.125	.431	505
1.500	.375	.125	.300	504
1.500	.500	.125	.337	S-445
1.500	.625	.125	.376	503
1.500	.750	.125	.413	2054
1.500	1.000	.118	.466	S-1221
1.500	1.000	.125	.487	S-747

\* Die may not be available. Check with a customer service representative

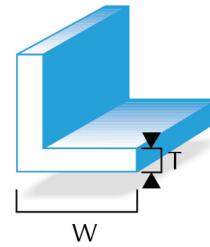
## STANDARD DIE DATA



### CHANNELS

Width	Heights	Thickness	Est Wt Lbs/Ft	NNE DIE#
1.500	1.062	.062	.261	10056*
1.500	1.250	.125	.563	632
1.500	1.500	.125	.637	563
1.750	.500	.125	.376	501
1.750	.750	.125	.437	499
1.750	1.000	.125	.524	4157
1.750	1.750	.125	.625	S-1032
1.750	2.000	.093	.620	S-574
1.800	3.500	.120	1.232	7709
2.000	.500	.125	.413	15658
2.000	1.000	.093	.426	S-2215
2.000	1.000	.118	.532	S-1189
2.000	1.000	.125	.526	444
2.000	1.000	.187	.815	S-2569
2.000	1.000	.250	1.050	6749
2.000	1.250	.125	.637	S-266
2.000	2.000	.125	.863	524
2.187	6.250	.250	4.256	8316*
2.250	.875	.125	.562	S-7386
2.263	1.125	.105	.546	S-1039
2.500	.750	.125	.562	S-2055
2.500	1.000	.187	.926	2570
2.500	1.500	.125	.787	2057
2.500	2.500	.125	1.087	3510
2.500	5.500	.125	1.987	5547
2.750	1.125	.250	1.350	2007
3.000	.500	.125	.563	1496
3.000	.750	.125	.637	S-700
3.000	1.000	.093	.537	10009
3.000	1.000	.125	.713	S-816
3.000	1.500	.125	.845	S-556
3.000	2.000	.125	1.013	5266
3.000	2.000	.375	2.813	2008
3.000	3.000	.125	1.313	3511
3.625	.812	.125	.750	2790
4.000	1.500	.125	1.013	605
4.000	1.750	.125	1.087	S-4152
4.500	1.750	.125	1.161	4151
4.500	2.000	.125	1.238	S-2056
5.000	2.000	.187	1.936	713
5.250	1.125	.125	1.087	11075

## STANDARD DIE DATA

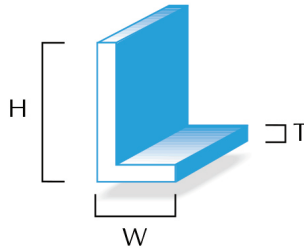


### EQUAL LEG ANGLES

Width	Thickness	Est Wt Lbs/Ft	NNE DIE#
.500	.093	.101	461
.500	.125	.131	447
.500	.062	.070	442
.625	.062	.089	463
.625	.093	.130	462
.625	.125	.168	441
.625	.188	.239	9142
.750	.125	.199	S-378
.750	.062	.107	S-464
.750	.093	.157	465
1.000	.250	.526	466
1.000	.187	.407	473
1.000	.125	.281	165
1.000	.050	.118	S-698
1.000	.062	.144	470
1.250	.062	.181	7300
1.250	.125	.356	450
1.250	.187	.520	S-270
1.250	.250	.676	467
1.500	.093	.324	S-1038
1.500	.125	.431	339
1.500	.187	.631	443
1.500	.250	.825	S-183
1.500	.500	1.500	9773
1.500	.062	.218	3432
1.750	.125	.506	S-468
1.750	.187	.744	440
1.750	.250	.936	7886
1.750	.437	1.606	427
2.000	.093	.440	S-977
2.000	.250	1.126	448
2.000	.125	.581	178
2.000	.187	.856	S-469
2.500	.125	.730	5199
2.500	.187	1.085	8282
3.000	.125	.881	521
3.000	.187	1.310	4952
3.000	.250	1.725	S-5261
3.500	.125	1.031	7647
4.000	.125	1.180	5345
4.000	.375	3.436	15843

\* Die may not be available. Check with a customer service representative

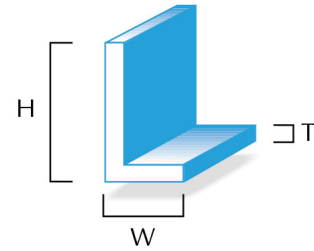
### STANDARD DIE DATA



### UNEQUAL LEG ANGLES

Width	Height	Thickness	Est Wt Lbs/Ft	NNE DIE#
.312	2.000	.125	.328	1388
.375	.750	.093	.115	781
.375	1.000	.062	.100	329
.500	.750	.062	.089	800
.500	.750	.125	.168	4154
.500	1.000	.093	.157	782
.500	1.000	.125	.206	S-787
.500	1.062	.187	.308	344
.500	1.250	.125	.244	588
.500	1.500	.125	.281	2059
.500	2.000	.125	.356	10342
.500	3.000	.125	.506	10245
.625	.875	.125	.206	1528
.625	1.000	.188	.324	6014
.625	1.750	.090	.247	S-111
.625	1.750	.125	.300	7878
.750	1.000	.125	.244	678
.750	1.000	.250	.450	13612
.750	1.250	.125	.281	419
.750	1.500	.125	.319	S-786
.750	1.800	.250	.690	14204
.750	2.000	.125	.394	2058
.750	2.250	.125	.431	625
.750	2.250	.250	.825	241
.813	1.062	.050	.109	7710
1.000	1.500	.060	.180	15818
1.000	1.500	.125	.356	S-785
1.000	1.500	.156	.439	449
1.000	1.750	.125	.393	4979
1.000	2.000	.125	.431	346
1.000	2.000	.187	.631	955
1.000	2.500	.125	.506	5196
1.000	3.000	.125	.581	523
1.000	3.250	.250	1.080	3699
1.000	4.000	.125	.730	4153
1.125	2.250	.125	.487	680
1.250	2.000	.250	.900	760
1.250	3.500	.125	.694	792
1.250	6.000	.125	1.062	15087
1.500	1.750	.125	.468	6943
1.500	2.000	.125	.506	5200
1.500	2.000	.188	.747	15682

### STANDARD DIE DATA



### UNEQUAL LEG ANGLES

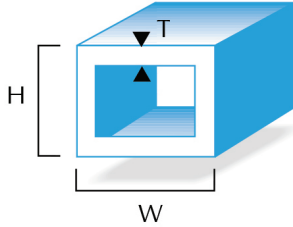
Width	Height	Thickness	Est Wt Lbs/Ft	NNE DIE#
1.500	2.250	.125	.526	631
1.500	2.500	.125	.579	5201
1.500	4.000	.188	1.200	10575
1.938	3.000	.187	1.071	3775
2.000	2.250	.250	1.200	4828
2.000	2.500	.125	.660	7760
2.000	3.000	.125	.731	5144
2.000	3.000	.250	1.424	S-4808
2.000	3.500	.125	.806	7096
2.000	4.000	.125	.881	S-530
2.000	5.000	.125	1.019	S-1261
2.250	5.250	.125	1.144	5256
2.500	3.500	.125	.808	6806
2.750	4.750	.250	2.176	5044
3.000	3.500	.125	.956	5545
3.000	4.000	.125	1.031	6944
3.000	5.000	.125	1.180	5258
3.000	5.500	.375	3.655	6888
3.187	4.500	.187	1.688	10853
4.000	5.000	.125	1.330	5257
5.000	2.000	.125	1.019	S-1261
6.000	1.250	.125	1.062	15087

\* Die may not be available. Check with a customer service representative



## STANDARD DIE DATA

- (a) Inside Corners .062 RadII • (b) Outside Corners .125 RadII  
 (c) Inside Corners .125 RadII • (d) Shape has ID Work  
 (e) Outside Corners .031

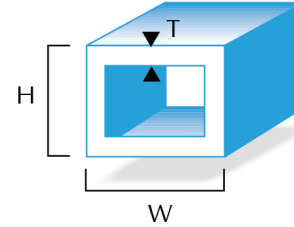


### RECTANGULAR TUBES

Width	Heights	Thickness	Est Wt Lbs/Ft	NNE DIE#
1.000	.500	.125	.374	TS-4631
1.500	.750	.062	.313	S-7119
1.500	.750	.078	.392	PH-3007
1.500	.750	.125	.600	S-PH-4630 (e, f)
1.500	1.000	.078	.437	PH-3008*
1.500	1.000	.125	.675	S-PH-536
1.525	.800	.150	.728	TS-11670
2.000	.750	.125	.750	S-TS-3189
2.000	1.000	.062	.428	PH-11660
2.000	1.000	.118	.782	TS-3192
2.000	1.000	.125	.826	PH-679
2.000	1.500	.125	.974	PH-591 (b, c)
2.000	1.500	.188	.141	PH-15401 (b, c)
2.250	1.750	.120	1.082	TS-1123
2.250	1.750	.125	1.129	PH14660 (c)
2.500	1.250	.125	1.050	PH-1470
2.500	1.500	.125	1.126	TS-865
3.000	1.000	.125	1.126	PH-2060
3.000	1.250	.125	1.200	PH-2229
3.000	1.750	.125	1.350	PH-1221
3.000	2.000	.125	1.426	TS-1455
3.000	2.000	.188	2.050	S-7117
3.000	2.500	.125	1.548	S-7246
3.250	1.500	.125	1.348	TS-8132
3.500	.875	.125	1.237	PH-1437
3.500	1.750	.062	.763	S-6037
3.500	1.750	.125	1.500	TS-1435
3.500	2.000	.093	1.186	TS-10499 (a)
4.000	1.000	.119	1.310	TS-4742
4.000	1.500	.093	1.186	S-6061
4.000	1.500	.125	1.558	S-7250
4.000	1.750	.093	1.255	TS-1953
4.000	1.750	.102	1.357	TS-3120
4.000	1.750	.125	1.650	PH-494
4.000	2.000	.125	1.726	TS-1633/S-7006
4.062	2.242	.090	1.345	TS-10489 (b)
4.500	1.250	.212	2.710	PH14672
4.500	1.750	.125	1.800	PH-2421
4.500	2.000	.125	1.875	TS-10441

## STANDARD DIE DATA

- (a) Inside Corners .062 RadII • (b) Outside Corners .125 RadII  
 (c) Inside Corners .125 RadII • (d) Shape has ID Work  
 (e) Outside Corners .031



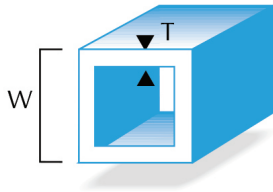
### RECTANGULAR TUBES

Width	Heights	Thickness	Est Wt Lbs/Ft	NNE DIE#
5.000	1.750	.125	1.950	PH-2422
5.000	2.000	.125	2.026	S-PH-2311
5.000	3.000	.125	2.330	PH-3080
5.000	4.000	.250	5.100	PH-8168 (a)
5.500	1.750	.125	2.100	PH-4651
6.000	1.500	.125	2.176	PH-2652
6.000	1.750	.125	2.232	S-7114
6.000	2.000	.090	1.689	S-7099
6.000	2.000	.118	2.207	S-7220
6.000	2.000	.125	2.326	PH-2131
6.000	3.000	.125	2.631	PH-14605
7.000	2.000	.125	2.625	PH-14606*
7.000	3.000	.125	2.925	PH-14607*
8.000	2.000	.125	2.929	PH-14608

\* Die may not be available. Check with a customer service representative

## STANDARD DIE DATA

- (a) .031 Radius on Outside Corners • (b) .060 Radius on Inside Corners  
 (c) .060 Radius on Outside Corners • (d) .125 Radius on Outside Corners  
 (e) .125 Radius on Inside Corners • (f) .093 Radius on Outside Corners  
 (g) .163 Radius on Inside Corners • (h) .313 Radius on Outside Corners

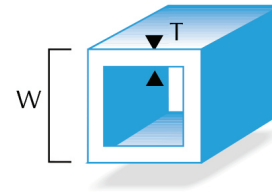


### SQUARE TUBES

Thickness	Width	Est Wt Lbs/Ft	NNE DIE#
.500	.062	.131	PH-535
.500	.125	.224	S-7118
.625	.062	.167	PH-456
.735	.042	.138	S-7223
.750	.055	.184	S-7053
.750	.062	.205	PH-3128
.750	.062	.205	PH-1434
.750	.095	.299	PH-14507
.750	.125	.376	S-7122 (f)
1.000	.050	.228	TS-4689
1.000	.055	.244	S-7200
1.000	.064	.288	PH-647
1.000	.065	.280	S-7037
1.000	.086	.324	S-7241
1.000	.090	.377	S-7022 (b, d)
1.000	.125	.526	PH-725
1.000	.125	.522	S-7038 Rounded Corners- .060
1.000	.125	.540	PH15310 Rounded Corners- .09375
1.125	.125	.601	PH15311 (f)
1.250	.065	.290	PH15351
1.250	.078	.439	S-PH-878
1.250	.090	.486	PH14674 (d)
1.250	.125	.676	PH-1469
1.250	.125	.668	PH15312 (f)
1.250	.250	1.200	S-7167
1.500	.063	.431	S-7035
1.500	.078	.532	S-PH-4639
1.500	.085	.572	S-7225
1.500	.093	.628	S-6024
1.500	.118	.791	S-7212
1.500	.125	.818	PH15363
1.500	.125	.826	PH-548
1.500	.188	1.185	PH-1403 (d, e)
1.500	.250	1.500	S-7155
1.750	.090	.718	S-7094
1.750	.125	.970	PH15362 (f)
1.750	.125	.976	PH-422

## STANDARD DIE DATA

- (a) .031 Radius on Outside Corners • (b) .060 Radius on Inside Corners  
 (c) .060 Radius on Outside Corners • (d) .125 Radius on Outside Corners  
 (e) .125 Radius on Inside Corners • (f) .093 Radius on Outside Corners  
 (g) .163 Radius on Inside Corners • (h) .313 Radius on Outside Corners

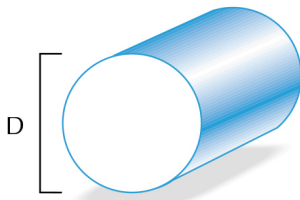


### SQUARE TUBES

Thickness	Width	Est Wt Lbs/Ft	NNE DIE#
1.982	.087	.791	S-7204
1.982	.118	1.056	S-7205
2.000	.060	0	PH-15430
2.000	.078	.720	PH-1584
2.000	.093	.851	S-6013
2.000	.125	1.126	PH-594
2.000	.188	1.611	S-7199
2.000	.188	1.638	PH-15402 (d, e)
2.000	.250	2.099	S-7215
2.250	.078	.812	PH-1144
2.250	.125	1.129	PH14660
2.500	.075	.883	PH14690
2.500	.125	1.424	TS-683
2.500	.250	2.700	S-7050
3.000	.093	1.297	S-6023
3.000	.118	1.646	S-7218
3.000	.125	1.730	PH-722
3.000	.250	3.310	PH14681
4.000	.093	1.743	PH-3125
4.000	.118	2.211	S-7219
4.000	.125	2.325	PH-2306
4.000	.125	2.234	PH-3162 (e)
4.000	.188	3.432	PH14695
4.000	.250	4.500	PH-8157
4.014	.100	1.843	PH15331
4.500	.125	2.624	PH-3104
5.000	.125	2.945	PH-14609
5.500	.125	3.225	PH-14610*
6.000	.125	3.525	PH-14611

\* Die may not be available. Check with a customer service representative

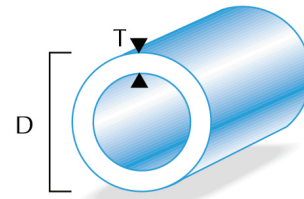
### STANDARD DIE DATA



#### ROUND ROD

Depth	Est Wt Lbs/Ft	NNE DIE#
.281±.003	.074	15183
.312	.090	S-887
.375	.131	616
.375±.003	.132	15812
.437		14302
.500	.235	2181
.530/.520	.260	15814
.562	.299	S-234
.625	.368	S-311
.750	.530	S-2496
.812	.623	2529
.812±.006	.622	15767
.875	.750	2513
.937	.826	3450
1.000	.942	1767
1.125±.003	1.193	15756
1.187	1.330	301
1.250	1.472	1187
1.350±.012	1.718	15795
1.375	1.744	6189/S-1276
1.375±.006		15775
1.500	2.120	S-300
1.562±.006		15766
1.625	2.488	15678*
1.625±.006	2.488	15678
1.687	2.684	8364
1.750	2.884	13425
1.875	3.331	14303
2.000	3.768	S-2581
2.250	4.768	13426*
2.375	5.274	3248
2.500	5.890	6184
2.750	7.124	15009
3.000	8.478	15010
3.500	11.546	14307

### STANDARD DIE DATA

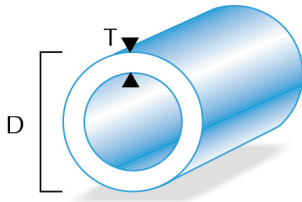


#### EXTRUDED PIPE

Thickness	Depth	Pipe Size	Schedule	Est Wt Lbs/Ft	NNE DIE#
.109	1.315	1	10	.496	PH13306
.109	1.900	1 1/2	10	.721	PH1659
.109	1.660	1 1/4	10	.625	PH1658
.109	2.375	2	10	.913	PH13307
.120	2.875	2 1/2	10	1.221	PH14620*
.120	3.500	3	10	1.498	PH14621
.120	4.000	3 1/2	10	1.720	PH14622
.120	4.500	4	10	1.942	PH14623
.134	5.563	5	10	2.688	PH14624*
.134	6.625	6	10	3.213	PH14625*
.133	1.315	1	40	.592	PH509
.145	1.900	1 1/2	40	.939	PH244
.140	1.660	1 1/4	40	.785	PH277
.109	.840	1/2	40	.300	S-7011
.154	2.375	2	40	1.290	PH1203
.203	2.875	2 1/2	40	2.044	TS-13304
.216	3.500	3	40	2.621	S-7230
.226	4.000	3 1/2	40	3.215	PH14616
.113	1.050	3/4	40	.399	PH-510
.237	4.500	4	40	3.733	PH14617
.258	5.563	5	40	5.057	PH14618
.280	6.625	6	40	6.697	PH14619
.200	1.900	1 1/2	80	1.274	PH-1548
.191	1.660	1 1/4	80	1.057	S-6016
.218	2.375	2	80	1.772	PH13303
.276	2.875	2 1/2	80	2.650	PH14668
.300	3.500	3	80	3.547	S-7106
.318	4.000	3 1/2	80	4.440	PH14626
.337	4.500	4	80	5.183	PH14627*
.375	5.563	5	80	7.188	PH14628
.432	6.625	6	80	9.884	PH14629*

\* Die may not be available. Check with a customer service representative

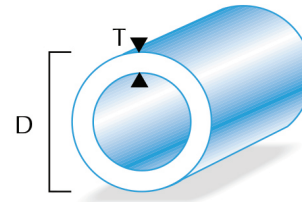
## STANDARD DIE DATA



### ROUND TUBES

Depth	Thickness	Est Wt Lbs/Ft	NNE DIE#
.594	.047	.096	PH-3141
.625	.058	.124	PH-15314
.625+.000/-	.112	.219	S-7245
.750	.050	.132	S-6040
.750	.062	.162	PH-11555
.750	.125	.294	S-7216
.750	.176	.379	PH-11652
.812	.080	.222	PH-11538
1.000	.055	.195	S-7224
1.000	.063	.222	S-7129
1.000	.065	.229	PH-10471
1.000	.075	.262	PH-11537
1.000	.125	.407	S-7018
1.250	.065	.290	PH15351
1.250	.080	.353	PH-11561
1.250	.090	.394	S-7047
1.250	.095	.414	PH-768
1.250	.110	.475	PH-769
1.250	.125	.530	S-7107
1.315	.109	.496	PH13306
1.315	.125	.560	S-7217
1.375	.080	.392	PH-3031
1.500	.065	.352	PH-7024
1.500	.080	.428	PH-11659
1.500	.093	.493	S-7185
1.500	.115	.600	S-7226
1.500	.125	.648	TS-10477
1.500	.250	1.178	S-7134
1.575	.125	.683	PH15305
1.660	.130	.749	S-7203
1.750	.065	.413	S-7043
1.905	.176	1.147	PH15304
1.997	.065	.469	PH11554
2.000	.065	.474	TS-4767
2.000	.093	.668	S-7109
2.000	.125	.883	S-7010
2.000	.500	2.827	PH15387
2.125	.156	1.157	PH14683
2.250	.065	.559	S-7055
2.250	.125	.100	PH14680
2.362	.197	1.608	PH15303

## STANDARD DIE DATA

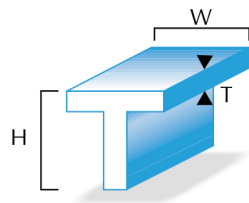


### ROUND TUBES

Depth	Thickness	Est Wt Lbs/Ft	NNE DIE#
2.375	.140	1.181	S-7213
2.375	.200	1.642	S-7214
2.500	.065	.596	PH-4633
2.500	.125	1.12	S-7108
2.500	.156	1.378	PH14682
2.500	.250	2.121	PH15389
3.000	.125	1.348	TS-3190
3.250	.125	1.475	S-7137
3.500	.300	3.547	S-7106
3.750	.125	1.709	TS-11541
4.000	.125	1.824	TS-3191
4.000	.250	3.534	PH15388
4.000	.318	4.440	PH14626
4.500	.125	2.061	PH-14612*
4.500	.500	.754	PH15309
5.000	.125	2.298	PH-14613
5.500	.125	2.532	PH-14614*
6.000	.125	2.767	PH-14615*

\* Die may not be available. Check with a customer service representative

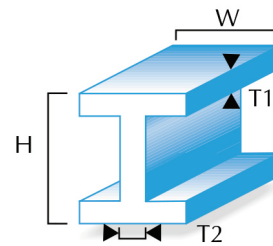
### STANDARD DIE DATA



#### TEES

Width	Height	Thickness	Est Wt Lbs/Ft	NNE DIE#
.500	1.000	.062	.109	<a href="#">328</a>
.750	.750	.125	.205	<a href="#">6793</a>
.750	1.250	.125	.281	<a href="#">7082</a>
1.000	.750	.125	.214	<a href="#">6543</a>
1.000	1.000	.125	.281	<a href="#">832</a>
1.125	1.125	.125	.319	<a href="#">520</a>
1.250	.875	.125	.300	<a href="#">4968</a>
1.375	1.375	.125	.396	<a href="#">1052</a>
1.500	1.500	.125	.431	<a href="#">3509</a>
1.500	1.750	.187	.688	<a href="#">1472</a>
1.750	.625	.125	.300	<a href="#">7879</a>
2.000	.750	.125	.393	<a href="#">6859</a>
2.000	1.624	.156	.649	<a href="#">242</a>
2.000	2.000	.187	.860	<a href="#">522</a>

### STANDARD DIE DATA



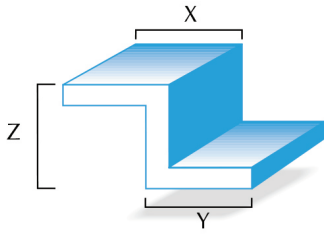
#### I BEAM

Width	Height	T1	T2	Est Wt Lbs/Ft	NNE DIE#
2.000	2.500	.125	.125	.956	<a href="#">S-1160</a>
2.500	3.000	.125	.125	.994	<a href="#">S-1154</a>
4.000	3.000	.170	.290	2.852	<a href="#">15246</a>
5.000	3.500	.190	.320	3.750	<a href="#">15247</a>
6.000	4.000	.210	.350	4.274	<a href="#">15248</a>

\* Die may not be available. Check with a customer service representative



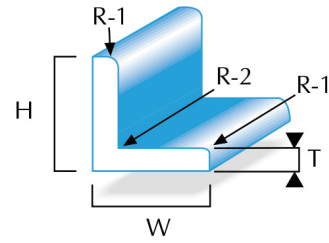
**STANDARD DIE DATA**



**ZEE BAR**

X	Y	Z	Thickness	Est Wt Lbs/Ft	NNE DIE#
.500	.500	.500	.093	.146	<a href="#">6937</a>
.625	.875	1.000	.125	.337	<a href="#">519</a>
.750	.750	.750	.125	.300	<a href="#">518</a>
.750	.750	.875	.125	.318	<a href="#">7298</a>
1.000	1.000	1.625	.125	.487	<a href="#">7151</a>
1.125	1.125	.375	.125	.413	<a href="#">5925</a>
1.125	1.125	1.000	.125	.450	<a href="#">6912</a>

**STANDARD DIE DATA**



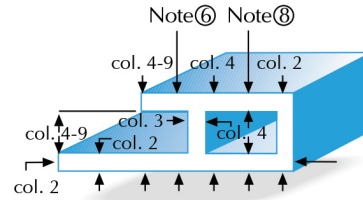
**STRUCTURAL ANGLES**

Width	Height	Thickness	R1	R2	Est Wt Lbs/Ft	NNE DIE#
1.500	1.500	.125	.125	.188	.433	<a href="#">S-1139</a>
1.000	1.000	.125	.094	.125	.284	<a href="#">S-793</a>
2.000	2.000	.125	.125	.250	.589	<a href="#">S-1142</a>
1.250	1.250	.125	.125	.188	.343	<a href="#">15061</a>
2.000	1.500	.188	.188	.188	.730	<a href="#">S-778</a>
2.000	3.000	.188	.188	.188	1.070	<a href="#">S-782</a>
1.000	1.000	.188	.094	.125	.400	<a href="#">15056</a>
3.000	3.000	.188	.250	.312	1.275	<a href="#">S-794</a>
2.000	2.000	.188	.188	.188	.850	<a href="#">S-774</a>
2.500	2.500	.188	.125	.250	1.100	<a href="#">S-792</a>
1.500	1.500	.188	.125	.187	.64	<a href="#">13027</a>
1.250	1.250	.188	.125	.188	.510	<a href="#">15062</a>
1.500	1.500	.250	.125	.188	.828	<a href="#">S-2488</a>
1.750	1.750	.250	.125	.188	.748	<a href="#">15744</a>
4.000	3.000	.250	.250	.375	2.024	<a href="#">2253</a>
1.750	1.750	.250	.125	.188	.956	<a href="#">15129</a>
4.000	4.000	.250	.250	.375	2.283	<a href="#">15063</a>
2.000	1.500	.250	.250	.250	.960	<a href="#">S-779</a>
2.000	3.000	.250	.250	.250	1.40	<a href="#">S-772</a>
3.000	3.000	.250	.250	.312	1.723	<a href="#">S-1167</a>
3.000	2.500	.250	.250	.250	1.540	<a href="#">S-780</a>
2.000	2.000	.250	.250	.250	1.115	<a href="#">S-1050</a>
2.500	2.500	.250	.125	.250	1.404	<a href="#">15058</a>
6.000	3.500	.313	.313	.500	3.46	<a href="#">13028</a>
5.000	3.000	.375	.312	.375	3.423	<a href="#">15042</a>
6.000	6.000	.375	.375	.500	5.119	<a href="#">15130</a>
2.500	2.500	.375	.125	.250	2.047	<a href="#">15715</a>
2.000	2.000	.375	.125	.250	1.606	<a href="#">15057</a>
4.000	4.000	.375	.205	.375	3.436	<a href="#">15843</a>
3.000	3.000	.375	.375	.375	2.470	<a href="#">S-781</a>
3.500	3.500	.375	.250	.375	2.926	<a href="#">15113</a>
4.050	4.000	.500	.375	.500	4.531	<a href="#">15106</a>
6.000	4.000	.500	.375	.500	5.725	<a href="#">15107</a>

\* Die may not be available. Check with a customer service representative

## EXTRUDED CROSS-SECTIONAL DIMENSION TOLERANCES

wire, rod, bar & profiles (shapes)<sup>1</sup>  
except for profiles (shapes) in T3510, T4510, T6510, T63510 and T8510<sup>7</sup>



TOLERANCES <sup>2 3</sup> — in. plus and minus																		
specified dimension in.	METAL DIMENSIONS				SPACE DIMENSIONS													
	All Except Those Covered by Column 3		Wall Thickness <sup>4</sup> Completely <sup>5</sup> Enclosing Space 0.11 sq. in. and Over (Eccentricity)		At Dimensioned Points 0.250 - 0.624 Inches from Base of Leg		At Dimensioned Points 0.625 - 1.249 Inches from Base of Leg		At Dimensioned Points 1.250 - 2.499 Inches from Base of Leg		At Dimensioned Points 2.500 - 3.999 Inches from Base of Leg		At Dimensioned Points 4.000 - 5.999 Inches from Base of Leg		At Dimensioned Points 6.000 - 8.000 Inches from Base of Leg			
Col. 1	Col. 2		Col. 3		Col. 4		Col. 5		Col. 6		Col. 7		Col. 8		Col. 9			
	Alloys 5083, 5086, 5454	11 Other Alloys	Alloys 5083, 5086, 5454	11 Other Alloys	Alloys 5083, 5086, 5454	11 Other Alloys	Alloys 5083, 5086, 5454	11 Other Alloys	Alloys 5083, 5086, 5454	11 Other Alloys	Alloys 5083, 5086, 5454	11 Other Alloys	Alloys 5083, 5086, 5454	11 Other Alloys	Alloys 5083, 5086, 5454	11 Other Alloys		
CIRCUMSCRIBING CIRCLE SIZES LESS THAN 10 INCHES IN DIAMETER																		
Up thru 0.124	.009	.006	±15% of specified dimension; ±.090 max. ±.015 min.	±10% of specified dimension; ±.060 max. ±.010 min.	.013	.010	.015	.012	-	-	-	-	-	-	-	-		
0.125-0.249	.011	.007			.016	.012	.018	.014	.020	.016	-	-	-	-	-	-	-	-
0.250-0.499	.012	.008			.018	.014	.020	.016	.022	.018	.024	.020	-	-	-	-	-	-
0.500-0.749	.014	.009			.021	.016	.023	.018	.025	.020	.027	.022	.036	.030	.041	.035	-	-
0.750-0.999	.015	.010			.023	.018	.025	.020	.027	.022	.030	.025	.036	.030	.041	.035	-	-
1.000-1.499	.018	.012	±15% of specified dimension; ±.090 max. ±.025 min.	±15% of specified dimension; ±.090 max. ±.015 min.	.027	.021	.029	.023	.032	.026	.036	.030	.041	.035	-	-		
1.500-1.999	.021	.014			.031	.024	.033	.026	.038	.031	.043	.036	.049	.042	.057	.050	.050	
2.000-3.999	.036	.024			.046	.034	.050	.038	.060	.048	.069	.057	.080	.068	.092	.080	.080	
4.000-5.999	.051	.034			.061	.044	.067	.050	.081	.064	.095	.078	.111	.094	.127	.110	.110	
6.000-7.999	.066	.044			.076	.054	.084	.062	.104	.082	.121	.099	.142	.120	.162	.140	.140	
8.000-9.999	.081	.054			.091	.064	.101	.074	.127	.100	.147	.120	.182	.145	.197	.170	.170	
10.000-11.999	.096	.064			.106	.074	.116	.084	.142	.110	.162	.130	.182	.150	.242	.210	.210	
12.000-13.999	.111	.074			.121	.084	.131	.094	.157	.120	.177	.140	.197	.160	.257	.220	.220	
14.000-15.999	.126	.084	.136	.094	.146	.104	.172	.130	.192	.150	.212	.170	.272	.230	.230			
16.000-17.999	.141	.094	.151	.104	.161	.114	.187	.140	.207	.160	.227	.180	.287	.240	.240			
18.000-19.999	.156	.104	.166	.114	.176	.124	.202	.150	.222	.170	.242	.190	.302	.250	.250			
18.000-19.999	.171	.114	±15% of specified dimension; ±.090 max. ±.025 min.	±15% of specified dimension; ±.090 max. ±.015 min.	.181	.124	.191	.134	.217	.160	.237	.180	.257	.200	.317	.260		
20.000-21.999	.186	.124			.196	.134	.206	.144	.232	.170	.252	.190	.272	.210	.332	.270	.270	
22.000-24.000	.201	.134			.211	.144	.221	.154	.247	.180	.267	.200	.287	.220	.347	.280	.280	
22.000-24.000	.201	.134			.211	.144	.221	.154	.247	.180	.267	.200	.287	.220	.347	.280	.280	

**Footnotes:**

<sup>1</sup> These Standard Tolerances are applicable to the average profile (shape); wider tolerances may be required for some profiles (shapes) and closer tolerances may be possible for others.

<sup>2</sup> The tolerances applicable to a dimension composed of two or more component dimensions is the sum of the tolerances of the component dimensions if all of the component dimensions are indicated.

<sup>3</sup> When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which applies to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.

<sup>4</sup> Where dimensions specified are outside and inside, rather than wall thickness itself, the allowable deviation (eccentricity) given in Column 3 applies to mean wall thickness. (Mean wall thickness is the average of two wall thickness measurements taken at opposite sides of the void.)

<sup>5</sup> In the case of Class 1 Hollow Profiles (Shapes) the standard wall thickness tolerance for extruded round tube is applicable. (A Class 1 Hollow Profile (Shape) is one whose void is round and one inch or more in diameter and whose weight is equally distributed on opposite sides of two or more equally spaced axes.)

## EXAMPLES ILLUSTRATING USE OF CROSS-SECTIONAL DIMENSION TOLERANCES

### CLOSED-SPACE DIMENSIONS

All dimensions designated "Y" are classed as "metal dimensions," and tolerances are determined from column 2.

Dimensions designated "X" are classed as "space dimensions through an enclosed void," and the tolerances applicable are determined from column 4 unless 75 percent or more of the dimension is metal, in which case column 2 applies.

### OPEN-SPACE DIMENSIONS

Tolerances applicable to dimensions "X" are determined as follows:

1. Locate dimension "X" in column 1.
2. Determine which of columns 4-9 is applicable, dependent on distance "A."
3. Locate proper tolerances in column 4, 5, 6, 7, 8 or 9 in the same line as dimension "X."

Dimensions "Y" are "metal dimensions"; tolerances are determined from column 2.

Distances "C" are shown merely to indicate incorrect values for determining which of columns 4-9 apply.

Tolerances applicable to dimensions "X" are determined as follows:

1. Locate distance "B" in column 1.
2. Determine which of columns 4-9 is applicable, dependent on distance "A."
3. Locate proper tolerances in column 4, 5, 6, 7, 8 or 9 in the same line as value chosen in column 1.

Tolerances applicable to dimensions "X" are determined by standard tolerances applicable to angles "A."

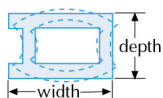
**Footnotes (continued):**

<sup>6</sup>At points less than 0.250 inch from base of leg the tolerances in Col. 2 are applicable.

<sup>7</sup>Tolerances for extruded profiles (shapes) in T3510, T4510, T6510, T7350, T76510, T8510 tempers shall be as agreed upon between purchaser and vendor at the time the contract or order is entered.

<sup>8</sup>The following tolerances apply where the space is completely enclosed (hollow profiles (shapes)); For the width (A), the balance is the value shown in Col. 4 for the depth dimension (D). For the depth (D), the tolerance is the value shown in Col. 4 for the width dimension (A). In no case is the tolerance for either width or depth less than the metal dimensions (Col. 2) at the corners.

Example – Alloy 6061 hollow profile (shape) having 1 X 3 rectangular outside dimensions: width tolerances is  $\pm 0.021$  inch and depth tolerance  $\pm 0.034$  inch. (Tolerances at corners, Col. 2 metal dimensions, are  $\pm 0.024$  inch for the width and  $\pm 0.012$  inch for the depth.) Note that the Col. 4 tolerances of 0.021 inch must be adjusted to 0.024 inch so that it is not less than the Col. 2 tolerance.



<sup>9</sup> These tolerances do not apply to space dimensions such as dimensions "X" and "Z" of the example (left), even when "Y" is 75 percent or more of "X." For the tolerance applicable to dimensions "X" and "Z," use Col. 4, 5, 6, 7, 8 or 9, dependent on distance "A."

<sup>10</sup> The wall thickness tolerance for hollow or semihollow profiles (shapes) shall be agreed upon between purchaser and vendor at the time the contract or order is entered when the nominal thickness of one wall is three times or greater than that of the opposite wall.



## LENGTH<sup>1</sup>

wire, rod, bar & profiles (shapes)

Specified Diameter (Wire and Rod); Specified Width (Bar); Circumscribing Circle Diameter <sup>4</sup> (Profiles (Shapes)) in.	Tolerance – in. plus			
	Allowable Deviation from Specified Length			
	Specified Length – ft.			
	Up thru 12	Over 12 thru 30	Over 30 thru 50	Over 50
Up through 2.999	<sup>1</sup> 1/4 <sup>8</sup>	<sup>1</sup> 1/4 <sup>4</sup>	<sup>3</sup> 1/4 <sup>8</sup>	1
3.000-7.999	<sup>3</sup> 1/4 <sup>16</sup>	<sup>5</sup> 1/4 <sup>16</sup>	<sup>7</sup> 1/4 <sup>16</sup>	1
8.000 and over	<sup>1</sup> 1/4 <sup>4</sup>	<sup>3</sup> 1/4 <sup>8</sup>	<sup>1</sup> 1/4 <sup>2</sup>	1

## STRAIGHTNESS<sup>1</sup>

rod, bar & profiles (shapes)

Product	Temper	Specified Diameter (Rod); Specified Width (Bar); Circumscribing Circle Diameter <sup>4</sup> (Profiles (Shapes)) in.	Specified Thickness (Rectangles); Minimum Thickness (Profiles (Shapes)) in.	Tolerance <sup>3</sup> – in.
				Allowable Deviation from Straight
				In Total Length or in any Measured Segment of One Ft. or more of Total Length
Rod and Square Hexagonal and Octagonal Bar	All except o TX510 <sup>2</sup> TX511 <sup>2</sup>	All	-	.0215 X Measured Length, ft.
	o	0.500 and over	-	.050 X Measured Length, ft.
	TX510 <sup>2</sup>	0.500 and over	-	.050 X Measured Length, ft.
	TX511 <sup>2</sup>	0.500 and over	-	.0125 X Measured Length, ft.
Rectangular Bar	All except o TX510 <sup>2</sup> TX511 <sup>2</sup>	Up through 1.499	Up through 0.094 <sup>7</sup> 0.095 and over	.050 X Measured Length, ft. .0125 X Measured Length, ft.
	o	Over 0.500	0.500 and over	.050 X Measured Length, ft.
	TX510 <sup>2</sup>	Over 0.500	0.500 and over	.050 X Measured Length, ft.
	TX511 <sup>2</sup>	Over 0.500	0.500 and over	.0125 X Measured Length, ft.
Profiles (Shapes)	All except o TX510 <sup>2</sup> TX511 <sup>2</sup>	Up through 1.499	Up through 0.094 <sup>7</sup> 0.095 and over	.050 X Measured Length, ft. .0125 X Measured Length, ft.
	o	Over 0.500	Up through 0.094 <sup>7</sup> 0.095 and over	.200 X Measured Length, ft. .050 X Measured Length, ft.
	TX511 <sup>2</sup>	0.500 and over	Up through 0.094 <sup>7</sup> 0.095 and over	.050 X Measured Length, ft. .0125 X Measured Length, ft.

### Footnotes:

<sup>1</sup> These Standard Tolerances are applicable to the average profile (shape); wider tolerances may be required for some profiles (shapes), and closer tolerances may be possible for others.

<sup>2</sup> TX510 and TX511 are general designations for the following stress relieved tempers: T3510, T4510, T61510, T6510, T8510, T73510, T76510 and T3511, T4511, T61511, T6511, T8511, T73511, T76511, respectively.

<sup>3</sup> When weight of piece on flat surface minimizes deviation.

<sup>4</sup> The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the cross section of the extruded product.

<sup>5</sup> Tolerances for T3510, T4510, T6510, T73510, T76510, and T8510 tempers shall be as agreed upon between purchaser and vendor at the time the contract or order is entered.

<sup>6</sup> See Standards Section (6) for Application of Twist Limits.

<sup>7</sup> Applies only if the thickness along at least 11/43 of the total perimeter is 0.094 or less. Otherwise use the tolerance shown for 0.095 and over.

<sup>8</sup> Tolerance for "o" temper material is four times the standard tolerances shown.

**TWIST<sup>1 6</sup>**

bar & profiles (shapes)

Product	Temper	Specified Width (Bar); Circumscribing Circle Diameter <sup>4</sup> (Profiles (Shapes)) in.	Specified Thickness (Rectangles); Minimum Thickness (Profiles (Shapes)) in.	Tolerance <sup>3</sup> – in.	
				Allowable Deviation from Straight	
				In Total Length or in any Measured Segment of One Ft. or more of Total Length	Maximum for Total Length
Bar	All except o TX510 <sup>2</sup> TX511 <sup>2</sup>	Up through 1.499	All	1 X Measured Length, ft.	7
		1.500-2.999	All	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	5
		3.000 and over	All	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	3
	o	0.500-1.499	0.500 and over	3 X Measured Length, ft.	7
		1.500-2.999	0.500 and over	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	5
		3.000-4.999	0.500 and over	<sup>3</sup> / <sub>4</sub> X Measured Length, ft.	3
	TX510 <sup>2</sup>	0.500-2.999	0.500 and over	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	7
		3.0500-1.499	0.500 and over	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	5
TX511 <sup>2</sup>	0.500-1.499	0.500 and over	1 X Measured Length, ft.	7	
	1.500-2.999	0.500 and over	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	5	
	3.000-over	0.500 and over	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	3	
Profiles (Shapes)	All except o TX510 <sup>2 5</sup> TX511 <sup>2</sup>	Up through 1.499	All	1 X Measured Length, ft.	7
		1.500-2.999	All	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	5
		3.000 and over	All	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	3
	o	0.500 and over	Up through 0.094	3 X Measured Length, ft.	7
		0.500-1.499	0.095 and over	3 X Measured Length, ft.	7
		1.500-2.999	0.095 and over	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	5
	TX511 <sup>2</sup>	0.500 and over	Up through 0.094	1 X Measured Length, ft.	7
		0.500-1.499	0.095 and over	1 X Measured Length, ft.	7
1.500-2.999		0.095 and over	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	5	
3.000 and over	0.095 and over	<sup>1</sup> / <sub>4</sub> X Measured Length, ft.	3		

**FLATNESS (FLAT SURFACES)<sup>1</sup>**

bar, solid profiles (shapes) and semihollow profiles (shapes) except for profiles (shapes) in o<sup>8</sup>, T3510, T4510, T6510, T73510, T76510 and T8510 TEMPER<sup>8</sup>

Minimum Thickness of Metal Forming the Surface in.	Surfaces Widths up thru 1 Inch or any 1 Inch Increment of Wider Surfaces Maximum Allowable Deviation D = Tolerance (in.)										
	Widths Over 1 Inch Maximum Allowable Deviation D = Tolerance X W (in.)										
	surface width - in.										
	up to 5.999	6.000 to 7.999	8.000 to 9.999	10.000 to 11.999	12.000 to 13.999	14.000 to 15.999	16.000 to 17.999	18.000 to 19.999	20.000 to 21.999	22.000 to 23.999	24.000 and up
	tolerance										
Up thru 0.124	.004	.006	.010	.014	-	-	-	-	-	-	-
0.125-0.187	.004	.006	.008	.012	.014	.014	.014	-	-	-	-
0.188-0.249	.004	.006	.008	.010	.012	.012	.012	.014	.014	-	-
0.250-0.374	.004	.006	.006	.008	.010	.010	.012	.012	.012	.014	-
0.375-0.499	.004	.004	.006	.008	.008	.008	.010	.010	.010	.012	.014
0.500-0.749	.004	.004	.006	.006	.008	.008	.008	.008	.010	.010	.012
0.750-0.999	.004	.004	.006	.006	.008	.008	.008	.008	.008	.008	.010
1.000-1.499	.004	.004	.004	.006	.008	.008	.008	.008	.008	.008	.008
1.500-1.999	.004	.004	.004	.004	.006	.006	.006	.008	.008	.008	.008
2.000 and up	.004	.004	.004	.004	.006	.006	.006	.006	.008	.008	.008

## FLATNESS (FLAT SURFACES)<sup>1</sup>

hollow profiles (shapes) except for profiles (shapes) in o<sup>9</sup>, T3510, T4510, T6510, T73510, T76510 and T8510 TEMPER<sup>5</sup>

Minimum Thickness of Metal Forming the Surface in.	Surfaces Widths up thru 1 Inch or any 1 Inch Increment of Wider Surfaces Maximum Allowable Deviation D = Tolerance (in.)										
	Widths Over 1 Inch Maximum Allowable Deviation D = Tolerance X W (in.)										
	surface width - in.										
	up to 5.999	6.000 to 7.999	8.000 to 9.999	10.000 to 11.999	12.000 to 13.999	14.000 to 15.999	16.000 to 17.999	18.000 to 19.999	20.000 to 21.999	22.000 to 23.999	24.000 and up
Up thru 0.124	.006	.008	.012	.016	-	-	-	-	-	-	-
0.125-0.187	.006	.008	.010	.014	.016	-	-	-	-	-	-
0.188-0.249	.004	.006	.010	.012	.014	.014	.014	.016	-	-	-
0.250-0.374	.004	.006	.008	.010	.012	.012	.012	.014	.014	.016	-
0.375-0.499	.004	.006	.008	.010	.010	.010	.012	.012	.012	.014	.016
0.500-0.749	.004	.004	.006	.008	.008	.008	.010	.018	.012	.012	.014
0.750-0.999	.004	.004	.006	.006	.008	.008	.008	.008	.010	.010	.012
1.000 and up	.004	.004	.004	.006	.006	.008	.008	.0084	.008	.008	.008

## SURFACE ROUGHNESS<sup>8</sup>

wire, rod, bar & profiles (shapes)

Specified Section Thickness in.	Allowable Depth of Conditions <sup>2</sup> in. max.
Up thru 0.063	.0015
0.064-0.125	.002
0.126-0.188	.0025
0.189-0.250	.003
0.251-0.500	.004
0.501 and over	.008

## SQUARENESS OF CUT ENDS<sup>1</sup>

wire, rod, bar and profiles (shapes)

Allowable Deviation from Square: 1 Degree
---

## CORNER AND FILLET RADII<sup>1</sup>

bar and profiles (shapes)

Specified Radius <sup>9</sup> in.	Tolerance - in.	
	Allowable Deviation from Specified Radius	
	Difference between radius A and specified radius	
Sharp corners	+ <sup>1</sup> 1/4 <sup>6,4</sup>	
0.016-0.187	± <sup>1</sup> 1/4 <sup>6,4</sup>	
0.188 and over	±10%	

<sup>1</sup>These Standard Tolerances are applicable to the average profile (shape); wider tolerances may be required for some profiles (shapes), and closer tolerances may be possible for others.

<sup>2</sup>Conditions include die lines and handling marks.

<sup>3</sup>As measured with a contour gauge whose surface is limited to a maximum subtended angle of 90 degrees. Extruded curved surfaces comprising more than a 90 degree subtended angle are checked by sliding the gauge across the surface, thus checking two or more 90-degree portions of the surface. Extruded profile (shape) surfaces comprising arcs formed by two or more radii require the use of a separate contour gauge for each portion of the surface formed by an individual radius.

<sup>4</sup>Tolerances for T3510, T4510, T6510, T73510, T76510 and T8510 tempers shall be agreed upon between purchaser and vendor and at the time the contract or order is entered.

<sup>5</sup>Angles are measured with protractors or with gauges. As illustrated, a four point contact system is used, two contact points being as close to the angle vertex as practical, and the others near the ends of the respective surfaces forming the angle. Between these points of measurement surface flatness is the controlling tolerance.

## CONTOUR (CURVED SHAPES)<sup>1,3</sup>

profiles (shapes)

Temper	Allowable deviation from specified contour:
All except o, TX510 <sup>4</sup>	0.005 inch per inch of chord length; 0.005 inch minimum. Not applicable to contours with chord length 6 inches and over.
o	0.015 inch per inch of chord length; 0.015 inch minimum. Not applicable to contours with chord length 6 inches and over.

## ANGULARITY<sup>1,5</sup>

bar and profiles (shapes)

Temper	Minimum Specified Leg Thickness in.	Tolerance Degrees plus and minus Allowable Deviation from Specified Angle		
		Ratio: <sup>6,7</sup> Leg or Surface Length To Leg or Metal Thickness		
		Col. 1	Col. 2	Col. 3
All except o, TX510 <sup>4</sup>	Up thru 0.187	1	1	1
	0.188-0.749	1	1	1 <sup>1</sup> /4 <sup>2</sup>
o	0.750 and over	1	1	1
	Up thru 0.187	3	3	6
	0.188-0.749	3	3	4 <sup>1</sup> /4 <sup>2</sup>
	0.750 and over	3	3	3

<sup>6</sup>When the area between the surface forming an angle is all metal, values in column 2 apply if the larger surface length to metal thickness ratio is 1 or less.

<sup>7</sup>When two legs are involved the one having the larger ratio determines the applicable column.

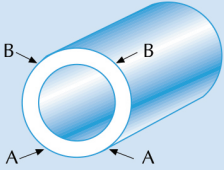
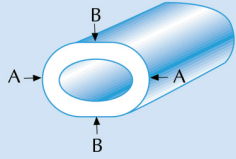
<sup>8</sup>Not applicable to 2219 alloy extrusions. Most profiles (shapes) in 2219 alloy will have die lines about twice the depth shown in the table; however for each profile (shape) the supplier should be contacted for the roughness value to apply.

<sup>9</sup>If unspecified, the radius shall be <sup>1</sup>/4<sup>32</sup> in. maximum including tolerances.

<sup>10</sup>Tolerances for "o" temper material is four times the standard tolerances shown.

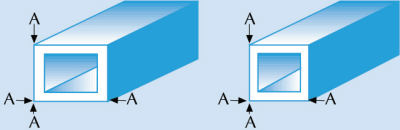
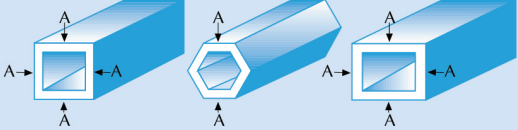
**TABLE 12.2 DIAMETER**

Round Tube Except for T3510, T4510, T6510, T73510 and T8510 Tempers<sup>7</sup>

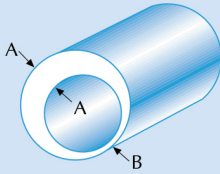
Specified Diameter <sup>1</sup> in.	Tolerance <sup>2</sup> – in. plus and minus			
	Allowable Deviation of Mean Diameter <sup>3</sup> from Specified Diameter (Size)		Allowable Deviation of Diameter at any Point from Specified Diameter <sup>4</sup>	
	 Difference between $1/4^2$ (AA + BB) and specified diameter		 Difference between AA + BB and specified diameter	
Col. 1	Col. 2		Col. 3	
	Alloys 5083, 5086, 5454	Other Alloys <sup>16</sup>	Alloys 5083, 5086, 5454	Other Alloys <sup>16</sup>
0.500-0.999	.015	.010	.030	.020
1.000-1.999	.018	.012	.038	.025
2.000-3.999	.023	.015	.045	.030
4.000-5.999	.038	.025	.075	.050
6.000-7.999	.053	.035	.113	.075
8.000-9.999	.068	.045	.150	.100
10.000-11.999	.083	.055	.188	.125
12.000-13.999	.098	.065	.225	.150
14.000-15.999	.113	.075	.263	.175
16.000-17.999	.128	.085	.300	.200

**TABLE 12.3 WIDTH AND DEPTH**

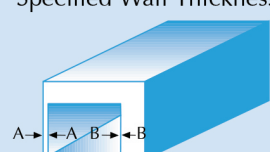
Square, Rectangular, Hexagonal, Octagonal Tube Except for T3510, T4510, T6510, T73510 and T8510 Tempers<sup>7</sup>

Specified Width or Depth <sup>1</sup> in.	Tolerance <sup>2</sup> – in. plus and minus				
	Allowable Deviation of Width or Depth at Corners from Specified Width or Depth		Allowable Deviation of Width or Depth not at Corners from Specified Width or Depth <sup>4</sup>		
	 Difference between AA and specified width or depth		 Difference between AA and specified width, depth or distance across flats		
Col. 1	Square, Rectangular		Square, Hexagonal, Octagonal		Rectangular
	Col. 2		Col. 3		Col.4
	Alloys 5083, 5086, 5454	Other Alloys <sup>16</sup>	Alloys 5083, 5086, 5454	Other Alloys <sup>16</sup>	All Alloys
0.500-0.749	.018	.012	.030	.020	The tolerance for the width is the value in the previous column for a dimension equal to the depth, and conversely, but in no case is the tolerance less than at the corners.  Example: The with tolerance of a 1 X 3 inch alloy 6061 rectangular tube is ± 0.025 inch and the depth tolerance ± 0.035 inch.
0.750-0.999	.021	.014	.030	.020	
1.000-1.999	.027	.018	.038	.025	
2.000-3.999	.038	.025	.053	.035	
4.000-4.999	.053	.035	.068	.045	
5.000-5.999	.068	.045	.083	.055	
6.000-6.999	.083	.055	.098	.065	
7.000-7.999	.098	.065	.108	.075	
8.000-8.999	.113	.075	.123	.085	
9.000-9.999	.128	.085	.143	.095	
10.000-10.999	.143	.095	.158	.105	
11.000-12.999	.158	.105	.173	.115	

**TABLE 12.4 WALL THICKNESS • Round Extruded Tube**

Specified Wall Thickness <sup>6</sup> in.	Tolerance <sup>2</sup> – in. plus and minus								
	Allowable Deviation of Mean Wall Thickness <sup>5</sup> from Specified Wall Thickness								Allowable Deviation of Wall Thickness at any Point from Mean Wall Thickness <sup>5</sup> (Eccentricity)
									
	Difference between $1/4^2$ (AA + BB) and specified wall thickness								
Outside Diameter – in.									
	Under 1.250		1.250-1.299		3.000-4.999		5.000 and over		Col. 6
Col. 1	Col. 2		Col. 3		Col.4		Col. 5		
	Alloys 5083, 5086, 5454	Other Alloys <sup>16</sup>	Alloys 5083, 5086, 5454	Other Alloys <sup>16</sup>	Alloys 5083, 5086, 5454	Other Alloys <sup>16</sup>	Alloys 5083, 5086, 5454	Other Alloys <sup>16</sup>	All Alloys
Under 0.047	.009	.006	-	-	-	-	-	-	Plus and minus 10 % of mean wall thickness  max ± 0.060 min ± 0.010
0.047-0.061	.011	.007	.012	.008	.012	.008	.015	.010	
0.062-0.077	.012	.008	.012	.008	.014	.009	.018	.012	
0.078-0.124	.014	.009	.014	.009	.015	.010	.023	.015	
0.125-0.249	.014	.009	.014	.009	.020	.013	.030	.020	
0.250-0.374	.017	.011	.017	.011	.024	.016	.038	.025	
0.375-0.499	-	-	.023	.015	.032	.021	.053	.035	max ± 0.060 min ± 0.010
0.500-0.749	-	-	.030	.020	.042	.028	.068	.045	
0.750-0.999	-	-	-	-	.053	.035	.083	.055	
1.000-1.499	-	-	-	-	.068	.045	.098	.065	
1.500-2.000	-	-	-	-	-	-	.113	.075	
2.001-2.499	-	-	-	-	-	-	.128	.085	± 0.120
2.500-2.999	-	-	-	-	-	-	.143	.095	
3.000-3.499	-	-	-	-	-	-	.158	.105	
3.500-4.000	-	-	-	-	-	-	.173	.115	

**TABLE 12.5 WALL THICKNESS • Other-Than-Round Extruded Tube**

Specified Wall Thickness <sup>6</sup> in.	Tolerance <sup>1,2</sup> – in. plus and minus					
	Allowable Deviation of Mean Wall Thickness <sup>5</sup> from Specified Wall Thickness				Allowable Deviation of Wall Thickness at any Point from Mean Wall Thickness <sup>5</sup> (Eccentricity)	
						
	Difference between $1/4^2$ (AA + BB) and specified wall thickness					
Circumscribing Circle Diameter <sup>10</sup> –in.						
	Under 5.000		5.000 and over		Under 5.000	5.000 and over
	Col. 2		Col. 3		Col.4	Col. 5
	Alloys 5083, 5086, 5454	Other Alloys <sup>16</sup>	Alloys 5083, 5086, 5454	Other Alloys <sup>16</sup>	All Alloys	All Alloys
Under 0.047	.008	.005	.012	.008	.005	Plus and minus 10 % of mean wall thickness  max ± 0.060 min ± 0.010
0.047-0.061	.009	.006	.014	.009	.007	
0.062-0.124	.011	.007	.015	.010	.010	
0.125-0.249	.012	.008	.023	.015	.015	
0.250-0.374	.017	.011	.030	.020	.025	
0.375-0.499	.021	.014	.045	.030	.030	max ± 0.060 min ± 0.010
0.500-0.749	.038	.025	.060	.040	.040	
0.750-0.999	.053	.035	.075	.050	.050	
1.000-1.499	.068	.045	.090	.060	.060	
1.500-2.000	-	-	.105	.070	-	

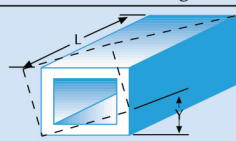
**TABLE 12.6 LENGTH**

Extruded Tube

Specified Outside Diameter or Width in.	Tolerance – in. plus except as noted							
	Allowable deviation from Specified Length							
	Straight				Coiled			
	Specified Length – ft.							
	Up thru 12	Over 12 thru 30	Over 30 thru 50	Over 50	Up thru 100	Over 100 thru 250	Over 250 thru 500	Over 500
0.500-1.249	<sup>1</sup> / <sub>4</sub> <sup>8</sup>	<sup>1</sup> / <sub>4</sub> <sup>4</sup>	<sup>3</sup> / <sub>4</sub> <sup>8</sup>	1	+5%, -0%	±10%	±15%	±20%
1.250-2.999	<sup>1</sup> / <sub>4</sub> <sup>8</sup>	<sup>1</sup> / <sub>4</sub> <sup>4</sup>	<sup>3</sup> / <sub>4</sub> <sup>8</sup>	1	-	-	-	-
3.000-7.999	<sup>3</sup> / <sub>4</sub> <sup>16</sup>	<sup>5</sup> / <sub>4</sub> <sup>16</sup>	<sup>7</sup> / <sub>4</sub> <sup>16</sup>	1	-	-	-	-
8.000 and over	<sup>1</sup> / <sub>4</sub> <sup>4</sup>	<sup>3</sup> / <sub>4</sub> <sup>8</sup>	<sup>1</sup> / <sub>4</sub> <sup>2</sup>	1	-	-	-	-

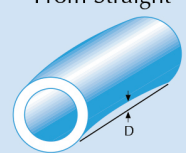
**TABLE 12.7 TWIST<sup>11</sup>**

Other-Than-Round Tube

Temper	Specified Width in.	Specified Thickness in.	Tolerance – Degrees	
			 Y (max.) in degrees	
			In Total Length or in any Segment of One Ft. or More of Total Length	Maximum for Total Length
All except o, TX510, TX511 <sup>8</sup>	0.500 thru 1.499	All	1 X Measured Length, ft.	7
	1.500-2.999	All	<sup>1</sup> / <sub>4</sub> <sup>2</sup> X Measured Length, ft.	5
	3.000 and over	All	<sup>1</sup> / <sub>4</sub> <sup>4</sup> X Measured Length, ft.	3
TX510 <sup>8</sup>	0.500 and over	0.095 and over	7	7
TX511 <sup>8</sup>	0.500-1.499	0.095 and over	1 X Measured Length, ft.	7
	1.500-2.999	0.095 and over	<sup>1</sup> / <sub>4</sub> <sup>2</sup> X Measured Length, ft.	5
	3.000 and over	0.095 and over	<sup>1</sup> / <sub>4</sub> <sup>4</sup> X Measured Length, ft.	3

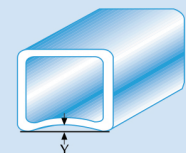
**TABLE 12.8 STRAIGHTNESS**

Tube in Straight Lengths

Temper	Specified Outside Diameter or Width in.	Tolerance <sup>9,12</sup> – in.
		Allowable Deviation (D) From Straight  In Total Length or in any Segment of One Ft. or More of Total Length
All except o, TX510 <sup>8</sup> , TX510 <sup>80</sup>	0.500-5.999	.010 X Measured length, ft.
	6.000 and over	.020 X Measured length, ft.
	.500 and over	7

**TABLE 12.9 FLATNESS**

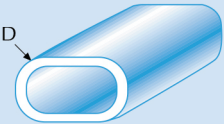
Except for O, T2510, T4510, T6510, T73510, T76510, and T8510 Tempers

Minimum Thickness of Metal Forming the Surface in.	Tolerance – in.	
	 Maximum Allowable Deviation Y	
	Widths up thru 1 in. or any 1 in. Increment of Wider Surfaces	Widths over 1 in. thru 5.999 In.
Up thru 0.187	0.006	0.006 X W (Inches)
0.188 and over	0.004	0.004 X W (Inches)

**TABLE 12.10 SQUARENESS OF CUT ENDS**

Allowable Deviation from Square: 1 Degree
---

**TABLE 12.11 CORNER AND FILLET RADII**

Specified Radius <sup>18</sup> in.	Tolerance – in.
	Allowable Deviation from Specified Radius
	
	Difference between radius A and specified radius
Sharp corners	+ <sup>1</sup> / <sub>4</sub> <sup>64</sup>
0.016-0.187	± <sup>1</sup> / <sub>4</sub> <sup>64</sup>
0.188 and over	±10%

**TABLE 12.12 ANGULARITY**

Allowable Deviation from Specified Angle: ±2 Degrees
--

**TABLE 12.13 SURFACE ROUGHNESS<sup>14 17</sup>**

Specified Outside Diameter in.	Specified Wall Thickness in.	Allowable Depth of Conditions <sup>13</sup> in., max.
Up thru 12.750	Up through 0.063	0.0025
	0.064-0.125	0.003
	0.126-0.188	0.0035
	0.189-.0250	0.004
	0.251-0.500	0.005
12.751-15.000	0.501 and over	0.008
	Up thru 0.500	0.010
15.001-20.000	0.501 and over	0.012
	Up thru 0.500	0.012
20.001 and over	0.501 and over	0.015
	Up thru 0.500	0.015
	0.501 and over	0.020

**TABLE 12.14 DENTS<sup>15</sup>**

<p>Depth of dents shall not exceed twice the tolerances specified in Table 12.2 for diameter at any point from specified diameter, except for tube having a wall thickness less than 2 1/4<sup>2</sup> percent of the outside diameter, in which case the following multipliers apply.</p> <p>2% to 2 1/4<sup>2</sup>% exclusive – 2.5 X tolerance (max.)</p> <p>1 1/4<sup>2</sup>% to 2% exclusive – 3.0 X tolerance (max.)</p> <p>1% to 1 1/4<sup>2</sup>% exclusive – 4.0 X tolerance (max.)</p>
---

**Footnotes:**

<sup>1</sup>When the outside diameter, inside diameter, and wall thickness (or their equivalent dimensions in other than round tube) are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three. When both outside and inside diameters or inside diameter and wall thickness are specified, the tolerance applicable to the specified or calculated O.D. dimension shall also apply to the I.D. dimension.

<sup>2</sup>When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which applied to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.

<sup>3</sup>Mean diameter is the average of two diameter measurements taken at right angles to each other at any point along the length.

<sup>4</sup>Not applicable in the annealed (O) temper of if wall thickness is less than 2 1/4<sup>2</sup> percent of outside diameter or equivalent round diameter. The equivalent round diameter is the diameter of a circle having a circumference equal to the perimeter of the tube.

<sup>5</sup>The mean wall thickness of round tube is the average of two measurements taken opposite each other. The mean wall thickness of other-than-round tube is the average of two measurements take opposite each other at approximate center line of tube and perpendicular to the longitudinal axis of the cross section.

<sup>6</sup>When dimensions specified are outside and inside, rather than wall thickness itself, allowable deviation at any point (eccentricity) applies to mean wall thickness.

<sup>7</sup>Tolerances for T3510, T4510, T6510, T73510, T76510, and T8510 tempers shall be as agreed upon between purchaser and vendor at the time the contract or order is entered.

<sup>8</sup>TX510 and TX511 are general designations for the following stress-relieved tempers: T3510, T4510, T6150, T8510, T73510, T76510; and T3511, T4511, T6511, T8511, T73511, T76511, respectively.

<sup>9</sup>When weight of piece on flat surface minimizes deviation.

<sup>10</sup>The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the cross section of the extruded product.

<sup>11</sup>See Standards Section (6) for Application of Twist Limits.

<sup>12</sup>Tolerances not applicable to TX510, or TX511 temper tube having a wall thickness less than 0.095 in.

<sup>13</sup>Conditions include die lines, mandrel lines and handling marks.

<sup>14</sup>For tube over 12.750 in. O.D. the 2000 and 7000 series alloys and 5000 series alloys with nominal magnesium content of 3 percent or more are excluded.

<sup>15</sup>Not applicable to O temper tube.

<sup>16</sup>Limited to those alloys listed in table 12.1.

<sup>17</sup>Not applicable to 2219 alloy tube. Most tubes in 2219 alloy will have die lines about twice the depth shown in the table; however, for each tube size the supplier should be contacted for the roughness value to apply.

<sup>18</sup>If unspecified, the radius shall be 1/4<sup>32</sup> in. maximum including tolerances.

## DECIMAL EQUIVALENTS

1/64	.01562
1/32	.03125
3/64	.04687
1/16	.0625
5/64	.07812
3/32	.09375
7/64	.10937
1/8	.1250
9/64	.14062
5/32	.15625
11/64	.17187
3/16	.1875
13/64	.20312
7/32	.21875
15/64	.23437
1/4	.2500
17/64	.26562
9/32	.28125
19/64	.29687
5/16	.3125
21/64	.32812
11/32	.34375
23/64	.35937
3/8	.3750
25/64	.39062
13/32	.40625
27/64	.42187
7/16	.4375
29/64	.45312
15/32	.46875
31/64	.48437
1/2	.5000

33/64	.51562
17/32	.53125
35/64	.54687
9/16	.5625
37/64	.57812
19/32	.59375
39/64	.60937
5/8	.6250
41/64	.64062
21/32	.65625
43/64	.67187
11/16	.6875
45/64	.70312
23/32	.71875
47/64	.73437
3/4	.7500
49/64	.76562
25/32	.78125
51/64	.79687
13/16	.8125
53/64	.82812
27/32	.84375
55/64	.85937
7/8	.8750
57/64	.89062
29/32	.90625
59/64	.92187
15/16	.9375
61/64	.95312
31/32	.96875
63/64	.98437
1	1.0000







## MANUFACTURING CAPABILITIES

- Extruding
- Precision Fly Cutting
- Prototyping
- Anodizing
- Epoxy Bonding
- Ultrasonic Cleaning
- Chromate Conversion
- Heat Treating
- Heliarc Welding
- CNC Machining
- Value Added Assembly
- Vacuum Brazing
- Dip Brazing
- Graining
- Sanding
- Painting
- Silk Screening
- Powder Coating
- Metal Tempering and Annealing
- Line Marking

## ALUMINUM EXTRUSION CAPABILITIES

- **53 Million Pounds Annual Capacity**
- Design Engineering Support
- Extrudability Analysis
- Premium Tolerances / Net Shape Design
- High Aspect Fin Ratios up to 16:1

## QUALITY SYSTEMS

- ISO 9100:2015
- PPAP(Pre Production Approval Process)
- FMEA (Failure Mode Effects Analysis)
- Broad Range of Certified Inspection Equipment - Including CMM's, Torque and Hardness Testing
- SPC (Statistical Process Control)
- Calibration Program for All Measurement Equipment
- Incoming, Inprocess, and Final Inspection Procedures
- Internal Quality Audits
- New Products Design Review
- Material Review Board

## ALUMINUM ALLOYS

- 6005
- 6061
- 6063
- 6082
- 6101
- 6105
- 6463
- Tempers: T4, T5, T6, T52

## EQUIPMENT

- 4 Aluminum Extrusion Presses
  - **3000 Ton Extrusion Press, 11-Inch**
  - **1900 Ton Extrusion Press, 8-Inch**
  - **1800 Ton Extrusion Press, 8-Inch**
  - **1650 Ton Extrusion Press, 7-Inch**
- 20 Automatic Cut Off Saws
- 90 CNC Machining Centers
- 35 Punch Presses
- Full Compliment of Finishing Equipment



WAKEFIELD THERMAL