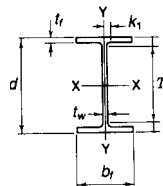


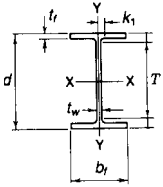
# Wide Flange Beams

## 4" to 44" Sections

## W Shapes Dimensions



Shapes	Area A	Depth d		Web		Flange				Distance		
				Thickness t <sub>w</sub>		Width b <sub>f</sub>		Thickness t <sub>f</sub>		k <sub>1</sub>	T	Workable Gage
				in.		in.		in.		in.	in.	in.
W 4 x 13	3.83	4.16	4 1/8	0.280	1/4	4.06	4	0.345	3/8	1/2	2 5/8	2 1/4
W 5 x 16	4.71	5.01	5	0.240	1/4	5.00	5	0.360	3/8	7/16	3 1/2	2 3/4
x 19	5.56	5.15	5 1/8	0.270	1/4	5.03	5	0.430	7/16	7/16	3 1/2	2 3/4
W 6 x 9	2.68	5.90	5 7/8	0.170	3/16	3.94	4	0.215	3/16	1/2	4 1/2	2 1/4
x 12	3.55	6.03	6	0.230	1/4	4.00	4	0.280	1/4	9/16	↓	↓
x 16	4.74	6.28	6 1/4	0.260	1/4	4.03	4	0.405	3/8	9/16	↓	↓
W 6 x 15	4.43	5.99	6	0.230	1/4	5.99	6	0.260	1/4	9/16	4 1/2	3 1/2
x 20	5.87	6.20	6 1/4	0.260	1/4	6.02	6	0.365	3/8	9/16	↓	↓
x 25	7.34	6.38	6 3/8	0.320	5/16	6.08	6 1/8	0.455	7/16	9/16	↓	↓
W 8 x 10	2.96	7.89	7 7/8	0.170	3/16	3.94	4	0.205	3/16	1/2	6 1/2	2 1/4
x 13	3.84	7.99	8	0.230	1/4	4.00	4	0.255	1/4	9/16	↓	↓
x 15	4.44	8.11	8 1/8	0.245	1/4	4.02	4	0.315	5/16	9/16	↓	↓
W 8 x 18	5.26	8.14	8 1/8	0.230	1/4	5.25	5 1/4	0.330	5/16	9/16	6 1/2	2 3/4
x 21	6.16	8.28	8 1/4	0.250	1/4	5.27	5 1/4	0.400	3/8	9/16	6 1/2	2 3/4
W 8 x 24	7.08	7.93	7 7/8	0.245	1/4	6.50	6 1/2	0.400	3/8	9/16	6 1/8	4
x 28	8.24	8.06	8	0.285	5/16	6.54	6 1/2	0.465	7/16	5/8	6 1/8	4
W 8 x 31	9.12	8.00	8	0.285	5/16	8.00	8	0.435	7/16	3/4	5 3/4	5 1/2
x 35	10.3	8.12	8 1/8	0.310	5/16	8.02	8	0.495	1/2	13/16	↓	↓
x 40	11.7	8.25	8 1/4	0.360	3/8	8.07	8 1/8	0.560	9/16	13/16	↓	↓
x 48	14.1	8.50	8 1/2	0.400	3/8	8.11	8 1/8	0.685	1 1/16	13/16	↓	↓
x 58	17.1	8.75	8 3/4	0.510	1/2	8.22	8 1/4	0.810	1 3/16	7/8	↓	↓
x 67	19.7	9.00	9	0.570	9/16	8.28	8 1/4	0.935	1 5/16	1 5/16	↓	↓



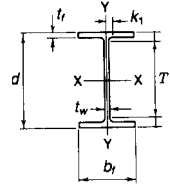
# W Shapes

## Dimensions

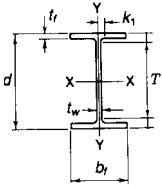
Shapes	Area A	Depth d		Web		Flange				Distance		
				Thickness t <sub>w</sub>		Width b <sub>f</sub>		Thickness t <sub>f</sub>		k <sub>1</sub>	T	Work-able Gage
				in.	in.	in.	in.	in.	in.	in.	in.	
W 10 x 12	3.54	9.87	9 <sup>7</sup> / <sub>8</sub>	0.190	<sup>3</sup> / <sub>16</sub>	3.96	4	0.210	<sup>3</sup> / <sub>16</sub>	<sup>9</sup> / <sub>16</sub>	8 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>4</sub>
x 15	4.41	10.0	10	0.230	<sup>1</sup> / <sub>4</sub>	4.00	4	0.270	<sup>1</sup> / <sub>4</sub>	<sup>9</sup> / <sub>16</sub>	↓	↓
x 17	4.99	10.1	10 <sup>7</sup> / <sub>8</sub>	0.240	<sup>1</sup> / <sub>4</sub>	4.01	4	0.330	<sup>5</sup> / <sub>16</sub>	<sup>9</sup> / <sub>16</sub>	↓	↓
x 19	5.62	10.2	10 <sup>1</sup> / <sub>4</sub>	0.250	<sup>1</sup> / <sub>4</sub>	4.02	4	0.395	<sup>3</sup> / <sub>8</sub>	<sup>5</sup> / <sub>8</sub>	↓	↓
W 10 x 22	6.49	10.2	10 <sup>7</sup> / <sub>8</sub>	0.240	<sup>1</sup> / <sub>4</sub>	5.75	5 <sup>3</sup> / <sub>4</sub>	0.360	<sup>3</sup> / <sub>8</sub>	<sup>5</sup> / <sub>8</sub>	8 <sup>1</sup> / <sub>4</sub>	2 <sup>3</sup> / <sub>4</sub>
x 26	7.61	10.3	10 <sup>3</sup> / <sub>8</sub>	0.260	<sup>1</sup> / <sub>4</sub>	5.77	5 <sup>3</sup> / <sub>4</sub>	0.440	<sup>7</sup> / <sub>16</sub>	<sup>11</sup> / <sub>16</sub>	↓	↓
x 30	8.84	10.5	10 <sup>1</sup> / <sub>2</sub>	0.300	<sup>5</sup> / <sub>16</sub>	5.81	5 <sup>3</sup> / <sub>4</sub>	0.510	<sup>1</sup> / <sub>2</sub>	<sup>11</sup> / <sub>16</sub>	↓	↓
W 10 x 33	9.71	9.73	9 <sup>3</sup> / <sub>4</sub>	0.290	<sup>5</sup> / <sub>16</sub>	7.96	8	0.435	<sup>7</sup> / <sub>16</sub>	<sup>3</sup> / <sub>4</sub>	7 <sup>1</sup> / <sub>2</sub>	5 <sup>1</sup> / <sub>2</sub>
x 39	11.5	9.92	9 <sup>7</sup> / <sub>8</sub>	0.315	<sup>5</sup> / <sub>16</sub>	7.99	8	0.530	<sup>1</sup> / <sub>2</sub>	<sup>13</sup> / <sub>16</sub>	↓	↓
x 45	13.3	10.1	10 <sup>7</sup> / <sub>8</sub>	0.350	<sup>3</sup> / <sub>8</sub>	8.02	8	0.620	<sup>5</sup> / <sub>8</sub>	<sup>13</sup> / <sub>16</sub>	↓	↓
W 10 x 49	14.4	10.0	10	0.340	<sup>5</sup> / <sub>16</sub>	10.0	10	0.560	<sup>9</sup> / <sub>16</sub>	<sup>13</sup> / <sub>16</sub>	7 <sup>1</sup> / <sub>2</sub>	5 <sup>1</sup> / <sub>2</sub>
x 54	15.8	10.1	10 <sup>7</sup> / <sub>8</sub>	0.370	<sup>3</sup> / <sub>8</sub>	10.0	10	0.615	<sup>5</sup> / <sub>8</sub>	<sup>13</sup> / <sub>16</sub>	↓	↓
x 60	17.6	10.2	10 <sup>1</sup> / <sub>4</sub>	0.420	<sup>7</sup> / <sub>16</sub>	10.1	10 <sup>7</sup> / <sub>8</sub>	0.680	<sup>11</sup> / <sub>16</sub>	<sup>13</sup> / <sub>16</sub>	↓	↓
x 68	20.0	10.4	10 <sup>3</sup> / <sub>8</sub>	0.470	<sup>1</sup> / <sub>2</sub>	10.1	10 <sup>1</sup> / <sub>4</sub>	0.770	<sup>3</sup> / <sub>4</sub>	<sup>7</sup> / <sub>8</sub>	↓	↓
x 77	22.6	10.6	10 <sup>5</sup> / <sub>8</sub>	0.530	<sup>1</sup> / <sub>2</sub>	10.2	10 <sup>1</sup> / <sub>4</sub>	0.870	<sup>7</sup> / <sub>8</sub>	<sup>7</sup> / <sub>8</sub>	↓	↓
x 88	25.9	10.8	10 <sup>7</sup> / <sub>8</sub>	0.605	<sup>5</sup> / <sub>8</sub>	10.3	10 <sup>1</sup> / <sub>4</sub>	0.990	1	<sup>15</sup> / <sub>16</sub>	↓	↓
x100	29.4	11.1	11 <sup>1</sup> / <sub>8</sub>	0.680	<sup>11</sup> / <sub>16</sub>	10.3	10 <sup>3</sup> / <sub>8</sub>	1.12	<sup>11</sup> / <sub>8</sub>	1	↓	↓
x112	32.9	11.4	11 <sup>3</sup> / <sub>8</sub>	0.755	<sup>3</sup> / <sub>4</sub>	10.4	10 <sup>3</sup> / <sub>8</sub>	1.25	<sup>11</sup> / <sub>4</sub>	1	↓	↓
W 12 x 14	4.16	11.9	11 <sup>7</sup> / <sub>8</sub>	0.200	<sup>3</sup> / <sub>16</sub>	3.97	4	0.225	<sup>1</sup> / <sub>4</sub>	<sup>9</sup> / <sub>16</sub>	10 <sup>3</sup> / <sub>8</sub>	2 <sup>1</sup> / <sub>4</sub>
x 16	4.71	12.0	12	0.220	<sup>1</sup> / <sub>4</sub>	3.99	4	0.265	<sup>1</sup> / <sub>4</sub>	<sup>9</sup> / <sub>16</sub>	↓	↓
x 19	5.57	12.2	12 <sup>7</sup> / <sub>8</sub>	0.235	<sup>1</sup> / <sub>4</sub>	4.01	4	0.350	<sup>3</sup> / <sub>8</sub>	<sup>9</sup> / <sub>16</sub>	↓	↓
x 22	6.48	12.3	12 <sup>1</sup> / <sub>4</sub>	0.260	<sup>1</sup> / <sub>4</sub>	4.03	4	0.425	<sup>7</sup> / <sub>16</sub>	<sup>5</sup> / <sub>8</sub>	↓	↓
W 12 x 26	7.65	12.2	12 <sup>1</sup> / <sub>4</sub>	0.230	<sup>1</sup> / <sub>4</sub>	6.49	6 <sup>1</sup> / <sub>2</sub>	0.380	<sup>3</sup> / <sub>8</sub>	<sup>3</sup> / <sub>4</sub>	10 <sup>7</sup> / <sub>8</sub>	3 <sup>1</sup> / <sub>2</sub>
x 30	8.79	12.3	12 <sup>3</sup> / <sub>8</sub>	0.260	<sup>1</sup> / <sub>4</sub>	6.52	6 <sup>1</sup> / <sub>2</sub>	0.440	<sup>7</sup> / <sub>16</sub>	<sup>3</sup> / <sub>4</sub>	↓	↓
x 35	10.3	12.5	12 <sup>1</sup> / <sub>2</sub>	0.300	<sup>5</sup> / <sub>16</sub>	6.56	6 <sup>1</sup> / <sub>2</sub>	0.520	<sup>1</sup> / <sub>2</sub>	<sup>3</sup> / <sub>4</sub>	↓	↓
W 12 x 40	11.7	11.9	12	0.295	<sup>5</sup> / <sub>16</sub>	8.01	8	0.515	<sup>1</sup> / <sub>2</sub>	<sup>7</sup> / <sub>8</sub>	9 <sup>1</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>2</sub>
x 45	13.1	12.1	12	0.335	<sup>5</sup> / <sub>16</sub>	8.05	8	0.575	<sup>9</sup> / <sub>16</sub>	<sup>15</sup> / <sub>16</sub>	↓	↓
x 50	14.6	12.2	12 <sup>1</sup> / <sub>4</sub>	0.370	<sup>3</sup> / <sub>8</sub>	8.08	8 <sup>1</sup> / <sub>8</sub>	0.640	<sup>5</sup> / <sub>8</sub>	<sup>15</sup> / <sub>16</sub>	↓	↓
W 12 x 53	15.6	12.1	12	0.345	<sup>3</sup> / <sub>8</sub>	10.0	10	0.575	<sup>9</sup> / <sub>16</sub>	<sup>15</sup> / <sub>16</sub>	9 <sup>1</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>2</sub>
x 58	17.0	12.2	12 <sup>1</sup> / <sub>4</sub>	0.360	<sup>3</sup> / <sub>8</sub>	10.0	10	0.640	<sup>5</sup> / <sub>8</sub>	<sup>15</sup> / <sub>16</sub>	9 <sup>1</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>2</sub>

# W Shapes

## Dimensions



Shapes	Area		Depth		Web		Flange			Distance		
	A		d		Thickness		Width		Thickness	k <sub>1</sub>	T	Workable Gage
	in. <sup>2</sup>		in.		t <sub>w</sub>		b <sub>f</sub>		t <sub>f</sub>			
W 12 x 65	19.1	12.1	12½	0.390	⅜	12.0	12	0.605	⅝	1	9½	5½
x 72	21.1	12.3	12¼	0.430	7/16	12.0	12	0.670	11/16	1 1/16	↓	↓
x 79	23.2	12.4	12⅝	0.470	½	12.1	12⅝	0.735	¾	1 1/16		
x 87	25.6	12.5	12½	0.515	½	12.1	12⅝	0.810	13/16	1 1/16		
x 96	28.2	12.7	12¾	0.550	9/16	12.2	12⅝	0.900	7/8	1 1/8		
x 106	31.2	12.9	12⅞	0.610	⅝	12.2	12¾	0.990	1	1 1/8		
x 120	35.3	13.1	13⅝	0.710	1 1/16	12.3	12⅝	1.11	1 1/8	1 3/16		
x 136	39.9	13.4	13⅝	0.790	13/16	12.4	12⅝	1.25	1 1/4	1 1/4		
x 152	44.7	13.7	13¾	0.870	7/8	12.5	12½	1.40	1 3/8	1 1/4		
x 170	50.0	14.0	14	0.960	15/16	12.6	12⅝	1.56	1 9/16	1 5/16		
x 190	55.8	14.4	14⅝	1.060	1 1/8	12.7	12⅝	1.74	1 3/4	1 9/8		
x 210	61.8	14.7	14¾	1.180	1 3/16	12.8	12¾	1.90	1 7/8	1 7/16		
x 230	67.7	15.1	15	1.290	1 5/16	12.9	12⅞	2.07	2 1/16	1 1/2		
x 252	74.0	15.4	15⅝	1.400	1 3/8	13.0	13	2.25	2 1/4	1 1/2		
x 279	81.9	15.9	15⅞	1.530	1 1/2	13.1	13⅝	2.47	2 1/2	1 9/8		
x 305	89.6	16.3	16⅝	1.630	1 5/8	13.2	13¾	2.71	2 11/16	1 5/8		
x 336	98.8	16.8	16⅞	1.780	1 3/4	13.4	13⅝	2.96	2 15/16	1 11/16		
W 14 x 22	6.49	13.7	13¾	0.230	¼	5.00	5	0.335	5/16	¾	11⅝	2¾
x 26	7.69	13.9	13⅞	0.255	¼	5.03	5	0.420	7/16	¾	11⅝	2¾
W 14 x 30	8.85	13.8	13⅞	0.270	¼	6.73	6¾	0.385	⅝	¾	11⅝	3½
x 34	10.0	14.0	14	0.285	5/16	6.75	6¾	0.455	7/16	¾	↓	↓
x 38	11.2	14.1	14⅝	0.310	5/16	6.77	6¾	0.515	1/2	13/16	↓	↓
W 14 x 43	12.6	13.7	13⅝	0.305	5/16	8.00	8	0.530	1/2	1	10⅞	5½
x 48	14.1	13.8	13¾	0.340	5/16	8.03	8	0.595	5/8	1	↓	↓
x 53	15.6	13.9	13⅞	0.370	⅜	8.06	8	0.660	1 1/16	1	↓	↓
W 14 x 61	17.9	13.9	13⅞	0.375	⅜	10.0	10	0.645	5/8	1	10⅞	5½
x 68	20.0	14.0	14	0.415	7/16	10.0	10	0.720	¾	1 1/16	↓	↓
x 74	21.8	14.2	14⅝	0.450	7/16	10.1	10⅞	0.785	13/16	1 1/16	↓	↓
x 82	24.0	14.3	14¼	0.510	1/2	10.1	10⅞	0.855	7/8	1 1/16	↓	↓
W 14 x 90	26.5	14.0	14	0.440	7/16	14.5	14½	0.710	1 1/16	1 7/16	10	5½
x 99	29.1	14.2	14⅝	0.485	1/2	14.6	14⅝	0.780	¾	1 7/16	↓	↓
x 109	32.0	14.3	14⅝	0.525	1/2	14.6	14⅝	0.860	7/8	1 1/2	↓	↓
x 120	35.3	14.5	14½	0.590	9/16	14.7	14⅝	0.940	15/16	1 1/2	↓	↓
x 132	38.8	14.7	14⅝	0.645	⅝	14.7	14¾	1.03	1	1 9/16	↓	↓



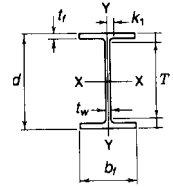
# W Shapes

## Dimensions

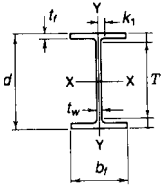
Shapes	Area A	Depth d		Web		Flange				Distance		
				Thickness t <sub>w</sub>		Width b <sub>f</sub>		Thickness t <sub>f</sub>		k <sub>1</sub>	T	Work- able Gage
				in.	in.	in.	in.	in.	in.	in.	in.	
W 14 x 145	42.7	14.8	14¾	0.680	1½	15.5	15½	1.09	1½	19½	10	3-7½-3
x 159	46.7	15.0	15	0.745	¾	15.6	15⅝	1.19	1¾	19½		
x 176	51.8	15.2	15¼	0.830	13/16	15.7	15⅝	1.31	1⅝	15⅝		
x 193	56.8	15.5	15½	0.890	7/8	15.7	15¾	1.44	17/16	11½		
x 211	62.0	15.7	15¾	0.980	1	15.8	15¾	1.56	19/16	11½		
x 233	68.5	16.0	16	1.070	1½	15.9	15⅞	1.72	1¾	1¾		
x 257	75.6	16.4	16⅜	1.180	1¾	16.0	16	1.89	1⅞	11¾		
x 283	83.3	16.7	16¾	1.290	1⅝	16.1	16⅞	2.07	21/16	1⅞		
x 311	91.4	17.1	17⅞	1.410	17/16	16.2	16¼	2.26	2¼	115/16		
x 342	101.0	17.5	17½	1.540	19/16	16.4	16⅝	2.47	2½	2		
x 370	109.0	17.9	17⅞	1.660	1⅝	16.5	16½	2.66	211/16	21/16		
x 398	117.0	18.3	18¼	1.770	1¾	16.6	16⅝	2.85	2⅞	2⅞		
x 426	125.0	18.7	18⅝	1.880	1⅞	16.7	16¾	3.04	3 1/16	2⅞		
x 455	134.0	19.0	19	2.020	2	16.8	16⅞	3.21	33/16	2¼		
x 500	147.0	19.6	19⅝	2.190	23/16	17.0	17	3.50	3½	23/16		
x 550	162.0	20.2	20¼	2.380	2⅝	17.2	17¼	3.82	313/16	2⅝		
x 605	178.0	20.9	20⅞	2.600	2⅝	17.4	17⅝	4.16	43/16	21/2		
x 665	196.0	21.6	21⅝	2.830	213/16	17.7	17⅞	4.52	4½	2⅝		
x 730	215.0	22.4	22⅝	3.070	31/16	17.9	17⅞	4.91	415/16	2¾	↓	↓
W 16 x 26	7.68	15.7	15¾	0.250	¼	5.50	5½	0.345	⅝	¾	13⅝	3½
x 31	9.13	15.9	15⅞	0.275	¼	5.53	5½	0.440	7/16	¾	13⅝	3½
W 16 x 36	10.6	15.9	15⅞	0.295	5/16	6.99	7	0.430	7/16	¾	13⅝	3½
x 40	11.8	16.0	16	0.305	5/16	7.00	7	0.505	½	13/16		
x 45	13.3	16.1	16⅞	0.345	⅝	7.04	7	0.565	9/16	13/16		
x 50	14.7	16.3	16¼	0.380	⅝	7.07	7⅞	0.630	⅝	13/16		
x 57	16.8	16.4	16⅜	0.430	7/16	7.12	7⅞	0.715	11/16	7/8	↓	↓
W 16 x 67	19.7	16.3	16⅜	0.395	⅝	10.2	10¼	0.665	11/16	1	13¼	5½
x 77	22.6	16.5	16½	0.455	7/16	10.3	10¼	0.760	¾	11/16		
x 89	26.2	16.8	16¾	0.525	½	10.4	10⅝	0.875	7/8	11/16		
x 100	29.5	17.0	17	0.585	9/16	10.4	10⅝	0.985	1	1⅞	↓	↓

# W Shapes

## Dimensions



Shapes	Area A	Depth d		Web		Flange			Distance			
				Thickness t <sub>w</sub>		Width b <sub>f</sub>		Thickness t <sub>f</sub>		k <sub>1</sub>	T	Workable Gage
				in.		in.		in.		in.	in.	in.
W 18 x 35	10.3	17.7	17¾	0.300	⅝	6.00	6	0.425	⅞	¾	15½	3½
x 40	11.8	17.9	17⅞	0.315	⅝	6.02	6	0.525	½	13/16	↓	↓
x 46	13.5	18.1	18	0.360	⅜	6.06	6	0.605	⅝	13/16	↓	↓
W 18 x 50	14.7	18.0	18	0.355	⅜	7.50	7½	0.570	⅞	13/16	15½	3½
x 55	16.2	18.1	18⅞	0.390	⅜	7.53	7½	0.630	⅝	13/16	↓	↓
x 60	17.6	18.2	18¼	0.415	⅞	7.56	7½	0.695	11/16	13/16	↓	↓
x 65	19.1	18.4	18⅝	0.450	⅞	7.59	7⅝	0.750	¾	⅞	↓	↓
x 71	20.8	18.5	18½	0.495	½	7.64	7⅝	0.810	13/16	⅞	↓	↓
W 18 x 76	22.3	18.2	18¼	0.425	⅞	11.0	11	0.680	11/16	11/16	15⅝	5½
x 86	25.3	18.4	18⅝	0.480	½	11.1	11⅞	0.770	¾	11/16	↓	↓
x 97	28.5	18.6	18⅝	0.535	⅞	11.1	11⅞	0.870	⅞	11/8	↓	↓
x 106	31.1	18.7	18¾	0.590	⅞	11.2	11¼	0.940	15/16	11/8	↓	↓
x 119	35.1	19.0	19	0.655	⅝	11.3	11¼	1.06	11/16	13/16	↓	↓
x 130	38.2	19.3	19¼	0.670	11/16	11.2	11⅞	1.20	13/16	13/16	↓	↓
x 143	42.1	19.5	19½	0.730	¾	11.2	11¼	1.32	15/16	13/16	↓	↓
x 158	46.3	19.7	19¾	0.810	13/16	11.3	11¼	1.44	17/16	11/4	↓	↓
x 175	51.3	20.0	20	0.890	⅞	11.4	11⅝	1.59	19/16	11/4	↓	↓
x 192	56.4	20.4	20⅝	0.960	15/16	11.5	11½	1.75	1¾	11/8	↓	↓
x 211	62.1	20.7	20⅝	1.060	11/16	11.6	11½	1.91	115/16	13/16	15½	↓
x 234	68.8	21.1	21	1.160	13/16	11.7	11⅝	2.11	21/8	13/16	↓	↓
x 258	75.9	21.5	21½	1.280	1¼	11.8	11¾	2.30	25/16	11/4	↓	↓
x 283	83.3	21.9	21⅞	1.400	1⅝	11.9	11⅞	2.50	21/2	15/16	↓	↓
x 311	91.6	22.3	22⅝	1.520	1½	12.0	12	2.74	2¾	1⅝	↓	↓
W 21 x 44	13.0	20.7	20⅝	0.350	⅜	6.50	6½	0.450	⅞	13/16	18⅝	3½
x 50	14.7	20.8	20⅞	0.380	⅜	6.53	6½	0.535	⅞	13/16	↓	↓
x 57	16.7	21.1	21	0.405	⅜	6.56	6½	0.650	⅝	13/16	↓	↓
W 21 x 48	14.1	20.6	20⅝	0.350	⅜	8.14	8⅞	0.430	⅞	13/16	18⅝	5½
x 55	16.2	20.8	20¾	0.375	⅜	8.22	8¼	0.522	½	13/16	↓	↓
x 62	18.3	21.0	21	0.400	⅜	8.24	8¼	0.615	⅝	13/16	↓	↓
x 68	20.0	21.1	21⅞	0.430	⅞	8.27	8¼	0.685	11/16	⅞	↓	↓
x 73	21.5	21.2	21¼	0.455	⅞	8.30	8¼	0.740	¾	⅞	↓	↓
x 83	24.3	21.4	21⅝	0.515	½	8.36	8⅝	0.835	13/16	⅞	↓	↓
x 93	27.3	21.6	21⅝	0.058	⅞	8.42	8⅝	0.930	15/16	15/16	↓	↓



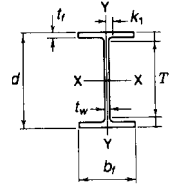
# W Shapes

## Dimensions

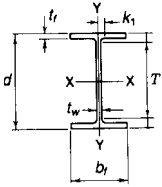
Shapes	Area A	Depth d		Web		Flange				Distance		
				Thickness t <sub>w</sub>		Width b <sub>f</sub>		Thickness t <sub>f</sub>		k <sub>1</sub>	T	Work-able Gage
				in.	in.	in.	in.	in.	in.	in.	in.	in.
W 21 x 101	29.8	21.4	21 <sup>3</sup> / <sub>8</sub>	0.500	1/2	12.3	12 <sup>1</sup> / <sub>4</sub>	0.800	1 <sup>3</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>16</sub>	18	5 <sup>1</sup> / <sub>2</sub>
x 111	32.7	21.5	21 <sup>1</sup> / <sub>2</sub>	0.550	9 <sup>1</sup> / <sub>16</sub>	12.3	12 <sup>3</sup> / <sub>8</sub>	0.875	7 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>8</sub>	↓	↓
x 122	35.9	21.7	21 <sup>5</sup> / <sub>8</sub>	0.600	5 <sup>1</sup> / <sub>8</sub>	12.4	12 <sup>3</sup> / <sub>8</sub>	0.960	1 <sup>5</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>		
x 132	38.8	21.8	21 <sup>7</sup> / <sub>8</sub>	0.650	5 <sup>1</sup> / <sub>8</sub>	12.4	12 <sup>1</sup> / <sub>2</sub>	1.04	1 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>		
x 147	43.2	22.1	22	0.720	3 <sup>1</sup> / <sub>4</sub>	12.5	12 <sup>1</sup> / <sub>2</sub>	1.15	1 <sup>1</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>16</sub>		
x 166	48.8	22.5	22 <sup>1</sup> / <sub>2</sub>	0.750	3 <sup>1</sup> / <sub>4</sub>	12.4	12 <sup>3</sup> / <sub>8</sub>	1.36	1 <sup>3</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>16</sub>		
x 182	53.6	22.7	22 <sup>3</sup> / <sub>4</sub>	0.830	1 <sup>3</sup> / <sub>16</sub>	12.5	12 <sup>1</sup> / <sub>2</sub>	1.48	1 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>4</sub>		
x 201	59.2	23.0	23	0.910	1 <sup>5</sup> / <sub>16</sub>	12.6	12 <sup>3</sup> / <sub>8</sub>	1.63	1 <sup>9</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>16</sub>		
W 24 x 55	16.2	23.6	23 <sup>3</sup> / <sub>8</sub>	0.395	3 <sup>1</sup> / <sub>8</sub>	7.01	7	0.505	1/2	1		
x 62	18.2	23.7	23 <sup>3</sup> / <sub>4</sub>	0.430	7 <sup>1</sup> / <sub>16</sub>	7.04	7	0.590	9 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>16</sub>	20 <sup>3</sup> / <sub>4</sub>	3 <sup>1</sup> / <sub>2</sub>
W 24 x 68	20.1	23.7	23 <sup>3</sup> / <sub>4</sub>	0.415	7 <sup>1</sup> / <sub>16</sub>	8.97	9	0.585	9 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>16</sub>	20 <sup>3</sup> / <sub>4</sub>	5 <sup>1</sup> / <sub>2</sub>
x 76	22.4	23.9	23 <sup>7</sup> / <sub>8</sub>	0.440	7 <sup>1</sup> / <sub>16</sub>	8.99	9	0.680	1 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>16</sub>	↓	↓
x 84	24.7	24.1	24 <sup>1</sup> / <sub>8</sub>	0.470	1/2	9.02	9	0.770	3 <sup>1</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>16</sub>		
x 94	27.7	24.3	24 <sup>1</sup> / <sub>4</sub>	0.515	1/2	9.07	9 1/8	0.875	7 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>16</sub>		
x 103	30.3	24.5	24 <sup>1</sup> / <sub>2</sub>	0.550	9 <sup>1</sup> / <sub>16</sub>	9.00	9	0.980	1	1 <sup>1</sup> / <sub>8</sub>		
W 24 x 104	30.6	24.1	24	0.500	1/2	12.8	12 <sup>3</sup> / <sub>4</sub>	0.750	3/4	1 <sup>1</sup> / <sub>16</sub>		
x 117	34.4	24.3	24 <sup>1</sup> / <sub>4</sub>	0.550	9 <sup>1</sup> / <sub>16</sub>	12.8	12 <sup>3</sup> / <sub>4</sub>	0.850	7 <sup>1</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>8</sub>	↓	↓
x 131	38.5	24.5	24 <sup>1</sup> / <sub>2</sub>	0.605	5 <sup>1</sup> / <sub>8</sub>	12.9	12 <sup>7</sup> / <sub>8</sub>	0.960	1 <sup>5</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>		
x 146	43.0	24.7	24 <sup>3</sup> / <sub>4</sub>	0.650	5 <sup>1</sup> / <sub>8</sub>	12.9	12 <sup>7</sup> / <sub>8</sub>	1.09	1 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>		
x 162	47.7	25.0	25	0.705	1 <sup>1</sup> / <sub>16</sub>	13.0	13	1.22	1 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>16</sub>		
x 176	51.7	25.2	25 <sup>1</sup> / <sub>4</sub>	0.750	3/4	12.9	12 <sup>7</sup> / <sub>8</sub>	1.34	1 <sup>5</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>16</sub>		
x 192	56.3	25.5	25 <sup>1</sup> / <sub>2</sub>	0.810	1 <sup>3</sup> / <sub>16</sub>	13.0	13	1.46	1 <sup>7</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>4</sub>		
x 207	60.7	25.7	25 <sup>3</sup> / <sub>4</sub>	0.870	7 <sup>1</sup> / <sub>8</sub>	13.0	13	1.57	1 <sup>9</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>4</sub>		
x 229	67.2	26.0	26	0.960	1 <sup>5</sup> / <sub>16</sub>	13.1	13 <sup>1</sup> / <sub>8</sub>	1.73	1 <sup>3</sup> / <sub>4</sub>	1 <sup>5</sup> / <sub>16</sub>		
x 250	73.5	26.3	26 <sup>3</sup> / <sub>8</sub>	1.04	1 <sup>1</sup> / <sub>16</sub>	13.2	13 <sup>1</sup> / <sub>8</sub>	1.89	1 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>		
x 279	82.0	26.7	26 <sup>3</sup> / <sub>4</sub>	1.16	1 <sup>3</sup> / <sub>16</sub>	13.3	13 <sup>1</sup> / <sub>4</sub>	2.09	2 <sup>1</sup> / <sub>16</sub>	1 <sup>7</sup> / <sub>16</sub>		
x 306	89.9	27.1	27 <sup>1</sup> / <sub>8</sub>	1.26	1 <sup>1</sup> / <sub>4</sub>	13.4	13 <sup>3</sup> / <sub>8</sub>	2.28	2 <sup>1</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>16</sub>		
x 335	98.4	27.5	27 <sup>1</sup> / <sub>2</sub>	1.38	1 <sup>3</sup> / <sub>8</sub>	13.5	13 <sup>1</sup> / <sub>2</sub>	2.48	2 <sup>1</sup> / <sub>2</sub>	1 <sup>1</sup> / <sub>2</sub>		
x 370	109.0	28.0	28	1.52	1 <sup>1</sup> / <sub>2</sub>	13.7	13 <sup>3</sup> / <sub>8</sub>	2.72	2 <sup>3</sup> / <sub>4</sub>	9 <sup>1</sup> / <sub>16</sub>		

# W Shapes

## Dimensions



Shapes	Area A	Depth d		Web		Flange				Distance		
				Thickness t <sub>w</sub>		Width b <sub>f</sub>		Thickness t <sub>f</sub>		k <sub>1</sub>	T	Workable Gage
				in.	in.	in.	in.	in.	in.	in.	in.	
W 27 x 84	24.8	26.7	26¾	0.460	7/16	10.0	10	0.640	5/8	11/16	23¾	5½
x 94	27.7	26.9	26⅞	0.490	½	10.0	10	0.745	¾	11/16	↓	↓
x 102	30.0	27.1	27⅞	0.515	½	10.0	10	0.830	13/16	11/16	↓	↓
x 114	33.5	27.3	27¼	0.570	9/16	10.1	10½	0.930	15/16	11/8	↓	↓
x 129	37.8	27.6	27⅝	0.610	5/8	10.0	10	1.10	11/8	11/8	↓	↓
W 27 x 146	43.1	27.4	27⅝	0.605	5/8	14.0	14	0.975	1	11/8	23¾	5½
x 161	47.6	27.6	27⅝	0.660	11/16	14.0	14	1.08	11/16	13/16	↓	↓
x 178	52.5	27.8	27¾	0.725	¾	14.1	14½	1.19	13/16	13/16	↓	↓
x 194	57.2	28.1	28⅞	0.750	¾	14.0	14	1.34	15/16	13/16	↓	↓
x 217	64.0	28.4	28⅞	0.830	13/16	14.1	14½	1.50	11/2	11/4	↓	↓
x 235	69.4	28.7	28⅝	0.910	15/16	14.2	14¼	1.61	15/8	15/16	↓	↓
x 258	76.0	29.0	29	0.980	1½	14.3	14¼	1.77	1¾	15/16	↓	↓
x 281	82.9	29.3	29¼	1.060	11/16	14.4	14¾	1.93	115/16	13/8	↓	↓
x 307	90.4	29.6	29⅝	1.160	13/16	14.4	14½	2.09	21/16	17/16	↓	↓
x 336	98.9	30.0	30	1.260	1¼	14.6	14½	2.28	2¼	17/16	↓	↓
x 368	108.0	30.4	30⅝	1.380	1⅝	14.7	14⅝	2.48	21/2	11/2	↓	↓
x 539	159	32.5	32½	1.970	2	15.3	15¼	3.54	39/16	113/16	↓	↓
W 30 x 90	26.4	29.5	29½	0.470	½	10.4	10¾	0.610	5/8	11/16	26½	5½
x 99	29.1	29.7	29⅝	0.520	½	10.5	10½	0.670	11/16	11/16	↓	↓
x 108	31.7	29.8	29⅞	0.545	9/16	10.5	10½	0.760	¾	11/8	↓	↓
x 116	34.2	30.0	30	0.565	9/16	10.5	10½	0.850	7/8	11/8	↓	↓
x 124	36.5	30.2	30⅞	0.585	9/16	10.5	10½	0.930	15/16	11/8	↓	↓
x 132	38.9	30.3	30¼	0.615	5/8	10.5	10½	1.00	1	11/8	↓	↓
x 148	43.5	30.7	30⅝	0.650	5/8	10.5	10½	1.18	13/16	11/8	↓	↓
W 30 x 173	51.0	30.4	30½	0.655	5/8	15.0	15	1.07	11/16	11/8	26½	5½
x 191	56.3	30.7	30⅝	0.710	11/16	15.0	15	1.19	13/16	13/16	↓	↓
x 211	62.2	30.9	31	0.775	¾	15.1	15½	1.32	15/16	13/16	↓	↓
x 235	69.2	31.3	31¼	0.830	13/16	15.1	15	1.50	11/2	11/4	↓	↓
x 261	76.9	31.6	31⅝	0.930	15/16	15.2	15⅞	1.65	15/8	15/16	↓	↓
x 292	85.9	32.0	32	1.02	1	15.3	15¼	1.85	17/8	15/16	↓	↓
x 326	95.8	32.4	32⅝	1.14	11/8	15.4	15¾	2.05	21/16	13/8	↓	↓
x 357	105.0	32.8	32¾	1.24	1¼	15.5	15½	2.24	2¼	17/16	↓	↓
x 391	115.0	33.2	32¼	1.36	1⅝	15.6	15⅝	2.44	27/16	11/2	↓	↓



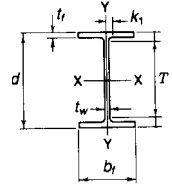
# W Shapes

## Dimensions

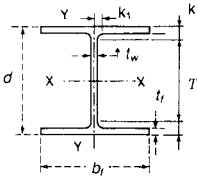
Shapes	Area A	Depth d		Web		Flange				Distance		
				Thickness t <sub>w</sub>		Width b <sub>f</sub>		Thickness t <sub>f</sub>		k <sub>1</sub>	T	Workable Gage
				in.		in.		in.		in.	in.	in.
W 33 x 118	34.7	32.9	32 <sup>7</sup> / <sub>8</sub>	0.550	9 <sup>1</sup> / <sub>16</sub>	11.5	11 <sup>1</sup> / <sub>2</sub>	0.740	3 <sup>4</sup> / <sub>4</sub>	1 <sup>1</sup> / <sub>8</sub>	29 <sup>5</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>
x 130	38.3	33.1	33 <sup>1</sup> / <sub>8</sub>	0.580	9 <sup>1</sup> / <sub>16</sub>	11.5	11 <sup>1</sup> / <sub>2</sub>	0.855	7 <sup>8</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>8</sub>	↓	↓
x 141	41.6	33.3	33 <sup>3</sup> / <sub>4</sub>	0.605	5 <sup>8</sup> / <sub>8</sub>	11.5	11 <sup>1</sup> / <sub>2</sub>	0.960	15 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>	↓	↓
x 152	44.8	33.5	33 <sup>1</sup> / <sub>2</sub>	0.635	5 <sup>8</sup> / <sub>8</sub>	11.6	11 <sup>5</sup> / <sub>8</sub>	1.06	1 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>	↓	↓
x 169	49.5	33.8	33 <sup>3</sup> / <sub>8</sub>	0.670	1 <sup>1</sup> / <sub>16</sub>	11.5	11 <sup>1</sup> / <sub>2</sub>	1.22	1 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>16</sub>	↓	↓
W 33 x 201	59.2	33.7	33 <sup>5</sup> / <sub>8</sub>	0.715	1 <sup>1</sup> / <sub>16</sub>	15.7	15 <sup>3</sup> / <sub>4</sub>	1.15	1 <sup>1</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>16</sub>	29 <sup>5</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>
x 221	65.2	33.9	33 <sup>7</sup> / <sub>8</sub>	0.775	3 <sup>4</sup> / <sub>4</sub>	15.8	15 <sup>3</sup> / <sub>4</sub>	1.28	1 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>16</sub>	↓	↓
x 241	71.0	34.2	34 <sup>1</sup> / <sub>8</sub>	0.830	13 <sup>1</sup> / <sub>16</sub>	15.9	15 <sup>7</sup> / <sub>8</sub>	1.40	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>	↓	↓
x 263	77.5	34.5	34 <sup>1</sup> / <sub>2</sub>	0.870	7 <sup>8</sup> / <sub>8</sub>	15.8	15 <sup>3</sup> / <sub>4</sub>	1.57	1 <sup>9</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>4</sub>	↓	↓
x 291	85.7	34.8	34 <sup>7</sup> / <sub>8</sub>	0.960	1 <sup>9</sup> / <sub>16</sub>	15.9	15 <sup>7</sup> / <sub>8</sub>	1.73	1 <sup>3</sup> / <sub>4</sub>	1 <sup>5</sup> / <sub>16</sub>	↓	↓
x 318	93.6	35.2	35 <sup>1</sup> / <sub>8</sub>	1.04	1 <sup>1</sup> / <sub>16</sub>	16.0	16	1.89	1 <sup>7</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>16</sub>	↓	↓
x 354	104.0	35.6	35 <sup>1</sup> / <sub>2</sub>	1.16	13 <sup>1</sup> / <sub>16</sub>	16.1	16 <sup>1</sup> / <sub>8</sub>	2.09	2 <sup>1</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>8</sub>	↓	↓
x 387	114.0	36.0	36	1.26	1 <sup>1</sup> / <sub>4</sub>	16.2	16 <sup>1</sup> / <sub>4</sub>	2.28	2 <sup>1</sup> / <sub>4</sub>	1 <sup>7</sup> / <sub>16</sub>	↓	↓
W 36 x 135	39.7	35.6	35 <sup>1</sup> / <sub>2</sub>	0.600	5 <sup>8</sup> / <sub>8</sub>	12.0	12	0.790	13 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>	32 <sup>1</sup> / <sub>8</sub>	5 <sup>1</sup> / <sub>2</sub>
x 150	44.2	35.9	35 <sup>5</sup> / <sub>8</sub>	0.625	5 <sup>8</sup> / <sub>8</sub>	12.0	12	0.940	15 <sup>1</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>8</sub>	↓	↓
x 160	47.0	36.0	36	0.650	5 <sup>8</sup> / <sub>8</sub>	12.0	12	1.02	1	1 <sup>1</sup> / <sub>8</sub>	↓	↓
x 170	50.1	36.2	36 <sup>1</sup> / <sub>8</sub>	0.680	1 <sup>1</sup> / <sub>16</sub>	12.0	12	1.10	1 <sup>1</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>16</sub>	↓	↓
x 182	53.6	36.3	36 <sup>3</sup> / <sub>8</sub>	0.725	3 <sup>4</sup> / <sub>4</sub>	12.1	12 <sup>1</sup> / <sub>8</sub>	1.18	1 <sup>3</sup> / <sub>16</sub>	1 <sup>3</sup> / <sub>16</sub>	↓	↓
x 194	57.0	36.5	36 <sup>1</sup> / <sub>2</sub>	0.765	3 <sup>4</sup> / <sub>4</sub>	12.1	12 <sup>1</sup> / <sub>8</sub>	1.26	1 <sup>1</sup> / <sub>4</sub>	1 <sup>3</sup> / <sub>16</sub>	↓	↓
x 210	61.8	36.7	36 <sup>3</sup> / <sub>4</sub>	0.830	13 <sup>1</sup> / <sub>16</sub>	12.2	12 <sup>1</sup> / <sub>8</sub>	1.36	1 <sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>4</sub>	↓	↓
x 232	68.1	37.1	37 <sup>1</sup> / <sub>8</sub>	0.870	7 <sup>8</sup> / <sub>8</sub>	12.1	12 <sup>1</sup> / <sub>8</sub>	1.57	1 <sup>9</sup> / <sub>16</sub>	1 <sup>1</sup> / <sub>4</sub>	↓	↓
x 256	75.4	37.4	37 <sup>3</sup> / <sub>8</sub>	0.960	1 <sup>5</sup> / <sub>16</sub>	12.2	12 <sup>1</sup> / <sub>4</sub>	1.73	1 <sup>3</sup> / <sub>4</sub>	1 <sup>5</sup> / <sub>16</sub>	↓	↓
W 36 x 231	68.1	36.5	36 <sup>1</sup> / <sub>2</sub>	0.760	3 <sup>4</sup> / <sub>4</sub>	16.5	16 <sup>1</sup> / <sub>2</sub>	1.26	1 <sup>1</sup> / <sub>4</sub>	1 <sup>9</sup> / <sub>16</sub>	31 <sup>3</sup> / <sub>8</sub>	7 <sup>1</sup> / <sub>2</sub>
x 247	72.5	36.7	36 <sup>5</sup> / <sub>8</sub>	0.800	13 <sup>1</sup> / <sub>16</sub>	16.5	16 <sup>1</sup> / <sub>2</sub>	1.35	1 <sup>3</sup> / <sub>8</sub>	1 <sup>5</sup> / <sub>8</sub>	↓	↓
x 262	77.0	36.9	36 <sup>7</sup> / <sub>8</sub>	0.840	13 <sup>1</sup> / <sub>16</sub>	16.6	16 <sup>1</sup> / <sub>2</sub>	1.44	1 <sup>7</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	↓	↓
x 282	82.9	37.1	37 <sup>1</sup> / <sub>8</sub>	0.885	7 <sup>8</sup> / <sub>8</sub>	16.6	16 <sup>5</sup> / <sub>8</sub>	1.57	1 <sup>9</sup> / <sub>16</sub>	1 <sup>5</sup> / <sub>8</sub>	↓	↓
x 302	88.8	37.3	37 <sup>3</sup> / <sub>8</sub>	0.945	1 <sup>5</sup> / <sub>16</sub>	16.7	16 <sup>5</sup> / <sub>8</sub>	1.68	1 <sup>11</sup> / <sub>16</sub>	1 <sup>11</sup> / <sub>16</sub>	↓	↓
x 330	97.0	37.7	37 <sup>5</sup> / <sub>8</sub>	1.02	1	16.6	16 <sup>5</sup> / <sub>8</sub>	1.85	1 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>4</sub>	↓	↓
x 361	106.0	38.0	38	1.12	1 <sup>1</sup> / <sub>8</sub>	16.7	16 <sup>3</sup> / <sub>4</sub>	2.01	2	1 <sup>3</sup> / <sub>4</sub>	↓	↓
x 395	116.0	38.4	38 <sup>3</sup> / <sub>8</sub>	1.22	1 <sup>1</sup> / <sub>4</sub>	16.8	16 <sup>7</sup> / <sub>8</sub>	2.20	2 <sup>3</sup> / <sub>16</sub>	1 <sup>13</sup> / <sub>16</sub>	↓	↓
x 441	130.0	38.9	38 <sup>7</sup> / <sub>8</sub>	1.36	1 <sup>3</sup> / <sub>8</sub>	17.0	17	2.44	2 <sup>7</sup> / <sub>16</sub>	1 <sup>7</sup> / <sub>8</sub>	↓	↓
x 487	143.0	39.3	39 <sup>3</sup> / <sub>4</sub>	1.50	1 <sup>1</sup> / <sub>2</sub>	17.1	17 <sup>1</sup> / <sub>8</sub>	2.68	2 <sup>11</sup> / <sub>16</sub>	1 <sup>15</sup> / <sub>16</sub>	↓	↓
x 529	156.0	39.8	39 <sup>3</sup> / <sub>4</sub>	1.61	1 <sup>5</sup> / <sub>8</sub>	17.2	17 <sup>1</sup> / <sub>4</sub>	2.91	2 <sup>15</sup> / <sub>16</sub>	2	↓	↓
x 652	192.0	41.1	41	1.97	2	17.6	17 <sup>5</sup> / <sub>8</sub>	3.54	3 <sup>9</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>16</sub>	↓	↓
x 800	236.0	42.6	42 <sup>1</sup> / <sub>2</sub>	2.38	2 <sup>5</sup> / <sub>8</sub>	18.0	18	4.29	4 <sup>5</sup> / <sub>16</sub>	2 <sup>3</sup> / <sub>8</sub>	↓	↓

# W Shapes

## Dimensions



Shapes	Area		Depth		Web		Flange			Distance				
	A		d		Thickness $t_w$		Width $b_f$		Thickness $t_f$	$k_1$	T	Workable Gage		
	in. <sup>2</sup>		in.		in.		in.		in.	in.	in.	in.		
W 40 x 149	43.8	38.2	38¼	0.630	5/8	11.8	11¾	0.830	13/16	1½	34	7½		
x 167	49.2	38.6	385/8	0.650	5/8	11.8	11¾	1.03	1	19/16				
x 183	53.3	39.0	39	0.650	5/8	11.8	11¾	1.20	13/16	19/16				
x 211	62.0	39.4	393/8	0.750	3/4	11.8	11¾	1.42	17/16	19/16				
x 235	69.0	39.7	39¾	0.830	13/16	11.9	117/8	1.58	19/16	15/8				
x 264	77.6	40.0	40	0.960	15/16	11.9	117/8	1.73	1¾	111/16				
x 278	82.0	40.2	401/8	1.03	1	12.0	12	1.81	113/16	1¾				
x 294	86.3	40.4	403/8	1.06	11/16	12.0	12	1.93	115/16	1¾				
x 327	96.0	40.8	40¾	1.18	13/16	12.1	121/8	2.13	21/8	113/16				
x 331	97.5	40.8	40¾	1.22	1¼	12.2	121/8	2.13	21/8	113/16				
x 392	115.0	41.6	415/8	1.42	17/16	12.4	123/8	2.52	2½	115/16				
W 40 x 199	58.5	38.7	385/8	0.650	5/8	15.8	15¾	1.07	11/16	19/16			34	7½
x 215	63.4	39.0	39	0.650	5/8	15.8	15¾	1.22	1¼	19/16				
x 249	73.3	39.4	393/8	0.750	3/4	15.8	15¾	1.42	17/16	19/16				
x 277	81.4	39.7	39¾	0.830	13/16	15.8	157/8	1.58	19/16	15/8				
x 297	87.4	39.8	397/8	0.930	15/16	15.8	157/8	1.65	15/8	111/16				
x 324	95.3	40.2	401/8	1.00	1	15.9	157/8	1.81	113/16	111/16				
x 362	107.0	40.6	40½	1.12	11/8	16.0	16	2.01	2	1¾				
x 372	109.0	40.6	405/8	1.16	13/16	16.1	161/8	2.05	21/16	113/16				
x 397	117.0	41.0	41	1.22	1¼	16.1	161/8	2.20	23/16	113/16				
x 431	127.0	41.3	41¼	1.34	15/16	16.2	16¼	2.36	23/8	17/8				
x 503	148.0	42.1	42	1.54	19/16	16.4	163/8	2.76	2¾	2				
x 593	174.0	43.0	43	1.79	113/16	16.7	16¾	3.23	3¼	21/8				
W 44 x 230	67.7	42.9	427/8	0.710	11/16	15.8	15¾	1.22	1¼	13/16	38¾	5½		
x 262	76.9	43.3	43¼	0.785	13/16	15.8	1¾	1.42	17/16	13/16				
x 290	85.4	43.6	433/8	0.865	7/8	15.8	157/8	1.58	19/16	1¼				
x 335	98.5	44.0	44	1.03	1	15.9	16	1.77	1¾	15/16				



# HP Shapes

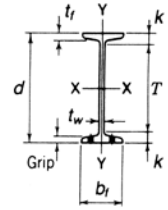
## Dimensions

Designation	Area A	Depth d		Web			Flange				Distance		
				Thickness t <sub>w</sub>		t <sub>w</sub> 2	Width b <sub>f</sub>		Thickness t <sub>f</sub>		T	k	k <sub>1</sub>
				in.	in.		in.	in.	in.	in.			
HP 8 x 36	10.6	8.02	8	0.805	7/16	1/4	8.155	8 1/8	0.445	7/16	6 1/8	1 5/16	5/8
HP 10 x 42	12.4	9.70	9 3/4	0.415	7/16	1/4	10.075	10 1/8	0.420	7/16	7 5/8	1 1/16	3/4
x 57	16.8	9.99	10	0.565	9/16	5/16	10.225	10 1/4	0.565	9/16	7 5/8	1 3/16	13/16
HP 12 x 53	15.5	11.78	11 3/4	0.435	7/16	1/4	12.045	12	0.435	7/16	9 1/2	1 1/8	7/8
x 63	18.4	11.94	12	0.515	1/2	1/4	12.125	12 1/8	0.515	1/2	9 1/2	1 1/4	7/8
x 74	21.8	12.13	12 1/8	0.605	5/8	5/16	12.215	12 1/4	0.610	5/8	9 1/2	1 5/16	15/16
x 84	24.6	12.28	12 1/4	0.685	1 1/16	3/8	12.295	12 1/4	0.685	1 1/16	9 1/2	1 3/8	1
HP 14 x 73	21.4	13.61	13 3/8	0.505	1/2	1/4	14.585	14 5/8	0.505	1/2	11 1/4	1 3/16	7/8
x 89	26.1	13.83	13 3/8	0.615	5/8	5/16	14.695	14 3/4	0.615	5/8	11 1/4	1 5/16	15/16
x 102	30.0	14.01	14	0.705	1 1/16	3/8	14.785	14 3/4	0.705	1 1/16	11 1/4	1 3/8	1
x 117	34.4	14.21	14 1/4	0.805	1 3/16	7/16	14.885	14 7/8	0.805	1 3/16	11 1/4	1 1/2	1 1/16



# I-Beams “S” Shapes 4” to 24”

## S Shapes Dimensions



Shapes	Area A	Depth d	Web			Flange			Distance		Grip	Max. Fige. Fastener		
			Thickness $t_w$	$\frac{t_w}{2}$	Width $b_f$	Thickness $t_f$	T	k						
	in. <sup>2</sup>	in.	in.	in.	in.	in.	in.	in.	in.	in.				
S 3 x 5.7 x 7.5	1.67	3.00	3	0.170	$\frac{3}{16}$	$\frac{1}{8}$	2.330	$2\frac{3}{8}$	0.260	$\frac{1}{4}$	$1\frac{5}{8}$	$1\frac{1}{16}$	$\frac{1}{4}$	—
	2.21	3.00	3	0.349	$\frac{3}{8}$	$\frac{3}{16}$	2.509	$2\frac{1}{2}$	0.260	$\frac{1}{4}$	$1\frac{5}{8}$	$1\frac{1}{16}$	$\frac{1}{4}$	—
S 4 x 7.7 x 9.5	2.26	4.00	4	0.193	$\frac{3}{16}$	$\frac{1}{8}$	2.663	$2\frac{5}{8}$	0.293	$\frac{5}{16}$	$2\frac{1}{2}$	$\frac{3}{4}$	$\frac{5}{16}$	—
	2.79	4.00	4	0.326	$\frac{3}{16}$	$\frac{3}{16}$	2.796	$2\frac{3}{4}$	0.293	$\frac{5}{16}$	$2\frac{1}{2}$	$\frac{3}{4}$	$\frac{5}{16}$	—
S 5 x 10 x 14.75	2.94	5.00	5	0.214	$\frac{3}{16}$	$\frac{1}{8}$	3.004	3	0.326	$\frac{5}{16}$	$3\frac{3}{8}$	$1\frac{3}{16}$	$\frac{5}{16}$	—
	4.34	5.00	5	0.494	$\frac{1}{2}$	$\frac{1}{4}$	3.284	$3\frac{1}{4}$	0.326	$\frac{5}{16}$	$3\frac{3}{8}$	$1\frac{3}{16}$	$\frac{5}{16}$	—
S 6 x 12.5 x 17.25	3.67	6.00	6	0.232	$\frac{1}{4}$	$\frac{1}{8}$	3.332	$3\frac{3}{8}$	0.359	$\frac{3}{8}$	$4\frac{1}{4}$	$\frac{7}{8}$	$\frac{3}{8}$	—
	5.07	6.00	6	0.465	$\frac{7}{16}$	$\frac{1}{4}$	3.565	$3\frac{5}{8}$	0.359	$\frac{3}{8}$	$4\frac{1}{4}$	$\frac{7}{8}$	$\frac{3}{8}$	$\frac{5}{8}$
S 7 x 17.25 x 20	5.07	6.00	6	0.465	$\frac{7}{16}$	$\frac{1}{4}$	3.565	$3\frac{5}{8}$	0.359	$\frac{3}{8}$	$4\frac{1}{4}$	$\frac{7}{8}$	$\frac{3}{8}$	$\frac{5}{8}$
	5.88	7.00	7	0.450	$\frac{7}{16}$	$\frac{1}{4}$	3.860	$3\frac{7}{8}$	0.392	$\frac{3}{8}$	$5\frac{1}{8}$	$1\frac{9}{16}$	$\frac{3}{8}$	$\frac{5}{8}$
S 8 x 18.4 x 23	5.41	8.00	8	0.271	$\frac{1}{4}$	$\frac{1}{8}$	4.001	4	0.426	$\frac{7}{16}$	6	1	$\frac{7}{16}$	$\frac{3}{4}$
	6.77	8.00	8	0.441	$\frac{7}{16}$	$\frac{1}{4}$	4.171	$4\frac{1}{8}$	0.426	$\frac{7}{16}$	6	1	$\frac{7}{16}$	$\frac{3}{4}$
S 10 x 25.4 x 35	7.46	10.00	10	0.311	$\frac{5}{16}$	$\frac{3}{16}$	4.661	$4\frac{5}{8}$	0.491	$\frac{1}{2}$	$7\frac{3}{4}$	$1\frac{1}{8}$	$\frac{1}{2}$	$\frac{3}{4}$
	10.3	10.00	10	0.594	$\frac{5}{8}$	$\frac{5}{16}$	4.944	5	0.491	$\frac{1}{2}$	$7\frac{3}{4}$	$1\frac{1}{8}$	$\frac{1}{2}$	$\frac{3}{4}$
S 12 x 31.8 x 35	9.35	12.00	12	0.350	$\frac{3}{8}$	$\frac{3}{16}$	5.000	5	0.544	$\frac{9}{16}$	$9\frac{5}{8}$	$1\frac{3}{16}$	$\frac{1}{2}$	$\frac{3}{4}$
	10.3	12.00	12	0.428	$\frac{7}{16}$	$\frac{1}{4}$	5.078	$5\frac{1}{8}$	0.544	$\frac{9}{16}$	$9\frac{5}{8}$	$1\frac{3}{16}$	$\frac{1}{2}$	$\frac{3}{4}$
S 12 x 40.8 x 50	12.0	12.00	12	0.462	$\frac{7}{16}$	$\frac{1}{4}$	5.252	$5\frac{1}{4}$	0.659	$\frac{11}{16}$	$9\frac{1}{8}$	$1\frac{7}{16}$	$\frac{5}{8}$	$\frac{3}{4}$
	14.7	12.00	12	0.687	$1\frac{1}{16}$	$\frac{3}{8}$	5.477	$5\frac{1}{2}$	0.659	$\frac{11}{16}$	$9\frac{1}{8}$	$1\frac{7}{16}$	$1\frac{1}{16}$	$\frac{3}{4}$
S 15 x 42.9 x 50	12.6	15.00	15	0.411	$\frac{7}{16}$	$\frac{1}{4}$	5.501	$5\frac{1}{2}$	0.622	$\frac{5}{8}$	$12\frac{1}{4}$	$1\frac{3}{8}$	$\frac{9}{16}$	$\frac{3}{4}$
	14.7	15.00	15	0.550	$\frac{9}{16}$	$\frac{5}{16}$	5.640	$5\frac{5}{8}$	0.622	$\frac{5}{8}$	$12\frac{1}{4}$	$1\frac{3}{8}$	$\frac{9}{16}$	$\frac{3}{4}$
S 18 x 54.7 x 70	16.1	18.00	18	0.461	$\frac{7}{16}$	$\frac{1}{4}$	6.001	6	0.691	$\frac{11}{16}$	15	$1\frac{1}{2}$	$\frac{11}{16}$	$\frac{7}{8}$
	20.6	18.00	18	0.711	$1\frac{1}{16}$	$\frac{3}{8}$	6.251	$6\frac{1}{4}$	0.691	$\frac{11}{16}$	15	$1\frac{1}{2}$	$1\frac{1}{16}$	$\frac{7}{8}$
S 20 x 66 x 75	19.4	20.00	20	0.505	$\frac{1}{2}$	$\frac{1}{4}$	6.255	$6\frac{1}{4}$	0.795	$\frac{13}{16}$	$16\frac{3}{4}$	$1\frac{5}{8}$	$\frac{13}{16}$	$\frac{7}{8}$
	22.0	20.00	20	0.635	$\frac{5}{8}$	$\frac{5}{16}$	6.385	$6\frac{3}{8}$	0.795	$\frac{13}{16}$	$16\frac{3}{4}$	$1\frac{5}{8}$	$\frac{13}{16}$	$\frac{7}{8}$
S 20 x 86 x 96	25.3	20.30	$20\frac{1}{4}$	0.660	$\frac{11}{16}$	$\frac{3}{8}$	7.060	7	0.920	$\frac{15}{16}$	$16\frac{3}{4}$	$1\frac{3}{4}$	$\frac{15}{16}$	1
	28.2	20.30	$20\frac{1}{4}$	0.800	$\frac{13}{16}$	$\frac{7}{16}$	7.200	$7\frac{1}{4}$	0.920	$\frac{15}{16}$	$16\frac{3}{4}$	$1\frac{3}{4}$	$\frac{15}{16}$	1
S 24 x 80 x 90 x 100	23.5	24.00	24	0.500	$\frac{1}{2}$	$\frac{1}{4}$	7.000	7	0.870	$\frac{7}{8}$	$20\frac{1}{2}$	$1\frac{3}{4}$	$\frac{7}{8}$	1
	26.5	24.00	24	0.625	$\frac{5}{8}$	$\frac{5}{16}$	7.125	$7\frac{1}{8}$	0.870	$\frac{7}{8}$	$20\frac{1}{2}$	$1\frac{3}{4}$	$\frac{7}{8}$	1
	29.3	24.00	24	0.745	$\frac{3}{4}$	$\frac{3}{8}$	7.245	$7\frac{1}{4}$	0.870	$\frac{7}{8}$	$20\frac{1}{2}$	$1\frac{3}{4}$	$\frac{7}{8}$	1
S 24 x 106 x 121	31.2	24.50	$24\frac{1}{2}$	0.620	$\frac{5}{8}$	$\frac{5}{16}$	7.870	$7\frac{7}{8}$	1.090	$\frac{11}{16}$	$20\frac{1}{2}$	2	$1\frac{1}{8}$	1
	35.6	24.50	$24\frac{1}{2}$	0.800	$\frac{13}{16}$	$\frac{7}{16}$	8.050	8	1.090	$\frac{11}{16}$	$20\frac{1}{2}$	2	$1\frac{1}{8}$	1

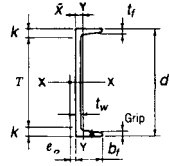
# Standard Channel

3" to 15"

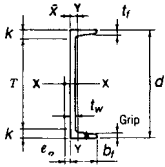


**Miscellaneous Channels  
&  
M Shapes  
3" to 18"**

# Channels Miscellaneous Dimensions



Shapes	Area A	Depth d	Web			Flange				Distance		Grip	Max. Flge. Fas- ten- er
			Thickness $t_w$	$\frac{t_w}{2}$	Width $b_f$	Thickness $t_f$	T	k	Grip				
									in.	in.	in.		
MC 3 x 7.1	2.09	3.00	0.310	$\frac{5}{16}$	$\frac{1}{8}$	1.940	$1\frac{7}{8}$	0.350	$\frac{3}{8}$				
MC 4 x 13.8	4.02	4.00	0.500	$\frac{1}{2}$	$\frac{1}{4}$	2.500	$2\frac{1}{2}$	0.500	$\frac{1}{4}$				
MC 6 x 12	3.53	6.00	0.310	$\frac{5}{16}$	$\frac{1}{8}$	2.497	$2\frac{1}{2}$	0.375	$\frac{3}{8}$	$4\frac{3}{8}$	$1\frac{3}{16}$	$\frac{3}{8}$	$\frac{5}{8}$
MC 6 x 15.1 x 16.3	4.44	6.00	0.316	$\frac{5}{16}$	$\frac{3}{16}$	2.941	3	0.475	$\frac{1}{2}$	$3\frac{7}{8}$	$1\frac{1}{16}$	$\frac{1}{2}$	$\frac{3}{4}$
	4.79	6.00	0.375	$\frac{3}{8}$	$\frac{3}{16}$	3.000	3	0.475	$\frac{1}{2}$	$3\frac{7}{8}$	$1\frac{1}{16}$	$\frac{1}{2}$	$\frac{3}{4}$
MC 6 x 15.3 x 18	4.50	6.00	0.340	$\frac{5}{16}$	$\frac{3}{16}$	3.500	$3\frac{1}{2}$	0.385	$\frac{3}{8}$	$4\frac{1}{4}$	$\frac{7}{8}$	$\frac{3}{8}$	$\frac{7}{8}$
	5.29	6.00	0.379	$\frac{3}{8}$	$\frac{3}{16}$	3.504	$3\frac{1}{2}$	0.475	$\frac{1}{2}$	$3\frac{7}{8}$	$1\frac{1}{16}$	$\frac{1}{2}$	$\frac{7}{8}$
MC 7 x 19.1 x 22.7	5.61	7.00	0.352	$\frac{3}{8}$	$\frac{3}{16}$	3.452	$3\frac{1}{2}$	0.500	$\frac{1}{2}$	$4\frac{3}{4}$	$1\frac{1}{8}$	$\frac{1}{2}$	$\frac{7}{8}$
	6.67	7.00	0.503	$\frac{1}{2}$	$\frac{1}{4}$	3.603	$3\frac{5}{8}$	0.500	$\frac{1}{2}$	$4\frac{3}{4}$	$1\frac{1}{8}$	$\frac{1}{2}$	$\frac{7}{8}$
MC 8 x 8.5	2.50	8.00	0.179	$\frac{3}{16}$	$\frac{1}{16}$	1.874	$1\frac{7}{8}$	0.311	$\frac{5}{16}$	$6\frac{1}{2}$	$\frac{3}{4}$	$\frac{5}{16}$	$\frac{5}{8}$
MC 8 x 1 8.7 x 20	5.50	8.00	0.353	$\frac{3}{8}$	$\frac{3}{16}$	2.978	3	0.500	$\frac{1}{2}$	$5\frac{3}{4}$	$1\frac{1}{8}$	$\frac{1}{2}$	$\frac{7}{8}$
	5.88	8.00	0.400	$\frac{3}{8}$	$\frac{3}{16}$	3.025	3	0.500	$\frac{1}{2}$	$5\frac{3}{4}$	$1\frac{1}{8}$	$\frac{1}{2}$	$\frac{7}{8}$
MC 8 x 21.4 x 22.8	6.28	8.00	0.375	$\frac{3}{8}$	$\frac{3}{16}$	3.450	$3\frac{1}{2}$	0.525	$\frac{1}{2}$	$5\frac{5}{8}$	$1\frac{3}{16}$	$\frac{1}{2}$	$\frac{7}{8}$
	6.70	8.00	0.427	$\frac{7}{16}$	$\frac{3}{16}$	3.502	$3\frac{1}{2}$	0.525	$\frac{1}{2}$	$5\frac{5}{8}$	$1\frac{3}{16}$	$\frac{1}{2}$	$\frac{7}{8}$
MC 9 x 23.9 x 25.4	7.02	9.00	0.400	$\frac{3}{8}$	$\frac{3}{16}$	3.450	$3\frac{1}{2}$	0.550	$\frac{9}{16}$	$6\frac{5}{8}$	$1\frac{3}{16}$	$\frac{9}{16}$	$\frac{7}{8}$
	7.47	9.00	0.450	$\frac{7}{16}$	$\frac{1}{4}$	3.500	$3\frac{1}{2}$	0.550	$\frac{9}{16}$	$6\frac{5}{8}$	$1\frac{3}{16}$	$\frac{9}{16}$	$\frac{7}{8}$
MC 10 x 6.5	1.91	10.00	0.152	$\frac{1}{8}$	$\frac{1}{16}$	1.127	$1\frac{1}{8}$	0.202	$\frac{3}{16}$	$9\frac{1}{8}$	$\frac{7}{16}$	—	—
MC 10 x 8.4	2.46	10.00	0.170	$\frac{3}{16}$	$\frac{1}{16}$	1.500	$1\frac{1}{2}$	0.280	$\frac{1}{4}$	$8\frac{5}{8}$	$1\frac{1}{16}$	—	—
MC 10 x 22 x 25	6.45	10.00	0.290	$\frac{5}{16}$	$\frac{1}{8}$	3.315	$3\frac{3}{8}$	0.575	$\frac{9}{16}$	$7\frac{1}{2}$	$1\frac{1}{4}$	$\frac{9}{16}$	$\frac{7}{8}$
	7.35	10.00	0.380	$\frac{3}{8}$	$\frac{3}{16}$	3.405	$3\frac{3}{8}$	0.575	$\frac{9}{16}$	$7\frac{1}{2}$	$1\frac{1}{4}$	$\frac{9}{16}$	$\frac{7}{8}$
MC 10 x 2 8.5 x 33.6 x 41.1	8.47	10.00	0.425	$\frac{7}{16}$	$\frac{3}{16}$	3.950	4	0.575	$\frac{9}{16}$	$7\frac{1}{2}$	$1\frac{1}{4}$	$\frac{9}{16}$	$\frac{7}{8}$
	9.87	10.00	0.575	$\frac{9}{16}$	$\frac{5}{16}$	4.100	$4\frac{1}{8}$	0.575	$\frac{9}{16}$	$7\frac{1}{2}$	$1\frac{1}{4}$	$\frac{9}{16}$	$\frac{7}{8}$
	12.1	10.00	0.796	$1\frac{3}{16}$	$\frac{3}{8}$	4.321	$4\frac{3}{8}$	0.575	$\frac{9}{16}$	$7\frac{1}{2}$	$1\frac{1}{4}$	$\frac{9}{16}$	$\frac{7}{8}$
MC 12 x 10.6	3.1	12.00	0.190	$\frac{3}{16}$	$\frac{1}{8}$	1.500	$1\frac{1}{2}$	0.309	$\frac{5}{16}$	$10\frac{5}{8}$	$1\frac{1}{16}$	—	—



# Channels

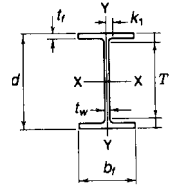
## Miscellaneous

### Dimensions

Shapes	Area A	Depth d	Web			Flange				Distance		Grip	Max. Fge. Faste-ner
			Thickness $t_w$	$\frac{t_w}{2}$	Width $b_f$	Thickness $t_f$	T	k					
									in.	in.	in.		
MC 12 x 31	9.12	12.00	0.370	$\frac{3}{8}$	$\frac{3}{16}$	3.670	$3\frac{5}{8}$	.0700	$1\frac{1}{16}$	$9\frac{3}{8}$	$1\frac{5}{16}$	$1\frac{1}{16}$	1
x 35	10.3	12.00	0.467	$\frac{7}{16}$	$\frac{1}{4}$	3.767	$3\frac{3}{4}$	.0700	$1\frac{1}{16}$	$9\frac{3}{8}$	$1\frac{5}{16}$	$1\frac{1}{16}$	1
x 40	11.8	12.00	0.590	$\frac{9}{16}$	$\frac{5}{16}$	3.890	$3\frac{7}{8}$	.0700	$1\frac{1}{16}$	$9\frac{3}{8}$	$1\frac{5}{16}$	$1\frac{1}{16}$	1
x 45	13.2	12.00	0.712	$1\frac{1}{16}$	$\frac{3}{8}$	4.012	4	.0700	$1\frac{1}{16}$	$9\frac{3}{8}$	$1\frac{5}{16}$	$1\frac{1}{16}$	1
x 50	14.7	12.00	0.835	$1\frac{3}{16}$	$\frac{7}{16}$	4.135	$4\frac{1}{8}$	.0700	$1\frac{1}{16}$	$9\frac{3}{8}$	$1\frac{5}{16}$	$1\frac{1}{16}$	1
MC 13 x 31.8	9.35	13.00	0.375	$\frac{3}{8}$	$\frac{3}{16}$	4.000	4	0.610	$\frac{5}{8}$	$10\frac{1}{4}$	$1\frac{3}{8}$	$\frac{9}{16}$	1
x 35	10.3	13.00	0.447	$\frac{7}{16}$	$\frac{1}{4}$	4.072	$4\frac{1}{8}$	0.610	$\frac{5}{8}$	$10\frac{1}{4}$	$1\frac{3}{8}$	$\frac{9}{16}$	1
x 40	11.8	13.00	0.560	$\frac{9}{16}$	$\frac{1}{4}$	4.185	$4\frac{1}{8}$	0.610	$\frac{5}{8}$	$10\frac{1}{4}$	$1\frac{3}{8}$	$\frac{9}{16}$	1
x 50	14.7	13.00	0.787	$1\frac{3}{16}$	$\frac{3}{8}$	4.412	$4\frac{3}{8}$	0.610	$\frac{5}{8}$	$10\frac{1}{4}$	$1\frac{3}{8}$	$\frac{5}{8}$	1
MC 18 x 42.7	12.6	18.00	0.450	$\frac{7}{16}$	$\frac{1}{4}$	3.950	4	0.625	$\frac{5}{8}$	$15\frac{1}{4}$	$1\frac{3}{8}$	$\frac{5}{8}$	1
x 45.8	13.5	18.00	0.500	$\frac{1}{2}$	$\frac{1}{4}$	4.000	4	0.625	$\frac{5}{8}$	$15\frac{1}{4}$	$1\frac{3}{8}$	$\frac{5}{8}$	1
x 51.9	15.3	18.00	0.600	$\frac{5}{8}$	$\frac{5}{16}$	4.100	$4\frac{1}{8}$	0.625	$\frac{5}{8}$	$15\frac{1}{4}$	$1\frac{3}{8}$	$\frac{5}{8}$	1
x 58	17.1	18.00	0.800	$1\frac{1}{16}$	$\frac{3}{8}$	4.200	$4\frac{1}{4}$	0.625	$\frac{5}{8}$	$15\frac{1}{4}$	$1\frac{3}{8}$	$\frac{5}{8}$	1

# M Shapes

## Dimensions

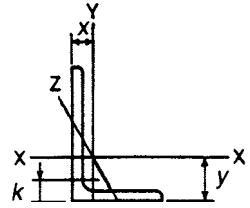


Shapes	Area A	Depth d	Web			Flange			Distance		Grip	Max. Flge. Faste-ner	
			Thickness t <sub>w</sub>		t <sub>w</sub> 2	Width b <sub>f</sub>		Thickness t <sub>f</sub>		T			k
	in. <sup>2</sup>	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.		
M 5 x 18.9	5.55	5.00	5	0.316	5/16	3/16	5.003	5	0.416	7/16	3/4	7/16	7/8
M 6 x 4.4	1.29	6.00	6	0.114	1/8	1/16	1.844	17/8	0.171	3/16	5/8	3/16	—
M 8 x 6.5	1.92	8.00	8	0.135	1/8	1/16	2.281	2 1/4	0.189	3/16	7	3/16	—
M 10 x 7.5	2.21	9.99	10	0.130	1/8	1/16	2.690	2 3/4	0.173	3/16	9 1/8	3/16	3/8
x 8	2.35	9.95	10	0.141	3/16	1/16	2.690	2 3/4	0.182	3/16	9 1/8	3/16	3/8
x 9	2.65	10.00	10	0.157	3/16	1/8	2.690	2 3/4	0.206	3/16	8 7/8	3/16	—
M 12 x 10	2.94	11.97	12	0.149	3/16	1/16	3.250	3 1/4	0.180	3/16	11	3/16	1/2
x 10.8	3.18	11.97	12	0.160	3/16	1/16	3.065	3 1/8	0.210	1/4	11	1/4	1/2
x 11.8	3.47	12.00	12	0.177	3/16	1/8	3.065	3 1/8	0.225	1/4	10 7/8	1/4	—
M 14 x 18	5.10	14.00	14	0.215	3/16	1/8	4.000	4	0.270	1/4	12 3/4	1/4	3/4

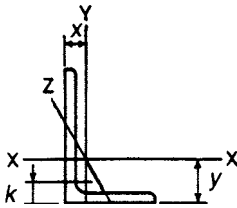
# Structural and Bar Angle Equal and Unequal Legs

# Angles

Equal legs  
Properties for designing



Size and Thickness	k	Weight per ft.	Area	Axis X-X				Axis Y-Y				Axis Z-Z		
				<i>l</i>	<i>S</i>	<i>r</i>	<i>y</i>	<i>l</i>	<i>S</i>	<i>r</i>	<i>x</i>	<i>r</i>	Tan	
in.	in.	lb.	in. <sup>2</sup>	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in.		
L 1 x 1 x 1/8	1/4	0.800	0.234	0.022	0.031	0.304	0.296	0.022	0.031	0.304	0.296	0.196	1.000	
L 1 1/8 x 1 1/8 x 1/8	7/32	0.900	0.266	0.032	0.040	0.345	0.327	0.032	0.040	0.345	0.327	0.221	1.000	
L 1 1/4 x 1 1/4 x 3/16	3/8	1.48	0.434	0.061	0.071	0.377	0.381	0.061	0.071	0.377	0.381	0.244	1.000	
	x 1/4	7/16	1.92	0.563	0.077	0.091	0.369	0.403	0.077	0.091	0.369	0.403	0.243	1.000
L 1 1/2 x 1 1/2 x 3/16	3/8	1.80	0.527	0.110	0.104	0.457	0.444	0.110	0.104	0.457	0.444	0.293	1.000	
	x 1/4	7/16	2.34	0.688	0.139	0.134	0.449	0.466	0.139	0.134	0.449	0.466	0.292	1.000
L 1 3/4 x 1 3/4 x 3/16	7/16	2.12	0.621	0.179	0.144	0.537	0.506	0.179	0.144	0.537	0.506	0.343	1.000	
	x 1/4	1/2	2.77	0.813	0.227	0.227	0.529	0.529	0.227	0.227	0.529	0.529	0.341	1.000
L 2 x 2 x 1/8	3/8	1.65	0.484	0.190	0.131	0.626	0.546	0.190	0.131	0.626	0.546	0.398	1.000	
	x 3/16	7/16	2.44	0.715	0.272	0.190	0.617	0.569	0.272	0.190	0.617	0.569	0.394	1.000
	x 1/4	1/2	3.19	0.938	0.348	0.247	0.609	0.592	0.348	0.247	0.609	0.592	0.391	1.000
	x 5/16	9/16	3.92	1.15	0.416	0.300	0.601	0.614	0.416	0.300	0.601	0.614	0.390	1.000
	x 3/8	5/8	4.7	1.36	0.479	0.351	0.594	0.636	0.479	0.351	0.594	0.636	0.389	1.000
L 2 1/2 x 2 1/2 x 3/16	1/2	3.07	0.902	0.547	0.303	0.778	0.694	0.547	0.303	0.778	0.694	0.495	1.000	
	x 1/4	9/16	4.1	1.19	0.709	0.394	0.769	0.717	0.703	0.394	0.769	0.717	0.491	1.000
	x 5/16	5/8	5.0	1.46	0.849	0.482	0.761	0.740	0.849	0.482	0.761	0.740	0.489	1.000
	x 3/8	11/16	5.9	1.73	0.984	0.566	0.753	0.762	0.984	0.566	0.753	0.762	0.487	1.000
	x 1/2	13/16	7.7	2.25	1.230	0.724	0.739	0.806	1.230	0.724	0.739	0.806	0.487	1.000
L 3 x 3 x 3/16	1/2	3.71	1.09	0.962	0.441	0.939	0.820	0.962	0.441	0.939	0.820	0.596	1.000	
	x 1/4	9/16	4.9	1.44	1.24	0.577	0.930	0.842	1.24	0.577	0.930	0.842	0.592	1.000
	x 5/16	5/8	6.1	1.78	1.51	0.707	0.922	0.865	1.51	0.707	0.922	0.865	0.589	1.000
	x 3/8	11/16	7.2	2.11	1.76	0.833	0.913	0.888	1.76	0.833	0.913	0.888	0.587	1.000
	x 1/2	13/16	9.4	2.75	2.22	1.07	0.898	0.932	2.22	1.07	0.898	0.932	0.584	1.000
L 3 1/2 x 3 1/2 x 1/4	5/8	5.8	1.69	1.69	0.794	1.09	0.968	2.01	0.794	1.09	0.968	0.694	1.000	
	x 5/16	11/16	7.2	2.09	2.09	0.976	1.08	0.990	2.45	0.976	1.08	0.990	0.690	1.000
	x 3/8	3/4	8.5	2.48	2.48	1.15	1.07	1.01	2.87	1.15	1.07	1.01	0.687	1.000
	x 1/2	7/8	11.1	3.25	3.25	1.49	1.06	1.06	3.64	1.49	1.06	1.06	0.683	1.000



# Angles

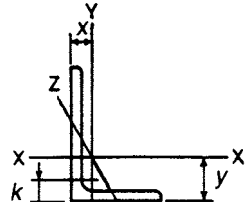
Equal legs

Properties for designing

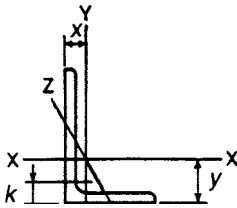
Size and Thickness	k	Weight per ft.	Area	Axis X-X				Axis Y-Y				Axis Z-Z	
				l	S	r	y	l	S	r	x	r	Tan
in.	in.	lb.	in. <sup>2</sup>	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in.	
L 4 x 4 x 1/4	5/8	6.6	1.94	1.94	1.05	1.25	1.09	3.04	1.05	1.25	1.09	0.795	1.000
x 5/16	11/16	8.2	2.40	2.40	1.29	1.24	1.12	3.71	1.29	1.24	1.12	0.791	1.000
x 3/8	3/4	9.8	2.86	2.86	1.52	1.23	1.14	4.36	1.52	1.23	1.14	0.788	1.000
x 1/2	7/8	12.8	3.75	3.75	1.97	1.22	1.18	5.56	1.97	1.22	1.18	0.782	1.000
x 5/8	1	15.7	4.61	4.61	2.40	1.20	1.23	6.66	2.40	1.20	1.23	0.779	1.000
x 3/4	1 1/8	18.5	5.44	5.44	2.81	1.19	1.27	7.67	2.81	1.19	1.27	0.778	1.000
L 5 x 5 x 5/16	13/16	10.3	3.03	7.42	2.04	1.57	1.37	7.42	2.04	1.57	1.37	0.994	1.000
x 3/8	7/8	12.3	3.61	8.74	2.42	1.56	1.39	8.74	2.42	1.56	1.39	0.990	1.000
x 1/2	1	16.2	4.75	11.3	3.16	1.54	1.43	11.3	3.16	1.54	1.43	0.983	1.000
x 5/8	1 1/8	20.0	5.86	13.6	3.86	1.52	1.48	13.6	3.86	1.52	1.48	0.978	1.000
x 3/4	1 1/4	23.6	6.94	15.7	4.53	1.51	1.52	15.7	4.53	1.51	1.52	0.975	1.000
L 6 x 6 x 5/16	13/16	12.4	3.65	13.0	2.97	1.89	1.62	13.0	2.97	1.89	1.62	1.20	1.000
x 3/8	7/8	14.9	4.36	15.4	3.53	1.88	1.64	15.4	3.53	1.88	1.64	1.19	1.000
x 1/2	1	19.6	5.75	19.9	4.61	1.86	1.68	19.9	4.61	1.86	1.68	1.18	1.000
x 5/8	1 1/8	24.2	7.11	24.2	5.66	1.84	1.73	24.2	5.66	1.84	1.73	1.18	1.000
x 3/4	1 1/4	28.7	8.44	28.2	6.66	1.83	1.78	28.2	6.66	1.83	1.78	1.17	1.000
x 1	1 1/2	37.4	11.0	35.5	8.57	1.80	1.86	35.5	8.57	1.80	1.86	1.17	1.000
L 8 x 8 x 1/2	1 1/8	26.4	7.75	48.6	8.36	2.50	2.19	48.6	8.36	2.50	2.19	1.59	1.000
x 5/8	1 1/4	32.7	9.61	59.4	10.3	2.49	2.23	59.4	10.3	2.49	2.23	1.58	1.000
x 3/4	1 3/8	38.9	11.4	69.7	12.2	2.47	2.28	69.7	12.2	2.47	2.28	1.58	1.000
x 1	1 5/8	51.0	15.0	89.0	15.8	2.44	2.37	89.0	15.8	2.44	2.37	1.56	1.000
x 1 1/8	1 3/4	56.9	16.7	89.0	17.5	2.42	2.41	89.0	17.5	2.42	2.41	1.56	1.000

# Angles

Unequal legs  
Properties for designing



Size and Thickness	k	Weight per ft.	Area	Axis X-X				Axis Y-Y				Axis Z-Z		
				l	S	r	y	l	S	r	x	r	Tan	
in.	in.	lb.	in. <sup>2</sup>	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in.	in.	
L 2½ x 2 x ¾	½	2.75	0.809	0.509	0.293	0.793	0.764	0.291	0.196	0.600	0.514	0.427	0.631	
x ¼	⅞	3.62	1.06	0.654	0.381	0.784	0.787	0.372	0.254	0.592	0.537	0.424	0.626	
x ⅝	⅝	4.5	1.31	0.788	0.466	0.776	0.809	0.446	0.310	0.584	0.559	0.422	0.620	
x ¾	11/16	5.3	1.55	0.912	0.547	0.768	0.831	0.514	0.363	0.577	0.581	0.420	0.614	
L 3 x 2 x ¾	½	3.07	0.902	0.842	0.415	0.966	0.970	0.307	0.200	0.583	0.470	0.439	0.446	
x ¼	⅞	4.1	1.19	1.09	0.542	0.957	0.993	0.392	0.260	0.574	0.493	0.435	0.440	
x ⅝	⅝	5.0	1.46	1.320	0.664	0.948	1.02	0.470	0.317	0.567	0.516	0.432	0.435	
x ¾	11/16	5.9	1.73	1.53	0.781	0.940	1.04	0.543	0.371	0.559	0.539	0.430	0.428	
x ½	13/16	7.7	2.25	1.920	1.00	0.924	1.08	0.672	0.474	0.546	0.583	0.428	0.414	
L 3 x 2½ x ¾	⅞	3.39	0.996	0.907	0.430	0.954	0.888	0.577	0.310	0.761	0.638	0.533	0.688	
x ¼	⅝	4.5	1.31	1.17	0.561	0.945	0.911	0.743	0.404	0.753	0.661	0.528	0.684	
x ⅝	11/16	5.6	1.62	1.42	0.688	0.937	0.933	0.898	0.494	0.744	0.683	0.525	0.680	
x ¾	¾	6.6	1.92	1.66	0.810	0.928	0.956	1.04	0.581	0.736	0.706	0.522	0.676	
x ½	7/8	8.5	2.50	2.08	1.04	0.913	1.00	1.30	0.744	0.722	0.750	0.520	0.667	
L 3½ x 2½ x ¼	11/16	4.9	1.44	1.44	0.755	1.12	1.11	0.777	0.412	0.735	0.614	0.544	0.506	
x ⅝	¾	6.1	1.78	1.78	0.927	1.11	1.14	0.939	0.504	0.727	0.637	0.540	0.501	
x ¾	13/16	7.2	2.11	2.11	1.09	1.10	1.16	1.09	0.592	0.719	0.660	0.537	0.496	
x ½	15/16	9.4	2.75	2.75	1.41	1.09	1.20	1.36	0.760	0.704	0.705	0.534	0.486	
L 3½ x 3½ x ¼	⅝	5.8	1.69	1.69	0.794	1.09	0.968	2.01	0.794	1.09	0.968	0.694	1.000	
x ⅝	11/16	7.2	2.09	2.09	0.976	1.08	0.990	2.45	0.976	1.08	0.990	0.690	1.000	
x ¾	¾	8.5	2.48	2.48	1.15	1.07	1.01	2.87	1.15	1.07	1.01	0.687	1.000	
x ½	7/8	11.1	3.25	3.25	1.49	1.06	1.06	3.64	1.49	1.06	1.06	0.683	1.000	
L 4 x 3 x ¼	11/16	5.8	1.69	1.69	1.00	1.28	1.24	1.36	0.599	0.896	0.736	0.651	0.559	
x ⅝	¾	7.2	2.09	2.09	1.23	1.27	1.26	1.65	0.734	0.887	0.759	0.647	0.554	
x ¾	13/16	8.5	2.48	2.48	1.46	1.26	1.28	1.92	0.866	0.879	0.782	0.644	0.551	
x ½	15/16	11.1	3.25	3.25	1.89	1.25	1.33	2.42	1.12	0.864	0.827	0.639	0.543	
L 4 x 3½ x ¼	11/16	6.2	1.81	1.81	1.03	1.27	1.16	2.09	0.808	1.07	0.909	0.734	0.759	
x ⅝	¾	7.7	2.25	2.25	1.26	1.26	1.18	2.55	0.994	1.07	0.932	0.730	0.757	
x ¾	13/16	9.1	2.67	2.67	1.49	1.25	1.21	2.95	1.17	1.06	0.955	0.727	0.755	
x ½	15/16	11.9	3.50	3.50	1.94	1.23	1.25	3.79	1.52	1.04	1.00	0.722	0.750	



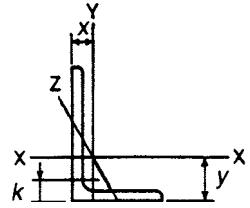
# Angles

Unequal legs  
Properties for designing

Size and Thickness	k	Weight per ft.	Area	Axis X-X				Axis Y-Y				Axis Z-Z	
				l	S	r	y	l	S	r	x	r	Tan
in.	in.	lb.	in. <sup>2</sup>	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in.	
L 5 x 3 x 1/4	3/4	6.6	1.94	5.11	1.53	1.62	1.66	1.44	0.614	0.861	0.657	0.663	0.371
x 5/16	13/16	8.2	2.40	6.26	1.89	1.61	1.68	1.75	0.753	0.853	0.681	0.658	0.368
x 3/8	7/8	9.8	2.86	7.37	2.24	1.61	1.70	2.04	0.888	0.845	0.704	0.654	0.364
x 1/2	1	12.8	3.75	9.45	2.91	1.59	1.75	2.58	1.15	0.829	0.750	0.648	0.357
x 5/8	1	15.7	4.61	11.4	3.55	1.57	1.80	3.06	1.39	0.815	0.796	0.644	0.349
L 5 x 3 1/2 x 1/4	3/4	7.0	2.06	5.39	1.57	1.62	1.56	2.23	0.830	1.04	0.814	0.770	0.492
x 5/16	13/16	8.7	2.56	6.60	1.94	1.61	1.59	2.72	1.02	1.03	0.838	0.776	0.489
x 3/8	7/8	10.4	3.05	7.78	2.29	1.60	1.61	3.18	1.21	1.02	0.861	0.762	0.486
x 1/2	1	13.6	4.00	9.99	2.99	1.58	1.66	4.05	1.56	1.01	0.906	0.755	0.479
x 5/8	1 1/8	16.8	4.92	12.0	3.65	1.56	1.70	4.83	1.90	0.991	0.951	0.751	0.472
x 3/4	1 1/4	19.8	5.81	13.9	4.28	1.55	1.75	5.55	2.22	0.977	0.996	0.748	0.464
L 6 x 3 1/2 x 5/16	13/16	9.8	2.87	10.9	2.73	1.95	2.01	2.85	1.04	0.996	0.763	0.772	0.352
x 3/8	7/8	11.7	3.42	12.9	3.24	1.94	2.04	3.34	1.23	0.998	0.787	0.767	0.350
x 1/2	1	15.3	4.50	16.6	4.24	1.92	2.08	4.25	1.59	0.972	0.833	0.759	0.344
L 6 x 4 x 5/16	13/16	10.3	3.03	11.4	2.79	1.94	1.92	4.18	1.35	1.17	0.918	0.882	0.448
x 3/8	7/8	12.3	3.61	13.5	3.32	1.93	1.94	4.90	1.60	1.17	0.941	0.877	0.446
x 1/2	1	16.2	4.75	17.4	4.33	1.91	1.99	6.27	2.08	1.15	0.987	0.870	0.440
x 5/8	1 1/8	20.0	5.86	21.1	5.31	1.90	2.03	7.52	2.54	1.13	1.03	0.864	0.435
x 3/4	1 1/4	23.6	6.94	24.5	6.25	1.88	2.08	8.68	2.97	1.12	1.08	0.860	0.428
L 7 x 4 x 3/8	7/8	13.6	3.98	20.6	4.44	2.27	2.37	5.10	1.63	1.13	0.870	0.880	0.340
x 1/2	1	17.9	5.25	26.7	5.81	2.25	2.42	6.53	2.12	1.11	0.917	0.872	0.335
x 5/8	1 1/8	22.1	6.48	32.4	7.14	2.24	2.46	7.84	2.58	1.10	0.963	0.865	0.329
x 3/4	1 1/4	26.2	7.69	37.8	8.42	2.22	2.51	9.05	3.03	1.09	1.01	0.860	0.324
L 8 x 4 x 1/2	1	19.6	5.75	38.5	7.49	2.59	2.86	6.74	2.15	1.08	0.859	0.865	0.267
x 3/4	1 1/4	28.7	8.44	54.9	10.9	2.55	2.95	9.36	3.07	1.05	0.953	0.852	0.258
x 1	1 1/2	37.4	11.0	69.6	14.1	2.52	3.05	11.6	3.94	1.03	1.05	0.846	0.247

# Angles

Unequal legs  
Properties for designing

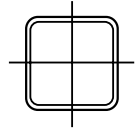


Size and Thickness	k	Weight per ft.	Area	Axis X-X				Axis Y-Y				Axis Z-Z	
				<i>l</i>	<i>S</i>	<i>r</i>	<i>y</i>	<i>l</i>	<i>S</i>	<i>r</i>	<i>x</i>	<i>r</i>	Tan
in.	in.	lb.	in. <sup>2</sup>	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in. <sup>4</sup>	in. <sup>3</sup>	in.	in.	in.	in.
L 8 x 6 x 7/16	15/16	20.2	5.93	39.2	7.07	2.57	2.45	19.3	4.23	1.80	1.45	1.31	0.560
x 1/2	1	23.0	6.75	44.3	8.02	2.56	2.47	21.7	4.79	1.79	1.47	1.30	0.558
x 5/8	1 1/8	28.5	8.36	54.1	9.87	2.54	2.52	26.3	5.88	1.77	1.52	1.29	0.554
x 3/4	1 1/4	33.8	9.94	63.4	11.7	2.53	2.56	30.7	6.92	1.76	1.56	1.29	0.551
x 1	1 1/2	44.2	13.0	80.8	15.1	2.49	2.65	38.8	8.92	1.73	1.65	1.28	0.543
L 9 x 4 x 5/8	1	21.3	6.25	53.2	9.34	2.92	3.31	6.92	2.17	1.05	0.810	0.854	0.220
x 9/16	1 1/16	23.8	7.00	59.1	10.4	2.91	3.33	7.63	2.41	1.04	0.834	0.850	0.218
x 1/2	1 1/8	26.3	7.73	64.9	11.5	2.90	3.36	8.32	2.65	1.04	0.810	0.847	0.216

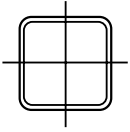
# Square Tubing All Sizes

# Structural Tubing Square

Dimensions and Properties



Square Tube	Design Wall Thickness, <i>t</i>	Nominal wt.	Area <i>A</i>	Square Tube	Design Wall Thickness, <i>t</i>	Nominal wt.	Area <i>A</i>		
	in.		lb./ft.		in. <sup>2</sup>		in.	lb./ft.	in. <sup>2</sup>
2 x 2 x 1/8	0.116	3.04	0.840	5 x 5 x 1/8	0.116	8.15	2.23		
	x 3/16	0.174	4.30		1.19	x 3/16	0.174	11.96	3.28
	x 1/4	0.233	5.38		1.51	x 1/4	0.233	15.58	4.30
2 1/4 x 2 1/4 x 1/8	0.116	3.47	0.956	x 3/8	0.291	19.03	5.26		
	x 3/16	0.174	4.94		1.37	x 3/8	0.349	22.30	6.18
	x 1/4	0.233	6.23		1.74	x 1/2	0.465	28.30	7.88
2 1/2 x 2 1/2 x 1/8	0.116	3.90	1.07	5 1/2 x 5 1/2 x 1/8	0.116	9.00	2.46		
	x 3/16	0.174	5.57		1.54	x 3/16	0.174	13.23	3.63
	x 1/4	0.233	7.08		1.97	x 1/4	0.233	17.28	4.77
	x 5/16	0.291	8.40		2.35	x 3/16	0.291	21.16	5.85
3 x 3 x 1/8	0.116	4.75	1.03	x 3/8	0.349	24.85	6.88		
	x 3/16	0.174	1.89		6 x 6 x 1/8	0.116	9.85	2.70	
	x 1/4	0.233	2.44			x 3/16	0.174	14.51	3.98
	x 5/16	0.291	2.94			x 1/4	0.233	18.99	5.24
	x 3/8	0.349	3.39			x 5/16	0.291	23.29	6.43
	3 1/2 x 3 1/2 x 1/8	0.116	5.60			1.54	x 3/8	0.349	27.41
x 3/16		0.174	2.24	x 1/2		0.465	35.11	9.74	
x 1/4		0.233	2.91	x 5/8	0.581	42.10	11.7		
x 5/16		0.291	3.52	7 x 7 x 1/8	0.116	11.55	3.16		
x 3/8		0.349	4.09		x 3/16	0.174	17.06	4.67	
4 x 4 x 1/8		0.116	6.45		1.77	x 1/4	0.233	22.39	6.17
	x 3/16	0.174	2.58		x 5/16	0.291	27.54	7.59	
	x 1/4	0.233	3.37		x 3/8	0.349	32.51	8.97	
	x 5/16	0.291	4.10		x 1/2	0.465	41.91	11.6	
	x 3/8	0.349	4.78	x 5/8	0.581	50.60	14.0		
	x 1/2	0.465	6.02	8 x 8 x 1/8	0.116	13.25	3.62		
4 1/2 x 4 1/2 x 1/8	0.116	7.30	2.00		x 3/16	0.174	19.61	5.37	
	x 3/16	0.174	2.93		x 1/4	0.233	25.79	7.10	
	x 1/4	0.233	3.84		x 5/16	0.291	31.79	8.76	
	x 5/16	0.291	4.68		x 3/8	0.349	37.61	10.4	
	x 3/8	0.349	5.48		x 1/2	0.465	48.72	13.5	
	x 1/2	0.465	6.95	x 5/8	0.581	59.11	16.4		



# Structural Tubing Square

Dimensions and Properties

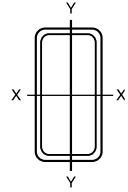
Square Tube	Design Wall Thickness, <i>t</i>	Nominal wt.	Area <i>A</i>	Square Tube	Design Wall Thickness, <i>t</i>	Nominal wt.	Area <i>A</i>			
	in.		lb./ft.		in. <sup>2</sup>		in.	lb./ft.	in. <sup>2</sup>	
9 x 9	x 1/8	0.116	14.95	4.09	12 x 12	x 3/16	0.174	29.82	8.15	
	x 3/16	0.174	22.16	6.06		x 1/4	0.233	39.40	10.8	
	x 1/4	0.233	29.19	8.03		x 5/16	0.291	48.81	13.4	
	x 5/16	0.291	36.05	9.92		x 3/8	0.349	58.03	16.0	
	x 3/8	0.349	42.72	11.8		x 1/2	0.465	75.94	20.9	
	x 1/2	0.465	55.53	15.3		x 5/8	0.581	93.14	25.7	
10 x 10	x 5/8	0.581	67.62	18.7	14 x 14	x 3/16	0.291	57.31	15.7	
	10 x 10	x 3/16	0.174	24.72		6.76	x 3/8	0.349	68.24	18.7
		x 1/4	0.233	32.60		8.96	x 1/2	0.456	89.55	24.6
		x 5/16	0.291	40.30		11.1	x 5/8	0.581	110.00	30.3
		x 3/8	0.349	47.82	13.2	16 x 16	x 3/16	0.291	65.82	18.1
		x 1/2	0.465	62.33	17.2		x 3/8	0.349	78.45	21.5
x 5/8	0.581	76.13	21.0	x 1/2	0.456		103.00	28.3		
					x 5/8	0.581	127.00	35.0		



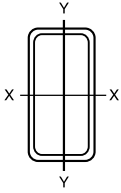
# Rectangular Tubing / Pipe All Sizes

# Structural Tubing Rectangular

Dimensions and Properties



Rectangular Tube	Design Wall Thickness, <i>t</i>	Nominal wt. lb./ft.	Area <i>A</i>	Rectangular Tube	Design Wall Thickness, <i>t</i>	Nominal wt. lb./ft.	Area <i>A</i>
	in.		in. <sup>2</sup>		in.		in. <sup>2</sup>
2 x 1 x 1/8	0.116	2.19	0.608	3 1/2 x 1 1/2 x 1/8	0.116	3.90	1.07
	x 3/16		0.174		0.845		x 3/16
2 x 1 1/2 x 1/8	0.116	2.62	0.724	x 1/4	0.233	7.08	1.97
	x 3/16		0.174		1.02		3 1/2 x 2 x 1/8
2 1/4 x 2 x 1/8	0.116	3.26	0.898	x 3/16	0.174	6.23	1.71
	x 3/16		0.174		1.28		x 1/4
2 1/2 x 1 x 1/8	0.116	2.62	0.724	3 1/2 x 2 1/2 x 1/8	0.116	4.75	1.30
	x 3/16		0.174		1.02		x 3/16
2 1/2 x 1 1/2 x 1/8	0.116	3.04	0.840	x 1/4	0.233	8.78	2.44
	x 3/16		0.174		1.19		x 5/16
x 1/4	0.233	5.38	1.51	x 3/8	0.349	12.09	3.39
	0.233		1.51		4 x 2 x 1/8		0.116
2 1/2 x 2 x 1/8	0.116	3.47	0.956	x 3/16	0.174	6.87	1.89
	x 3/16		0.174		1.37		x 1/4
x 1/4	0.233	6.23	1.74	x 3/16	0.291	10.54	2.94
	0.233		1.74		x 3/8		0.349
3 x 1 x 1/8	0.116	3.04	0.840	4 x 2 x 1/8	0.116	4.75	1.30
	x 3/16		0.174		1.19		x 3/16
3 x 1 1/2 x 1/8	0.116	3.47	0.956	x 1/4	0.233	8.78	2.44
	x 3/16		0.174		1.37		x 3/16
x 1/4	0.233	6.23	1.74	x 3/8	0.349	12.09	3.39
	0.233		1.74		4 x 3 x 1/8		0.116
3 x 2 x 1/8	0.116	3.90	1.07	x 3/16	0.174	8.15	2.24
	x 3/16		0.174		1.54		x 1/4
x 1/4	0.233	7.08	1.97	x 3/16	0.291	12.67	3.52
	x 3/16		0.291		2.35		x 3/8
3 x 2 1/2 x 1/8	0.116	4.32	1.19	5 x 2 x 1/8	0.116	5.60	1.54
	x 3/16		0.174		1.71		x 3/16
x 1/4	0.233	7.93	2.21	x 1/4	0.233	10.48	2.91
	x 3/16		0.291		2.64		x 3/16
x 5/16	0.291	9.47	2.64	x 1/4	0.233	12.18	3.37
	0.291		2.64		x 5/16		0.291
5 x 3 x 1/8	0.116	6.45	1.77	x 3/8	0.349	17.20	4.78
	x 3/16		0.174		2.58		x 1/2
x 1/4	0.233	7.93	2.21	x 5/16	0.291	14.80	4.10
	x 3/16		0.174		1.71		x 3/8
x 5/16	0.291	9.47	2.64	x 1/2	0.465	21.50	6.02



# Structural Tubing

## Rectangular

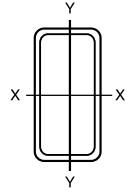
Dimensions and Properties

Rectangular Tube	Design Wall Thickness, <i>t</i>	Nominal wt.	Area A	Rectangular Tube	Design Wall Thickness, <i>t</i>	Nominal wt.	Area A						
	in.		lb./ft.		in. <sup>2</sup>		in.	lb./ft.	in. <sup>2</sup>				
5 x 4 x 1/8	0.116	7.30	2.00	7 x 3 x 1/8	0.116	8.15	2.23						
	x 3/16				0.174			10.70	2.93	x 3/16	0.174	11.98	3.28
	x 1/4				0.233			13.88	3.84	x 1/4	0.233	15.58	4.30
	x 5/16				0.291			16.93	4.68	x 5/16	0.291	19.06	5.26
	x 3/8				0.349			19.75	5.48	x 3/8	0.349	22.30	6.18
	x 1/2				0.465			24.90	6.95	x 1/2	0.465	28.30	7.88
6 x 2 x 1/8	0.116	6.45	1.77	7 x 4 x 1/8	0.116	9.00	2.46						
	x 3/16				0.174			9.43	2.58	x 3/16	0.174	13.26	3.63
	x 1/4				0.233			12.18	3.37	x 1/4	0.233	17.28	4.77
	x 5/16				0.291			14.80	4.10	x 5/16	0.291	21.19	5.85
	x 3/8				0.349			17.20	4.78	x 3/8	0.349	24.85	6.88
6 x 3 x 1/8	0.116	7.30	2.00	7 x 5 x 1/8	0.116	9.85	2.70						
	x 3/16				0.174			10.70	2.93	x 3/16	0.174	14.54	3.98
	x 1/4				0.233			13.88	3.84	x 1/4	0.233	18.99	5.24
	x 5/16				0.291			16.93	4.68	x 5/16	0.291	23.32	6.43
	x 3/8				0.349			19.75	5.48	x 3/8	0.349	27.41	7.58
	x 1/2				0.465			24.90	6.95	x 1/2	0.465	35.11	9.74
6 x 4 x 1/8	0.116	8.15	2.23	8 x 2 x 1/8	0.116	8.15	2.23						
	x 3/16				0.174			11.98	3.28	x 3/16	0.174	11.98	3.28
	x 1/4				0.233			15.58	4.30	x 1/4	0.233	15.58	4.30
	x 5/16				0.291			19.06	5.26	x 5/16	0.291	19.06	5.26
	x 3/8				0.349			22.30	6.18	x 3/8	0.349	22.30	6.18
	x 1/2				0.465			28.30	7.88	x 1/2	0.465	28.30	7.88
6 x 5 x 1/8	0.116	9.00	2.46	8 x 3 x 1/8	0.116	9.00	2.46						
	x 3/16				0.174			13.26	3.63	x 3/16	0.174	13.26	3.63
	x 1/4				0.233			17.28	4.77	x 1/4	0.233	17.28	4.77
	x 5/16				0.291			21.19	5.85	x 5/16	0.291	21.19	5.85
	x 3/8				0.349			24.85	6.88	x 3/8	0.349	24.85	6.88
	x 1/2				0.465			31.71	8.81	x 1/2	0.465	31.71	8.81
7 x 2 x 1/8	0.116	7.30	2.00	x 3/16	0.174	10.70	2.93						
	x 1/4				0.233			13.88	3.84				

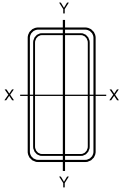
# Structural Tubing

## Rectangular

Dimensions and Properties



Rectangular Tube	Design Wall Thickness, $t$	Nominal wt.	Area $A$	Rectangular Tube	Design Wall Thickness, $t$	Nominal wt.	Area $A$		
	in.				lb./ft.			in. <sup>2</sup>	in.
8 x 4 x 1/8	0.116	9.85	2.70	10 x 2 x 1/8	0.116	9.85	2.70		
	x 3/16	0.174	14.54		3.98	x 3/16	0.174	14.54	3.98
	x 1/4	0.233	18.99		5.24	x 1/4	0.233	18.99	5.24
	x 5/16	0.291	23.32		6.43	x 5/16	0.291	23.32	6.43
	x 3/8	0.349	27.41		7.58	x 3/8	0.349	27.41	7.58
	x 1/2	0.465	35.11		9.74				
	x 5/8	0.581	42.10		11.7				
8 x 6 x 3/16	0.174	17.10	4.67	10 x 3 x 1/8	0.116	10.70	2.93		
	x 1/4	0.233	6.17		x 3/16	0.174	15.82	4.32	
	x 5/16	0.291	7.59		x 1/4	0.233	20.69	5.70	
	x 3/8	0.349	8.97		x 5/16	0.291	25.45	7.01	
	x 1/2	0.465	11.6		x 3/8	0.349	29.96	8.27	
	x 5/8	0.581	14.0						
9 x 3 x 3/16	0.174	14.54	3.98	10 x 4 x 1/8	0.116	11.55	3.16		
	x 1/4	0.233	5.24		x 3/16	0.174	17.10	4.67	
	x 5/16	0.291	6.43		x 1/4	0.233	22.39	6.17	
	x 3/8	0.349	7.58		x 5/16	0.291	27.58	7.59	
	x 1/2	0.465	9.74		x 3/8	0.349	32.51	8.97	
					x 1/2	0.465	41.91	11.6	
					x 5/8	0.581	50.60	14.0	
9 x 5 x 3/16	0.174	17.10	4.67	10 x 5 x 3/16	0.174	18.38	5.02		
	x 1/4	0.233	6.17		x 1/4	0.233	24.09	6.63	
	x 5/16	0.291	7.59		x 5/16	0.291	29.71	8.17	
	x 3/8	0.349	8.97		x 3/8	0.349	35.06	9.67	
	x 1/2	0.465	11.6						
	x 5/8	0.581	14.0						
9 x 7 x 3/16	0.174	19.66	5.37	10 x 6 x 3/16	0.174	19.66	5.37		
	x 1/4	0.233	7.10		x 1/4	0.233	25.79	7.10	
	x 5/16	0.291	8.76		x 3/16	0.291	31.84	8.76	
	x 3/8	0.349	10.4		x 3/8	0.349	37.61	10.4	
	x 1/2	0.465	13.5		x 1/2	0.465	48.72	13.5	
	x 5/8	0.581	16.4		x 5/8	0.581	59.11	16.4	



# Structural Tubing

## Rectangular

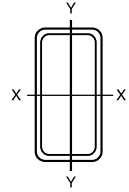
Dimensions and Properties

Rectangular Tube	Design Wall Thickness, <i>t</i>	Nominal wt. lb./ft.	Area <i>A</i>	Rectangular Tube	Design Wall Thickness, <i>t</i>	Nominal wt. lb./ft.	Area <i>A</i>	
	in.		in. <sup>2</sup>		in.		in. <sup>2</sup>	
10 x 8 x 3/16	0.174	22.22	6.06	12 x 10 x 1/4	0.233	36.00	9.90	
	x 1/4 0.233	29.19	8.03		x 5/16 0.291	44.62	12.2	
	x 5/16 0.291	36.10	9.92		x 3/8 0.349	52.93	14.6	
	x 3/8 0.349	42.72	11.8		x 1/2 0.465	69.14	19.0	
	x 1/2 0.465	55.53	15.3		14 x 4 x 3/16	0.174	22.12	6.06
	x 5/8 0.581	67.62	18.7			x 1/4 0.233	29.25	8.03
12 x 2 x 3/16	0.174	17.10	4.67	x 5/16 0.291	36.09	9.92		
	x 1/4 0.233	22.39	6.17	x 3/8 0.349	42.75	11.8		
	x 5/16 0.291	27.58	7.59	x 1/2 0.465	55.53	15.3		
12 x 3 x 3/16	0.174	18.38	5.02	x 5/8 0.581	67.59	18.7		
	x 1/4 0.233	24.09	6.63	14 x 6 x 3/16	0.174	24.66	6.76	
	x 5/16 0.291	29.71	8.17		x 1/4 0.233	32.66	8.96	
12 x 4 x 3/16	0.174	19.66	5.37		x 5/16 0.291	40.35	11.1	
	x 1/4 0.233	25.79	7.10	x 3/8 0.349	47.86	13.2		
	x 5/16 0.291	31.84	8.76	x 1/2 0.465	62.33	17.2		
	x 3/8 0.349	37.61	10.4	x 5/8 0.581	76.09	21.0		
	x 1/2 0.465	48.72	13.5	14 x 10 x 1/4	0.233	39.48	10.8	
x 5/8 0.581	59.11	16.4	x 3/16 0.291		48.87	13.4		
12 x 6 x 3/16	0.174	22.22	6.06		x 3/8 0.349	58.07	16.0	
	x 1/4 0.233	29.19	8.03	x 1/2 0.465	75.94	20.9		
	x 5/16 0.291	36.10	9.92	x 5/8 0.581	93.10	25.7		
	x 3/8 0.349	42.72	11.8	16 x 4 x 3/16	0.174	24.66	6.76	
	x 1/2 0.465	55.53	15.3		x 1/4 0.233	32.66	8.96	
x 5/8 0.581	67.62	18.7	x 5/16 0.291		40.35	11.1		
12 x 8 x 3/16	0.174	24.78	6.76		x 3/8 0.349	47.86	13.2	
	x 1/4 0.233	32.60	8.96		x 1/2 0.465	62.33	17.2	
	x 5/16 0.291	40.36	11.1	x 5/8 0.581	76.09	21.0		
	x 3/8 0.349	47.82	13.2	16 x 8 x 1/4	0.233	39.48	10.8	
	x 1/2 0.465	62.33	17.2		x 3/16 0.291	48.87	13.4	
x 5/8 0.581	76.13	21.0	x 3/8 0.349		58.07	16.0		
12 x 8 x 3/16	0.174	24.78	6.76		x 1/2 0.465	75.94	20.9	
	x 1/4 0.233	32.60	8.96		x 5/8 0.581	93.10	25.7	
	x 5/16 0.291	40.36	11.1	16 x 8 x 1/4	0.233	39.48	10.8	
	x 3/8 0.349	47.82	13.2		x 3/16 0.291	48.87	13.4	
	x 1/2 0.465	62.33	17.2		x 3/8 0.349	58.07	16.0	
x 5/8 0.581	76.13	21.0	x 1/2 0.465		75.94	20.9		
					x 5/8 0.581	93.10	25.7	

# Structural Tubing

## Rectangular

Dimensions and Properties



Rectangular Tube	Design Wall Thickness, <i>t</i>	Nominal wt.	Area <i>A</i>	Rectangular Tube	Design Wall Thickness, <i>t</i>	Nominal wt.	Area <i>A</i>		
	in.		lb./ft.		in. <sup>2</sup>		in.	lb./ft.	in. <sup>2</sup>
16 x 12 x <sup>5</sup> / <sub>16</sub>	0.291	57.38	15.7	20 x 8 x <sup>5</sup> / <sub>16</sub>	0.291	57.31	15.7		
	x <sup>3</sup> / <sub>8</sub> 0.349		68.29		18.7		x <sup>3</sup> / <sub>8</sub> 0.349	68.29	18.7
	x <sup>1</sup> / <sub>2</sub> 0.465		89.55		24.6		x <sup>1</sup> / <sub>2</sub> 0.465	89.55	24.6
	x <sup>5</sup> / <sub>8</sub> 0.581		110.00		30.3		x <sup>5</sup> / <sub>8</sub> 0.581	110.00	30.3
18 x 6 x <sup>1</sup> / <sub>4</sub>	0.233	39.48	10.8	20 x 12 x <sup>5</sup> / <sub>16</sub>	0.291	65.82	18.1		
	x <sup>5</sup> / <sub>16</sub> 0.291		48.87		13.4		x <sup>3</sup> / <sub>8</sub> 0.349	78.45	21.5
	x <sup>3</sup> / <sub>8</sub> 0.349		58.07		16.0		x <sup>1</sup> / <sub>2</sub> 0.465	103.00	28.3
	x <sup>1</sup> / <sub>2</sub> 0.465		75.94		20.9		x <sup>5</sup> / <sub>8</sub> 0.581	127.00	35.0
	x <sup>5</sup> / <sub>8</sub> 0.581		93.10		25.7				
20 x 4 x <sup>1</sup> / <sub>4</sub>	0.233	39.48	10.8						
	x <sup>5</sup> / <sub>16</sub> 0.291		48.87	13.4					
	x <sup>3</sup> / <sub>8</sub> 0.349		58.07	16.0					
	x <sup>1</sup> / <sub>2</sub> 0.465		75.94	20.9					



# Pipe

## Dimensions and Properties

Dimensions				Weight per ft. lbs. Plain Ends	Properties				Schedule No.
Nominal Diameter in.	Outside Diameter in.	Inside Diameter in.	Wall Thickness in.		A in. <sup>2</sup>	I in. <sup>4</sup>	S in. <sup>3</sup>	r in.	
<b>Standard Weight</b>									
½	.840	.622	.85	.250	.017	.041	.041	.261	40
¾	1.050	.824	1.13	.333	.037	.071	.071	.334	40
1	1.315	1.049	1.68	.494	.087	.133	.133	.421	40
1¼	1.660	1.380	2.27	.669	.195	.235	.235	.540	40
1½	1.900	1.610	2.72	.799	.310	.326	.326	.623	40
2	2.375	2.067	3.65	1.07	.666	.561	.561	.787	40
2½	2.875	2.469	5.79	1.70	1.53	1.06	1.06	.947	40
3	3.500	3.068	7.58	2.23	3.02	1.72	1.72	1.16	40
3½	4.000	3.548	9.11	2.68	4.79	2.39	2.39	1.34	40
4	4.500	4.026	10.79	3.17	7.23	3.21	3.21	1.51	40
5	5.563	5.047	14.62	4.30	15.2	5.45	5.45	1.88	40
6	6.625	6.065	18.97	5.58	28.1	8.50	8.50	2.25	40
8	8.625	7.981	28.55	8.40	72.5	16.8	16.8	2.94	40
10	10.750	10.020	40.48	11.9	161	29.9	29.9	3.67	40
12	12.750	12.000	49.56	14.6	279	43.8	43.8	4.38	—
<b>Extra Strong</b>									
½	.840	.546	.147	1.09	.320	.020	.048	.250	80
¾	1.050	.742	.154	1.47	.433	.045	.085	.321	80
1	1.315	.957	.179	2.17	.639	.106	.161	.407	80
1¼	1.660	1.278	.191	3.00	.881	.242	.291	.524	80
1½	1.900	1.500	.200	3.63	1.07	.391	.412	.605	80
2	2.375	1.939	.218	5.02	1.48	.868	.731	.766	80
2½	2.875	2.323	.276	7.66	2.25	1.92	1.34	.924	80
3	3.500	2.900	.300	10.25	3.02	3.89	2.23	1.14	80
3½	4.000	3.364	.318	12.50	3.68	6.28	3.14	1.31	80
4	4.500	3.826	.337	14.98	4.41	9.61	4.27	1.48	80
5	5.563	4.813	.375	20.78	6.11	20.7	7.43	1.84	80
6	6.625	5.761	.432	28.57	8.40	40.5	12.2	2.19	80
8	8.625	7.625	.500	43.39	12.8	106	24.5	2.88	80
10	10.750	9.750	.500	54.74	16.1	212	39.4	3.63	60
12	12.750	11.750	.500	65.42	19.2	362	56.7	4.33	—
<b>Double-Extra Strong</b>									
2	2.375	1.503	.436	9.03	2.66	1.31	1.10	.703	—
2½	2.875	1.771	.552	13.69	4.03	2.87	2.00	.844	—
3	3.500	2.300	.600	18.58	5.47	5.99	3.42	1.05	—
4	4.500	3.152	.674	27.54	8.10	15.3	6.79	1.37	—
5	5.563	4.063	.750	38.55	11.3	33.6	12.1	1.72	—
6	6.625	4.897	.864	53.16	15.6	66.3	20.0	2.06	—
8	8.625	6.875	.875	72.42	21.3	162	37.6	2.76	—

The listed sections are available in conformance with ASTM Specification A53 Grade B or A501. Other sections are made to these specifications. Consult with pipe manufacturers or distributors for availability.



# Universal Mill Plate & Plate

## Universal Mill Plate & Plate

Universal Mill Plate								
Weight in Pounds								
Size	Per Foot	20'	Size	Per Foot	20'	Size	Per Foot	20'
¼ x 9	7.66	153.14	½ x 9	15.31	306.29	1 x 9	30.63	612.58
x 10	8.51	170.16	x 10	17.02	340.32	x 10	34.03	680.64
x 12	10.21	204.19	x 12	20.42	408.38	x 12	40.84	816.77
5/16 x 9	9.57	191.43	5/8 x 9	19.14	382.86	1¼ x 10	42.54	850.80
x 10	10.64	212.70	x 10	21.27	425.40	x 12	51.05	1020.96
x 12	12.76	255.24	x 12	25.52	510.48	1½ x 10	51.05	1020.96
¾ x 9	11.49	229.72	¾ x 9	22.97	459.43	x 12	61.26	1255.15
x 10	2.76	255.24	x 10	25.52	510.48			
x 12	15.31	306.29	x 12	30.63	612.57			

Plate					
Size		Weight Per Plate	Size		Weight Per Plate
<b>3/16</b>	<b>7.66# / Sq. Ft.</b>		<b>1/4</b>	<b>10.21# / Sq. Ft.</b>	
	48 x 96	245.05		48 x 96	326.71
	x 120	306.32		x 120	408.38
	x 144	367.58		x 144	490.06
	x 240	612.63		x 240	816.77
	60 x 96	306.32		60 x 96	408.38
	x 120	382.90		x 120	510.48
	x 144	459.47		x 144	612.58
	x 240	765.79		x 240	1020.96
	x 360	1148.69		x 360	1531.44
	72 x 96	367.58		72 x 96	490.06
	x 120	459.47		x 120	612.58
	x 144	551.37		x 144	735.09
	x 240	918.95		x 240	1225.15
	x 360	1378.42		x 360	1837.73
	84 x 96	428.84		84 x 96	571.74
	x 120	536.05		x 120	714.67
	x 144	643.26		x 144	857.61
	x 240	1072.11		x 240	1429.34
	x 360	1608.16		x 360	2144.02
96 x 120	612.63	96 x 120	816.77		
x 144	735.16	x 144	980.12		
x 240	1225.26	x 240	1633.54		
x 360	1837.90	x 360	2450.30		



# Plate

Plate				
Size	Weight Per Plate	Size	Weight Per Plate	
<b>1/2</b>	<b>20.42# / Sq. Ft.</b>			
	48 x 96		653.41	
	x 120		816.77	
	x 144		980.12	
	x 240		1633.54	
	60 x 96		816.77	
	x 120		1020.96	
	x 144		1225.15	
	x 240		2041.92	
	x 360		3062.88	
	72 x 96		980.12	
	x 120		1225.15	
	x 144		1470.18	
	x 240		2450.30	
	x 360		3675.46	
	84 x 96		1143.48	
	x 120		1429.34	
	x 144		1715.21	
	x 240		2858.69	
	x 360		4288.03	
	96 x 120		1633.54	
	x 144		1960.25	
	x 240		3267.07	
	x 360		4900.61	
	x 480		6534.14	
	120 x 240		4083.84	
	x 360		6125.76	
	x 480		8167.68	
<b>9/16</b>	<b>22.97# / Sq. Ft.</b>			
<b>5/8</b>	<b>25.52# / Sq. Ft.</b>			
	48 x 96		816.77	
	x 120		1020.96	
	60 x 120		1276.20	
	x 240		2552.40	
	72 x 120		1531.44	
	x 240		3062.88	
	84 x 120		1786.68	
	x 240		3573.36	
		<b>5/8</b>	<b>25.52# / Sq. Ft.</b>	
			96 x 120	2041.92
			x 240	4083.84
			x 360	6125.76
		<b>11/16</b>	<b>28.08# / Sq. Ft.</b>	
		<b>3/4</b>	<b>30.63# / Sq. Ft.</b>	
			48 x 96	980.12
			x 120	1225.15
			x 144	1470.18
			x 240	2450.30
			60 x 96	1225.15
			x 120	1513.44
			x 144	1837.73
			x 240	3062.88
			x 360	4594.32
			72 x 96	1470.18
			x 120	1837.73
			x 144	2205.27
			x 240	3675.46
			x 360	5513.18
			84 x 96	1715.22
			x 120	2144.02
			x 144	2572.82
			x 240	4288.03
			x 360	6432.05
			96 x 120	2450.31
			x 144	2940.36
			x 240	4900.61
			x 360	7350.91
			x 480	9801.22
			120 x 240	6125.76
			x 360	9188.64
			x 480	12251.52

# Plate

Plate			
Size	Weight Per Plate	Size	Weight Per Plate
<b>13/16</b>	<b>33.18# / Sq. Ft.</b>	<b>1</b>	<b>40.84# / Sq. Ft.</b>
<b>7/8</b>	<b>35.73# / Sq. Ft.</b>		84 x 96
	48 x 96		x 120
	x 120		x 144
	x 144		x 240
	x 240		x 340
	60 x 96		96 x 120
	x 120		x 144
	x 144		x 240
	x 240		x 360
	72 x 120		x 480
	x 240		120 x 240
	84 x 120		x 360
	x 240		x 480
	96 x 120	<b>1 1/8</b>	<b>45.94# / Sq. Ft.</b>
	x 240	<b>1 1/4</b>	<b>51.05# / Sq. Ft.</b>
	x 360		48 x 96
<b>15/16</b>	<b>38.29# / Sq. Ft.</b>		x 120
<b>1</b>	<b>40.84# / Sq. Ft.</b>		60 x 120
	48 x 96		x 240
	x 120		72 x 120
	x 144		x 240
	x 240		84 x 120
	60 x 96		x 240
	x 120		96 x 120
	x 144		x 240
	x 240		x 360
	x 360	<b>1 3/16</b>	<b>48.50# / Sq. Ft.</b>
	72 x 96	<b>1 3/8</b>	<b>56.15# / Sq. Ft.</b>
	x 120		
	x 144		
	x 240		
	x 360		

# Plate

Plate			
Size	Weight Per Plate	Size	Weight Per Plate
<b>1 1/2</b>	<b>61.26# / Sq. Ft.</b>	<b>1 7/8</b>	<b>76.57# / Sq. Ft.</b>
48 x 96	1960.24		
x 120	2450.30	<b>2</b>	<b>81.68# / Sq. Ft.</b>
60 x 120	3062.88	48 x 96	2613.66
x 240	6125.76	x 120	3267.07
72 x 120	3675.45	60 x 120	4083.84
x 240	7350.91	x 240	8167.68
84 x 120	4288.03	72 x 120	4900.61
x 240	8576.06	x 240	9801.61
96 x 120	4900.60	84 x 120	5717.37
x 240	9801.22	x 240	11434.75
x 360	14701.80	96 x 120	6534.14
		x 240	13068.29
<b>1 5/8</b>	<b>66.36# / Sq. Ft.</b>	x 360	19602.43
<b>1 3/4</b>	<b>71.47# / Sq. Ft.</b>		
48 x 96	2286.95		
x 120	2858.68		
60 x 120	3573.36		
x 240	7146.72		
72 x 120	4288.03		
x 240	8576.06		
84 x 120	5002.70		
x 240	10005.41		
96 x 120	5717.37		
x 240	11434.75		
x 360	17152.13		

**Strip**  
**Flat Bar**  
**Round Bar**  
**Square Bar**  
**Rebar**

## Hot Rolled Strip & Hot Rolled Flat Bar

Hot Rolled Strip						Hot Rolled Flat Bar					
Weight in Pounds						Weight in Pounds					
Size	Per Foot	20'	Size	Per Foot	20'	Size	Per Foot	20'	Size	Per Foot	20'
1/8 x 1/2	0.213	4.26	3/16 x 1/2	0.319	6.38	7/8 x 6	17.85	357.00	1 1/2 x 2	10.20	204.00
x 5/8	0.266	5.32	x 5/8	0.398	7.96	x 7	20.83	416.60	x 2 1/2	12.75	255.00
x 3/4	0.319	6.38	x 3/4	0.478	9.56	x 8	23.80	470.00	x 3	15.30	306.00
x 7/8	0.372	7.44	x 7/8	0.558	11.16				x 4	20.40	408.00
x 1	0.425	8.50	x 1	0.638	12.76	1 x 1 1/2	5.10	102.00	x 5	25.50	510.00
x 1 1/4	0.531	10.62	x 1 1/4	0.797	15.94	x 2	6.80	136.00	x 6	30.60	612.00
x 1 1/2	0.638	12.76	x 1 1/2	0.956	19.12	x 2 1/2	8.50	170.00	x 7	35.70	714.00
x 1 3/4	0.744	14.88	x 1 3/4	1.120	22.40	x 3	10.20	204.00	x 8	40.80	816.00
x 2	0.850	17.00	x 2	1.280	25.60	x 3 1/2	11.90	238.00			
x 2 1/4	0.956	19.12	x 2 1/4	1.430	28.60	x 4	13.60	272.00	1 3/4 x 4	23.80	476.00
x 2 1/2	1.063	21.26	x 2 1/2	1.594	31.88	x 4 1/2	15.30	306.00	x 4 1/2	26.77	535.40
x 2 3/4	1.169	23.38	x 2 3/4	1.753	35.06	x 5	17.00	340.00	x 5	29.75	595.00
x 3	1.275	25.50	x 3	1.913	38.26	x 6	20.40	408.00	x 6	35.70	714.00
x 3 1/2	1.488	29.76	x 3 1/2	2.230	44.60	x 7	23.80	476.00	x 7	41.65	833.00
x 4	1.700	34.00	x 4	2.550	51.00	x 8	27.20	544.00	x 8	47.60	952.00
x 4 1/2	1.913	38.26	x 5	3.188	63.76						
x 5	2.125	42.50	6	3.825	76.50	1 1/8 x 2	7.65	153.00	2 x 2 1/2	17.00	340.00
x 6	2.550	51.00	x 7	4.463	89.25	x 2 1/2	9.56	191.20	x 3	20.40	408.00
x 7	2.975	59.50	x 8	5.100	102.00	x 3	11.48	229.60	x 4	27.20	544.00
x 8	3.400	68.00	x 10	6.375	127.50	x 4	15.30	306.00	x 5	34.00	680.00
x 10	4.250	85.00	x 12	7.650	153.00	x 5	19.13	382.00	x 6	40.80	816.00
x 12	5.100	102.00				x 6	22.95	459.00	x 7	47.60	952.00
x 16	6.800	136.00							x 8	54.40	1088.00
						1 1/4 x 2	8.50	170.00			
						x 2 1/2	10.63	212.50			
						x 3	12.75	255.00			
						x 4	17.00	340.00			
						x 5	21.25	425.00			
						x 6	25.50	510.00			
						x 7	29.75	595.00			
						x 8	34.00	680.00			

# Hot Rolled Round Bar & Hot Rolled Square Bar

Hot Rolled Round Bar								
Theoretical Weight in Pounds								
Size	Per Foot (1)	20'	Size	Per Foot (1)	20'	Size	Per Foot (1)	20'
1/4	0.167	3.34	2 1/8	12.060	241.20	5 3/4	88.29	1765.80
5/16	0.261	5.22	2 1/4	13.520	270.40	6	96.13	1922.60
3/8	0.376	7.52	2 3/8	15.060	301.20	6 1/4	104.31	2086.20
7/16	0.511	10.22	2 1/2	16.690	333.80	6 1/2	112.82	2256.40
1/2	0.668	13.36	2 5/8	18.400	368.00	6 3/4	121.67	2433.40
9/16	0.845	16.90	2 3/4	20.190	403.80	7	130.85	2617.00
5/8	1.043	20.86	3	24.030	480.60	7 1/4	140.36	2807.20
3/4	1.500	30.00	3 1/4	28.210	564.20	7 1/2	150.21	3004.20
7/8	2.040	40.80	3 1/2	32.170	654.20	7 3/4	160.40	3208.00
1	2.670	53.40	3 3/8	35.090	701.80	8	170.90	3418.00
1 1/8	3.380	67.60	3 3/4	37.550	751.00	8 1/4	181.75	3635.00
1 1/4	4.170	83.40	4	42.73	854.60	8 1/2	192.93	3858.60
1 3/8	5.050	101.00	4 1/4	48.23	964.60	9	216.30	4326.00
1 1/2	6.010	120.20	4 1/2	54.08	1081.60	9 1/2	241.00	4820.00
1 5/8	7.050	141.00	4 3/4	60.25	1205.00	10	267.04	5340.80
1 3/4	8.180	163.60	5	66.76	1335.20	10 1/2	294.40	5888.00
1 7/8	9.390	187.80	5 1/4	73.60	1472.00	12	384.53	7690.60
2	10.680	213.60	5 1/2	80.78	1615.60			

Hot Rolled Square Bar								
Weight in Pounds								
Size	Per Foot	20'	Size	Per Foot	20'	Size	Per Foot	20'
1/4	0.213	4.26	1 1/8	4.300	86.00	2 5/8	23.430	468.60
5/16	0.332	6.64	1 1/4	5.310	106.20	2 3/4	25.710	514.20
3/8	0.478	9.56	1 3/8	6.430	128.60	3	30.600	612.00
7/16	0.651	13.02	1 1/2	7.650	153.00	3 1/4	35.910	718.20
1/2	0.850	17.00	1 5/8	8.980	179.60	3 1/2	41.650	833.00
9/16	1.080	21.60	1 3/4	10.410	208.20	4	54.400	1088.00
5/8	1.330	26.60	1 7/8	11.950	239.00	4 1/2	68.850	1377.00
3/4	1.910	38.20	2	13.600	272.00	5	85.000	1700.00
7/8	2.600	52.00	2 1/4	17.210	344.20	6	122.400	2448.00
1	3.400	68.00	2 1/2	21.250	425.00			

# Rebar

Rebar				
Bar Size Designation	Weight Pounds Per Foot	Nominal Diameter Inches	Cross Sectional Area-Sq. Inches	Perimeter Inches
#3	0.375	0.376	0.11	1.178
#4	0.668	0.500	0.20	1.571
#5	1.043	0.625	0.31	1.963
#6	1.502	0.750	0.44	2.356
#7	2.044	0.875	0.60	2.749
#8	2.670	1.000	0.79	3.142
#9	3.400	1.128	1.00	3.544
#10	4.303	1.270	1.27	3.990
#11	5.313	1.410	1.56	4.430
#14	7.650	1.693	2.25	5.320
#18	13.600	2.257	4.00	7.090

# Information Tables

# Standard Mill Practice

Methods of increasing areas and weights by spreading rolls

## W Shapes

To vary the area and weight within a given nominal size, the flange width, the flange thickness and the web thickness are changed, as shown in Fig. 1.

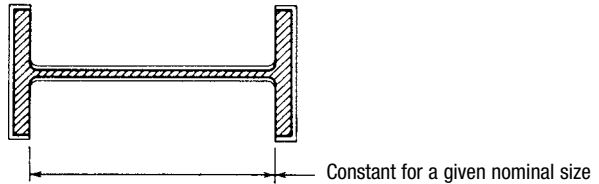


Figure 1

## S Shapes and American Standard Channels

To vary the area and weight within a given nominal size, the web thickness and the flange width are changed by an equal amount, as shown in Figs. 2 and 3.

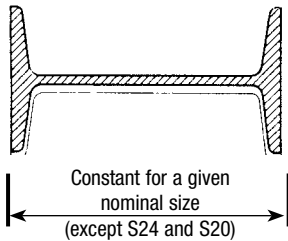


Figure 2

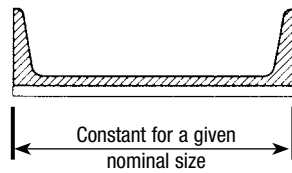


Figure 3

## Angles

To vary area and weight for a given leg length, the thickness of each leg is changed. Note that leg length is changed slightly by this method (Fig. 4).



Figure 4

# Standard Mill Practice

## Cambering of rolled beams

All beams are straightened after rolling to meet permissible variations for sweep and camber listed herein after for **W** shapes and **S** shapes. The following data refers to the subsequent cold cambering of beams to produce a predetermined dimension.

The maximum lengths that can be cambered depend on the length to which a given section can be rolled, with a maximum of 100 ft. The following table outlines the maximum and minimum induced camber of **W** shapes and **S** shapes.

**MAXIMUM AND MINIMUM INDUCED CAMBER**

Sections Nominal Depth In.	Specified Length of Beam, Ft.				
	Over 30 to 42, incl.	Over 42 to 52, incl.	Over 52 to 65, incl.	Over 65 to 85, incl.	Over 85 to 100, incl.
	Max. and Min. Camber Acceptable, In.				
<b>W</b> Shapes, 24 and over	1 to 2, incl.	1 to 3, incl.	2 to 4, incl.	3 to 5, incl.	3 to 6, incl.
<b>W</b> Shapes, 14 to 21, incl. and <b>S</b> shapes, 12 in. and over	¾ to 2½, incl.	1 to 3, incl.	2 to 4, incl.	2½ to 5, incl.	Inquire

Consult the producer for specific camber and/or lengths outside the above listed available lengths and sections.

Mill camber in beams of less depth than tabulated should not be specified.

A single minimum value for camber, within the ranges shown above for the length ordered, should be specified.

Camber is measured at the mill and will not necessarily be present in the same amount in the section of beam as received due to release of stress induced during the cambering operation. In general, 75% of the specified camber is likely to remain.

Camber will approximate a simple regular curve nearly the full length of the beam, or between any two points specified.

Camber is ordinarily specified by the ordinate at the mid-length of the portion of the beam to be curved. Ordinates at other points should not be specified.

Although mill cambering to achieve reverse or other compound curves is not considered practical, fabricating shop facilities for cambering by heat can accomplish such results as well as form regular curves in excess of the limits tabulated above. Refer to Effects of Heat on Steel, Part 6 of this Manual, for further information.

# Standard Mill Practice

## Cambering of rolled beams

### PERMISSIBLE VARIATIONS FOR CAMBER ORDINATE

Lengths	Plus Variation	Minus Variation
50 ft. and less	½ inch	0
Over 50 ft.	½ in. plus ⅛ in. for each 10 ft. or fraction thereof in excess of 50 ft.	0

### OTHER PERMISSIBLE VARIATIONS

*Area and Weight Variation:* ± 2.5% theoretical or specified amount.

*Ends Out-of-Square:* 1/64 in. per in. of depth, or of flange width if greater than the depth.

*Camber and Sweep:*

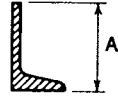
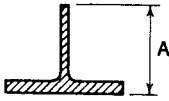
Sizes	Length	Permissible Variation, In.	
		Camber	Sweep
Sizes with flange width equal to or greater than 6 in.	All	$\frac{1}{8}$ in. x $\frac{(\text{total length, ft.})}{10}$	
Sizes with flange width less than 6 in.	All	$\frac{1}{8}$ in. x $\frac{(\text{total length, ft.})}{10}$	$\frac{1}{8}$ in. x $\frac{(\text{total length, ft.})}{5}$
Certain sections with a flange width approx. equal to depth & specified on order as columns <sup>b</sup>	45 ft. and under	$\frac{1}{8}$ in. x $\frac{(\text{total length, ft.})}{10}$ with ⅜ in. max	
	Over 45 ft.	$\frac{3}{8}$ in. + $\left[ \frac{(\text{total length, ft.} - 45)}{10} \right]$	

<sup>b</sup>Applies only to: W 8 x 31 and heavier, W 10 x 49 and heavier, W 12 x 65 and heavier, W 14 x 90 and heavier. If other sections are specified on the order as columns, the tolerance will be subject to negotiation with the manufacturer.

# Standard Mill Practice

Tees split from W, M and S shapes  
Angles split from channels

## PERMISSIBLE VARIATIONS IN DEPTH



Dimension A may be approximately  $\frac{1}{2}$  beam or channel depth, or any dimension resulting from off-center splitting, or splitting on two lines as specified on the order.

Depth of Beam from which Tees or Angles are Split	Variations in Depth A Over and Under	
	Tees	Angles
To 6 in., excl.	$\frac{1}{8}$	$\frac{1}{8}$
6 to 16, excl.	$\frac{3}{16}$	$\frac{3}{16}$
16 to 20, excl.	$\frac{1}{4}$	$\frac{1}{4}$
20 to 24, excl.	$\frac{5}{16}$	—
24 and over	$\frac{3}{8}$	—

The above variations for depths of tees or angles include the permissible variations in depth for the beams and channels before splitting.

## OTHER PERMISSIBLE VARIATIONS

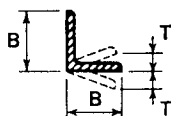
Other permissible variations in cross section, as well as permissible variations in length, area and weight variation and ends out-of-square, will correspond to those of the beam or channel before splitting, except

$$\text{camber} = \frac{1}{8} \text{ in.} \times \frac{(\text{total length, ft})}{5}$$

# Standard Mill Practice

\*Angles, bar size

## PERMISSIBLE VARIATIONS IN CROSS SECTION



<sup>a</sup> Specified Length of Leg, in.	Variations from Thickness for Thickness Given, Over and Under, in.			B Length of Leg Over and Under, in.	T, Out of Square per Inch of B, in.
	<sup>3</sup> / <sub>16</sub> and Under	Over <sup>3</sup> / <sub>16</sub> to <sup>3</sup> / <sub>8</sub> incl.	Over <sup>3</sup> / <sub>8</sub>		
1 and under	0.008	0.010		<sup>1</sup> / <sub>32</sub>	<sup>3</sup> / <sub>128</sub> <sup>b</sup>
Over 1 to 2, inc.	0.010	0.010	0.012	<sup>3</sup> / <sub>64</sub>	<sup>3</sup> / <sub>128</sub> <sup>b</sup>
Over 2 to 3, excl.	0.012	0.015	0.015	<sup>1</sup> / <sub>16</sub>	<sup>3</sup> / <sub>128</sub> <sup>b</sup>

<sup>a</sup>The longer leg of an unequal angle determines the size for permissible variations.  
<sup>b</sup><sup>3</sup>/<sub>128</sub>-in. per in. = 1 1/2 degrees.

## PERMISSIBLE VARIATIONS IN LENGTH

Section	Variations Over Specified Length for Lengths Given No Variation Under				
	5 to 10 ft. excl.	10 to 20 ft. excl.	20 to 30 ft. excl.	30 to 40 ft. excl.	40 to 65 Ft. incl.
All sizes of bar-size angles	<sup>5</sup> / <sub>8</sub>	1	1 1/2	2	2 1/2

## OTHER PERMISSIBLE VARIATIONS

*Camber* = <sup>1</sup>/<sub>4</sub> in. in any 5 ft, or <sup>1</sup>/<sub>4</sub> in. x  $\frac{(\text{total length, ft})}{5}$

*Straightness*: Because of warpage, permissible variations for straightness do not apply to bars if any subsequent heating operation has been performed.

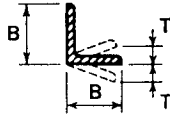
*Ends Out-of-Square*: <sup>3</sup>/<sub>128</sub>-in. per in. of leg length or 1 1/2 degrees. Variation based on longer leg of an unequal angle.

\* A member is "bar size" when its greatest cross-sectional dimension is less than 3 in.

# Standard Mill Practice

\*Angles, structural size

## PERMISSIBLE VARIATIONS IN CROSS SECTION



Section	Nominal Size, in. <sup>a</sup>	B Length of Leg, in.		T, Out of Square per Inch of B, in.
		Over Theoretical	Under Theoretical	
Angles	3 to 4, incl.	1/8	3/32	3/128 <sup>b</sup>
	Over 4 to 6, incl.	1/8	1/8	3/128 <sup>b</sup>
	Over 6	3/16	1/8	3/128 <sup>b</sup>

<sup>a</sup>For unequal leg angles, longer leg determines classification.

<sup>b</sup>3/128-in. per in. = 1 1/2 degrees.

## PERMISSIBLE VARIATIONS IN LENGTH

Section	Variations Over Specified Length for Lengths Given No Variation Under										
	To 30 ft., incl.		Over 30 to 40 ft., incl.		Over 40 to 50 ft., incl.		Over 50 to 65 ft., incl.		Over 65 ft.		
Angles	Over	Under	Over	Over	Under	Over	Under	Over	Over	Over	Under
		1/2	1/4	3/4	1/4	1	1/4	1 1/8	1/4	1 1/4	1/4

## OTHER PERMISSIBLE VARIATIONS

*Area and Weight Variation:* ± 2.5% theoretical or specified amount.

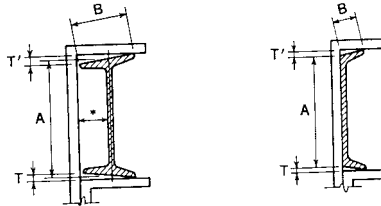
*Ends Out-of-Square:* 3/128 in. per in. of leg length, or 1 1/2 degrees. Variations based on the longer leg of an unequal angle.

*Camber* = 1/8 in. x  $\frac{(\text{total length, ft.})}{5}$ , applied to either leg

# Standard Mill Practice

## S Shapes, M Shapes and channels

### PERMISSIBLE VARIATIONS IN CROSS SECTION



Section	Nominal Size, in.	A, Depth, In. <sup>a</sup>		B, Flange Width, In.		T + T <sup>b</sup> Out of Square per Inch of B, In.
		Over Theoretical	Under Theoretical	Over Theoretical	Under Theoretical	
S shapes and M shapes	3 to 7, incl.	3/32	1/16	1/8	1/8	1/32
	Over 7 to 14, incl.	1/8	3/32	3/32	5/32	1/32
	Over 14 to 24, incl.	3/16	1/8	3/16	3/16	1/32
Channels	Over 7 to 14, incl.	3/32	1/16	1/8	1/8	1/32
	Over 7 to 14, incl.	1/8	3/32	1/8	5/32	1/32
	Over 14	3/16	1/8	1/8	3/16	1/32

<sup>a</sup>A is measured at centerline of web for beams; and at back of web for channels.  
<sup>b</sup>T + T applies when flanges of channels are tied in or out.

### PERMISSIBLE VARIATIONS IN LENGTH

Section	Variations from Specified Length for Lengths Given, in.										
	To 30 ft., incl.		Over 30 to 40 ft., incl.		Over 40 to 50 ft., incl.		Over 50 to 65 ft., incl.		Over 65 ft.		
S shapes, M shapes and Channels	Over	Under	Over	Over	Under	Over	Under	Over	Over	Over	Under
	1/2	1/4	3/4	1/4	1	1/4	1 1/8	1/4	1 1/4	1/4	

### OTHER PERMISSIBLE VARIATIONS

*Area and Weight Variation:* ± 2.5% theoretical or specified amount.

*Ends Out-of-Square:* 3/128 in. per in. of leg length, or 1 1/2 degrees. Variations based on the longer leg of an unequal angle.

*Camber* = 1/8 in. x  $\frac{(\text{total length, ft.})}{5}$ , applied to either leg

# Standard Mill Practice

## Steel pipe and tubing

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### DIMENSION AND WEIGHT TOLERANCES

#### *Round Tubing and Pipe*

ASTM A53

ASTM A618

**Weight** – The weight of the pipe as specified in Table X2 and Table X3 (ASTM Specification A53) shall not vary by more than  $\pm 10\%$ .

Note that the weight tolerance of  $\pm 10\%$  is determined from the weights of the customary lifts of pipe as produced for shipment by the mill, divided by the number of feet of pipe in the lift. On pipe sizes over 4 in. where individual lengths may be weighed, the weight tolerance is applicable to the individual length.

**Diameter** – For pipe 2 in. and over in nominal diameter, the outside diameter shall not vary more than  $\pm 1$  percent from the standard specified.

**Thickness** – The minimum wall thickness at any point shall be not more than 12.5 percent under the nominal wall thickness specified.

**Outside Dimensions** – For round hot formed structural tubing 2 in. and over in nominal size, the outside diameter shall not vary more than  $\pm 1$  percent from the standard specified.

**Mass (A618 only)** – The mass of structural tubing shall not be less than the specified value by more than 3.5 percent.

**Length** – Structural tubing is commonly produced in random mill lengths, in multiple lengths, and in definite cut lengths. When cut lengths are specified for structural tubing, the length tolerances shall be in accordance with the following table:

	22 ft. and under		Over 22 ft. to 44 ft., incl.
	Over	Under	Over
Length tolerance for specified cut lengths, in.	1/2	1/4	3/4

**Straightness** – The permissible variation for straightness of structural tubing shall be  $1/8$  in. times the number of feet of total length divided by 5.

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# Standard Mill Practice

## Steel pipe and tubing

### DIMENSION AND WEIGHT TOLERANCES

#### *Square and Rectangular Tubing*

ASTM A500 and ASTM A618

**Outside Dimensions** – The specified dimensions, measured across the flats at positions at least 2 in. from either end of square or rectangular tubing and including an allowance for convexity or concavity, shall not exceed the plus and minus tolerance shown in the following table:

Largest Outside Dimension Across Flats, in.	Tolerance <sup>a</sup> Plus and Minus, in.
2½ and under	0.020
Over 2½ to 3½, incl.	0.025
Over 3½ to 5½, incl.	0.030
Over 5½	1 percent

<sup>a</sup> The respective outside dimension tolerances include the allowances for convexity and concavity.

**Lengths** – Structural tubing is commonly produced in random mill lengths, in multiple lengths, and in definite cut lengths. When cut lengths are specified for structural tubing, the length tolerances shall be in accordance with the following table:

	22 ft. and under		Over 22 ft. to 44 ft., incl.	
	Over	Under	Over	Under
Length tolerance for specified cut lengths, in.	½	¼	¾	¼

**Mass (A816 only)** – The mass of structural tubing shall not be less than the specified value by more than 3.5 percent.

**Straightness** – The permissible variation for straightness of structural tubing shall be 1/8 in. times the number of feet of total length divided by 5.

**Straightness of Sides** – For square or rectangular structural tubing, adjacent sides may deviate from 90 degrees by a tolerance of plus or minus 2 degrees max.

**Radius of Corners** – For square or rectangular structural tubing, the radius of any outside corner of the section shall not exceed three times the specified wall thickness.

**Twist** – The tolerances for twist or variation with respect to axial alignment of the section, for square and rectangular structural tubing, shall be as shown in the following table:

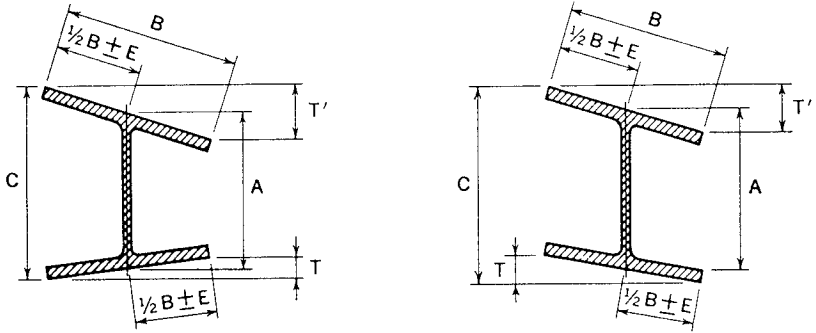
Specified Dimension of Longest Side, in.	Maximum Twist per 3 ft. of Length, in.
1½ and under	0.050
Over 1½ to 2½, incl.	0.062
Over 2½ to 4, incl.	0.075
Over 4 to 6, incl.	0.087
Over 6 to 8, incl.	0.100
Over 8	0.112

Twist is measured by holding down one end of a square or rectangular tube on a flat surface plate with the bottom side of the tube parallel to the surface plate and noting the height that either corner, at the opposite end of the bottom side of the tube, extends above the surface plate.

**Wall Thickness (A500 only)** – The tolerance for wall thickness exclusive of the weld area shall be plus and minus 10 percent of the nominal wall thickness specified. The wall thickness is to be measured at the center of the flat.

# Standard Mill Practice

W shapes, HP shapes



## PERMISSIBLE VARIATIONS IN CROSS SECTION

Section Nominal Size, in.	A, Depth, In.		B, Flange Width, In.		T + T Flanges, Out of Square, Max, In.	E, <sup>a</sup> Web off Center Max, In.	C, Max, Depth at any Cross-Section over Theoretical Depth, In.
	Over Theoretical	Under Theoretical	Over Theoretical	Under Theoretical			
To 12, incl.	1/8	1/8	1/4	3/16	1/4	3/16	1/4
Over 12	1/8	1/8	1/4	3/16	5/16	3/16	1/4

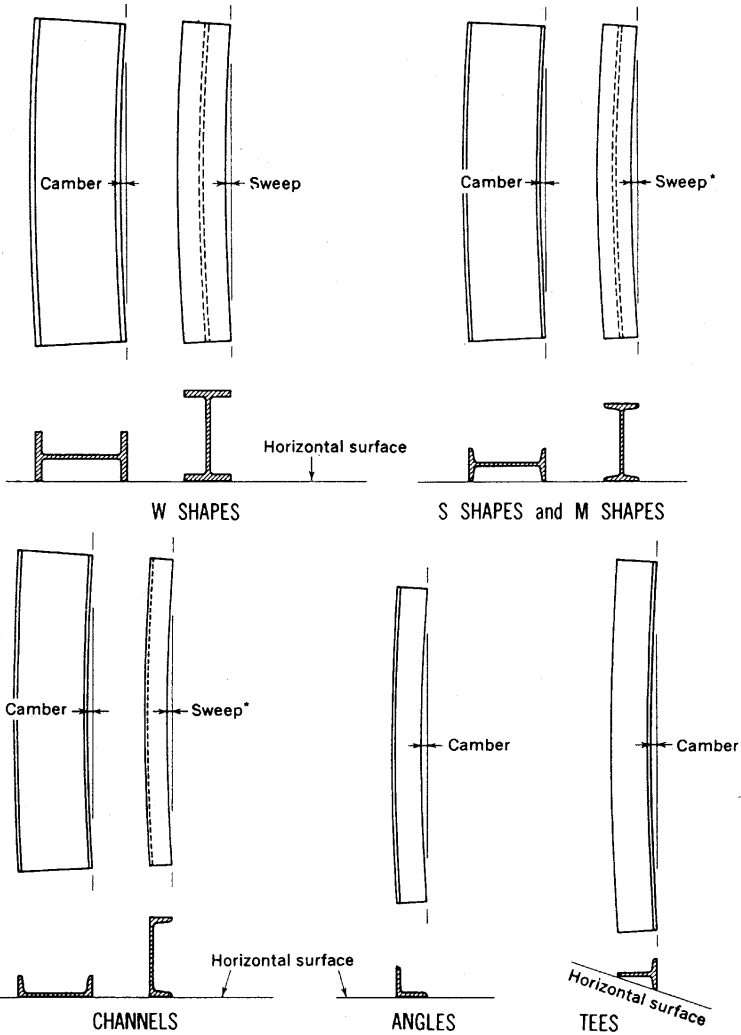
<sup>a</sup>Variation of 5/16-in. max. for sections over 426 lb./ft.

## PERMISSIBLE VARIATIONS IN LENGTH

W Shapes	30 ft. and Under		Over 30 ft.	
	Over	Under	Over	Under
Beams 24 in. and under in nominal depth	3/8	3/8	3/8 plus 1/16 for each additional 5 ft. or fraction thereof	3/8
Beams over 24 in. nominal depth all columns	1/2	1/2	1/2 plus 1/16 for each additional 5 ft. or fraction thereof	1/2

# Standard Mill Practice

Positions for measuring camber and sweep



\* Due to the extreme variations in flexibility of these shapes, straightness for tolerances for sweep are subject to negotiations between manufacturer and purchaser for individual sections involved.

# Useful Information

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Surface of frustum of cone or pyramid = sum of circumference of both ends x  $\frac{1}{2}$  slant height plus area of both ends.

Content of frustum of cone or pyramid = multiply area of two ends and get square root.  
Add the 2 areas and x  $\frac{1}{4}$  altitude.

Doubling the diameter of a pipe increases its capacity four times.

A gallon of water (U.S. standard) weighs  $8\frac{1}{3}$  lbs. and contains 231 cubic inches.

A cubic foot of water contains  $7\frac{1}{2}$  gallons, 1728 cubic inches, and weighs  $62\frac{1}{2}$  lbs.

To find the pressure in pounds per square inch of a column of water,  
multiply the height of the column in feet by 0.434.

Steam rising from water at its boiling point ( $212^{\circ}$  F) has a pressure  
equal to the atmosphere (14.7 lbs. to the square inch)

A standard horse power: the evaporation of 30 lbs. of water per hour  
from a feed water temperature of  $100^{\circ}$  F into steam at 70 lbs. gauge pressure.

To find capacity of tanks any size, given dimensions of cylinder in inches, to find its capacity  
in U.S. gallons: square the diameter, multiply by the length and by 0.0034.

To ascertain heating surface in tubular boilers, multiply  $\frac{2}{3}$  the circumference  
of the boiler by length of boiler in inches and add to it the area of all the tubes.

To find circumference of a circle, multiply diameter by 3.1416.

To find diameter of a circle, multiply circumference by 0.31831.

To find area of a circle, multiply square of diameter by 0.7854

Area of a rectangle = length multiplied by breadth.

Doubling the diameter of a circle increases its area four times.

To find area of triangle, multiply base by  $\frac{1}{2}$  perpendicular height.

Area of ellipse = product both diameter x 0.7854.

Area of parallelogram = base x altitude.

To find side of an inscribed square, multiply diameter by 0.7071 or  
multiply circumference by 0.2251 or divide circumference by 4.4428

Side of an inscribed cube = radius of sphere x 1.1547

To find side of an equal square, multiply diameter by 0.8862.

Square. A side multiplied by 1.4142 equals diameter of its circumscribing circle

A side multiplied by 4.443 equals circumference of its circumscribing circle.

A side multiplied by 1.128 equals diameter of an equal circle

A side multiplied by 3.547 equals circumference of an equal circle

To find cubic inches in a ball, multiply cube of diameter by 0.5236.

To find cubic contents of a cone, multiply area of base by  $\frac{1}{4}$  the altitude.

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# Useful Information

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## TEMPERATURE CONVERSION

A Fahrenheit degree is smaller than a Celsius (Centigrade degree, one Fahrenheit degree being  $\frac{5}{9}$  of a Celsius degree.

To convert Fahrenheit degrees into Celsius, subtract 32, multiply by 5, and divide by 9.

To convert Celsius into Fahrenheit, multiply 9, divide by 5, and add 32.

The freezing point of water is 32° F, 0° C. The boiling point is 212° F, 100° C.

## WEIGHTS AND MEASURES

### AVOIRDUPOIS WEIGHT

27 $\frac{11}{32}$	1 dram
16 drams	1 ounce
16 ounces	1 pound
25 pounds	1 quarter
4 quarters	1 cwt.
2,000 pounds	1 short ton
2,240 pounds	1 long ton

### TROY WEIGHT

24 grains	1 pwt.
20 pwt.	1 ounce
12 ounces	1 pound

Used for weighing gold, silver and jewels

### CUBIC MEASURE

1,728 cubic inches	1 cubic foot
27 cubic feet	1 cubic yard
128 cubic feet	1 cord (wood)
40 cubic feet	1 ton (shipping)
2,150.42 cubic in.	1 standard bu.
231 cubic in.	1 U.S. standard gallon
1 cubic ft.	about $\frac{4}{9}$ of a bushel

### DRY MEASURE

2 pints	1 quart
8 quarts	1 peck
4 pecks	1 bushel

### LIQUID MEASURE

4 gills	1 pint
2 pints	1 quart
4 quarts	1 gallon
31 $\frac{1}{2}$ gallons	1 barrel

### IMPERIAL LIQUID MEASURE

1 U.S. gal.	0.833 Imperial gal.
1 U.S. gal.	3.785 liters
1 Imperial gal.	1.201 U.S. gal.
1 Imperial gal.	4.546 liters
1 liter	0.264 U.S. gal.
1 liter	0.220 Imperial gal.

### LONG MEASURE

12 inches	1 foot
3 feet	1 yard
5 $\frac{1}{2}$ yards	1 rod
40 rods	1 furlong
8 furlongs	1 sta. mile
3 miles	1 league

### MARINER'S MEASURE

6 feet	1 fathom
120 fathoms	1 cable length
7 $\frac{1}{3}$ cable lengths	1 mile
5,280 feet	1 statute mile
6,080.2 feet	1 nautical mile

### SQUARE MILE

144 sq. inches	1 sq. ft.
9 sq. ft.	1 sq. yard
30 $\frac{1}{4}$ sq. yards	1 sq. rod
40 sq. rods	1 rood
4 roods	1 acre
640 acres	1 sq. mile

# Useful Information

## METRIC EQUIVALENTS

### LINEAR MEASURE

1 centimeter ..... 0.3937 inches  
 1 inch ..... 2.54 centimeters  
 1 decimeter ... 0.937 in. / 0.328 foot  
 1 foot ..... 3.048 decimeter  
 1 meter ..... 39.37 in./ 1.0936 yds.  
 1 yard ..... 0.9144 meter  
 1 dekameter ..... 1.9884 rods  
 1 rod ..... 0.5029 dekameter  
 1 kilometer ..... 0.621 mile  
 1 mile ..... 1.609 kilometers

### SQUARE MEASURE

1 sq. centimeter..... 0.1550 sq. in.  
 1 sq. in. .... 6.452 sq. centimeters  
 1 sq. decimeter ..... 0.1076 sq.ft.  
 1 sq. ft. .... 9.2903 sq.dec.  
 1 sq. meter ..... 1.196 sq. yds.  
 1 sq.yd. .... 0.8361 sq. meter  
 1 acre ..... 160 sq.rods

1 sq. rod ..... 0.00625 acre  
 1 hectare ..... 2.47 acres  
 1 acre ..... 0.4047 hectare  
 1 sq. kilometer ..... 0.386 sq. mile  
 1 sq. mile ..... 2.59 sq. kilometer

### MEASURE OF VOLUME

1 cubic centimeter..... 0.61 cu. in.  
 1 cubic in. .... 16.39 cubic cent.  
 1 cubic decimeter ... 0.0353 cubic ft.  
 1 cubic foot ..... 28.317 cubic dec.  
 1 cubic meter ..... 1.308 cubic yds.  
 1 cubic yard..... 0.7646 cubic meter  
 1 stere ..... 0.2759 cord  
 1 cord ..... 3.624 steres  
 1 liter 0.906 qt. dry... 1.0567 qts. liq.  
 1 qt. dry ..... 1.101 liters  
 1 qt. liquid ..... 0.9463 liter  
 1 dekaliter  
 .....2.6417 gal./1.135 pecks  
 1 gal. .... 0.3785 dekaliter  
 1 peck ..... 0.881 dekaliter

1 hektoliter ..... 2.8375 bushels  
 1 bushel ..... 0.3524 hektoliter

### WEIGHTS

1 gram ..... 0.03527 ounce  
 1 ounce ..... 28.35 grams  
 1 kilogram ..... 2.2046 pounds  
 1 pound ..... 0.4536 kilogram  
 1 metric ton .....0.98421 English ton  
 1 English ton..... 1.016 metric ton

## APPROXIMATE METRIC EQUIVALENTS

1 decimeter ..... 4 inches  
 1 liter .....1.06 qts liq./0.9 qts. dry  
 1 meter ..... 1.1 yards  
 1 kilometer ..... $\frac{5}{8}$  of a mile  
 1 hektoliter ..... 2 $\frac{5}{8}$  bushels  
 1 hectare ..... 2 $\frac{1}{2}$  acres  
 1 kilogram ..... 2 $\frac{1}{2}$  lbs.  
 1 stere or cubic meter ...  $\frac{1}{4}$  of a cord  
 1 metric ton ..... 2,204.6 lbs.

## FRACTION AND DECIMAL CHART

1/64 ..... 0.15625	17/64 ..... 0.265625	33/64 ..... 0.515625	49/64 ..... 0.765625
1/32 ..... 0.03125	9/32 ..... 0.28125	17/32 ..... 0.53125	25/32 ..... 0.78125
3/64 ..... 0.046875	19/64 ..... 0.296875	35/64 ..... 0.546875	51/64 ..... 0.796875
1/16 ..... 0.0625	5/16 ..... 0.3125	9/16 ..... 0.5625	13/16 ..... 0.8125
5/64 ..... 0.078125	21/64 ..... 0.328125	37/64 ..... 0.578125	53/64 ..... 0.828125
3/32 ..... 0.09375	11/32 ..... 0.34375	19/32 ..... 0.59375	27/32 ..... 0.84375
7/64 ..... 0.109375	23/64 ..... 0.359375	39/64 ..... 0.609375	55/64 ..... 0.859375
1/8 ..... 0.125	3/8 ..... 0.375	5/8 ..... 0.625	7/8 ..... 0.875
9/64 ..... 0.140625	25/64 ..... 0.390625	41/64 ..... 0.640625	57/64 ..... 0.890625
5/32 ..... 0.15625	13/32 ..... 0.40625	21/32 ..... 0.65625	29/32 ..... 0.90625
11/64 ..... 0.171875	27/64 ..... 0.421875	43/64 ..... 0.671875	59/64 ..... 0.921875
3/16 ..... 0.1875	7/16 ..... 0.4375	11/16 ..... 0.6875	15/16 ..... 0.9375
13/64 ..... 0.203125	29/64 ..... 0.453125	45/64 ..... 0.703125	61/64 ..... 0.953125
7/32 ..... 0.21875	15/32 ..... 0.46875	23/32 ..... 0.71875	31/32 ..... 0.96875
15/64 ..... 0.234375	31/64 ..... 0.484375	47/64 ..... 0.734375	63/64 ..... 0.984375
1/4 ..... 0.250	1/2 ..... 0.500	3/4 ..... 0.750	1 ..... 1.000

