POCKET COMPANION

ABRIDGED EDITION

CARNEGIE STEEL COMPANY

AISC E&R Library
5447

1931

A. I. A. 13-b-1

B125

TOPICAL INDEX

B125

Pocket Companion

ABRIDGED EDITION

INFORMATION AND TABLES
FOR
ENGINEERS AND DESIGNERS

AND OTHER DATA PERTAINING TO

STRUCTURAL STEEL

CARNEGIE STEEL COMPANY
General Offices
Carnegie Building - Pittsburgh, Pa.

ILLINOIS STEEL COMPANY
General Offices
208 South La Salle Street, Chicago, Ill.

Subsidiaries of United States Steel Corporation

Export Distributors
United States Steel Products Co.
New York, N. Y.

Pacific Coast Distributors
Columbia Steel Company
San Francisco, Calif.

G12104XXXM431

Copyrighted 1931 by
Carnegie Steel Company
Pittsburgh, Pa.
and
Illinois Steel Company
Chicago, Ill.

Printed in U. S. A.

FOREWORD

THE purpose of this Book is to place in the hands of users of structural steel advance information as to certain changes which it has been found desirable to make in the series of CB Sections. Time has not permitted the preparation of the Twenty-fourth Edition of the complete Pocket Companion, so this book will be called Pocket Companion—Abridged Edition, 1931.

Complete data pertaining to CB Sections, American Standard and other structural sections most suitable for use in bridge, building, car and ship construction are included in this book.

Safe loads and other data for structural sections are in accordance with the standard specifications of the American Institute of Steel Construction, revised November 1st, 1928.

Sections shown in this book, except where specifically noted, are rolled by both Carnegie Steel Co. and Illinois Steel Co. Where sections are rolled by only one of the two companies, such sections carry the following symbols:

⧈ Rolled by Carnegie Steel Company only, and

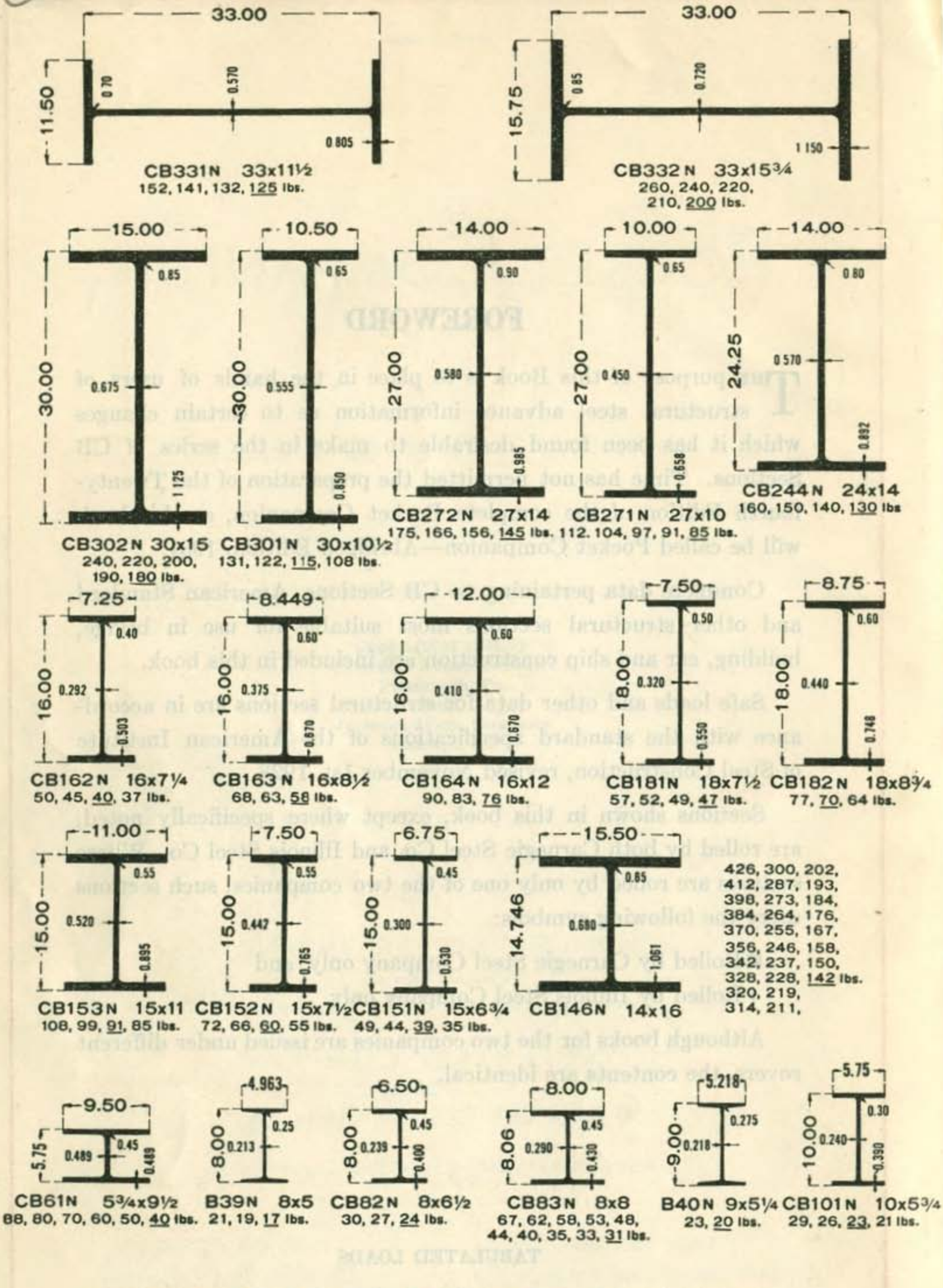
◆ Rolled by Illinois Steel Company only.

Although books for the two companies are issued under different covers, the contents are identical.

TABULATED LOADS

The tabulated loads herein presented are expressed in kips. The term kip has been extensively used in technical literature to designate one thousand pounds and is employed here as being terse and convenient.

(6) 1931

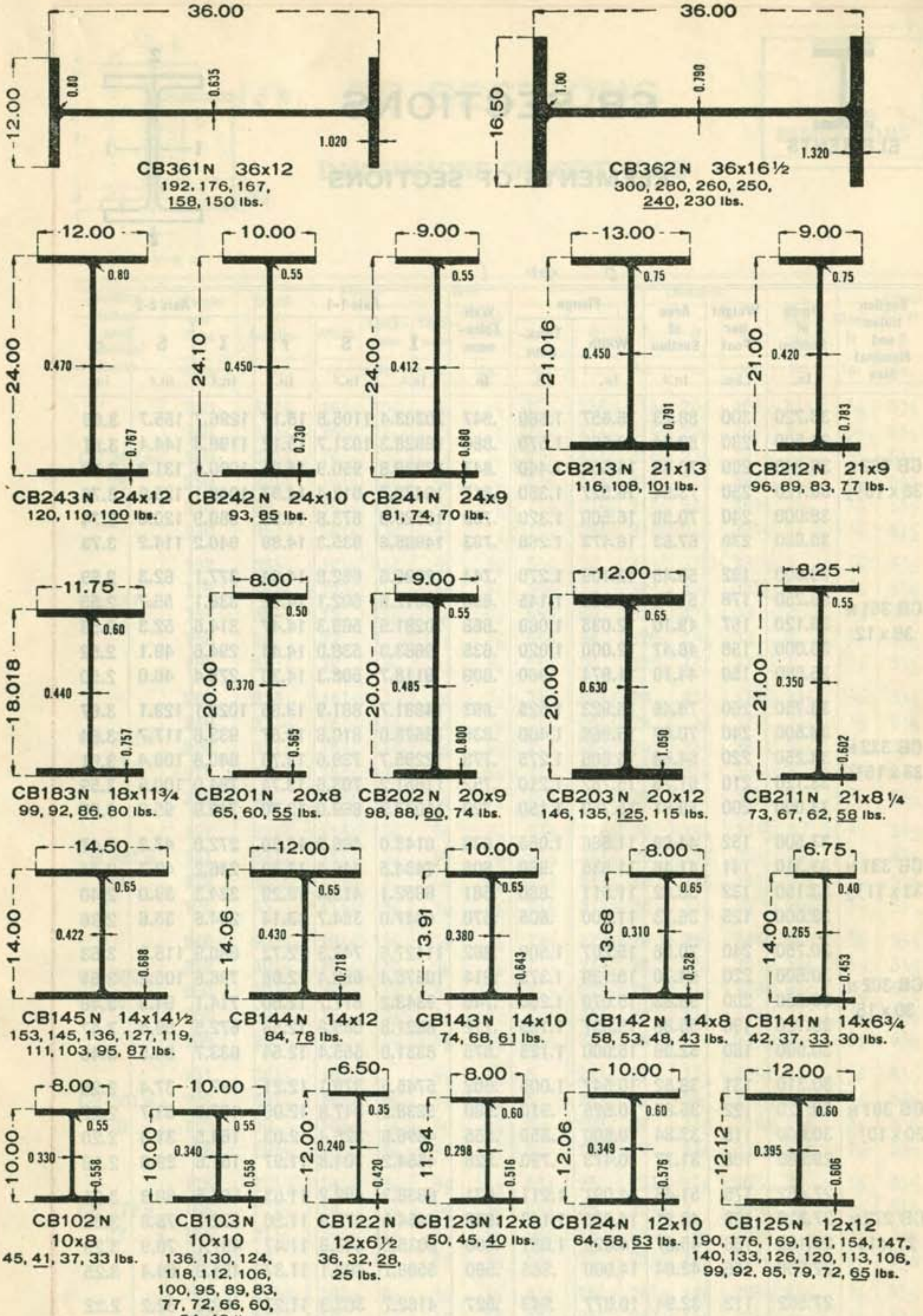


C B SECTIONS

DIAGRAMS SHOWING NORMAL DIMENSIONS IN INCHES

RANGE OF WEIGHTS PER LINEAR FOOT

(7)



NOTE - WEIGHTS UNDERLINED THUS <u>80</u> CORRESPOND TO DIMENSIONS SHOWN

ELEMENTS

CB SECTIONS (93)

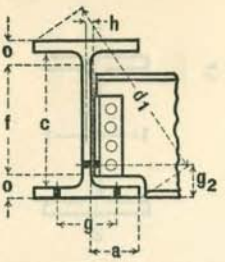
ELEMENTS OF SECTIONS

b m t

Section Index and Nominal Size	Depth of Section	Weight per Foot	Area of Section	Flange Width	Flange Thickness	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	$In.^2$	In.	In.	In.	$In.^4$	$In.^3$	In.	$In.^4$	$In.^3$	In.
CB 362 N 36 x 16½	36.720	300	88.23	16.657	1.680	.947	20303.4	1105.8	15.17	1296.7	155.7	3.83
	36.500	280	82.34	16.596	1.570	.886	18828.3	1031.7	15.12	1198.3	144.4	3.81
	36.240	260	76.46	16.553	1.440	.843	17230.8	950.9	15.01	1090.5	131.8	3.78
	36.120	250	73.54	16.527	1.380	.817	16478.7	912.4	14.97	1040.1	125.9	3.76
	36.000	240	70.58	16.500	1.320	.790	15729.0	873.8	14.93	989.9	120.0	3.74
	35.880	230	67.63	16.473	1.260	.763	14985.6	835.3	14.89	940.2	114.2	3.73
CB 361 N 36 x 12	36.500	192	56.45	12.109	1.270	.744	12096.6	662.8	14.64	377.1	62.3	2.59
	36.250	176	51.76	12.063	1.145	.698	10912.6	602.1	14.52	336.1	55.7	2.55
	36.120	167	49.10	12.033	1.080	.668	10281.5	569.3	14.47	314.6	52.3	2.53
	36.000	158	46.47	12.000	1.020	.635	9683.8	538.0	14.44	294.6	49.1	2.52
	35.880	150	44.10	11.974	.960	.609	9118.7	508.3	14.38	275.4	46.0	2.50
CB 332 N 33 x 15¾	33.750	260	76.46	15.923	1.525	.893	14881.7	881.9	13.95	1028.1	129.1	3.67
	33.500	240	70.57	15.866	1.400	.836	13578.0	810.6	13.87	933.6	117.7	3.64
	33.250	220	64.68	15.808	1.275	.778	12295.7	739.6	13.79	840.8	106.4	3.61
	33.120	210	61.76	15.782	1.210	.752	11651.2	703.6	13.74	794.0	100.6	3.59
	33.000	200	58.81	15.750	1.150	.720	11037.9	669.0	13.70	749.9	95.2	3.57
CB 331 N 33 x 11½	33.500	152	44.69	11.566	1.055	.636	8143.0	486.2	13.50	272.8	47.2	2.47
	33.310	141	41.46	11.535	.960	.605	7434.5	446.4	13.39	246.2	42.7	2.44
	33.150	132	38.82	11.511	.880	.581	6852.1	413.4	13.29	224.3	39.0	2.40
	33.000	125	36.73	11.500	.805	.570	6347.0	384.7	13.14	204.6	35.6	2.36
CB 302 N 30 x 15	30.750	240	70.58	15.207	1.500	.882	11427.6	743.3	12.72	880.9	115.9	3.53
	30.500	220	64.70	15.139	1.375	.814	10375.4	680.4	12.66	796.6	105.2	3.51
	30.250	200	58.83	15.070	1.250	.745	9343.2	617.7	12.60	714.1	94.8	3.48
	30.120	190	55.88	15.037	1.185	.712	8821.8	585.8	12.56	672.5	89.4	3.47
	30.000	180	52.96	15.000	1.125	.675	8331.0	555.4	12.54	633.7	84.5	3.46
CB 301 N 30 x 10½	30.310	131	38.52	10.547	1.005	.602	5745.6	379.1	12.21	197.1	37.4	2.26
	30.120	122	35.85	10.525	.910	.580	5238.2	347.8	12.09	177.3	33.7	2.22
	30.000	115	33.84	10.500	.850	.555	4896.6	326.4	12.03	164.5	31.3	2.20
	29.880	108	31.77	10.473	.790	.528	4554.2	304.8	11.97	151.6	29.0	2.18
CB 272 N 27 x 14	27.452	175	51.46	14.091	1.211	.671	6838.3	498.2	11.53	565.5	80.3	3.31
	27.328	166	48.81	14.058	1.149	.638	6454.5	472.4	11.50	532.7	75.8	3.30
	27.192	156	45.87	14.020	1.081	.600	6035.6	443.9	11.47	497.1	70.9	3.29
	27.000	145	42.64	14.000	.985	.580	5508.7	408.1	11.37	451.0	64.4	3.25
CB 271 N 27 x 10	27.582	112	32.94	10.077	.949	.527	4182.7	303.3	11.27	162.2	32.2	2.22
	27.450	104	30.60	10.040	.883	.490	3867.1	281.8	11.24	149.2	29.7	2.21
	27.326	97	28.53	10.010	.821	.460	3582.6	262.2	11.21	137.5	27.5	2.20
	27.162	91	26.76	10.005	.739	.455	3269.7	240.8	11.05	123.6	24.7	2.15
	27.000	85	25.00	10.000	.658	.450	2964.3	219.6	10.89	109.9	22.0	2.10

only

✓ ✓ ? ? c only ? ? ? ? ? ? ?



CB SECTIONS

DIMENSIONS

DIMENSIONS OF SECTIONS

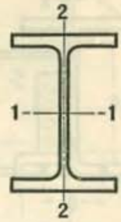
Section Index and Nominal Depth	Weight per Foot	Depth of Section	Flange		Web		Distance							Usual Gage
			Width	Thickness	Thickness	Half Thickness+	a	c	f	o	d_1	Min. g_2	Clear h	g
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
CB 362 N 36	300	36 3/4	16 5/8	1 11/16	15/16	1/2	7 7/8	33 3/8	31 3/8	2 11/16	40 3/8	3 1/2	9/16	5 1/2
	280	36 1/2	16 5/8	1 9/16	7/8	7/16	7 7/8	33 3/8	31 3/8	2 9/16	40 1/8	3 1/2	1/2	5 1/2
	260	36 1/4	16 1/2	1 7/16	7/8	7/16	7 7/8	33 3/8	31 3/8	2 7/16	39 7/8	3 1/4	1/2	5 1/2
	250	36 1/8	16 1/2	1 3/8	13/16	7/16	7 7/8	33 3/8	31 3/8	2 3/8	39 3/4	3 1/4	1/2	5 1/2
	240	36	16 1/2	1 5/16	13/16	7/16	7 7/8	33 3/8	31 3/8	2 5/16	39 5/8	3 1/4	1/2	5 1/2
	230	35 7/8	16 1/2	1 1/4	3/4	3/8	7 7/8	33 3/8	31 3/8	2 1/4	39 1/2	3	7/16	5 1/2
CB 361 N 36	192	36 1/2	12 1/8	1 1/4	3/4	3/8	5 5/8	34	32 3/8	2 1/16	38 1/2	3	7/16	5 1/2
	176	36 1/4	12 1/8	1 1/8	11/16	3/8	5 5/8	34	32 3/8	1 15/16	38 1/4	3	7/16	5 1/2
	167	36 1/8	12	1 1/16	11/16	3/8	5 5/8	34	32 3/8	1 7/8	38	3	7/16	5 1/2
	158	36	12	1	5/8	5/16	5 5/8	34	32 3/8	1 13/16	38	3	3/8	5 1/2
	150	35 7/8	12	15/16	5/8	5/16	5 5/8	34	32 3/8	1 3/4	37 7/8	3	3/8	5 1/2
CB 332 N 33	260	33 3/4	15 7/8	1 1/2	15/16	7/16	7 1/2	30 3/4	29	2 3/8	37 3/8	3 1/2	1/2	5 1/2
	240	33 1/2	15 7/8	1 3/8	7/8	7/16	7 1/2	30 3/4	29	2 1/4	37 1/8	3 1/4	1/2	5 1/2
	220	33 1/4	15 3/4	1 1/4	13/16	3/8	7 1/2	30 3/4	29	2 1/8	36 7/8	3 1/4	7/16	5 1/2
	210	33 1/8	15 3/4	1 3/16	3/4	3/8	7 1/2	30 3/4	29	2 1/16	36 3/4	3	7/16	5 1/2
	200	33	15 3/4	1 1/8	3/4	3/8	7 1/2	30 3/4	29	2	36 5/8	3	7/16	5 1/2
CB 331 N 33	152	33 1/2	11 5/8	1 1/16	5/8	5/16	5 1/2	31 3/8	30	1 3/4	35 1/2	3	3/8	5 1/2
	141	33 1/4	11 1/2	15/16	5/8	5/16	5 1/2	31 3/8	30	1 5/8	35 1/4	2 3/4	3/8	5 1/2
	132	33 1/8	11 1/2	7/8	5/8	5/16	5 1/2	31 3/8	30	1 9/16	35 1/8	2 3/4	3/8	5 1/2
	125	33	11 1/2	13/16	9/16	5/16	5 1/2	31 3/8	30	1 1/2	35	2 3/4	3/8	5 1/2
CB 302 N 30	240	30 3/4	15 1/4	1 1/2	7/8	7/16	7 1/8	27 3/4	26	2 3/8	34 5/16	3 1/2	1/2	5 1/2
	220	30 1/2	15 1/8	1 3/8	13/16	7/16	7 1/8	27 3/4	26	2 1/4	34 1/16	3 1/4	1/2	5 1/2
	200	30 1/4	15 1/8	1 1/4	3/4	3/8	7 1/8	27 3/4	26	2 1/8	33 13/16	3 1/4	7/16	5 1/2
	190	30 1/8	15	1 3/16	3/4	3/8	7 1/8	27 3/4	26	2 1/16	33 11/16	3 1/4	7/16	5 1/2
	180	30	15	1 1/8	11/16	3/8	7 1/8	27 3/4	26	2	33 9/16	3	7/16	5 1/2
CB 301 N 30	131	30 1/4	10 1/2	1	5/8	5/16	5	28 1/4	27	1 5/8	32 1/8	3	3/8	5 1/2
	122	30 1/8	10 1/2	15/16	5/8	5/16	5	28 1/4	27	1 9/16	31 15/16	2 3/4	3/8	5 1/2
	115	30	10 1/2	7/8	9/16	5/16	5	28 1/4	27	1 1/2	31 13/16	2 3/4	3/8	5 1/2
	108	29 7/8	10 1/2	13/16	9/16	1/4	5	28 1/4	27	1 7/16	31 11/16	2 3/4	5/16	5 1/2
CB 272 N 27	175	27 1/2	14 1/8	1 3/16	11/16	3/8	6 3/4	25	23 1/4	2 1/16	30 7/8	3	7/16	5 1/2
	166	27 3/8	14	1 1/8	5/8	5/16	6 3/4	25	23 1/4	2	30 3/4	3	3/8	5 1/2
	156	27 1/4	14	1 1/16	5/8	5/16	6 3/4	25	23 1/4	1 15/16	30 5/8	3	3/8	5 1/2
	145	27	14	1	5/8	5/16	6 3/4	25	23 1/4	1 7/8	30 7/16	2 3/4	3/8	5 1/2
CB 271 N 27	112	27 5/8	10 1/8	15/16	9/16	1/4	4 3/4	25 5/8	24 3/8	1 9/16	29 3/8	2 3/4	5/16	5 1/2
	104	27 1/2	10	7/8	1/2	1/4	4 3/4	25 5/8	24 3/8	1 1/2	29 1/4	2 3/4	5/16	5 1/2
	97	27 3/8	10	13/16	1/2	1/4	4 3/4	25 5/8	24 3/8	1 7/16	29 1/8	2 3/4	5/16	5 1/2
	91	27 1/8	10	3/4	1/2	1/4	4 3/4	25 5/8	24 3/8	1 3/8	29	2 1/2	5/16	5 1/2
	85	27	10	11/16	7/16	1/4	4 3/4	25 5/8	24 3/8	1 5/16	28 13/16	2 1/2	5/16	5 1/2

ELEMENTS

CB SECTIONS

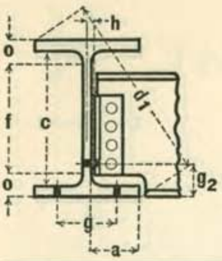
1931

ELEMENTS OF SECTIONS



b m t

Section Index and Nominal Size	Depth of Section	Weight per Foot	Area of Section	Flange		Web Thickness	Axis 1-1			Axis 2-2		
				Width	Thickness		I	S	r	I	S	r
	In.	Lbs.	In.^{2}	In.	In.	In.	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.
	24.714	160	47.05	14.095	1.124	.665	5092.2	412.1	10.40	525.2	74.5	3.34
CB 244 N	24.562	150	44.12	14.063	1.048	.633	4727.5	384.9	10.35	486.4	69.2	3.32
24 x 14	24.406	140	41.15	14.031	.970	.601	4360.0	357.3	10.29	447.1	63.7	3.30
	24.250	130	38.21	14.000	.892	.570	3999.3	329.8	10.23	408.4	58.3	3.27
CB 243 N	24.310	120	35.28	12.089	.922	.559	3630.6	298.7	10.14	271.9	45.0	2.78
24 x 12	24.160	110	32.35	12.043	.847	.513	3310.2	274.0	10.12	246.9	41.0	2.76
	24.000	100	29.39	12.000	.767	.470	2981.4	248.4	10.07	221.2	36.9	2.74
CB 242 N	24.260	93	27.34	10.031	.810	.481	2725.4	224.7	9.98	136.5	27.2	2.23
24 x 10	24.100	85	24.99	10.000	.730	.450	2454.6	203.7	9.91	121.9	24.4	2.21
CB 241 N	24.120	81	23.84	9.041	.740	.453	2292.6	190.1	9.81	91.3	20.2	1.96
24 x 9	24.000	74	21.77	9.000	.680	.412	2088.3	174.0	9.79	82.8	18.4	1.95
	23.880	70	20.59	8.996	.620	.408	1929.1	161.6	9.68	75.4	16.8	1.91
CB 213 N	21.264	116	34.12	13.057	.915	.507	2819.7	265.2	9.09	339.7	52.0	3.16
21 x 13	21.138	108	31.76	13.023	.852	.473	2608.0	246.8	9.06	313.9	48.2	3.14
	21.016	101	29.69	13.000	.791	.450	2413.8	229.7	9.02	289.8	44.6	3.12
	21.376	96	28.24	9.104	.971	.524	2196.5	205.5	8.82	122.4	26.9	2.08
CB 212 N	21.240	89	26.17	9.065	.903	.485	2024.9	190.7	8.80	112.4	24.8	2.07
21 x 9	21.122	83	24.41	9.032	.844	.452	1879.0	177.9	8.77	103.9	23.0	2.06
	21.000	77	22.63	9.000	.783	.420	1732.1	165.0	8.75	95.3	21.2	2.05
	21.334	73	21.46	8.327	.769	.427	1650.1	154.7	8.77	74.2	17.8	1.86
CB 211 N	21.210	67	19.71	8.293	.707	.393	1506.2	142.0	8.74	67.3	16.2	1.85
21 x 8¼	21.098	62	18.23	8.267	.651	.367	1382.0	131.0	8.71	61.4	14.9	1.84
	21.000	58	17.06	8.250	.602	.350	1279.1	121.8	8.66	56.4	13.7	1.82
	20.380	146	42.95	12.080	1.240	.710	3108.8	305.1	8.51	364.9	60.4	2.91
CB 203 N	20.180	135	39.71	12.039	1.140	.669	2832.3	280.7	8.45	332.0	55.2	2.89
20 x 12	20.000	125	36.76	12.000	1.050	.630	2587.7	258.8	8.39	302.8	50.5	2.87
	19.820	115	33.83	11.961	.960	.591	2348.3	237.0	8.33	274.2	45.8	2.85
	20.380	98	28.82	9.092	.990	.577	2009.7	197.2	8.35	124.3	27.4	2.08
CB 202 N	20.180	88	25.87	9.036	.890	.521	1784.4	176.9	8.30	109.7	24.3	2.06
20 x 9	20.000	80	23.53	9.000	.800	.485	1596.3	159.6	8.24	97.4	21.6	2.03
	19.880	74	21.77	8.966	.740	.451	1466.7	147.6	8.21	89.1	19.9	2.02
CB 201 N	20.250	65	19.12	8.046	.690	.416	1309.9	129.4	8.28	60.0	14.9	1.77
20 x 8	20.120	60	17.65	8.025	.625	.395	1189.1	118.2	8.21	53.9	13.4	1.75
	20.000	55	16.19	8.000	.565	.370	1075.6	107.6	8.15	48.3	12.1	1.73



DIMENSIONS

CB SECTIONS

DIMENSIONS OF SECTIONS

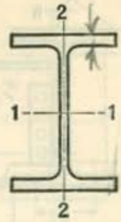
Section Index and Nominal Depth	Weight per Foot	Depth of Section	Flange		Web		Distance							Usual Gage
			Width	Thickness	Thickness	Half Thickness+	a	c	f	o	d_1	Min. g_2	Clear h	g
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
CB 244 N 24	160	24 3/4	14 1/8	1 1/8	11/16	3/8	6 3/4	22 1/2	20 7/8	1 15/16	28 1/2	3	7/16	5 1/2
	150	24 1/2	14 1/8	1 1/16	5/8	5/16	6 3/4	22 1/2	20 7/8	1 7/8	28 5/16	3	3/8	5 1/2
	140	24 3/8	14	1	5/8	5/16	6 3/4	22 1/2	20 7/8	1 13/16	28 3/16	2 3/4	3/8	5 1/2
	130	24 1/4	14	7/8	9/16	5/16	6 3/4	22 1/2	20 7/8	1 11/16	28 1/16	2 3/4	3/8	5 1/2
CB 243 N 24	120	24 1/4	12 1/8	15/16	9/16	5/16	5 3/4	22 1/2	20 7/8	1 3/4	27 3/16	2 3/4	3/8	5 1/2
	110	24 1/8	12	7/8	1/2	1/4	5 3/4	22 1/2	20 7/8	1 11/16	27	2 3/4	5/16	5 1/2
	100	24	12	3/4	1/2	1/4	5 3/4	22 1/2	20 7/8	1 9/16	26 7/8	2 1/2	5/16	5 1/2
CB 242 N 24	93	24 1/4	10	13/16	1/2	1/4	4 3/4	22 5/8	21 1/2	1 3/8	26 5/16	2 3/4	5/16	5 1/2
	85	24 1/8	10	3/4	7/16	1/4	4 3/4	22 5/8	21 1/2	1 5/16	26 1/8	2 1/2	5/16	5 1/2
CB 241 N 24	81	24 1/8	9	3/4	7/16	1/4	4 1/4	22 5/8	21 1/2	1 5/16	25 13/16	2 1/2	5/16	5 1/2
	74	24	9	11/16	7/16	1/4	4 1/4	22 5/8	21 1/2	1 1/4	25 11/16	2 1/2	5/16	5 1/2
	70	23 7/8	9	5/8	7/16	1/4	4 1/4	22 5/8	21 1/2	1 3/16	25 9/16	2 1/2	5/16	5 1/2
CB 213 N 21	116	21 1/4	13	15/16	1/2	1/4	6 1/4	19 3/8	17 7/8	1 11/16	25	2 3/4	5/16	5 1/2
	108	21 1/8	13	7/8	1/2	1/4	6 1/4	19 3/8	17 7/8	1 5/8	24 7/8	2 3/4	5/16	5 1/2
	101	21	13	13/16	7/16	1/4	6 1/4	19 3/8	17 7/8	1 9/16	24 3/4	2 3/4	5/16	5 1/2
CB 212 N 21	96	21 3/8	9 1/8	1	9/16	1/4	4 1/4	19 3/8	17 7/8	1 3/4	23 1/4	2 3/4	5/16	5 1/2
	89	21 1/4	9 1/8	7/8	1/2	1/4	4 1/4	19 3/8	17 7/8	1 5/8	23 1/8	2 3/4	5/16	5 1/2
	83	21 1/8	9	7/8	7/16	1/4	4 1/4	19 3/8	17 7/8	1 5/8	23	2 3/4	5/16	5 1/2
	77	21	9	13/16	7/16	1/4	4 1/4	19 3/8	17 7/8	1 9/16	22 7/8	2 3/4	5/16	5 1/2
CB 211 N 21	73	21 3/8	8 3/8	3/4	7/16	1/4	4	19 3/4	18 3/4	1 5/16	22 15/16	2 3/4	5/16	5 1/2
	67	21 1/4	8 1/4	11/16	7/16	3/16	4	19 3/4	18 3/4	1 1/4	22 13/16	2 1/2	1/4	5 1/2
	62	21 1/8	8 1/4	5/8	3/8	3/16	4	19 3/4	18 3/4	1 3/16	22 11/16	2 1/2	1/4	5 1/2
	58	21	8 1/4	5/8	3/8	3/16	4	19 3/4	18 3/4	1 3/16	22 9/16	2 1/2	1/4	5 1/2
CB 203 N 20	146	20 3/8	12 1/8	1 1/4	3/4	3/8	5 5/8	17 7/8	16 5/8	1 7/8	23 3/4	3	7/16	5 1/2
	135	20 1/8	12	1 1/8	11/16	3/8	5 5/8	17 7/8	16 5/8	1 3/4	23 1/2	3	7/16	5 1/2
	125	20	12	1 1/16	5/8	5/16	5 5/8	17 7/8	16 5/8	1 11/16	23 3/8	3	3/8	5 1/2
	115	19 7/8	12	15/16	5/8	5/16	5 5/8	17 7/8	16 5/8	1 9/16	23 3/16	3	3/8	5 1/2
CB 202 N 20	98	20 3/8	9 1/8	1	9/16	5/16	4 1/4	18 3/8	17 1/4	1 9/16	22 3/8	2 3/4	3/8	5 1/2
	88	20 1/8	9	7/8	9/16	1/4	4 1/4	18 3/8	17 1/4	1 7/16	22 1/8	2 3/4	5/16	5 1/2
	80	20	9	13/16	1/2	1/4	4 1/4	18 3/8	17 1/4	1 3/8	21 15/16	2 3/4	5/16	5 1/2
	74	19 7/8	9	3/4	7/16	1/4	4 1/4	18 3/8	17 1/4	1 5/16	21 13/16	2 1/2	5/16	5 1/2
CB 201 N 20	65	20 1/4	8	11/16	7/16	1/4	3 7/8	18 7/8	17 7/8	1 3/16	21 13/16	2 1/2	5/16	5 1/2
	60	20 1/8	8	5/8	7/16	3/16	3 7/8	18 7/8	17 7/8	1 1/8	21 11/16	2 1/2	1/4	5 1/2
	55	20	8	9/16	3/8	3/16	3 7/8	18 7/8	17 7/8	1 1/16	21 9/16	2 1/2	1/4	5 1/2

ELEMENTS

CB SECTIONS

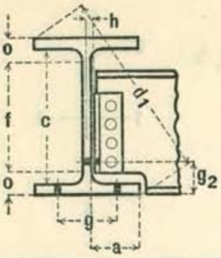
1931

ELEMENTS OF SECTIONS



b m r

Section Index and Nominal Size	Depth of Section	Weight per Foot	Area of Section	Flange Width	Flange Thick-ness	Web Thick-ness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	In.^{2}	In.	In.	In.	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.
	18.274	99	29.12	11.795	.885	.485	1777.1	194.5	7.81	242.2	41.1	2.88
CB 183 N	18.138	92	27.06	11.770	.817	.460	1631.8	179.9	7.76	222.2	37.8	2.87
18 x 11¾	18.018	86	25.29	11.750	.757	.440	1506.6	167.2	7.72	204.8	34.9	2.85
	17.898	80	23.52	11.730	.697	.420	1383.4	154.6	7.67	187.6	32.0	2.82
CB 182 N	18.152	77	22.65	8.790	.824	.480	1283.9	141.5	7.53	93.5	21.3	2.03
18 x 8¾	18.000	70	20.59	8.750	.748	.440	1155.3	128.4	7.49	83.7	19.1	2.02
	17.870	64	18.83	8.715	.683	.405	1047.2	117.2	7.46	75.5	17.3	2.00
	18.250	57	16.76	7.558	.675	.378	952.0	104.3	7.54	48.7	12.9	1.70
CB 181 N	18.120	52	15.29	7.531	.610	.351	857.3	94.6	7.49	43.5	11.6	1.69
18 x 7½	18.060	49	14.40	7.507	.580	.327	808.6	89.5	7.49	41.0	10.9	1.69
	18.000	47	13.82	7.500	.550	.320	768.6	85.4	7.46	38.7	10.3	1.67
CB 164 N	16.250	90	26.47	12.070	.795	.480	1285.5	158.2	6.97	233.2	38.6	2.97
16 x 12	16.120	83	24.42	12.040	.730	.450	1172.3	145.4	6.93	212.5	35.3	2.95
	16.000	76	22.33	12.000	.670	.410	1065.5	133.2	6.91	193.1	32.2	2.94
CB 163 N	16.230	68	19.99	8.510	.785	.436	924.4	113.9	6.80	80.8	19.0	2.01
16 x 8½	16.120	63	18.52	8.477	.730	.403	851.7	105.7	6.78	74.2	17.5	2.00
	16.000	58	17.06	8.449	.670	.375	776.5	97.1	6.75	67.4	16.0	1.99
	16.250	50	14.70	7.318	.628	.360	668.1	82.2	6.74	41.1	11.2	1.67
CB 162 N	16.120	45	13.23	7.286	.563	.328	594.6	73.8	6.70	36.3	10.0	1.66
16 x 7¼	16.000	40	11.78	7.250	.503	.292	525.9	65.7	6.68	32.0	8.8	1.65
	15.880	37	10.88	7.248	.443	.290	470.0	59.2	6.57	28.1	7.8	1.61
	15.320	108	31.77	11.097	1.055	.617	1320.4	172.4	6.45	240.6	43.4	2.75
CB 153 N	15.160	99	29.11	11.039	.975	.559	1200.4	158.4	6.42	218.8	39.6	2.74
15 x 11	15.000	91	26.76	11.000	.895	.520	1089.1	145.2	6.38	198.7	36.1	2.73
	14.880	85	24.99	10.970	.835	.490	1007.2	135.4	6.35	183.9	33.5	2.71
	15.310	72	21.18	7.580	.920	.522	838.2	109.5	6.29	67.0	17.7	1.78
CB 152 N	15.160	66	19.41	7.538	.845	.480	760.0	100.3	6.26	60.5	16.0	1.77
15 x 7½	15.000	60	17.63	7.500	.765	.442	680.7	90.8	6.21	53.9	14.4	1.75
	14.880	55	16.18	7.463	.705	.405	620.4	83.4	6.19	48.9	13.1	1.74
	15.250	49	14.41	6.832	.655	.382	569.6	74.7	6.29	34.9	10.2	1.56
CB 151 N	15.120	44	12.93	6.793	.590	.343	507.1	67.1	6.26	30.9	9.1	1.55
15 x 6¾	15.000	39	11.47	6.750	.530	.300	448.8	59.8	6.25	27.2	8.1	1.54
	14.880	35	10.29	6.725	.470	.275	396.7	53.3	6.21	23.9	7.1	1.52



CB SECTIONS

DIMENSIONS

DIMENSIONS OF SECTIONS

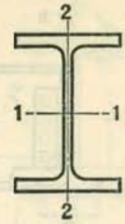
Section Index and Nominal Depth	Weight per Foot	Depth of Section	Flange Width	Flange Thickness	Web Thickness	Web Half Thickness+	Distance a	Distance c	Distance f	Distance o	Distance d_1	Min. g_2	Clear h	Usual Gage g
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
CB 183 N 18	99	18 1/4	11 3/4	7/8	1/2	1/4	5 5/8	16 1/2	15 1/4	1 1/2	21 3/4	2 3/4	5/16	5 1/2
	92	18 1/8	11 3/4	13/16	1/2	1/4	5 5/8	16 1/2	15 1/4	1 7/16	21 5/8	2 3/4	5/16	5 1/2
	86	18	11 3/4	3/4	7/16	1/4	5 5/8	16 1/2	15 1/4	1 3/8	21 1/2	2 3/4	5/16	5 1/2
	80	17 7/8	11 3/4	11/16	7/16	1/4	5 5/8	16 1/2	15 1/4	1 5/16	21 7/16	2 3/4	5/16	5 1/2
CB 182 N 18	77	18 1/8	8 3/4	13/16	1/2	1/4	4 1/8	16 1/2	15 1/4	1 7/16	20 3/16	2 3/4	5/16	5 1/2
	70	18	8 3/4	3/4	7/16	1/4	4 1/8	16 1/2	15 1/4	1 3/8	20 1/16	2 3/4	5/16	5 1/2
	64	17 7/8	8 3/4	11/16	7/16	3/16	4 1/8	16 1/2	15 1/4	1 5/16	19 15/16	2 3/4	1/4	5 1/2
CB 181 N 18	57	18 1/4	7 1/2	11/16	3/8	3/16	3 5/8	16 7/8	15 7/8	1 3/16	19 13/16	2 1/2	1/4	4
	52	18 1/8	7 1/2	5/8	3/8	3/16	3 5/8	16 7/8	15 7/8	1 1/8	19 5/8	2 1/2	1/4	4
	49	18	7 1/2	9/16	5/16	3/16	3 5/8	16 7/8	15 7/8	1 1/16	19 9/16	2 1/2	1/4	4
	47	18	7 1/2	9/16	5/16	3/16	3 5/8	16 7/8	15 7/8	1 1/16	19 1/2	2 1/2	1/4	4
CB 164 N 16	90	16 1/4	12 1/8	13/16	1/2	1/4	5 3/4	14 5/8	13 1/2	1 7/16	20 1/4	2 3/4	5/16	5 1/2
	83	16 1/8	12	3/4	7/16	1/4	5 3/4	14 5/8	13 1/2	1 3/8	20 1/8	2 1/2	5/16	5 1/2
	76	16	12	11/16	7/16	1/4	5 3/4	14 5/8	13 1/2	1 5/16	20	2 1/2	5/16	5 1/2
CB 163 N 16	68	16 1/4	8 1/2	13/16	7/16	1/4	4	14 5/8	13 1/2	1 7/16	18 3/8	2 3/4	5/16	5 1/2
	63	16 1/8	8 1/2	3/4	7/16	3/16	4	14 5/8	13 1/2	1 3/8	18 1/4	2 3/4	1/4	5 1/2
	58	16	8 1/2	11/16	3/8	3/16	4	14 5/8	13 1/2	1 5/16	18 1/8	2 1/2	1/4	5 1/2
CB 162 N 16	50	16 1/4	7 3/8	5/8	3/8	3/16	3 1/2	15	14 1/4	1	17 7/8	2 1/2	1/4	4
	45	16 1/8	7 1/4	9/16	5/16	3/16	3 1/2	15	14 1/4	15/16	17 3/4	2 1/2	1/4	4
	40	16	7 1/4	1/2	5/16	3/16	3 1/2	15	14 1/4	7/8	17 5/8	2 1/2	1/4	4
	37	15 7/8	7 1/4	7/16	5/16	3/16	3 1/2	15	14 1/4	13/16	17 1/2	2 1/4	1/4	4
CB 153 N 15	108	15 3/8	11 1/8	1 1/16	5/8	5/16	5 1/4	13 1/4	12 1/8	1 5/8	18 15/16	3	3/8	5 1/2
	99	15 1/8	11	1	9/16	5/16	5 1/4	13 1/4	12 1/8	1 9/16	18 13/16	2 3/4	3/8	5 1/2
	91	15	11	7/8	9/16	1/4	5 1/4	13 1/4	12 1/8	1 7/16	18 5/8	2 3/4	5/16	5 1/2
	85	14 7/8	11	13/16	1/2	1/4	5 1/4	13 1/4	12 1/8	1 3/8	18 1/2	2 3/4	5/16	5 1/2
CB 152 N 15	72	15 1/4	7 5/8	15/16	9/16	1/4	3 1/2	13 1/2	12 3/8	1 1/2	17 1/8	2 3/4	5/16	4
	66	15 1/8	7 1/2	7/8	1/2	1/4	3 1/2	13 1/2	12 3/8	1 7/16	16 15/16	2 3/4	5/16	4
	60	15	7 1/2	3/4	7/16	1/4	3 1/2	13 1/2	12 3/8	1 5/16	16 13/16	2 3/4	5/16	4
	55	14 7/8	7 1/2	11/16	7/16	3/16	3 1/2	13 1/2	12 3/8	1 1/4	16 11/16	2 1/2	1/4	4
CB 151 N 15	49	15 1/4	6 7/8	5/8	3/8	3/16	3 1/4	14	13	1 1/16	16 3/4	2 1/2	1/4	4
	44	15 1/8	6 3/4	9/16	3/8	3/16	3 1/4	14	13	1	16 5/8	2 1/2	1/4	4
	39	15	6 3/4	1/2	5/16	3/16	3 1/4	14	13	15/16	16 1/2	2 1/4	1/4	4
	35	14 7/8	6 3/4	1/2	5/16	1/8	3 1/4	14	13	15/16	16 3/8	2 1/4	3/16	4

ELEMENTS

CB SECTIONS

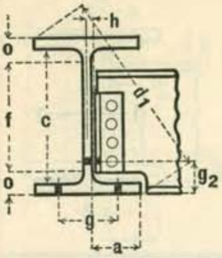
1931

ELEMENTS OF SECTIONS



Section Index and Nominal Size	Depth of Section	Weight per Foot	Area of Section	Flange		Web Thick-ness	Axis 1-1			Axis 2-2		
				Width	Thick-ness		I	S	r	I	S	r
	In.	Lbs.	In.^{2}	In.	In.	In.	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.
	18.690	426	125.30	16.699	3.033	1.879	6611.4	707.5	7.26	2361.2	282.8	4.34
	18.500	412	121.16	16.647	2.938	1.827	6309.7	682.1	7.22	2265.7	272.2	4.32
	18.310	398	117.05	16.595	2.843	1.775	6015.2	657.0	7.17	2171.7	261.7	4.31
	18.120	384	112.92	16.541	2.748	1.721	5726.9	632.1	7.12	2078.4	251.3	4.29
	17.940	370	108.83	16.479	2.658	1.659	5455.1	608.2	7.08	1987.5	241.2	4.27
	17.750	356	104.68	16.422	2.563	1.602	5179.3	583.6	7.03	1896.4	231.0	4.26
	17.560	342	100.56	16.365	2.468	1.545	4910.4	559.3	6.99	1806.9	220.8	4.24
	17.380	328	96.47	16.299	2.378	1.479	4656.8	535.9	6.95	1719.7	211.0	4.22
	17.190	314	92.36	16.240	2.283	1.420	4400.5	512.0	6.90	1632.9	201.1	4.20
	17.000	300	88.24	16.179	2.188	1.359	4150.1	488.2	6.86	1547.2	191.3	4.19
	16.810	287	84.39	16.133	2.093	1.313	3912.3	465.5	6.81	1467.3	181.9	4.17
	16.620	273	80.28	16.070	1.998	1.250	3674.1	442.1	6.77?	1384.2	172.3	4.15
	16.500	264	77.62	16.026	1.938	1.206	3525.4	427.3	6.74	1331.5	166.2	4.14
CB 146 N	16.370	255	74.98	15.992	1.873	1.172	3372.3	412.0	6.71	1278.6	159.9	4.13
14 x 16	16.250	246	72.33	15.947	1.813	1.127	3228.6	397.4	6.68	1227.1	153.9	4.12
	16.120	237	69.68	15.911	1.748	1.091	3080.2	382.2	6.65	1175.0	147.7	4.11
	16.000	228	67.03	15.865	1.688	1.045	2941.4	367.7	6.62	1124.7	141.8	4.10
	15.870	219	64.42	15.830	1.623	1.010	2798.8	352.7	6.59	1074.2	135.7	4.08
	15.750	211	62.04	15.800	1.563	.980	2670.4	339.1	6.56	1028.6	130.2	4.07
	15.630	202	59.38	15.751	1.503	.931	2538.1	324.8	6.54	979.8	124.4	4.06
	15.500	193	56.75	15.713	1.438	.893	2402.3	310.0	6.51	930.6	118.5	4.05
	15.380	184	54.12	15.665	1.378	.845	2275.3	295.9	6.48	883.6	112.8	4.04
	15.250	176	51.73	15.642	1.313	.822	2149.1	281.9	6.45	838.2	107.2	4.03
	15.120	167	49.10	15.602	1.248	.782	2020.4	267.2	6.41	790.5	101.3	4.01
	15.000	158	46.44	15.550	1.188	.730	1899.6	253.3	6.40	745.0	95.8	4.01
	14.880	150	44.13	15.520	1.128	.700	1787.2	240.2	6.36	703.2	90.6	3.99
	14.746	142	41.76	15.500	1.061	.680	1667.8	226.2	6.32	658.9	85.0	3.97
	16.810	*320	94.09	16.710	2.093	1.890	4140.7	492.6	6.63	1635.0	195.7	4.17
	✓	✓		?.003	3	?.003	? 1.6	? .5	? .01	1.2	.1	.01
	15.000	153	44.98	14.828	1.188	.750	1820.9	242.8	6.36	646.0	87.1	3.79
	14.880	145	42.62	14.789	1.128	.711	1710.9	230.0	6.34	608.5	82.3	3.78
	14.750	136	39.98	14.740	1.063	.662	1592.3	215.9	6.31	567.7	77.0	3.77
	14.620	127	37.33	14.690	.998	.612	1476.0	201.9	6.29	527.6	71.8	3.76
CB 145 N	14.500	119	34.97	14.649	.938	.571	1372.2	189.3	6.26	491.7	67.1	3.75
14 x 14½	14.370	111	32.62	14.618	.873	.540	1265.3	176.1	6.23	454.7	62.2	3.73
	14.250	103	30.27	14.576	.813	.498	1165.4	163.6	6.20	419.8	57.6	3.72
	14.120	95	27.92	14.544	.748	.466	1062.5	150.5	6.17	383.7	52.8	3.71
	14.000	87	25.56	14.500	.688	.422	966.2	138.0	6.15	349.7	48.2	3.70

*Column Core Section.



CB SECTIONS

DIMENSIONS

DIMENSIONS OF SECTIONS

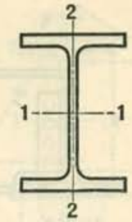
Section Index and Nominal Depth	Weight per Foot	Depth of Section	Flange Width	Flange Thickness	Web Thickness	Web Half Thickness+	a	c	f (Distance)	o (Distance)	d_1 (Distance)	Min. g_2	Clear h	Usual Gage g
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
	426	18 3/4	16 3/4	3 1/16	1 7/8	15/16	7 3/8	12 5/8	11 3/8	3 11/16	25 1/8			
	412	18 1/2	16 5/8	2 15/16	1 13/16	15/16	7 3/8	12 5/8	11 3/8	3 9/16	24 15/16			
	398	18 1/4	16 5/8	2 13/16	1 13/16	7/8	7 3/8	12 5/8	11 3/8	3 7/16	24 3/4			
	384	18 1/8	16 1/2	2 3/4	1 3/4	7/8	7 3/8	12 5/8	11 3/8	3 3/8	24 9/16			
	370	18	16 1/2	2 11/16	1 11/16	7/8	7 3/8	12 5/8	11 3/8	3 5/16	24 3/8			
	356	17 3/4	16 3/8	2 9/16	1 5/8	13/16	7 3/8	12 5/8	11 3/8	3 3/16	24 3/16			
	342	17 1/2	16 3/8	2 7/16	1 9/16	13/16	7 3/8	12 5/8	11 3/8	3 1/16	24 1/16			
	328	17 3/8	16 1/4	2 3/8	1 1/2	3/4	7 3/8	12 5/8	11 3/8	3	23 7/8			
	314	17 1/4	16 1/4	2 5/16	1 7/16	3/4	7 3/8	12 5/8	11 3/8	2 15/16	23 11/16			
	300	17	16 1/8	2 3/16	1 3/8	11/16	7 3/8	12 5/8	11 3/8	2 13/16	23 1/2			
	287	16 3/4	16 1/8	2 1/16	1 5/16	11/16	7 3/8	12 5/8	11 3/8	2 11/16	23 5/16			
	273	16 5/8	16 1/8	2	1 1/4	5/8	7 3/8	12 5/8	11 3/8	2 5/8	23 1/8			
	264	16 1/2	16	1 15/16	1 1/4	5/8	7 3/8	12 5/8	11 3/8	2 9/16	23			
CB 146 N 14	255	16 3/8	16	1 7/8	1 3/16	5/8	7 3/8	12 5/8	11 3/8	2 1/2	22 15/16			3 — 5 1/2 — 3
	246	16 1/4	16	1 13/16	1 1/8	9/16	7 3/8	12 5/8	11 3/8	2 7/16	22 13/16			
	237	16 1/8	15 7/8	1 3/4	1 1/8	9/16	7 3/8	12 5/8	11 3/8	2 3/8	22 11/16			
	228	16	15 7/8	1 11/16	1 1/16	9/16	7 3/8	12 5/8	11 3/8	2 5/16	22 9/16			
	219	15 7/8	15 7/8	1 5/8	1	1/2	7 3/8	12 5/8	11 3/8	2 1/4	22 7/16			
	211	15 3/4	15 3/4	1 9/16	1	1/2	7 3/8	12 5/8	11 3/8	2 3/16	22 5/16			
	202	15 5/8	15 3/4	1 1/2	15/16	1/2	7 3/8	12 5/8	11 3/8	2 1/8	22 1/4			
	193	15 1/2	15 3/4	1 7/16	15/16	7/16	7 3/8	12 5/8	11 3/8	2 1/16	22 1/8			
	184	15 3/8	15 5/8	1 3/8	7/8	7/16	7 3/8	12 5/8	11 3/8	2	22			
	176	15 1/4	15 5/8	1 5/16	13/16	7/16	7 3/8	12 5/8	11 3/8	1 15/16	21 7/8			
	167	15 1/8	15 5/8	1 1/4	13/16	7/16	7 3/8	12 5/8	11 3/8	1 7/8	21 3/4			
	158	15	15 1/2	1 3/16	3/4	3/8	7 3/8	12 5/8	11 3/8	1 13/16	21 5/8			
	150	14 7/8	15 1/2	1 1/8	11/16	3/8	7 3/8	12 5/8	11 3/8	1 3/4	21 1/2			
	142	14 3/4	15 1/2	1 1/16	11/16	3/8	7 3/8	12 5/8	11 3/8	1 11/16	21 7/16			
	*320	16 3/4	16 3/4	2 1/16	1 7/8	15/16	7 3/8	12 5/8	11 3/8	2 11/16	23 3/4			
	153	15	14 7/8	1 3/16	3/4	3/8	7	12 5/8	11 3/8	1 13/16	21 1/8			5 1/2
	145	14 7/8	14 3/4	1 1/8	3/4	3/8	7	12 5/8	11 3/8	1 3/4	21			5 1/2
	136	14 3/4	14 3/4	1 1/16	11/16	3/8	7	12 5/8	11 3/8	1 11/16	20 7/8			5 1/2
CB 145 N 14	127	14 5/8	14 3/4	1	5/8	5/16	7	12 5/8	11 3/8	1 5/8	20 3/4			5 1/2
	119	14 1/2	14 5/8	15/16	9/16	5/16	7	12 5/8	11 3/8	1 9/16	20 11/16	2 3/4	3/8	5 1/2
	111	14 3/8	14 5/8	7/8	9/16	5/16	7	12 5/8	11 3/8	1 1/2	20 1/2	2 3/4	3/8	5 1/2
	103	14 1/4	14 5/8	13/16	1/2	1/4	7	12 5/8	11 3/8	1 7/16	20 7/16	2 3/4	5/16	5 1/2
	95	14 1/8	14 1/2	3/4	1/2	1/4	7	12 5/8	11 3/8	1 3/8	20 5/16	2 3/4	5/16	5 1/2
	87	14	14 1/2	11/16	7/16	1/4	7	12 5/8	11 3/8	1 5/16	20 3/16	2 1/2	5/16	5 1/2

*Column Core Section.

ELEMENTS

CB SECTIONS

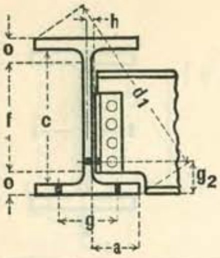
1931



ELEMENTS OF SECTIONS

b m r

Section Index and Nominal Size	Depth of Section	Weight per Foot	Area of Section	Flange Width	Flange Thickness	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	$In.^2$	In.	In.	In.	$In.^4$	$In.^3$	In.	$In.^4$	$In.^3$	In.
CB 144 N 14 x 12	14.180	84	24.68	12.021	.778	.451	927.2	130.8	6.13	225.4	37.5	3.02
	14.060	78	22.94	12.000	.718	.430	850.5	121.0	6.09	206.9	34.5	3.00
CB 143 N 14 x10	14.190	74	21.75	10.071	.783	.451	795.9	112.2	6.05	133.4	26.5	2.48
	14.060	68	20.00	10.040	.718	.420	723.4	102.9	6.01	121.2	24.1	2.46
	13.910	61	17.94	10.000	.643	.380	640.8	92.1	5.98	107.3	21.5	2.45
CB 142 N 14 x 8	14.060	58	17.03	8.096	.718	.406	596.7	84.9	5.92	63.6	15.7	1.93
	13.940	53	15.56	8.060	.658	.370	541.0	77.6	5.90	57.5	14.3	1.92
	13.810	48	14.10	8.030	.593	.340	484.0	70.1	5.86	51.2	12.8	1.91
	13.680	43	12.64	8.000	.528	.310	428.3	62.6	5.82	45.1	11.3	1.89
CB 141 N 14 x 6¾	14.250	42	12.35	6.818	.578	.333	435.3	61.1	5.94	30.6	9.0	1.57
	14.120	37	10.87	6.776	.513	.291	380.9	53.9	5.92	26.6	7.9	1.57
	14.000	33	9.69	6.750	.453	.265	334.7	47.8	5.88	23.2	6.9	1.55
	13.880	30	8.81	6.745	.393	.260	294.3	42.4	5.78	20.1	6.0	1.51
CB 125 N 12 x 12	14.380	190	55.86	12.671	1.736	1.066	1891.5	263.1	5.82	589.8	93.1	3.25
	14.120	176	51.75	12.613	1.606	1.008	1710.6	242.3	5.75	538.1	85.3	3.22
	14.000	169	49.69	12.574	1.546	.969	1626.9	232.4	5.72	513.2	81.6	3.21
	13.880	161	47.33	12.513	1.486	.908	1540.0	221.9	5.70	486.0	77.7	3.20
	13.750	154	45.27	12.481	1.421	.876	1455.5	211.7	5.67	461.1	73.9	3.19
	13.620	147	43.21	12.449	1.356	.844	1372.8	201.6	5.64	436.6	70.1	3.18
	13.500	140	41.15	12.407	1.296	.802	1295.5	191.9	5.61	413.1	66.6	3.17
	13.380	133	39.10	12.365	1.236	.760	1219.9	182.3	5.59	389.9	63.1	3.16
	13.250	126	37.04	12.331	1.171	.726	1142.0	172.4	5.55	366.3	59.4	3.14
	13.120	120	35.26	12.318	1.106	.713	1069.9	163.1	5.51	344.9	56.0	3.13
	13.000	113	33.21	12.274	1.046	.669	998.8	153.7	5.48	322.7	52.6	3.12
	12.880	106	31.15	12.228	.986	.623	929.0	144.3	5.46	300.7	49.2	3.11
	12.750	99	29.09	12.191	.921	.586	857.3	134.5	5.43	278.3	45.7	3.09
	12.620	92	27.04	12.154	.856	.549	787.4	124.8	5.40	256.3	42.2	3.08
	12.500	85	24.98	12.106	.796	.501	722.0	115.5	5.38	235.5	38.9	3.07
	12.380	79	23.22	12.081	.736	.476	661.9	106.9	5.34	216.4	35.8	3.05
	12.250	72	21.15	12.041	.671	.436	596.2	97.3	5.31	195.3	32.4	3.04
	12.120	65	19.09	12.000	.606	.395	532.0	87.8	5.28	174.6	29.1	3.02
CB 124 N 12 x 10	12.310	64	18.81	10.060	.701	.409	527.5	85.7	5.30	119.0	23.7	2.52
	12.190	58	17.04	10.014	.641	.363	475.3	78.0	5.28	107.4	21.4	2.51
	12.060	53	15.57	10.000	.576	.349	425.4	70.5	5.23	96.1	19.2	2.48
CB 123 N 12 x 8	12.190	50	14.69	8.077	.641	.375	393.0	64.5	5.17	56.4	14.0	1.96
	12.060	45	13.21	8.042	.576	.340	349.3	57.9	5.14	50.0	12.4	1.95
	11.940	40	11.75	8.000	.516	.298	308.6	51.7	5.13	44.1	11.0	1.94
CB 122 N 12 x 6½	12.250	36	10.58	6.560	.545	.300	282.3	46.1	5.17	25.7	7.8	1.56
	12.120	32	9.42	6.535	.480	.275	247.0	40.8	5.12	22.3	6.8	1.54
	12.000	28	8.22	6.500	.420	.240	213.4	35.6	5.10	19.2	5.9	1.53
	11.868	25	7.36	6.500	.354	.240	182.9	30.8	4.98	16.2	5.0	1.48



CB SECTIONS

DIMENSIONS OF SECTIONS

I

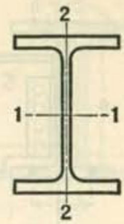
DIMENSIONS

Section Index and Nominal Depth	Weight per Foot	Depth of Section	Flange Width	Flange Thickness	Web Thickness	Web Half Thickness+	Distance a	Distance c	Distance f	Distance o	Distance d_1	Distance Min. g_2	Distance Clear h	Usual Gage g
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
CB 144 N	84	14 1/8	12	3/4	7/16	1/4	5 3/4	12 5/8	11 3/8	1 3/8	18 5/8	2 1/2	5/16	5 1/2
14	78	14	12	11/16	7/16	1/4	5 3/4	12 5/8	11 3/8	1 5/16	18 1/2	2 1/2	5/16	5 1/2
CB 143 N	74	14 1/4	10 1/8	13/16	7/16	1/4	4 3/4	12 5/8	11 3/8	1 7/16	17 7/16	2 3/4	5/16	5 1/2
14	68	14	10	11/16	7/16	1/4	4 3/4	12 5/8	11 3/8	1 5/16	17 5/16	2 1/2	5/16	5 1/2
	61	13 7/8	10	5/8	3/8	3/16	4 3/4	12 5/8	11 3/8	1 1/4	17 3/16	2 1/2	1/4	5 1/2
	58	14	8 1/8	11/16	7/16	3/16	3 7/8	12 5/8	11 3/8	1 5/16	16 1/4	2 1/2	1/4	5 1/2
CB 142 N	53	14	8	11/16	3/8	3/16	3 7/8	12 5/8	11 3/8	1 5/16	16 1/8	2 1/2	1/4	5 1/2
14	48	13 3/4	8	9/16	3/8	3/16	3 7/8	12 5/8	11 3/8	1 3/16	16	2 1/2	1/4	5 1/2
	43	13 5/8	8	1/2	5/16	3/16	3 7/8	12 5/8	11 3/8	1 1/8	15 7/8	2 1/4	1/4	5 1/2
	42	14 1/4	6 7/8	9/16	3/8	3/16	3 1/4	13 1/8	12 1/4	15/16	15 13/16	2 1/2	1/4	4
CB 141 N	37	14 1/8	6 3/4	1/2	5/16	3/16	3 1/4	13 1/8	12 1/4	7/8	15 11/16	2 1/4	1/4	4
14	33	14	6 3/4	7/16	1/4	1/8	3 1/4	13 1/8	12 1/4	13/16	15 9/16	2 1/4	3/16	4
	30	13 7/8	6 3/4	3/8	1/4	1/8	3 1/4	13 1/8	12 1/4	3/4	15 7/16	2 1/4	3/16	4
	190	14 3/8	12 5/8	1 3/4	1 1/16	9/16	5 3/4	10 7/8	9 3/4	2 3/8	19 3/16			5 1/2
	176	14 1/8	12 5/8	1 5/8	1	1/2	5 3/4	10 7/8	9 3/4	2 1/4	18 15/16			5 1/2
	169	14	12 5/8	1 9/16	1	1/2	5 3/4	10 7/8	9 3/4	2 3/16	18 7/8			5 1/2
	161	13 7/8	12 1/2	1 1/2	15/16	1/2	5 3/4	10 7/8	9 3/4	2 1/8	18 3/4			5 1/2
	154	13 3/4	12 1/2	1 7/16	7/8	7/16	5 3/4	10 7/8	9 3/4	2 1/16	18 5/8			5 1/2
	147	13 5/8	12 1/2	1 3/8	7/8	7/16	5 3/4	10 7/8	9 3/4	2	18 1/2			5 1/2
	140	13 1/2	12 3/8	1 5/16	13/16	7/16	5 3/4	10 7/8	9 3/4	1 15/16	18 3/8			5 1/2
	133	13 3/8	12 3/8	1 1/4	3/4	3/8	5 3/4	10 7/8	9 3/4	1 7/8	18 1/4			5 1/2
CB 125 N	126	13 1/4	12 3/8	1 3/16	3/4	3/8	5 3/4	10 7/8	9 3/4	1 13/16	18 1/8			5 1/2
12	120	13 1/8	12 3/8	1 1/8	3/4	3/8	5 3/4	10 7/8	9 3/4	1 3/4	18			5 1/2
	113	13	12 1/4	1 1/16	11/16	3/8	5 3/4	10 7/8	9 3/4	1 11/16	17 15/16			5 1/2
	106	12 7/8	12 1/4	1	5/8	5/16	5 3/4	10 7/8	9 3/4	1 5/8	17 13/16			5 1/2
	99	12 3/4	12 1/4	15/16	5/8	5/16	5 3/4	10 7/8	9 3/4	1 9/16	17 11/16			5 1/2
	92	12 5/8	12 1/8	7/8	9/16	5/16	5 3/4	10 7/8	9 3/4	1 1/2	17 9/16			5 1/2
	85	12 1/2	12 1/8	13/16	1/2	1/4	5 3/4	10 7/8	9 3/4	1 7/16	17 7/16	2 3/4	5/16	5 1/2
	79	12 3/8	12 1/8	3/4	1/2	1/4	5 3/4	10 7/8	9 3/4	1 3/8	17 5/16	2 1/2	5/16	5 1/2
	72	12 1/4	12	11/16	7/16	1/4	5 3/4	10 7/8	9 3/4	1 5/16	17 3/16	2 1/2	5/16	5 1/2
	65	12 1/8	12	5/8	7/16	3/16	5 3/4	10 7/8	9 3/4	1 1/4	17 1/16	2 1/2	1/4	5 1/2
	64	12 1/4	10	11/16	7/16	1/4	4 7/8	10 7/8	9 3/4	1 5/16	15 15/16	2 1/2	5/16	5 1/2
CB 124 N	58	12 1/4	10	5/8	3/8	3/16	4 7/8	10 7/8	9 3/4	1 1/4	15 13/16	2 1/2	1/4	5 1/2
12	53	12	10	9/16	3/8	3/16	4 7/8	10 7/8	9 3/4	1 3/16	15 11/16	2 1/2	1/4	5 1/2
CB 123 N	50	12 1/4	8 1/8	5/8	3/8	3/16	3 7/8	10 7/8	9 3/4	1 1/4	14 5/8	2 1/2	1/4	5 1/2
12	45	12	8	9/16	3/8	3/16	3 7/8	10 7/8	9 3/4	1 3/16	14 9/16	2 1/2	1/4	5 1/2
	40	12	8	1/2	5/16	3/16	3 7/8	10 7/8	9 3/4	1 1/8	14 3/8	2 1/4	1/4	5 1/2
	36	12 1/4	6 1/2	9/16	5/16	3/16	3 1/8	11 1/8	10 1/2	15/16	13 15/16	2 1/2	1/4	4
CB 122 N	32	12 1/8	6 1/2	1/2	5/16	1/8	3 1/8	11 1/8	10 1/2	7/8	13 13/16	2 1/4	3/16	4
12	28	12	6 1/2	7/16	1/4	1/8	3 1/8	11 1/8	10 1/2	13/16	13 11/16	2 1/4	3/16	4
	25	11 7/8	6 1/2	3/8	1/4	1/8	3 1/8	11 1/8	10 1/2	3/4	13 9/16	2 1/4	3/16	4

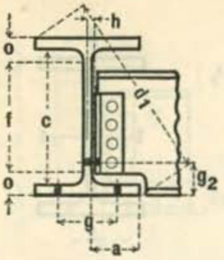
ELEMENTS

CB SECTIONS 1931

ELEMENTS OF SECTIONS



Section Index and Nominal Size	Depth of Section	Weight per Foot	Area of Section	Flange Width	Flange Thickness	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	$In.^2$	In.	In.	In.	$In.^4$	$In.^3$	In.	$In.^4$	$In.^3$	In.
	11.880	136	40.01	10.575	1.498	.915	916.9	154.4	4.79	295.9	56.0	2.72
	11.750	130	38.23	10.540	1.433	.880	864.2	147.1	4.75	280.2	53.2	2.71
	11.620	124	36.45	10.505	1.368	.845	812.9	139.9	4.72	264.8	50.4	2.70
	11.500	118	34.68	10.461	1.308	.801	765.2	133.1	4.70	250.0	47.8	2.68
	11.380	112	32.92	10.416	1.248	.756	718.6	126.3	4.67	235.4	45.2	2.67
	11.250	106	31.16	10.380	1.183	.720	671.0	119.3	4.64	220.8	42.5	2.66
	11.120	100	29.42	10.345	1.118	.685	624.7	112.4	4.61	206.6	39.9	2.65
CB 103 N	11.000	95	27.92	10.322	1.058	.662	584.2	106.2	4.58	194.2	37.6	2.64
10 x 10	10.880	89	26.17	10.275	.998	.615	542.1	99.7	4.55	180.6	35.2	2.63
	10.750	83	24.41	10.235	.933	.575	498.9	92.8	4.52	166.9	32.6	2.61
	10.620	77	22.65	10.195	.868	.535	456.9	86.1	4.49	153.4	30.1	2.60
	10.500	72	21.17	10.170	.808	.510	420.4	80.1	4.46	141.8	27.9	2.59
	10.380	66	19.43	10.120	.748	.460	382.5	73.7	4.44	129.3	25.6	2.58
	10.250	60	17.65	10.075	.683	.415	343.5	67.0	4.41	116.5	23.1	2.57
	10.120	54	15.89	10.030	.618	.370	305.6	60.4	4.39	104.0	20.7	2.56
	10.000	49	14.38	10.000	.558	.340	272.7	54.5	4.35	93.0	18.6	2.54
	10.120	45	13.22	8.020	.618	.350	248.3	49.1	4.33	53.2	13.3	2.01
CB 102 N	10.000	41	12.06	8.000	.558	.330	222.3	44.5	4.29	47.7	11.9	1.99
10 x 8	9.880	37	10.85	7.975	.498	.305	196.6	39.8	4.26	42.1	10.6	1.97
	9.750	33	9.72	7.965	.433	.295	170.8	35.0	4.19	36.5	9.2	1.94
	10.240	29	8.54	5.789	.510	.279	159.3	31.1	4.32	16.5	5.7	1.39
CB 101 N	10.120	26	7.65	5.770	.450	.260	139.7	27.6	4.27	14.4	5.0	1.37
10 x 5¾	10.000	23	6.76	5.750	.390	.240	120.5	24.1	4.22	12.4	4.3	1.35
	9.900	21	6.18	5.750	.340	.240	106.3	21.5	4.15	10.8	3.8	1.32
	9.062	67	19.70	8.285	.931	.575	275.6	60.8	3.74	88.4	21.3	2.12
	8.942	62	18.22	8.230	.871	.520	252.2	56.4	3.72	81.0	19.7	2.11
	8.810	58	17.04	8.220	.805	.510	230.3	52.3	3.68	74.6	18.2	2.09
	8.678	53	15.57	8.175	.739	.465	207.1	47.7	3.65	67.4	16.5	2.08
CB 83 N	8.562	48	14.10	8.115	.681	.405	186.3	43.5	3.63	60.7	15.0	2.07
8 x 8	8.442	44	12.92	8.090	.621	.380	167.5	39.7	3.60	54.8	13.6	2.06
	8.312	40	11.74	8.075	.556	.365	148.3	35.7	3.55	48.8	12.1	2.04
	8.182	35	10.28	8.025	.491	.315	128.2	31.3	3.53	42.3	10.5	2.03
	8.124	33	9.70	8.010	.462	.300	119.8	29.5	3.51	39.6	9.9	2.02
	8.060	31	9.10	8.000	.430	.290	110.9	27.5	3.49	36.7	9.2	2.01
CB 82 N	8.196	30	8.81	6.559	.498	.298	107.8	26.3	3.50	23.4	7.1	1.63
8 x 6½	8.098	27	7.93	6.529	.449	.268	95.9	23.7	3.48	20.8	6.4	1.62
	8.000	24	7.06	6.500	.400	.239	84.2	21.1	3.46	18.3	5.6	1.61



CB SECTIONS

DIMENSIONS OF SECTIONS

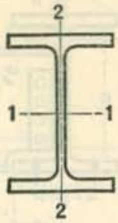
DIMENSIONS

Section Index and Nominal Depth	Weight per Foot	Depth of Section	Flange Width	Flange Thick-ness	Web Thick-ness	Web Half Thick-ness+	Distance a	Distance c	Distance f	Distance o	Distance d_1	Distance Min. g_2	Distance Clear h	Usual Gage g
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
	136	11 7/8	10 5/8	1 1/2	15/16	1/2	4 7/8	8 7/8	7 3/4	2 1/16	15 15/16			5 1/2
	130	11 3/4	10 1/2	1 7/16	7/8	7/16	4 7/8	8 7/8	7 3/4	2	15 13/16			5 1/2
	124	11 5/8	10 1/2	1 3/8	7/8	7/16	4 7/8	8 7/8	7 3/4	1 15/16	15 11/16			5 1/2
	118	11 1/2	10 1/2	1 5/16	13/16	7/16	4 7/8	8 7/8	7 3/4	1 7/8	15 9/16			5 1/2
	112	11 3/8	10 3/8	1 1/4	3/4	3/8	4 7/8	8 7/8	7 3/4	1 13/16	15 7/16			5 1/2
	106	11 1/4	10 3/8	1 3/16	3/4	3/8	4 7/8	8 7/8	7 3/4	1 3/4	15 5/16			5 1/2
	100	11 1/8	10 3/8	1 1/8	11/16	3/8	4 7/8	8 7/8	7 3/4	1 11/16	15 1/4			5 1/2
CB 103 N	95	11	10 3/8	1 1/16	11/16	3/8	4 7/8	8 7/8	7 3/4	1 5/8	15 1/8			5 1/2
10	89	10 7/8	10 1/4	1	5/8	5/16	4 7/8	8 7/8	7 3/4	1 9/16	15			5 1/2
	83	10 3/4	10 1/4	15/16	9/16	5/16	4 7/8	8 7/8	7 3/4	1 1/2	14 7/8			5 1/2
	77	10 5/8	10 1/4	7/8	9/16	5/16	4 7/8	8 7/8	7 3/4	1 7/16	14 3/4			5 1/2
	72	10 1/2	10 1/8	13/16	1/2	1/4	4 7/8	8 7/8	7 3/4	1 3/8	14 5/8			5 1/2
	66	10 3/8	10 1/8	3/4	1/2	1/4	4 7/8	8 7/8	7 3/4	1 5/16	14 1/2	2 1/2	5/16	5 1/2
	60	10 1/4	10 1/8	11/16	7/16	1/4	4 7/8	8 7/8	7 3/4	1 1/4	14 3/8	2 1/2	5/16	5 1/2
	54	10 1/8	10	5/8	3/8	3/16	4 7/8	8 7/8	7 3/4	1 3/16	14 1/4	2 1/2	1/4	5 1/2
	49	10	10	9/16	3/8	3/16	4 7/8	8 7/8	7 3/4	1 1/8	14 3/16	2 1/2	1/4	5 1/2
	45	10 1/8	8	5/8	3/8	3/16	3 7/8	8 7/8	7 3/4	1 3/16	12 15/16	2 1/2	1/4	5 1/2
CB 102 N	41	10	8	9/16	3/8	3/16	3 7/8	8 7/8	7 3/4	1 1/8	12 13/16	2 1/2	1/4	5 1/2
10	37	9 7/8	8	1/2	5/16	3/16	3 7/8	8 7/8	7 3/4	1 1/16	12 3/4	2 1/4	1/4	5 1/2
	33	9 3/4	8	7/16	5/16	3/16	3 7/8	8 7/8	7 3/4	1	12 5/8	2 1/4	1/4	5 1/2
	29	10 1/4	5 3/4	1/2	5/16	1/8	2 3/4	9 1/4	8 5/8	13/16	11 13/16	2 1/4	3/16	3
CB 101 N	26	10 1/8	5 3/4	7/16	1/4	1/8	2 3/4	9 1/4	8 5/8	3/4	11 11/16	2 1/4	3/16	3
10	23	10	5 3/4	3/8	1/4	1/8	2 3/4	9 1/4	8 5/8	11/16	11 9/16	2 1/4	3/16	3
	21	9 7/8	5 3/4	5/16	1/4	1/8	2 3/4	9 1/4	8 5/8	5/8	11 1/2	2 1/4	3/16	3
	67	9	8 1/4	15/16	9/16	5/16	3 7/8	7 1/4	6 1/4	1 3/8	12 5/16			5 1/2
	62	9	8 1/4	7/8	9/16	1/4	3 7/8	7 1/4	6 1/4	1 5/16	12 3/16			5 1/2
	58	8 3/4	8 1/4	13/16	1/2	1/4	3 7/8	7 1/4	6 1/4	1 1/4	12 1/16			5 1/2
	53	8 5/8	8 1/8	3/4	1/2	1/4	3 7/8	7 1/4	6 1/4	1 3/16	11 15/16			5 1/2
CB 83 N	48	8 1/2	8 1/8	11/16	7/16	3/16	3 7/8	7 1/4	6 1/4	1 1/8	11 13/16			5 1/2
8	44	8 1/2	8 1/8	5/8	3/8	3/16	3 7/8	7 1/4	6 1/4	1 1/16	11 3/4			5 1/2
	40	8 1/4	8 1/8	9/16	3/8	3/16	3 7/8	7 1/4	6 1/4	1	11 5/8			5 1/2
	35	8 1/8	8	1/2	5/16	3/16	3 7/8	7 1/4	6 1/4	15/16	11 1/2	2 1/4	1/4	5 1/2
	33	8 1/8	8	7/16	5/16	3/16	3 7/8	7 1/4	6 1/4	7/8	11 7/16	2 1/4	1/4	5 1/2
	31	8	8	7/16	5/16	3/16	3 7/8	7 1/4	6 1/4	7/8	11 3/8	2 1/4	1/4	5 1/2
	30	8 1/4	6 1/2	1/2	5/16	3/16	3 1/8	7 1/4	6 1/4	15/16	10 1/2	2 1/4	1/4	4
CB 82 N	27	8 1/8	6 1/2	7/16	5/16	1/8	3 1/8	7 1/4	6 1/4	7/8	10 7/16	2 1/4	3/16	4
8	24	8	6 1/2	3/8	1/4	1/8	3 1/8	7 1/4	6 1/4	13/16	10 5/16	2 1/4	3/16	4

ELEMENTS

CB SECTIONS 1931

ELEMENTS OF SECTIONS



Section Index and Nominal Size	Depth of Section	Weight per Foot	Area of Section	Flange Width	Flange Thickness	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	In.^{2}	In.	In.	In.	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.
CB 61 N $5\frac{3}{4} \times 9\frac{1}{2}$ ©	6.842	88	25.87	10.046	1.035	1.035	187.3	54.7	2.69	175.4	34.9	2.60
	6.666	80	23.52	9.959	.947	.948	164.9	49.5	2.65	156.3	31.4	2.58
	6.444	70	20.58	9.846	.836	.835	138.7	43.0	2.60	133.3	27.1	2.54
	6.216	60	17.63	9.733	.722	.722	113.9	36.7	2.54	111.1	22.8	2.51
	5.986	50	14.70	9.617	.607	.606	91.0	30.4	2.49	90.1	18.7	2.48
	5.750	40	11.76	9.500	.489	.489	69.6	24.2	2.43	69.9	14.7	2.44

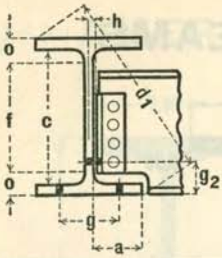
BEAMS-STANDARD MILL

Section Index and Nominal Size	Depth of Section	Weight per Foot	Area of Section	Flange Width	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	In.^{2}	In.	In.	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.
B 40 N $9 \times 5\frac{1}{4}$ ©	9	23	6.76	5.316	.316	91.6	20.4	3.68	8.4	3.2	1.12
	9	20	5.88	5.218	.218	85.6	19.0	3.82	7.9	3.0	1.16
B 39 N 8×5 ©	8	21	6.17	5.110	.360	63.4	15.9	3.21	6.6	2.6	1.03
	8	19	5.59	5.037	.287	60.3	15.1	3.29	6.3	2.5	1.06
	8	17	5.00	4.963	.213	57.2	14.3	3.38	6.0	2.4	1.09

H-BEAMS

Section Index and Nominal Size	Depth of Section	Weight per Foot	Area of Section	Flange Width	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
H 4 8×8	8	37.7	11.00	8.125	.500	120.8	30.2	3.31	36.9	9.1	1.83
	8	34.3	10.00	8.000	.375	115.5	28.9	3.40	35.1	8.8	1.87
	8	32.6	9.50	7.938	.313	112.8	28.2	3.45	34.2	8.6	1.90
H 3A 6×6	6	27.5	8.08	6.063	.438	49.3	16.4	2.47	16.0	5.3	1.41
	6	25.0	7.33	5.938	.313	47.0	15.7	2.53	14.9	5.0	1.43
H 3 6×6	6	22.5	6.61	6.063	.375	41.0	13.7	2.49	12.2	4.0	1.36
	6	20.0	5.86	5.938	.250	38.8	12.9	2.57	11.4	3.8	1.39
H 2 5×5 ©	5	18.9	5.47	5.000	.313	23.8	9.5	2.08	7.8	3.1	1.20
H 1 4×4 ©	4	13.8	3.99	4.000	.313	10.7	5.3	1.64	3.6	1.8	0.95

© Carnegie Steel Company only.



CB SECTIONS

DIMENSIONS

DIMENSIONS OF SECTIONS

Section Index and Nominal Depth	Weight per Foot	Depth of Section	Flange Width	Flange Thickness	Web Thickness	Web Half Thickness +	Distance a	Distance c	Distance f	Distance o	Distance d_1	Usual Gage g
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
CB 61 N 5 3/4 [C]	88	6 7/8	10	1 1/16	1 1/16	9/16	4 1/2	4 3/4	3 7/8	1 1/2	12 3/16	5 1/2
	80	6 5/8	10	15/16	15/16	1/2	4 1/2	4 3/4	3 7/8	1 3/8	12	5 1/2
	70	6 1/2	9 7/8	13/16	7/8	7/16	4 1/2	4 3/4	3 7/8	1 1/4	11 13/16	5 1/2
	60	6 1/4	9 3/4	3/4	3/4	3/8	4 1/2	4 3/4	3 7/8	1 3/16	11 9/16	5 1/2
	50	6	9 5/8	5/8	5/8	5/16	4 1/2	4 3/4	3 7/8	1 1/16	11 3/8	5 1/2
	40	5 3/4	9 1/2	1/2	1/2	1/4	4 1/2	4 3/4	3 7/8	15/16	11 1/8	5 1/2

BEAMS-STANDARD MILL

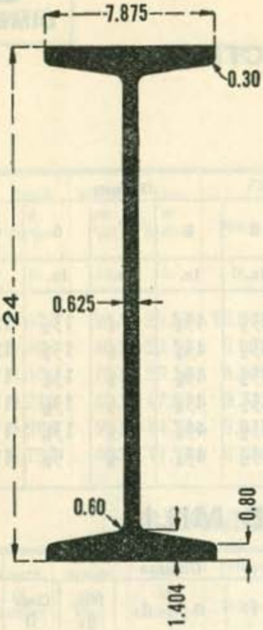
Section Index and Nominal Depth	Weight per Foot	Depth of Section	Flange Width	Flange Thickness	Web Thickness	Web Half Thickness+	Distance a	Distance f	Distance o	Distance d_1	Distance Min. g_2	Distance Clear h	Usual Gage g	Max. Flange Rivet
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
B 40 N 9 [C]	23	9	5 5/16	3/8	5/16	3/16	2 1/2	7 1/2	3/4	10 1/2	2 1/4	1/4	3	7/8
	20	9	5 3/16	3/8	3/16	1/8	2 1/2	7 1/2	3/4	10 7/16	2 1/4	3/16	3	7/8
B 39 N 8 [C]	21	8	5 1/8	5/16	3/8	3/16	2 3/8	6 5/8	11/16	9 1/2	2 1/4	1/4	3	3/4
	19	8	5 1/16	5/16	5/16	3/16	2 3/8	6 5/8	11/16	9 1/2	2 1/4	1/4	3	3/4
	17	8	5	5/16	3/16	1/8	2 3/8	6 5/8	11/16	9 7/16	2 1/4	3/16	3	3/4

H-BEAMS

Section Index and Nominal Depth	Weight per Foot	Depth of Section	Flange Width	Flange Thickness	Web Thickness	Web Half Thickness+	Distance a	Distance f	Distance o	Distance d_1	Distance Min. g_2	Distance Clear h	Usual Gage g	Max. Flange Rivet
H 4 8	37.7	8	8 1/8	7/16	1/2	1/4	3 13/16	6 1/4	7/8	11 7/16			5	7/8
	34.3	8	8	7/16	3/8	3/16	3 13/16	6 1/4	7/8	11 5/16			5	7/8
	32.6	8	7 15/16	7/16	5/16	3/16	3 13/16	6 1/4	7/8	11 1/4			5	7/8
H 3A 6	27.5	6	6 1/16	1/2	7/16	1/4	2 13/16	4 1/4	7/8	8 9/16			3 1/2	7/8
	25.0	6	5 15/16	1/2	5/16	3/16	2 13/16	4 1/4	7/8	8 1/2			3 1/2	7/8
H 3 6	22.5	6	6 1/16	3/8	3/8	3/16	2 7/8	4 7/16	3/4	8 9/16			3 1/2	7/8
	20.0	6	5 15/16	3/8	1/4	1/8	2 7/8	4 7/16	3/4	8 1/2			3 1/2	7/8
H 2 5 [C]	18.9	5	5	7/16	5/16	3/16	2 3/8	3 3/8	13/16	7 1/16			2 3/4	3/4
H 1 4 [C]	13.8	4	4	3/8	5/16	3/16	1 7/8	2 1/2	3/4	5 11/16			2 1/4	5/8

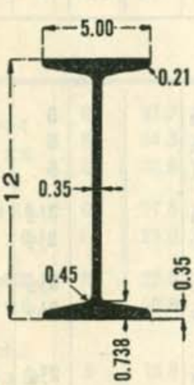
[C] Carnegie Steel Company only.

AMERICAN STANDARD BEAMS 1931

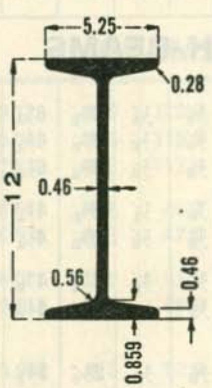


B 18 24x7⅞
120, 115, 110, 105.9 lbs.

B 1 24x7
100, 95, 90, 85, 79.9 lbs.



B 9 12x5
35, 31.8 lbs.

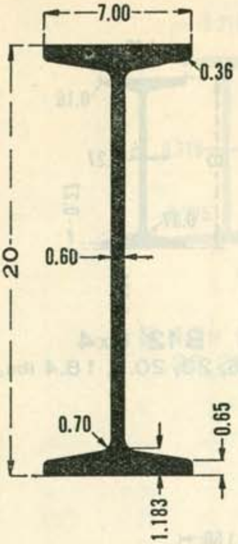


B 8 12x5¼
55, 50, 45, 40.8 lbs.

B 7 15x5½
55, 50, 45, 42.9 lbs.

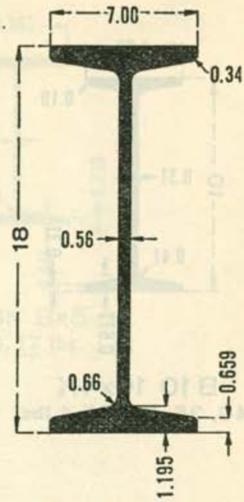
DIAGRAMS SHOWING MINIMUM DIMENSIONS IN INCHES
RANGE OF WEIGHTS PER LINEAR FOOT

AMERICAN STANDARD BEAMS

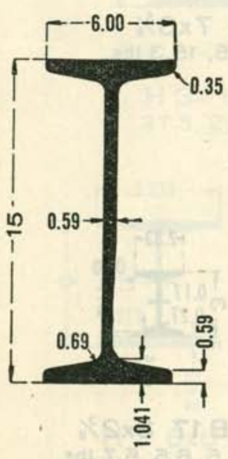


B 2 20x7
100, 95, 90, 85, 81.4 lbs.

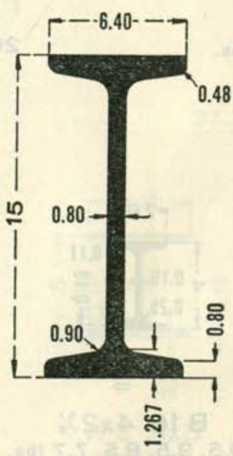
B 3 20x6¼
75, 70, 65.4 lbs.



B 19 18x7
90, 85, 80, 75.6 lbs.



B 6 15x6
75, 70, 65, 60.8 lbs.

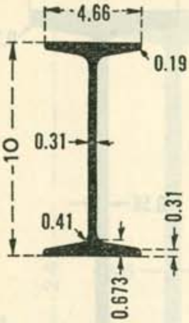


B 5 15x6⅜
100, 95, 90, 85, 81.3 lbs.

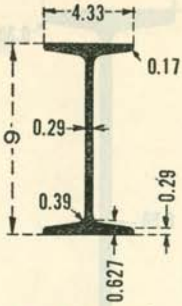
B 4 18x6
70, 65, 60, 54.7 lbs.

DIAGRAMS SHOWING MINIMUM DIMENSIONS IN INCHES
RANGE OF WEIGHTS PER LINEAR FOOT

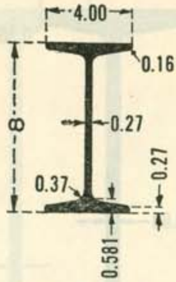
AMERICAN STANDARD BEAMS 1931



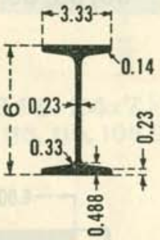
B 10 10x4⅝
40, 35, 30, 25.4 lbs.



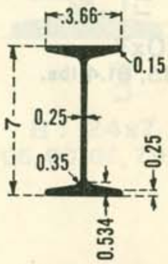
B 11 9x4⅜
35, 30, 25, 21.8 lbs.



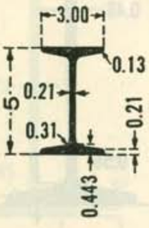
B 12 8x4
25.5, 23, 20.5, 18.4 lbs.



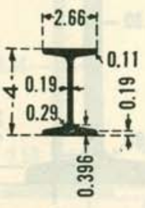
B 14 6x3⅜
17.25, 14.75, 12.5 lbs.



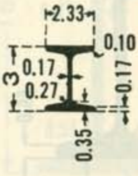
B 13 7x3⅝
20, 17.5, 15.3 lbs.



B 15 5x3
14.75, 12.25, 10 lbs.



B 16 4x2⅝
10.5, 9.5, 8.5, 7.7 lbs.

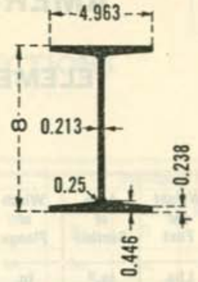


B 17 3x2⅜
7.5, 6.5, 5.7 lbs.

DIAGRAMS SHOWING MINIMUM DIMENSIONS IN INCHES
RANGE OF WEIGHTS PER LINEAR FOOT

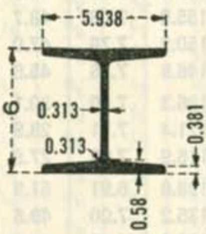
STANDARD MILL BEAMS

B 40N 9x5¼
23, 20 lbs.

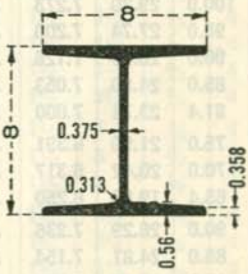


B 39N 8x5
21, 19, 17 lbs.

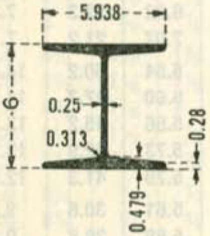
H-BEAMS



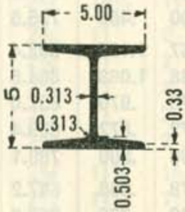
H 3A 6x6
27.5, 25 lbs.



H 4 8x8
37.7, 34.3, 32.6 lbs.



H 3 6x6
22.5, 20 lbs.



H 2 5x5
18.9 lbs.

H 1 4x4
13.8 lbs.

DIAGRAMS SHOWING DIMENSIONS IN INCHES
RANGE OF WEIGHTS PER LINEAR FOOT

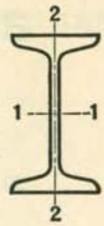
NOTE:—WEIGHTS UNDERLINED THUS 34.3 CORRESPOND TO DIMENSIONS SHOWN

ELEMENTS

BEAMS 1931

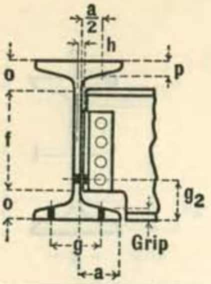
AMERICAN STANDARD

ELEMENTS OF SECTIONS



Section Index and Nominal Size	Depth of Beam	Weight per Foot	Area of Section	Width of Flange	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	In.²	In.	In.	In.⁴	In.³	In.	In.⁴	In.³	In.
B 18 24 x 7⅞	24	120.0	35.13	8.048	.798	3010.8	250.9	9.26	84.9	21.1	1.56
		115.0	33.67	7.987	.737	2940.5	245.0	9.35	82.8	20.7	1.57
		110.0	32.18	7.925	.675	2869.1	239.1	9.44	80.6	20.3	1.58
		105.9	30.98	7.875	.625	2811.5	234.3	9.53	78.9	20.0	1.60
B 1 24 x 7	24	100.0	29.25	7.247	.747	2371.8	197.6	9.05	48.4	13.4	1.29
		95.0	27.79	7.186	.686	2301.5	191.8	9.08	47.0	13.0	1.30
		90.0	26.30	7.124	.624	2230.1	185.8	9.21	45.5	12.8	1.32
		85.0	24.84	7.063	.563	2159.8	180.0	9.33	44.2	12.5	1.33
		79.9	23.33	7.000	.500	2087.2	173.9	9.46	42.9	12.2	1.36
B 2 20 x 7	20	100.0	29.20	7.273	.873	1648.3	164.8	7.51	52.4	14.4	1.34
		95.0	27.74	7.200	.800	1599.7	160.0	7.59	50.5	14.0	1.35
		90.0	26.26	7.126	.726	1550.3	155.0	7.68	48.7	13.7	1.36
		85.0	24.80	7.053	.653	1501.7	150.2	7.78	47.0	13.3	1.38
		81.4	23.74	7.000	.600	1466.3	146.6	7.86	45.8	13.1	1.39
B 3 20 x 6¼	20	75.0	21.90	6.391	.641	1263.5	126.3	7.60	30.1	9.4	1.17
		70.0	20.42	6.317	.567	1214.2	121.4	7.71	28.9	9.2	1.19
		65.4	19.08	6.250	.500	1169.5	116.9	7.83	27.9	8.9	1.21
B 19 18 x 7 Ⓒ	18	90.0	26.29	7.236	.796	1256.5	139.6	6.91	51.9	14.3	1.40
		85.0	24.81	7.154	.714	1216.6	135.2	7.00	49.8	14.0	1.42
		80.0	23.34	7.072	.632	1176.8	130.8	7.10	47.9	13.6	1.43
		75.6	22.04	7.000	.560	1141.8	126.9	7.20	46.3	13.2	1.45
B 4 18 x 6	18	70.0	20.46	6.251	.711	917.5	101.9	6.70	24.5	7.8	1.09
		65.0	18.98	6.169	.629	877.7	97.5	6.80	23.4	7.6	1.11
		60.0	17.50	6.087	.547	837.8	93.1	6.92	22.3	7.3	1.13
		54.7	15.94	6.000	.460	795.5	88.4	7.07	21.2	7.1	1.15
B 5 15x6⅜	15	100.0	29.08	6.767	1.167	892.4	119.0	5.54	50.2	14.8	1.31
		95.0	27.59	6.668	1.068	864.5	115.3	5.60	47.7	14.3	1.31
		90.0	26.12	6.570	.970	837.0	111.6	5.66	45.2	13.8	1.32
		85.0	24.65	6.472	.872	809.4	107.9	5.73	42.9	13.3	1.32
		81.3	23.57	6.400	.800	789.1	105.2	5.79	41.3	12.9	1.32
B 6 15 x 6	15	75.0	21.85	6.278	.868	687.2	91.6	5.61	30.6	9.8	1.18
		70.0	20.38	6.180	.770	659.6	87.9	5.69	28.8	9.3	1.19
		65.0	18.91	6.082	.672	632.1	84.3	5.78	27.2	8.9	1.20
		60.8	17.68	6.000	.590	609.0	81.2	5.87	26.0	8.7	1.21
B 7 15x5½	15	55.0	16.06	5.738	.648	508.7	67.8	5.63	17.0	5.9	1.03
		50.0	14.59	5.640	.550	481.1	64.2	5.74	16.0	5.7	1.05
		45.0	13.12	5.542	.452	453.6	60.5	5.88	15.0	5.4	1.07
		42.9	12.49	5.500	.410	441.8	58.9	5.95	14.6	5.3	1.08

Ⓒ Carnegie Steel Company only.



BEAMS

AMERICAN STANDARD

DIMENSIONS OF SECTIONS

I DIMENSIONS

Section Index and Depth	Weight per Foot	Flange		Web		Distance			Standards for Connections				
		Width	Thickness	Thickness	Half Thickness +	a	f	o	Min. g_2	Clear. h	Gage g	Grip	Max. Flange Rivet
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
B 18 24	120.0	8 1/16	1 1/8	13/16	7/16	3 5/8	20 1/4	1 7/8	3 1/4	1/2	5	1 1/8	7/8
	115.0	8	1 1/8	3/4	3/8	3 5/8	20 1/4	1 7/8	3 1/4	7/16	5	1 1/8	7/8
	110.0	7 15/16	1 1/8	11/16	3/8	3 5/8	20 1/4	1 7/8	3 1/4	7/16	5	1 1/8	7/8
	105.9	7 7/8	1 1/8	5/8	5/16	3 5/8	20 1/4	1 7/8	3 1/4	3/8	5	1 1/8	7/8
B 1 24	100.0	7 1/4	7/8	3/4	3/8	3 1/4	20 3/4	1 5/8	3	7/16	4	7/8	7/8
	95.0	7 3/16	7/8	11/16	3/8	3 1/4	20 3/4	1 5/8	3	7/16	4	7/8	7/8
	90.0	7 1/8	7/8	5/8	5/16	3 1/4	20 3/4	1 5/8	3	3/8	4	7/8	7/8
	85.0	7 1/16	7/8	9/16	5/16	3 1/4	20 3/4	1 5/8	3	3/8	4	7/8	7/8
	79.9	7	7/8	1/2	1/4	3 1/4	20 3/4	1 5/8	3	5/16	4	7/8	7/8
B 2 20	100.0	7 1/4	15/16	7/8	7/16	3 3/16	16 1/2	1 3/4	3 1/4	1/2	4	1	7/8
	95.0	7 3/16	15/16	13/16	7/16	3 3/16	16 1/2	1 3/4	3 1/4	1/2	4	1	7/8
	90.0	7 1/8	15/16	3/4	3/8	3 3/16	16 1/2	1 3/4	3 1/4	7/16	4	1	7/8
	85.0	7 1/16	15/16	5/8	3/8	3 3/16	16 1/2	1 3/4	3 1/4	3/8	4	1	7/8
	81.4	7	15/16	5/8	5/16	3 3/16	16 1/2	1 3/4	3 1/4	3/8	4	1	7/8
B 3 20	75.0	6 3/8	13/16	5/8	3/8	2 7/8	17	1 1/2	3	7/16	4	3/4	7/8
	70.0	6 5/16	13/16	9/16	5/16	2 7/8	17	1 1/2	3	3/8	4	3/4	7/8
	65.4	6 1/4	13/16	1/2	1/4	2 7/8	17	1 1/2	3	5/16	4	3/4	7/8
B 19 18 ©	90.0	7 1/4	15/16	13/16	7/16	3 1/4	14 1/2	1 3/4	3 1/4	1/2	4	1	7/8
	85.0	7 1/8	15/16	11/16	3/8	3 1/4	14 1/2	1 3/4	3 1/4	7/16	4	1	7/8
	80.0	7 1/16	15/16	5/8	3/8	3 1/4	14 1/2	1 3/4	3 1/4	7/16	4	1	7/8
	75.6	7	15/16	9/16	5/16	3 1/4	14 1/2	1 3/4	3 1/4	3/8	4	1	7/8
B 4 18	70.0	6 1/4	11/16	11/16	3/8	2 3/4	15 1/4	1 3/8	2 3/4	7/16	3 1/2	3/4	7/8
	65.0	6 3/16	11/16	5/8	3/8	2 3/4	15 1/4	1 3/8	2 3/4	7/16	3 1/2	3/4	7/8
	60.0	6 1/8	11/16	9/16	5/16	2 3/4	15 1/4	1 3/8	2 3/4	3/8	3 1/2	3/4	7/8
	54.7	6	11/16	7/16	1/4	2 3/4	15 1/4	1 3/8	2 3/4	5/16	3 1/2	3/4	7/8
B 5 15	100.0	6 3/4	1 1/16	1 3/16	5/8	2 13/16	11	2	3 1/4	11/16	4	1	7/8
	95.0	6 11/16	1 1/16	1 1/16	9/16	2 13/16	11	2	3 1/4	5/8	4	1	7/8
	90.0	6 9/16	1 1/16	1	1/2	2 13/16	11	2	3 1/4	9/16	4	1	7/8
	85.0	6 1/2	1 1/16	7/8	7/16	2 13/16	11	2	3 1/4	1/2	4	1	7/8
	81.3	6 3/8	1 1/16	13/16	7/16	2 13/16	11	2	3 1/4	1/2	3 1/2	1	7/8
B 6 15	75.0	6 1/4	13/16	7/8	7/16	2 11/16	11 3/4	1 5/8	3	1/2	3 1/2	7/8	3/4
	70.0	6 3/16	13/16	3/4	7/16	2 11/16	11 3/4	1 5/8	3	1/2	3 1/2	7/8	3/4
	65.0	6 1/16	13/16	11/16	3/8	2 11/16	11 3/4	1 5/8	3	7/16	3 1/2	7/8	3/4
	60.8	6	13/16	9/16	5/16	2 11/16	11 3/4	1 5/8	3	3/8	3 1/2	7/8	3/4
B 7 15	55.0	5 3/4	5/8	5/8	3/8	2 9/16	12 1/2	1 1/4	2 3/4	7/16	3 1/2	5/8	3/4
	50.0	5 5/8	5/8	9/16	5/16	2 9/16	12 1/2	1 1/4	2 3/4	3/8	3 1/2	5/8	3/4
	45.0	5 9/16	5/8	1/2	1/4	2 9/16	12 1/2	1 1/4	2 3/4	5/16	3 1/2	5/8	3/4
	42.9	5 1/2	5/8	7/16	1/4	2 9/16	12 1/2	1 1/4	2 3/4	5/16	3 1/2	5/8	3/4

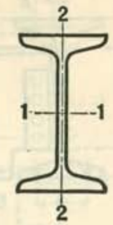
© Carnegie Steel Company only.

ELEMENTS

BEAMS

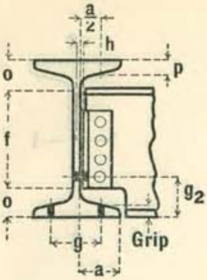
1931

AMERICAN STANDARD



ELEMENTS OF SECTIONS

Section Index and Nominal Size	Depth of Beam	Weight per Foot	Area of Section	Width of Flange	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	In.²	In.	In.	In.⁴	In.³	In.	In.⁴	In.³	In.
B 8 12x5¼	12	55.0	16.04	5.600	.810	319.3	53.2	4.46	17.3	6.2	1.04
		50.0	14.57	5.477	.687	301.6	50.3	4.55	16.0	5.8	1.05
		45.0	13.10	5.355	.565	284.1	47.3	4.66	14.8	5.5	1.06
		40.8	11.84	5.250	.460	268.9	44.8	4.77	13.8	5.3	1.08
B 9 12 x 5	12	35.0	10.20	5.078	.428	227.0	37.8	4.72	10.0	3.9	0.99
		31.8	9.26	5.000	.350	215.8	36.0	4.83	9.5	3.8	1.01
B 10 10 x 4⅝	10	40.0	11.69	5.091	.741	158.0	31.6	3.68	9.4	3.7	0.90
		35.0	10.22	4.944	.594	145.8	29.2	3.78	8.5	3.4	0.91
		30.0	8.75	4.797	.447	133.5	26.7	3.91	7.6	3.2	0.93
		25.4	7.38	4.660	.310	122.1	24.4	4.07	6.9	3.0	0.97
B 11 9 x 4⅜	9	35.0	10.22	4.764	.724	111.3	24.7	3.30	7.3	3.0	0.84
		30.0	8.76	4.601	.561	101.4	22.5	3.40	6.4	2.8	0.85
		25.0	7.28	4.437	.397	91.4	20.3	3.54	5.6	2.5	0.88
		21.8	6.32	4.330	.290	84.9	18.9	3.67	5.2	2.4	0.90
B 12 8 x 4	8	25.5	7.43	4.262	.532	68.1	17.0	3.03	4.7	2.2	0.80
		23.0	6.71	4.171	.441	64.2	16.0	3.09	4.4	2.1	0.81
		20.5	5.97	4.079	.349	60.2	15.1	3.18	4.0	2.0	0.82
		18.4	5.34	4.000	.270	56.9	14.2	3.26	3.8	1.9	0.84
B 13 7 x 3⅝	7	20.0	5.83	3.860	.450	41.9	12.0	2.68	3.1	1.6	0.74
		17.5	5.09	3.755	.345	38.9	11.1	2.77	2.9	1.6	0.76
		15.3	4.43	3.660	.250	36.2	10.4	2.86	2.7	1.5	0.78
B 14 6 x 3⅜	6	17.25	5.02	3.565	.465	26.0	8.7	2.28	2.3	1.3	0.68
		14.75	4.29	3.443	.343	23.8	7.9	2.36	2.1	1.2	0.69
		12.5	3.61	3.330	.230	21.8	7.3	2.46	1.8	1.1	0.72
B 15 5 x 3	5	14.75	4.29	3.284	.494	15.0	6.0	1.87	1.7	1.0	0.63
		12.25	3.56	3.137	.347	13.5	5.4	1.95	1.4	0.91	0.63
		10.0	2.87	3.000	.210	12.1	4.8	2.05	1.2	0.82	0.65
B 16 4 x 2⅝	4	10.5	3.05	2.870	.400	7.1	3.5	1.52	1.0	0.70	0.57
		9.5	2.76	2.796	.326	6.7	3.3	1.56	0.91	0.65	0.58
		8.5	2.46	2.723	.253	6.3	3.2	1.60	0.83	0.61	0.58
		7.7	2.21	2.660	.190	6.0	3.0	1.64	0.77	0.58	0.59
B 17 3 x 2⅜	3	7.5	2.17	2.509	.349	2.9	1.9	1.15	0.59	0.47	0.52
		6.5	1.88	2.411	.251	2.7	1.8	1.19	0.51	0.43	0.52
		5.7	1.64	2.330	.170	2.5	1.7	1.23	0.46	0.40	0.53



BEAMS

AMERICAN STANDARD

DIMENSIONS

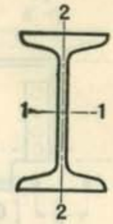
DIMENSIONS OF SECTIONS

Section Index and Depth	Weight per Foot	Flange Width	Flange Thickness	Web Thickness	Web Half Thickness +	Distance a	Distance f	Distance o	Min. g_2	Clear. h	Gage g	Grip p	Max. Flange Rivet
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
B 8 12	55.0	5 5/8	11/16	13/16	7/16	2 3/8	9 1/4	1 3/8	2 3/4	1/2	3 1/2	3/4	3/4
	50.0	5 1/2	11/16	11/16	3/8	2 3/8	9 1/4	1 3/8	2 3/4	7/16	3 1/2	3/4	3/4
	45.0	5 3/8	11/16	9/16	5/16	2 3/8	9 1/4	1 3/8	2 3/4	3/8	3	3/4	3/4
	40.8	5 1/4	11/16	7/16	1/4	2 3/8	9 1/4	1 3/8	2 3/4	5/16	3	3/4	3/4
B 9 12	35.0	5 1/16	9/16	7/16	1/4	2 5/16	9 3/4	1 1/8	2 1/2	5/16	3	9/16	3/4
	31.8	5	9/16	3/8	3/16	2 5/16	9 3/4	1 1/8	2 1/2	1/4	3	9/16	3/4
B 10 10	40.0	5 1/16	1/2	3/4	3/8	2 3/16	8	1	2 1/2	7/16	2 3/4	1/2	3/4
	35.0	4 15/16	1/2	5/8	5/16	2 3/16	8	1	2 1/2	3/8	2 3/4	1/2	3/4
	30.0	4 13/16	1/2	7/16	1/4	2 3/16	8	1	2 1/2	5/16	2 3/4	1/2	3/4
	25.4	4 11/16	1/2	5/16	3/16	2 3/16	8	1	2 1/2	1/4	2 3/4	1/2	3/4
B 11 9	35.0	4 3/4	7/16	3/4	3/8	2	7	1	2 1/2	7/16	2 1/2	1/2	3/4
	30.0	4 5/8	7/16	9/16	5/16	2	7	1	2 1/2	3/8	2 1/2	1/2	3/4
	25.0	4 7/16	7/16	3/8	1/4	2	7	1	2 1/2	5/16	2 1/2	1/2	3/4
	21.8	4 5/16	7/16	5/16	3/16	2	7	1	2 1/2	1/4	2 1/2	1/2	3/4
B 12 8	25.5	4 1/4	7/16	9/16	5/16	1 7/8	6 1/4	7/8	2 1/4	3/8	2 1/4	1/2	3/4
	23.0	4 3/16	7/16	7/16	1/4	1 7/8	6 1/4	7/8	2 1/4	5/16	2 1/4	7/16	3/4
	20.5	4 1/16	7/16	3/8	3/16	1 7/8	6 1/4	7/8	2 1/4	1/4	2 1/4	7/16	3/4
	18.4	4	7/16	1/4	3/16	1 7/8	6 1/4	7/8	2 1/4	1/4	2 1/4	7/16	3/4
B 13 7	20.0	3 7/8	3/8	7/16	1/4	1 11/16	5 1/4	7/8	2	5/16	2 1/4	3/8	5/8
	17.5	3 3/4	3/8	3/8	3/16	1 11/16	5 1/4	7/8	2	1/4	2 1/4	3/8	5/8
	15.3	3 11/16	3/8	1/4	1/8	1 11/16	5 1/4	7/8	2	3/16	2 1/4	3/8	5/8
B 14 6	17.25	3 9/16	3/8	7/16	1/4	1 9/16	4 1/2	3/4	2	5/16	2	3/8	5/8
	14.75	3 7/16	3/8	3/8	3/16	1 9/16	4 1/2	3/4	2	1/4	2	3/8	5/8
	12.5	3 5/16	3/8	1/4	1/8	1 9/16	4 1/2	3/4	2	3/16	2	3/8	5/8
B 15 5	14.75	3 5/16	5/16	1/2	1/4	1 3/8	3 1/2	3/4	2	5/16	1 3/4	3/8	1/2
	12.25	3 1/8	5/16	3/8	3/16	1 3/8	3 1/2	3/4	2	1/4	1 3/4	3/8	1/2
	10.0	3	5/16	3/16	1/8	1 3/8	3 1/2	3/4	2	3/16	1 3/4	3/8	1/2
B 16 4	10.5	2 7/8	5/16	7/16	1/4	1 1/4	2 3/4	5/8	1 3/4	5/16	1 1/2	5/16	1/2
	9.5	2 13/16	5/16	5/16	3/16	1 1/4	2 3/4	5/8	1 3/4	1/4	1 1/2	5/16	1/2
	8.5	2 3/4	5/16	1/4	3/16	1 1/4	2 3/4	5/8	1 3/4	1/4	1 1/2	5/16	1/2
	7.7	2 11/16	5/16	3/16	1/8	1 1/4	2 3/4	5/8	1 3/4	3/16	1 1/2	5/16	1/2
B 17 3	7.5	2 1/2	1/4	3/8	3/16	1 1/16	1 3/4	5/8		1/4	1 1/2	5/16	3/8
	6.5	2 7/16	1/4	1/4	3/16	1 1/16	1 3/4	5/8		1/4	1 1/2	5/16	3/8
	5.7	2 5/16	1/4	3/16	1/8	1 1/16	1 3/4	5/8		3/16	1 1/2	5/16	3/8

ELEMENTS

BEAMS

1931

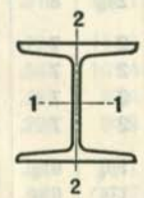


STANDARD MILL

ELEMENTS OF SECTIONS

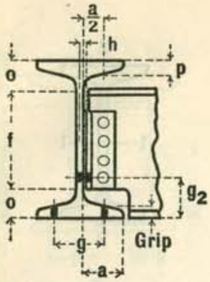
Section Index and Nominal Size	Depth of Beam	Weight per Foot	Area of Section	Width of Flange	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	In.²	In.	In.	In.⁴	In.³	In.	In.⁴	In.³	In.
B 40N 9 x 5¼ ©	9	23	6.76	5.316	.316	91.6	20.4	3.68	8.4	3.2	1.12
		20	5.88	5.218	.218	85.6	19.0	3.82	7.9	3.0	1.16
B 39N 8 x 5 ©	8	21	6.17	5.110	.360	63.4	15.9	3.21	6.6	2.6	1.03
		19	5.59	5.037	.287	60.3	15.1	3.29	6.3	2.5	1.06
		17	5.00	4.963	.213	57.2	14.3	3.38	6.0	2.4	1.09

H-BEAMS



Section Index and Nominal Size	Depth of Beam	Weight per Foot	Area of Section	Width of Flange	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	In.²	In.	In.	In.⁴	In.³	In.	In.⁴	In.³	In.
H 4 8 x 8	8	37.7	11.00	8.125	.500	120.8	30.2	3.31	36.9	9.1	1.83
		34.3	10.00	8.000	.375	115.5	28.9	3.40	35.1	8.8	1.87
		32.6	9.50	7.938	.313	112.8	28.2	3.45	34.2	8.6	1.90
H 3A 6 x 6	6	27.5	8.08	6.063	.438	49.3	16.4	2.47	16.0	5.3	1.41
		25.0	7.33	5.938	.313	47.0	15.7	2.53	14.9	5.0	1.43
H 3 6 x 6	6	22.5	6.61	6.063	.375	41.0	13.7	2.49	12.2	4.0	1.36
		20.0	5.86	5.938	.250	38.8	12.9	2.57	11.4	3.8	1.39
H 2 5 x 5 ©	5	18.9	5.47	5.000	.313	23.8	9.5	2.08	7.8	3.1	1.20
H 1 4 x 4 ©	4	13.8	3.99	4.000	.313	10.7	5.3	1.64	3.6	1.8	0.95

© Carnegie Steel Company only.



BEAMS

STANDARD MILL

DIMENSIONS

DIMENSIONS OF SECTIONS

Section Index and Depth	Weight per Foot	Flange		Web		Distance			Standards for Connections				
		Width	Thickness	Thickness	Half Thickness+	a	f	o	Min. g_2	Clear. h	Gage g	Grip	Max. Flange Rivet
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
B 40N 9 ©	23	5 5/16	3/8	5/16	3/16	2 1/2	7 1/2	3/4	2 1/4	1/4	3	3/8	7/8
	20	5 3/16	3/8	3/16	1/8	2 1/2	7 1/2	3/4	2 1/4	3/16	3	3/8	7/8
B 39N 8 ©	21	5 1/8	5/16	3/8	3/16	2 3/8	6 5/8	11/16	2 1/4	1/4	3	5/16	3/4
	19	5 1/16	5/16	5/16	3/16	2 3/8	6 5/8	11/16	2 1/4	1/4	3	5/16	3/4
	17	5	5/16	3/16	1/8	2 3/8	6 5/8	11/16	2 1/4	3/16	3	5/16	3/4

H-BEAMS

Section Index and Depth	Weight per Foot	Flange		Web		Distance			Standards for Connections			
		Width	Thickness	Thickness	Half Thickness +	a	f	o	Min. g_2	Gage g	Grip	Max. Flange Rivet
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
H 4 8	37.7	8 1/8	7/16	1/2	1/4	3 13/16	6 1/4	7/8	2 1/4	5	7/16	7/8
	34.3	8	7/16	3/8	3/16	3 13/16	6 1/4	7/8	2 1/4	5	7/16	7/8
	32.6	7 15/16	7/16	5/16	3/16	3 13/16	6 1/4	7/8	2 1/4	5	7/16	7/8
H 3A 6	27.5	6 1/16	1/2	7/16	1/4	2 13/16	4 1/4	7/8	2	3 1/2	1/2	7/8
	25.0	5 15/16	1/2	5/16	3/16	2 13/16	4 1/4	7/8	2	3 1/2	1/2	7/8
H 3 6	22.5	6 1/16	3/8	3/8	3/16	2 7/8	4 7/16	3/4	2	3 1/2	3/8	7/8
	20.0	5 15/16	3/8	1/4	1/8	2 7/8	4 7/16	3/4	2	3 1/2	3/8	7/8
H 2 5 ©	18.9	5	7/16	5/16	3/16	2 3/8	3 3/8	13/16	2	2 3/4	7/16	3/4
H 1 4 ©	13.8	4	3/8	5/16	3/16	1 7/8	2 1/2	3/4	1 3/4	2 1/4	3/8	5/8

© Carnegie Steel Company only.

ELEMENTS

BEAMS

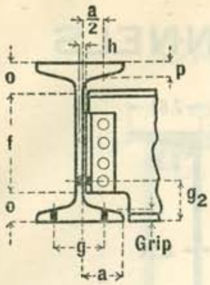
(13)

ILLINOIS - SPECIAL LIGHT

ELEMENTS OF SECTIONS

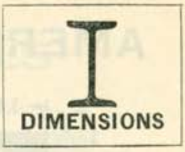
Section Index and Nominal Size	Depth of Section	Weight per Foot	Area of Section	Flange Width	Flange Thickness	Web Thickness	Axis 1-1 I	Axis 1-1 S	Axis 1-1 r	Axis 2-2 I	Axis 2-2 S	Axis 2-2 r
	In.	Lbs.	In.²	In.	In.	In.	In.⁴	In.³	In.	In.⁴	In.³	In.
B 20 24 x 7 Φ	24	71.0	20.88	7.00	.685	.480	1815.0	151.2	9.32	34.0	9.7	1.26
B 21 21 x 7 Φ	21	75.0	22.05	7.00	.820	.520	1524.0	145.1	8.32	41.9	12.0	1.38
B 22 21 x 6½ Φ	21	58.0	16.90	6.50	.620	.430	1143.0	108.8	8.22	24.5	7.5	1.20
B 23 18 x 6 Φ	18	46.0	13.34	6.00	.555	.380	675.7	75.1	7.12	17.1	5.7	1.13
B 24 15 x 5½ Φ	15	35.0	10.22	5.50	.490	.330	367.9	49.0	6.00	11.6	4.2	1.06
B 25 12 x 5 Φ	12	25.0	7.35	5.00	.420	.270	175.5	29.2	4.89	7.3	2.9	1.00
B 26 10 x 5 Φ	10	22.0	6.42	5.00	.400	.250	110.3	22.1	4.15	6.9	2.8	1.03

Φ Illinois Steel Company only.



BEAMS

ILLINOIS - SPECIAL LIGHT

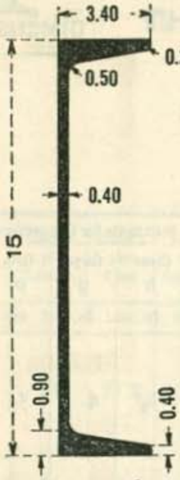


DIMENSIONS OF SECTIONS

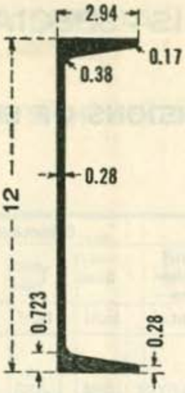
Section Index and Depth	Weight per Foot	Flange Width	Flange Thickness	Web Thickness	Web Half Thickness +	Distance a	Distance f	Distance o	Standards for Connections Min. g_2	Clear h	Gage g	Grip p	Max. Flange Rivet
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
B 20 24 Φ	71.0	7	11/16	1/2	1/4	3 1/4	19 1/4	2 3/8	3 5/8	5/16	4	11/16	7/8
B 21 21 Φ	75.0	7	13/16	1/2	5/16	3 1/4	15 3/4	2 5/8	3 7/8	3/8	4	13/16	7/8
B 22 21 Φ	58.0	6 1/2	5/8	7/16	1/4	3 1/16	16 3/4	2 1/8	3 3/8	5/16	4	9/16	7/8
B 23 18 Φ	46.0	6	9/16	3/8	1/4	2 13/16	14 1/4	1 7/8	3 1/8	5/16	3 1/2	9/16	3/4
B 24 15 Φ	35.0	5 1/2	1/2	5/16	3/16	2 9/16	11 3/4	1 5/8	2 15/16	1/4	3 1/2	7/16	3/4
B 25 12 Φ	25.0	5	7/16	1/4	3/16	2 3/8	9 1/4	1 3/8	2 11/16	1/4	3	3/8	3/4
B 26 10 Φ	22.0	5	3/8	1/4	1/8	2 3/8	7 1/4	1 3/8	2 9/16	3/16	3	3/8	3/4

Φ Illinois Steel Company only.

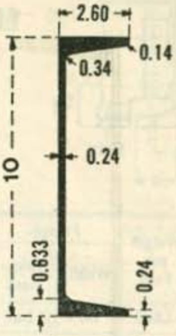
AMERICAN STANDARD CHANNELS



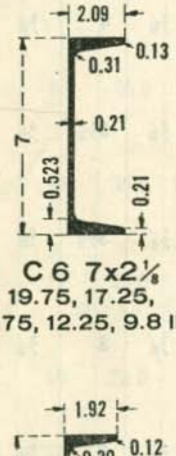
C 1 15x3⅜
55, 50, 45,
40, 35, 33.9 lbs.



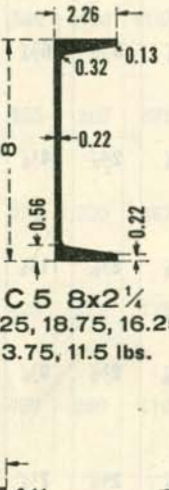
C 2 12x3
40, 35, 30, 25, 20.7 lbs.



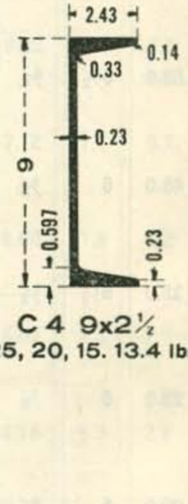
C 3 10x2⅝
35, 30, 25, 20, 15.3 lbs.



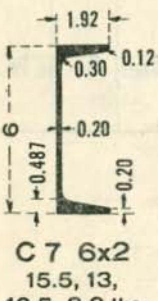
C 6 7x2⅛
19.75, 17.25,
14.75, 12.25, 9.8 lbs.



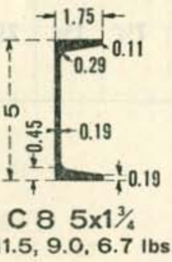
C 5 8x2¼
21.25, 18.75, 16.25,
13.75, 11.5 lbs.



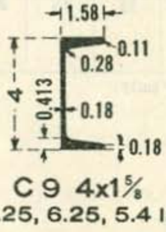
C 4 9x2½
25, 20, 15. 13.4 lbs.



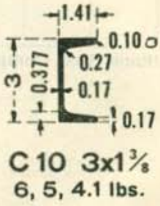
C 7 6x2
15.5, 13,
10.5, 8.2 lbs.



C 8 5x1¾
11.5, 9.0, 6.7 lbs.



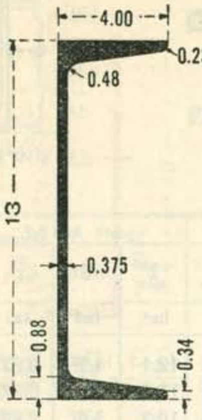
C 9 4x1⅝
7.25, 6.25, 5.4 lbs.



C 10 3x1⅜
6, 5, 4.1 lbs.

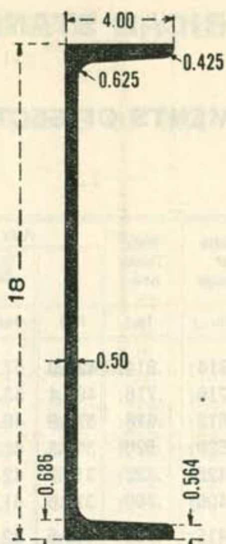
DIAGRAMS SHOWING MINIMUM DIMENSIONS IN INCHES
RANGE OF WEIGHTS PER LINEAR FOOT

CAR BUILDING CHANNELS



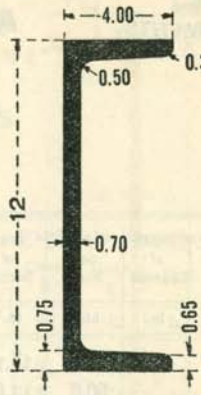
C 20 13x4

50, 45, 40,
37, 35, 31.8 lbs.



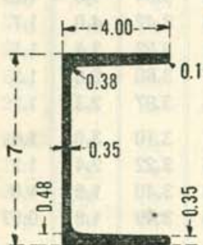
C 60 18x4

58, 51.9, 45.8, 42.7 lbs.



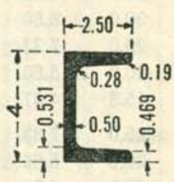
C 170 12x4

50, 48.6, 46.6,
44.5, 40, 35 lbs.



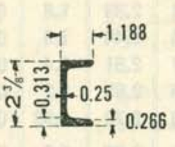
C 211 7x4

18.8 lbs.



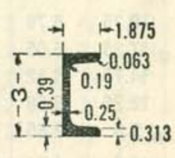
C 200 4x2½

13.8 lbs.



C 221 2⅜x1¼

3.87 lbs.



C 192 3x1⅞

10.3, 9, 7.1, 6.5, 5.8 lbs.

DIAGRAMS SHOWING DIMENSIONS IN INCHES
RANGE OF WEIGHTS PER LINEAR FOOT

NOTE:—WEIGHTS UNDERLINED THUS 31.8 CORRESPOND TO DIMENSIONS SHOWN

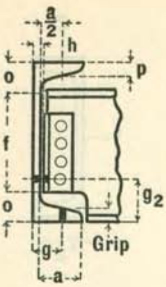
ELEMENTS

CHANNELS

AMERICAN STANDARD

ELEMENTS OF SECTIONS

Section Index and Nominal Size	Depth of Channel	Weight per Foot	Area of Section	Width of Flange	Web Thickness	Axis 1-1			Axis 2-2			
						I	S	r	I	S	r	y
	In.	Lbs.	$In.^2$	In.	In.	$In.^4$	$In.^3$	In.	$In.^4$	$In.^3$	In.	In.
C 1 15 x 3⅜	15	55.0	16.11	3.814	.814	429.0	57.2	5.16	12.1	4.1	0.87	0.82
		50.0	14.64	3.716	.716	401.4	53.6	5.24	11.2	3.8	0.87	0.80
		45.0	13.17	3.618	.618	373.9	49.8	5.33	10.3	3.6	0.88	0.79
		40.0	11.70	3.520	.520	346.3	46.2	5.44	9.3	3.4	0.89	0.78
		35.0	10.23	3.422	.422	318.7	42.5	5.58	8.4	3.2	0.91	0.79
		33.9	9.90	3.400	.400	312.6	41.7	5.62	8.2	3.2	0.91	0.79
C 2 12 x 3	12	40.0	11.73	3.415	.755	196.5	32.8	4.09	6.6	2.5	0.75	0.72
		35.0	10.26	3.292	.632	178.8	29.8	4.18	5.9	2.3	0.76	0.69
		30.0	8.79	3.170	.510	161.2	26.9	4.28	5.2	2.1	0.77	0.68
		25.0	7.32	3.047	.387	143.5	23.9	4.43	4.5	1.9	0.79	0.68
		20.7	6.03	2.940	.280	128.1	21.4	4.61	3.9	1.7	0.81	0.70
C 3 10 x 2⅝	10	35.0	10.27	3.180	.820	115.2	23.0	3.34	4.6	1.9	0.67	0.69
		30.0	8.80	3.033	.673	103.0	20.6	3.42	4.0	1.7	0.67	0.65
		25.0	7.33	2.886	.526	90.7	18.1	3.52	3.4	1.5	0.68	0.62
		20.0	5.86	2.739	.379	78.5	15.7	3.66	2.8	1.3	0.70	0.61
		15.3	4.47	2.600	.240	66.9	13.4	3.87	2.3	1.2	0.72	0.64
C 4 9 x 2½	9	25.0	7.33	2.812	.612	70.5	15.7	3.10	3.0	1.4	0.64	0.61
		20.0	5.86	2.648	.448	60.6	13.5	3.22	2.4	1.2	0.65	0.59
		15.0	4.39	2.485	.285	50.7	11.3	3.40	1.9	1.0	0.67	0.59
		13.4	3.89	2.430	.230	47.3	10.5	3.49	1.8	0.97	0.67	0.61
C 5 8 x 2¼	8	21.25	6.23	2.619	.579	47.6	11.9	2.77	2.2	1.1	0.60	0.59
		18.75	5.49	2.527	.487	43.7	10.9	2.82	2.0	1.0	0.60	0.57
		16.25	4.76	2.435	.395	39.8	9.9	2.89	1.8	0.94	0.61	0.56
		13.75	4.02	2.343	.303	35.8	9.0	2.99	1.5	0.86	0.62	0.56
		11.5	3.36	2.260	.220	32.3	8.1	3.10	1.3	0.79	0.63	0.58
C 6 7 x 2	7	19.75	5.79	2.509	.629	33.1	9.4	2.39	1.8	0.96	0.56	0.58
		17.25	5.05	2.404	.524	30.1	8.6	2.44	1.6	0.86	0.56	0.55
		14.75	4.32	2.299	.419	27.1	7.7	2.51	1.4	0.79	0.57	0.53
		12.25	3.58	2.194	.314	24.1	6.9	2.59	1.2	0.71	0.58	0.53
		9.8	2.85	2.090	.210	21.1	6.0	2.72	0.98	0.63	0.59	0.55
C 7 6 x 2	6	15.5	4.54	2.279	.559	19.5	6.5	2.07	1.3	0.73	0.53	0.55
		13.0	3.81	2.157	.437	17.3	5.8	2.13	1.1	0.65	0.53	0.52
		10.5	3.07	2.034	.314	15.1	5.0	2.22	0.87	0.57	0.53	0.50
		8.2	2.39	1.920	.200	13.0	4.3	2.34	0.70	0.50	0.54	0.52
C 8 5 x 1¾	5	11.5	3.36	2.032	.472	10.4	4.1	1.76	0.82	0.54	0.49	0.51
		9.0	2.63	1.885	.325	8.8	3.5	1.83	0.64	0.45	0.49	0.48
		6.7	1.95	1.750	.190	7.4	3.0	1.95	0.48	0.38	0.50	0.49



CHANNELS

AMERICAN STANDARD

DIMENSIONS

DIMENSIONS OF SECTIONS

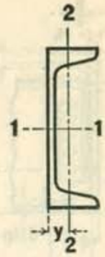
Section Index and Depth	Weight per Foot	Flange		Web		Distance			Standards for Connections				
		Width	Thick-ness	Thick-ness	Half Thick-ness +	a	f	o	Min. g_2	Clear. h	Gage g	Grip	Max. Flange Rivet
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
C 1 15	55.0	3 13/16	5/8	13/16	7/16	3	12 1/4	1 3/8	2 3/4	15/16	2 1/4	11/16	1
	50.0	3 11/16	5/8	11/16	3/8	3	12 1/4	1 3/8	2 3/4	13/16	2 1/4	11/16	1
	45.0	3 5/8	5/8	5/8	5/16	3	12 1/4	1 3/8	2 3/4	11/16	2	5/8	1
	40.0	3 1/2	5/8	1/2	5/16	3	12 1/4	1 3/8	2 3/4	5/8	2	5/8	1
	35.0	3 7/16	5/8	7/16	1/4	3	12 1/4	1 3/8	2 3/4	1/2	2	5/8	1
	33.9	3 3/8	5/8	3/8	1/4	3	12 1/4	1 3/8	2 3/4	1/2	2	5/8	1
C 2 12	40.0	3 7/16	1/2	3/4	7/16	2 11/16	10	1	2 1/2	7/8	2	5/8	7/8
	35.0	3 5/16	1/2	5/8	3/8	2 11/16	10	1	2 1/2	3/4	2	5/8	7/8
	30.0	3 3/16	1/2	1/2	5/16	2 11/16	10	1	2 1/2	5/8	1 3/4	1/2	7/8
	25.0	3 1/16	1/2	3/8	1/4	2 11/16	10	1	2 1/2	1/2	1 3/4	1/2	7/8
	20.7	2 15/16	1/2	1/4	3/16	2 11/16	10	1	2 1/2	3/8	1 3/4	1/2	7/8
C 3 10	35.0	3 3/16	7/16	13/16	7/16	2 3/8	8 1/4	7/8	2 1/2	15/16	1 3/4	1/2	3/4
	30.0	3 1/16	7/16	11/16	3/8	2 3/8	8 1/4	7/8	2 1/2	3/4	1 3/4	1/2	3/4
	25.0	2 7/8	7/16	1/2	5/16	2 3/8	8 1/4	7/8	2 1/2	5/8	1 3/4	1/2	3/4
	20.0	2 3/4	7/16	3/8	1/4	2 3/8	8 1/4	7/8	2 1/2	1/2	1 1/2	7/16	3/4
	15.3	2 5/8	7/16	1/4	1/8	2 3/8	8 1/4	7/8	2 1/2	5/16	1 1/2	7/16	3/4
C 4 9	25.0	2 13/16	7/16	5/8	5/16	2 3/16	7 1/4	7/8	2 1/2	11/16	1 1/2	1/2	3/4
	20.0	2 5/8	7/16	7/16	1/4	2 3/16	7 1/4	7/8	2 1/2	9/16	1 1/2	1/2	3/4
	15.0	2 1/2	7/16	5/16	3/16	2 3/16	7 1/4	7/8	2 1/2	3/8	1 3/8	7/16	3/4
	13.4	2 7/16	7/16	1/4	1/8	2 3/16	7 1/4	7/8	2 1/2	5/16	1 3/8	7/16	3/4
C 5 8	21.25	2 5/8	3/8	9/16	5/16	2 1/16	6 1/4	7/8	2 1/4	11/16	1 1/2	7/16	3/4
	18.75	2 1/2	3/8	1/2	1/4	2 1/16	6 1/4	7/8	2 1/4	9/16	1 1/2	7/16	3/4
	16.25	2 7/16	3/8	3/8	1/4	2 1/16	6 1/4	7/8	2 1/4	1/2	1 1/2	7/16	3/4
	13.75	2 5/16	3/8	5/16	3/16	2 1/16	6 1/4	7/8	2 1/4	3/8	1 3/8	3/8	3/4
	11.5	2 1/4	3/8	1/4	1/8	2 1/16	6 1/4	7/8	2 1/4	5/16	1 3/8	3/8	3/4
C 6 7	19.75	2 1/2	3/8	5/8	3/8	1 7/8	5 1/2	3/4	2	3/4	1 1/2	7/16	5/8
	17.25	2 3/8	3/8	1/2	5/16	1 7/8	5 1/2	3/4	2	5/8	1 1/2	7/16	5/8
	14.75	2 5/16	3/8	7/16	1/4	1 7/8	5 1/2	3/4	2	1/2	1 1/4	7/16	5/8
	12.25	2 3/16	3/8	5/16	3/16	1 7/8	5 1/2	3/4	2	7/16	1 1/4	3/8	5/8
	9.8	2 1/16	3/8	3/16	1/8	1 7/8	5 1/2	3/4	2	5/16	1 1/4	3/8	5/8
C 7 6	15.5	2 1/4	3/8	9/16	5/16	1 3/4	4 1/2	3/4	2	5/8	1 3/8	3/8	5/8
	13.0	2 3/16	3/8	7/16	1/4	1 3/4	4 1/2	3/4	2	1/2	1 3/8	3/8	5/8
	10.5	2 1/16	3/8	5/16	3/16	1 3/4	4 1/2	3/4	2	7/16	1 1/8	3/8	5/8
	8.2	1 15/16	3/8	3/16	1/8	1 3/4	4 1/2	3/4	2	5/16	1 1/8	5/16	5/8
C 8 5	11.5	2 1/16	5/16	1/2	1/4	1 9/16	3 3/4	5/8	2	9/16	1 1/8	5/16	1/2
	9.0	1 7/8	5/16	5/16	3/16	1 9/16	3 3/4	5/8	2	7/16	1 1/8	5/16	1/2
	6.7	1 3/4	5/16	3/16	1/8	1 9/16	3 3/4	5/8	2	5/16	1 1/8	5/16	1/2

ELEMENTS

CHANNELS

AMERICAN STANDARD

ELEMENTS OF SECTIONS



Section Index and Nominal Size	Depth of Channel	Weight per Foot	Area of Section	Width of Flange	Web Thickness	Axis 1-1			Axis 2-2			
						I	S	r	I	S	r	y
	In.	Lbs.	In.^{2}	In.	In.	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.	In.
C 9 4 x 1⅝	4	7.25	2.12	1.720	.320	4.5	2.3	1.47	0.44	0.35	0.46	0.46
		6.25	1.82	1.647	.247	4.1	2.1	1.50	0.38	0.32	0.45	0.46
		5.4	1.56	1.580	.180	3.8	1.9	1.56	0.32	0.29	0.45	0.46
C 10 3 x 1½	3	6.0	1.75	1.596	.356	2.1	1.4	1.08	0.31	0.27	0.42	0.46
		5.0	1.46	1.498	.258	1.8	1.2	1.12	0.25	0.24	0.41	0.44
		4.1	1.19	1.410	1.70	1.6	1.1	1.17	0.20	0.21	0.41	0.44

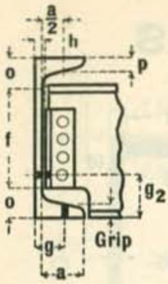
CHANNELS-CAR BUILDING

Section Index and Nominal Size	Depth of Channel	Weight per Foot	Area of Section	Width of Flange	Web Thickness	I (1-1)	S (1-1)	r (1-1)	I (2-2)	S (2-2)	r (2-2)	y
C 20 13 x 4	13	50.0	14.66	4.412	.787	312.9	48.1	4.62	16.7	4.9	1.07	0.98
		45.0	13.18	4.298	.673	292.0	44.9	4.71	15.3	4.6	1.08	0.97
		40.0	11.71	4.185	.560	271.4	41.7	4.82	13.9	4.3	1.09	0.97
		37.0	10.82	4.117	.492	258.9	39.8	4.89	13.0	4.2	1.10	0.98
		35.0	10.24	4.072	.447	250.7	38.6	4.95	12.5	4.0	1.10	0.99
		31.8	9.30	4.000	.375	237.5	36.5	5.05	11.6	3.9	1.11	1.01
C 170 12 x 4	12	50.0	14.64	4.135	.835	268.1	44.7	4.28	17.8	5.8	1.10	1.06
		48.6	14.22	4.100	.800	263.0	43.8	4.30	17.3	5.7	1.10	1.05
		46.6	13.62	4.050	.750	255.8	42.6	4.33	16.6	5.5	1.11	1.05
		44.5	**13.02**	**4.000**	**.700**	**248.6**	**41.4**	**4.37**	**16.0**	**5.4**	**1.11**	**1.05**
		40.0	11.70	3.890	.590	232.8	38.8	4.46	14.5	5.1	1.12	1.05
		35.0	10.23	3.767	.467	215.1	35.8	4.59	12.9	4.8	1.12	1.07
C 211 7 x 4	7	18.8	5.48	4.000	.350	42.9	12.2	2.80	8.3	3.0	1.23	1.23
C 200 4 x 2½ [C]	4	13.8	4.00	2.500	.500	8.8	4.4	1.49	2.2	1.4	0.74	0.86
*C 192 3 x 1⅞ [C]	3	10.3	3.02	2.250	.625	3.4	2.3	1.06	1.16	0.76	0.62	0.73
		9.0	2.64	2.125	.500	3.1	2.1	1.09	0.97	0.68	0.61	0.71
		7.1	2.08	1.938	.313	2.7	1.8	1.14	0.71	0.56	0.58	0.68
		6.5	**1.89**	**1.875**	**.250**	**2.6**	**1.7**	**1.17**	**0.63**	**0.52**	**0.58**	**0.67**
		5.8	1.68	1.805	.180	2.4	1.6	1.20	0.53	0.47	0.56	0.68
C 221 2⅜ x 1¼ [C]	2⅜	3.87	1.14	1.188	.250	0.87	0.73	0.88	0.14	0.18	0.35	0.40

Dimensions and properties of the British Standard Sections are indicated in **bold type.**

*Illinois Steel Co. 3″ Channel C 21 has same dimensions as C 192 above, except depth at web is 3″ and flanges are flared outward to measure 3⅛″ at toe of flanges.

[C] Carnegie Steel Company only.



CHANNELS

AMERICAN STANDARD

DIMENSIONS

DIMENSIONS OF SECTIONS

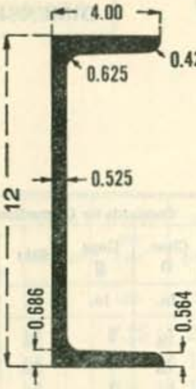
Section Index and Depth	Weight per Foot	Flange		Web		Distance			Standards for Connections				
		Width	Thickness	Thickness	Half Thickness+	a	f	o	Min. g_2	Clear. h	Gage g	Grip	Max. Flange Rivet
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
	7.25	1 3/4	5/16	5/16	3/16	1 3/8	2 3/4	5/8	1 3/4	7/16	1	5/16	1/2
C 9	6.25	1 5/8	5/16	1/4	1/8	1 3/8	2 3/4	5/8	1 3/4	5/16	1	5/16	1/2
4	5.4	1 9/16	5/16	3/16	1/8	1 3/8	2 3/4	5/8	1 3/4	1/4	1	5/16	1/2
	6.0	1 5/8	1/4	3/8	3/16	1 1/4	1 3/4	5/8	...	7/16	7/8	1/4	1/2
C 10	5.0	1 1/2	1/4	1/4	1/8	1 1/4	1 3/4	5/8	...	5/16	7/8	1/4	1/2
3	4.1	1 7/16	1/4	3/16	1/8	1 1/4	1 3/4	5/8	...	1/4	7/8	1/4	1/2

CHANNELS-CAR BUILDING

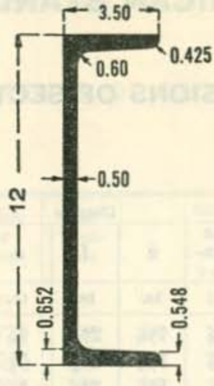
Section Index and Depth	Weight per Foot	Flange Width	Flange Thickness	Web Thickness	Web Half Thickness+	a	f	o	Min. g_2	Clear. h	Gage g	Grip	Max. Flange Rivet
	50.0	4 7/16	5/8	13/16	7/16	3 5/8	10 3/8	1 5/16	2 3/4	7/8	2 1/2	5/8	7/8
	45.0	4 5/16	5/8	11/16	3/8	3 5/8	10 3/8	1 5/16	2 3/4	3/4	2 1/2	5/8	7/8
C 20	40.0	4 3/16	5/8	9/16	5/16	3 5/8	10 3/8	1 5/16	2 3/4	5/8	2 1/2	5/8	7/8
13	37.0	4 1/8	5/8	1/2	1/4	3 5/8	10 3/8	1 5/16	2 3/4	9/16	2 1/2	9/16	7/8
	35.0	4 7/16	5/8	7/16	1/4	3 5/8	10 3/8	1 5/16	2 3/4	1/2	2 1/2	9/16	7/8
	31.8	4	5/8	3/8	3/16	3 5/8	10 3/8	1 5/16	2 3/4	7/16	2 1/2	9/16	7/8
	50.0	4 1/8	11/16	13/16	7/16	3 5/16	9 1/2	1 1/4	2 1/2	15/16	2 1/2	11/16	7/8
	48.6	4 1/8	11/16	13/16	7/16	3 5/16	9 1/2	1 1/4	2 1/2	7/8	2 1/2	11/16	7/8
C 170	46.6	4 1/16	11/16	3/4	3/8	3 5/16	9 1/2	1 1/4	2 1/2	13/16	2 1/2	11/16	7/8
12	44.5	4	11/16	11/16	3/8	3 5/16	9 1/2	1 1/4	2 1/2	13/16	2 1/2	11/16	7/8
	40.0	3 7/8	11/16	9/16	5/16	3 5/16	9 1/2	1 1/4	2 1/2	11/16	2 1/2	11/16	7/8
	35.0	3 3/4	11/16	7/16	1/4	3 5/16	9 1/2	1 1/4	2 1/2	9/16	2 1/2	11/16	7/8
C 211 7	18.8	4	7/16	3/8	3/16	3 5/8	5 1/4	7/8	2	7/16	2 1/2	7/16	7/8
C 200 4 Ⓒ	13.8	2 1/2	1/2	1/2	1/4	2	2 3/8	13/16	1 3/4	9/16	1 1/2	1/2	5/8
	10.3	2 1/4	3/8	5/8	5/16	1 5/8	1 3/4	5/8	...	11/16	1	3/8	5/8
*C 192	9.0	2 1/8	3/8	1/2	1/4	1 5/8	1 3/4	5/8	...	9/16	1	3/8	5/8
3	7.1	1 15/16	3/8	5/16	3/16	1 5/8	1 3/4	5/8	...	3/8	1	3/8	5/8
Ⓒ	6.5	1 7/8	3/8	1/4	1/8	1 5/8	1 3/4	5/8	...	5/16	1	3/8	5/8
	5.8	1 13/16	3/8	3/16	1/8	1 3/8	1 3/4	5/8	...	1/4	1	3/8	5/8
C 221 2 3/8 Ⓒ	3.9	1 3/16	5/16	1/4	1/8	15/16	1 1/8	5/8	...	5/16	3/4	5/16	3/8

Dimensions for flange thickness are the averages between dimensions of toe and root of flanges.
Dimensions f, o and h, provide working clearances.
Gages, g, are usual standard gages, but may be varied if conditions require.
Gages for outstanding legs of connection angles on channels are determined by 1/2 web thickness of channels given in tables.
*Illinois Steel Co. 3″ channel C 21 has same dimensions as C 192 above, except depth at web is 3″ and flanges are flared outward to measure 3 1/8″ at the toe of flanges.
Ⓒ Carnegie Steel Company only.

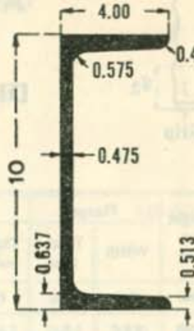
SHIP BUILDING CHANNELS



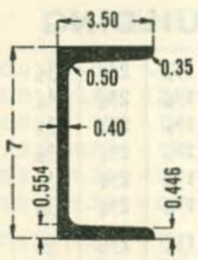
C 21 12x4
44.7, 40.6, 36.5, 34.5 lbs.



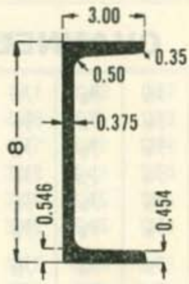
C 171 12x3½
41.1, 37.0, 32.9, 30.9 lbs.



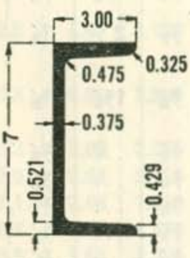
C 26 10x4
37.0, 33.6, 30.2, 28.5 lbs.



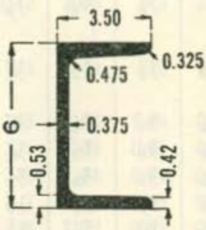
C 41 7x3½
25.0, 22.7, 20.3, 19.1 lbs.



C 37 8x3
25.5, 22.7, 20, 19.3, 18.7 lbs.



C 42 7x3
20.0, 17.6, 16.4 lbs.



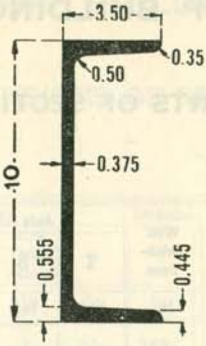
C 46 6x3½
22.0, 20.0, 18.0, 16.9 lbs.

DIAGRAMS SHOWING DIMENSIONS IN INCHES
RANGE OF WEIGHTS PER LINEAR FOOT

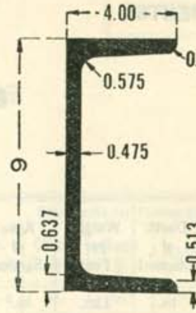
NOTE:—WEIGHTS UNDERLINED THUS 36.5 CORRESPOND TO DIMENSIONS SHOWN

SHIP BUILDING CHANNELS

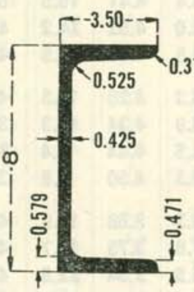
C 27 10x3½
35.1, 31.7, <u>28.3</u>,
26.6, 24.9 lbs.



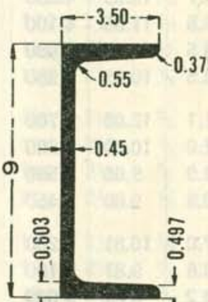
C 28 10x3½
25.3, <u>23.6</u>, 21.9 lbs.



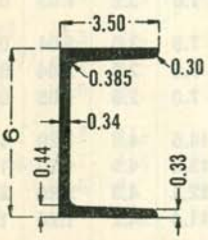
C 31 9x4
34.7, 31.7, <u>28.6</u>, 27.1 lbs.



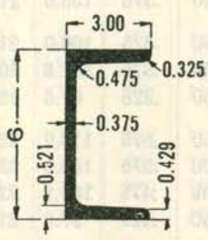
C 36 8x3½
28.2, 25.5, <u>22.8</u>, 21.4 lbs.



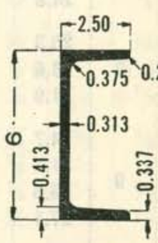
C 32 9x3½
31.6, 28.5, <u>25.4</u>, 23.9 lbs.



C 109 6x3½
<u>15.3</u> lbs.



C 47 6x3
<u>16.3</u>, 15.1 lbs.



C 48 6x2½
13.3, <u>12.0</u> lbs.

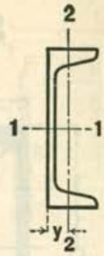
DIAGRAMS SHOWING DIMENSIONS IN INCHES
RANGE OF WEIGHTS PER LINEAR FOOT
NOTE:—WEIGHTS UNDERLINED THUS <u>28.3</u> CORRESPOND TO DIMENSIONS SHOWN

ELEMENTS

CHANNELS

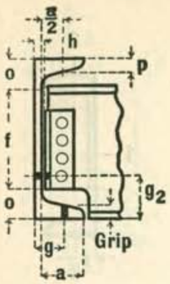
SHIP BUILDING

ELEMENTS OF SECTIONS



Section Index and Nominal Size	Depth of Channel	Weight per Foot	Area of Section	Width of Flange	Web Thickness	Axis 1-1			Axis 2-2			
						I	S	r	I	S	r	y
	In.	Lbs.	In.²	In.	In.	In.⁴	In.³	In.	In.⁴	In.³	In.	In.
C 60 18 x 4 ©	18	58.0	16.98	4.200	.700	670.7	74.5	6.29	18.5	5.6	1.04	0.88
		51.9	15.18	4.100	.600	622.1	69.1	6.40	17.1	5.3	1.06	0.87
		45.8	**13.38**	**4.000**	**.500**	**573.5**	**63.7**	**6.55**	**15.8**	**5.1**	**1.09**	**0.89**
		42.7	12.48	3.950	.450	549.2	61.0	6.64	15.0	4.9	1.10	0.90
C 21 (BSC 26) 12 x 4 ©	12	44.7	13.05	4.200	.725	245.0	40.8	4.33	16.8	5.3	1.14	1.04
		40.6	11.85	4.100	.625	230.6	38.4	4.41	15.5	5.1	1.15	1.04
		36.5	**10.65**	**4.000**	**.525**	**216.2**	**36.0**	**4.51**	**14.2**	**4.8**	**1.16**	**1.06**
		34.5	10.05	3.950	.475	209.0	34.8	4.57	13.5	4.7	1.16	1.07
C 171 (BSC 25) 12 x 3½ ©	12	41.1	12.00	3.700	.700	217.8	36.3	4.26	11.3	4.0	0.97	0.89
		37.0	10.80	3.600	.600	203.4	33.9	4.34	10.3	3.8	0.98	0.89
		32.9	**9.60**	**3.500**	**.500**	**189.0**	**31.5**	**4.44**	**9.4**	**3.6**	**0.99**	**0.89**
		30.9	9.00	3.450	.450	181.8	30.3	4.50	8.9	3.5	0.99	0.90
C 26 (BSC 21) 10 x 4 ©	10	37.0	10.81	4.200	.675	146.3	29.3	3.68	14.9	4.8	1.18	1.10
		33.6	9.81	4.100	.575	138.0	27.6	3.75	13.7	4.6	1.18	1.11
		30.2	**8.81**	**4.000**	**.475**	**129.7**	**25.9**	**3.84**	**12.5**	**4.3**	**1.19**	**1.13**
		28.5	8.31	3.950	.425	125.5	25.1	3.89	11.8	4.2	1.19	1.15
C 27 (BSC 20) 10 x 3½ ©	10	35.1	10.23	3.700	.675	133.6	26.7	3.61	10.4	3.8	1.01	0.95
		31.7	9.23	3.600	.575	125.2	25.0	3.69	9.5	3.6	1.01	0.95
		28.3	**8.23**	**3.500**	**.475**	**116.9**	**23.4**	**3.77**	**8.6**	**3.4**	**1.02**	**0.96**
		26.6	7.73	3.450	.425	112.7	22.5	3.82	8.1	3.3	1.02	0.97
		24.9	7.23	3.400	.375	108.6	21.7	3.88	7.6	3.2	1.03	0.98
C 28 (BSC 19) 10 x 3½ ©	10	25.3	7.38	3.550	.425	106.0	21.2	3.79	7.9	3.0	1.04	0.94
		23.6	**6.88**	**3.500**	**.375**	**101.8**	**20.4**	**3.85**	**7.5**	**2.9**	**1.04**	**0.96**
		21.9	6.38	3.450	.325	97.6	19.5	3.91	7.0	2.8	1.05	0.98
C 31 (BSC 18) 9 x 4 ©	9	34.7	10.13	4.200	.675	113.0	25.1	3.34	14.5	4.8	1.20	1.15
		31.7	9.23	4.100	.575	106.9	23.8	3.40	13.3	4.5	1.20	1.16
		28.6	**8.33**	**4.000**	**.475**	**100.9**	**22.4**	**3.48**	**12.1**	**4.3**	**1.20**	**1.18**
		27.1	7.88	3.950	.425	97.8	21.7	3.52	11.4	4.2	1.20	1.20
C 32 (BSC 17) 9 x 3½ ©	9	31.6	9.21	3.700	.650	99.4	22.1	3.29	9.7	3.6	1.03	0.98
		28.5	8.31	3.600	.550	93.4	20.7	3.35	8.8	3.4	1.03	0.98
		25.4	**7.41**	**3.500**	**.450**	**87.3**	**19.4**	**3.43**	**8.0**	**3.2**	**1.04**	**1.00**
		23.9	6.96	3.450	.400	84.3	18.7	3.48	7.5	3.1	1.04	1.01

Dimensions and properties of the British Standard Sections are indicated in **bold type**.
© Carnegie Steel Company only.



CHANNELS

SHIP BUILDING

DIMENSIONS

DIMENSIONS OF SECTIONS

Section Index and Depth	Weight per Foot	Flange		Web		Distance			Standards for Connections				
		Width	Thickness	Thickness	Half Thickness+	a	f	o	Min. g_2	Clear. h	Gage g	Grip	Max. Flange Rivet
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
C 60	58.0	4 3/16	5/8	11/16	3/8	3 1/2	15 3/8	1 5/16	2 3/4	13/16	2 1/2	5/8	1
18	51.9	4 1/8	5/8	5/8	5/16	3 1/2	15 3/8	1 5/16	2 3/4	11/16	2 1/2	5/8	1
[C]	45.8	4	5/8	1/2	1/4	3 1/2	15 3/8	1 5/16	2 3/4	9/16	2 1/2	5/8	1
	42.7	3 15/16	5/8	7/16	1/4	3 1/2	15 3/8	1 5/16	2 3/4	9/16	2 1/2	5/8	1
C 21	44.7	4 3/16	5/8	3/4	3/8	3 1/2	9 3/8	1 5/16	2 1/2	13/16	2 1/2	5/8	1
(BSC 26)	40.6	4 1/8	5/8	5/8	5/16	3 1/2	9 3/8	1 5/16	2 1/2	11/16	2 1/2	5/8	1
12	36.5	4	5/8	1/2	5/16	3 1/2	9 3/8	1 5/16	2 1/2	5/8	2 1/2	5/8	1
[C]	34.5	3 15/16	5/8	1/2	1/4	3 1/2	9 3/8	1 5/16	2 1/2	9/16	2 1/2	5/8	1
C 171	41.1	3 11/16	5/8	11/16	3/8	3	9 1/2	1 1/4	2 1/2	13/16	2	5/8	7/8
(BSC 25)	37.0	3 5/8	5/8	5/8	5/16	3	9 1/2	1 1/4	2 1/2	11/16	2	5/8	7/8
12	32.9	3 1/2	5/8	1/2	1/4	3	9 1/2	1 1/4	2 1/2	9/16	2	5/8	7/8
[C]	30.9	3 7/16	5/8	7/16	1/4	3	9 1/2	1 1/4	2 1/2	9/16	2	5/8	7/8
C 26	37.0	4 3/16	9/16	11/16	3/8	3 1/2	7 1/2	1 1/4	2 1/2	3/4	2 1/2	9/16	7/8
(BSC 21)	33.6	4 1/8	9/16	9/16	5/16	3 1/2	7 1/2	1 1/4	2 1/2	11/16	2 1/2	9/16	7/8
10	30.2	4	9/16	1/2	1/4	3 1/2	7 1/2	1 1/4	2 1/2	9/16	2 1/2	9/16	7/8
[C]	28.5	3 15/16	9/16	7/16	1/4	3 1/2	7 1/2	1 1/4	2 1/2	1/2	2 1/2	9/16	7/8
	35.1	3 11/16	9/16	11/16	3/8	3	7 5/8	1 3/16	2 1/2	3/4	2	9/16	7/8
C 27	31.7	3 5/8	9/16	9/16	5/16	3	7 5/8	1 3/16	2 1/2	11/16	2	9/16	7/8
(BSC 20)	28.3	3 1/2	9/16	1/2	1/4	3	7 5/8	1 3/16	2 1/2	9/16	2	9/16	7/8
10	26.6	3 7/16	9/16	7/16	1/4	3	7 5/8	1 3/16	2 1/2	1/2	2	9/16	7/8
[C]	24.9	3 3/8	9/16	3/8	3/16	3	7 5/8	1 3/16	2 1/2	7/16	2	9/16	7/8
C 28	25.3	3 9/16	1/2	7/16	1/4	3 1/8	7 7/8	1 1/16	2 1/2	1/2	2	1/2	7/8
(BSC 19)	23.6	3 1/2	1/2	3/8	3/16	3 1/8	7 7/8	1 1/16	2 1/2	7/16	2	1/2	7/8
10	21.9	3 7/16	1/2	5/16	3/16	3 1/8	7 7/8	1 1/16	2 1/2	7/16	2	1/2	7/8
[C]													
C 31	34.7	4 3/16	9/16	11/16	3/8	3 1/2	6 1/2	1 1/4	2 1/2	3/4	2 1/2	9/16	7/8
(BSC 18)	31.7	4 1/8	9/16	9/16	5/16	3 1/2	6 1/2	1 1/4	2 1/2	11/16	2 1/2	9/16	7/8
9	28.6	4	9/16	1/2	1/4	3 1/2	6 1/2	1 1/4	2 1/2	9/16	2 1/2	9/16	7/8
[C]	27.1	3 15/16	9/16	7/16	1/4	3 1/2	6 1/2	1 1/4	2 1/2	1/2	2 1/2	9/16	7/8
C 32	31.6	3 11/16	9/16	5/8	3/8	3 1/16	6 5/8	1 3/16	2 1/2	3/4	2	9/16	7/8
(BSC 17)	28.5	3 5/8	9/16	9/16	5/16	3 1/16	6 5/8	1 3/16	2 1/2	5/8	2	9/16	7/8
9	25.4	3 1/2	9/16	7/16	1/4	3 1/16	6 5/8	1 3/16	2 1/2	9/16	2	9/16	7/8
[C]	23.9	3 7/16	9/16	3/8	1/4	3 1/16	6 5/8	1 3/16	2 1/2	1/2	2	9/16	7/8

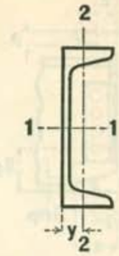
[C] Carnegie Steel Company only.

ELEMENTS

CHANNELS

SHIP BUILDING

ELEMENTS OF SECTIONS

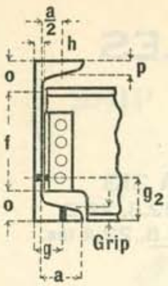


Section Index and Nominal Size	Depth of Channel	Weight per Foot	Area of Section	Width of Flange	Web Thickness	Axis 1-1			Axis 2-2			
						I	S	r	I	S	r	y
	In.	Lbs.	In.^{2}	In.	In.	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.	In.
C 36 (BSC 13) 8 x 3½ Ⓒ	8	28.2	8.23	3.700	.625	71.8	18.0	2.95	9.0	3.4	1.05	1.02
		25.5	7.43	3.600	.525	67.6	16.9	3.02	8.2	3.2	1.05	1.02
		22.8	**6.63**	**3.500**	**.425**	**63.3**	**15.8**	**3.09**	**7.4**	**3.0**	**1.05**	**1.04**
		21.4	6.23	3.450	.375	61.2	15.3	3.13	6.9	2.9	1.05	1.05
C 37 (BSC 12) 8 x 3 Ⓒ	8	25.5	7.43	3.225	.600	62.6	15.6	2.90	5.8	2.5	0.89	0.86
		22.7	6.63	3.125	.500	58.3	14.6	2.97	5.3	2.3	0.89	0.85
		20.0	5.83	3.025	.400	54.0	13.5	3.05	4.7	2.2	0.90	0.86
		19.3	**5.63**	**3.000**	**.375**	**53.0**	**13.2**	**3.07**	**4.5**	**2.1**	**0.90**	**0.87**
		18.7	5.43	2.975	.350	51.9	13.0	3.09	4.4	2.1	0.90	0.88
C 41 (BSC 10) 7 x 3½ Ⓒ	7	25.0	7.30	3.700	.600	49.9	14.3	2.62	8.3	3.2	1.07	1.06
		⏀22.7	6.60	3.600	.500	47.1	13.5	2.67	7.5	3.0	1.07	1.07
		20.3	**5.90**	**3.500**	**.400**	**44.2**	**12.6**	**2.74**	**6.7**	**2.8**	**1.07**	**1.09**
		19.1	5.55	3.450	.350	42.8	12.2	2.78	6.3	2.7	1.07	1.11
C 42 (BSC 9) 7 x 3 Ⓒ	7	20.0	5.82	3.100	.475	40.2	11.5	2.63	4.7	2.1	0.90	0.88
		17.6	**5.12**	**3.000**	**.375**	**37.3**	**10.7**	**2.70**	**4.2**	**2.0**	**0.90**	**0.90**
		16.4	4.77	2.950	.325	35.9	10.2	2.74	3.9	1.9	0.90	0.91
C 46 (BSC 8) 6 x 3½ Ⓒ	6	22.0	6.42	3.700	.575	33.0	11.0	2.27	7.6	2.9	1.09	1.12
		20.0	5.82	3.600	.475	31.2	10.4	2.32	6.9	2.8	1.09	1.13
		18.0	**5.22**	**3.500**	**.375**	**29.4**	**9.8**	**2.38**	**6.1**	**2.6**	**1.08**	**1.15**
		16.9	4.92	3.450	.325	28.5	9.5	2.41	5.7	2.5	1.08	1.17
C 109 6 x 3½ Ⓒ	6	15.3	4.48	3.500	.340	25.3	8.4	2.38	5.1	2.1	1.08	1.08
C 47 (BSC 7) 6 x 3 Ⓒ	6	**16.3**	**4.75**	**3.000**	**.375**	**25.8**	**8.6**	**2.33**	**4.0**	**1.9**	**0.91**	**0.95**
		15.1	4.37	2.938	.313	24.7	8.2	2.38	3.6	1.8	0.91	0.97
C 48 (BSC 5) 6 x 2½ Ⓒ	6	13.3	3.90	2.563	.375	19.7	6.6	2.25	2.1	1.2	0.74	0.71
		12.0	**3.52**	**2.500**	**.313**	**18.6**	**6.2**	**2.30**	**2.0**	**1.1**	**0.75**	**0.72**

Dimensions and properties of the British Standard Sections are indicated in **bold type.**

Ⓒ Carnegie Steel Company.

⏀ Illinois Steel Company 22.7 lb. weight only.



CHANNELS

SHIP BUILDING

[DIMENSIONS

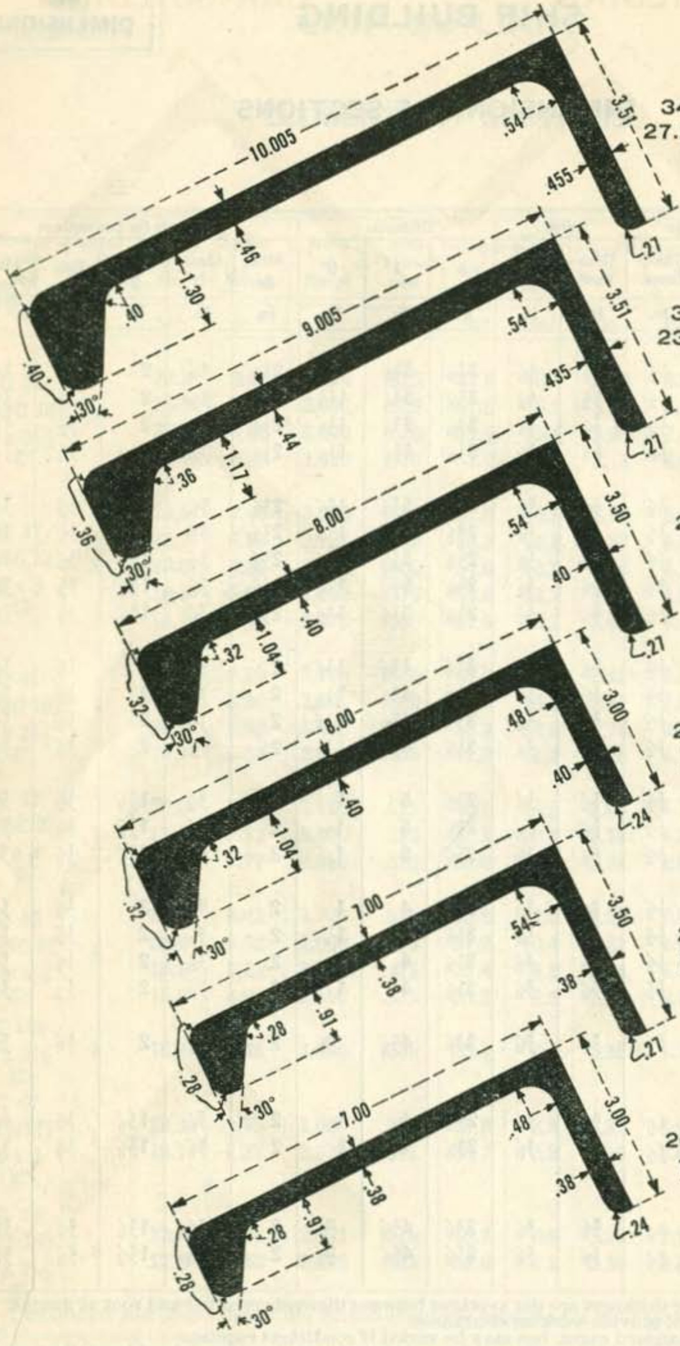
DIMENSIONS OF SECTIONS

Section Index and Depth	Weight per Foot	Flange		Web		Distance			Standards for Connections				
		Width	Thickness	Thickness	Half Thickness+	a	f	o	Min. g_2	Clear. h	Gage g	Grip	Max. Flange Rivet
	Lbs.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	
C 36 (BSC 13) 8 🄲	28.2	3 11/16	1/2	5/8	5/16	3 1/16	5 3/4	1 1/8	2 1/4	11/16	2	1/2	7/8
	25.5	3 5/8	1/2	1/2	5/16	3 1/16	5 3/4	1 1/8	2 1/4	5/8	2	1/2	7/8
	22.8	3 1/2	1/2	7/16	1/4	3 1/16	5 3/4	1 1/8	2 1/4	1/2	2	1/2	7/8
	21.4	3 7/16	1/2	3/8	3/16	3 1/16	5 3/4	1 1/8	2 1/4	7/16	2	1/2	7/8
C 37 (BSC 12) 8 🄲	25.5	3 1/4	1/2	5/8	5/16	2 5/8	5 7/8	1 1/16	2 1/4	11/16	1 3/4	1/2	7/8
	22.7	3 1/8	1/2	1/2	1/4	2 5/8	5 7/8	1 1/16	2 1/4	9/16	1 3/4	1/2	7/8
	20.0	3	1/2	3/8	1/4	2 5/8	5 7/8	1 1/16	2 1/4	1/2	1 3/4	1/2	7/8
	19.3	3	1/2	3/8	3/16	2 5/8	5 7/8	1 1/16	2 1/4	7/16	1 3/4	1/2	7/8
	18.7	3	1/2	3/8	3/16	2 5/8	5 7/8	1 1/16	2 1/4	7/16	1 3/4	1/2	7/8
C 41 (BSC 10) 7 🄲	25.0	3 11/16	1/2	5/8	5/16	3 1/8	4 7/8	1 1/16	2	11/16	2	1/2	7/8
	Φ22.7	3 5/8	1/2	1/2	1/4	3 1/8	4 7/8	1 1/16	2	9/16	2	1/2	7/8
	20.3	3 1/2	1/2	3/8	1/4	3 1/8	4 7/8	1 1/16	2	1/2	2	1/2	7/8
	19.1	3 7/16	1/2	3/8	3/16	3 1/8	4 7/8	1 1/16	2	7/16	2	1/2	7/8
C 42 (BSC 9) 7 🄲	20.0	3 1/8	1/2	1/2	1/4	2 5/8	5	1	2	9/16	1 7/8	1/2	7/8
	17.6	3	1/2	3/8	3/16	2 5/8	5	1	2	7/16	1 7/8	1/2	7/8
	16.4	2 15/16	1/2	5/16	3/16	2 5/8	5	1	2	3/8	1 7/8	1/2	7/8
C 46 (BSC 8) 6 🄲	22.0	3 11/16	1/2	9/16	5/16	3 1/8	4	1	2	11/16	2	1/2	7/8
	20.0	3 5/8	1/2	1/2	1/4	3 1/8	4	1	2	9/16	2	1/2	7/8
	18.0	3 1/2	1/2	3/8	3/16	3 1/8	4	1	2	7/16	2	1/2	7/8
	16.9	3 7/16	1/2	5/16	3/16	3 1/8	4	1	2	7/16	2	1/2	7/8
C 109 6 🄲	15.3	3 1/2	3/8	5/16	3/16	3 3/16	4 3/8	13/16	2	7/16	2	3/8	7/8
C 47 (BSC 7) 6 🄲	16.3	3	1/2	3/8	3/16	2 5/8	4	1	2	7/16	1 7/8	1/2	3/4
	15.1	2 15/16	1/2	5/16	3/16	2 5/8	4	1	2	3/8	1 7/8	1/2	3/4
C 48 (BSC 5) 6 🄲	13.3	2 9/16	3/8	3/8	3/16	2 3/16	4 3/8	13/16	2	7/16	1 1/2	3/8	5/8
	12.0	2 1/2	3/8	5/16	3/16	2 3/16	4 3/8	13/16	2	3/8	1 1/2	3/8	5/8

Dimensions for flange thickness are the averages between dimensions of toe and root of flanges.
Dimensions f, o and h, provide working clearances.
Gages, g, are usual standard gages, but may be varied if conditions require.
Gages for oustanding legs of connection angles on channels are determined by 1/2 web thickness of channels given in tables.

🄲 Carnegie Steel Company. Φ Illinois Steel Company 22.7 lb. weight only.

SHIP BUILDING BULB ANGLES



BA 313
34.7, 32.3, 29.9
27.2, 24.8, 22.4 lbs.

BA 312
30.8, 28.6, 26.4
23.8, 21.6, 19.4 lbs.

BA 311
24.3, 22.3, 20.0
18.0, 16.0 lbs.

BA 310
23.3, 21.4, 19.2
17.3, 15.4 lbs.

BA 309
21.1, 19.3, 17.1
15.3, 13.6 lbs.

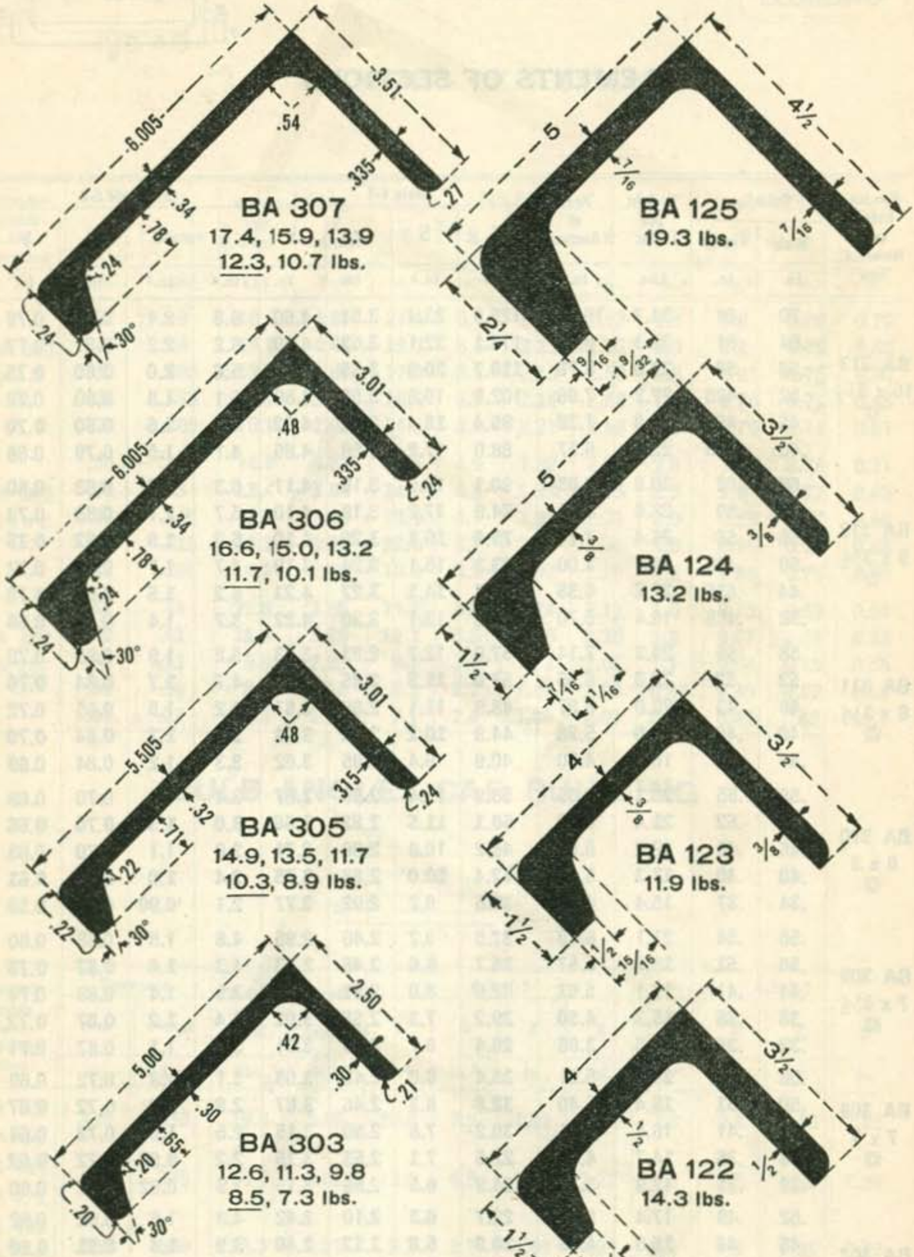
BA 308
20.2, 18.4, 16.4
14.7, 12.9 lbs.

WEIGHTS UNDERSCORED ARE SHOWN IN PROFILE

BULB ANGLES

SHIP BUILDING

CAR BUILDING



BA 307
17.4, 15.9, 13.9
<u>12.3</u>, 10.7 lbs.

BA 306
16.6, 15.0, 13.2
<u>11.7</u>, 10.1 lbs.

BA 305
14.9, 13.5, 11.7
<u>10.3</u>, 8.9 lbs.

BA 303
12.6, 11.3, 9.8
<u>8.5</u>, 7.3 lbs.

BA 125
19.3 lbs.

BA 124
13.2 lbs.

BA 123
11.9 lbs.

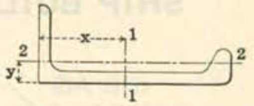
BA 122
14.3 lbs.

WEIGHTS UNDERSCORED ARE SHOWN IN PROFILE

ELEMENTS

BULB ANGLES

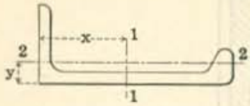
SHIP BUILDING



ELEMENTS OF SECTIONS

Section Index and Nominal Size	Thickness		Weight per Foot	Area of Section	Axis 1-1				Axis 2-2			
	Web	Flange			I	S	r	x	I	S	r	y
	In.	In.	Lbs.	In.²	In.⁴	In.³	In.	In.	In.⁴	In.³	In.	In.
BA 313 10 x 3½ ©	.70	.64	34.7	10.20	125.6	23.4	3.51	4.69	6.8	2.4	0.81	0.79
	.64	.61	32.3	9.49	118.1	22.1	3.53	4.69	6.2	2.2	0.81	0.77
	.58	.58	29.9	8.78	110.7	20.9	3.55	4.70	5.6	2.0	0.80	0.75
	.52	.485	27.2	7.98	102.9	19.6	3.59	4.80	5.1	1.8	0.80	0.72
	.46	.455	24.8	7.28	95.4	18.4	3.62	4.82	4.6	1.6	0.80	0.70
	.40	.425	22.4	6.57	88.0	17.2	3.66	4.85	4.1	1.5	0.79	0.68
BA 312 9 x 3½ ©	.68	.62	30.8	9.03	90.1	18.2	3.16	4.11	6.3	2.2	0.83	0.80
	.62	.59	28.6	8.38	84.6	17.2	3.18	4.10	5.7	2.1	0.83	0.78
	.56	.56	26.4	7.74	79.0	16.1	3.20	4.10	5.2	1.9	0.82	0.75
	.50	.465	23.8	7.00	73.3	15.1	3.24	4.19	4.7	1.7	0.82	0.72
	.44	.435	21.6	6.35	67.7	14.1	3.27	4.21	4.2	1.5	0.82	0.70
	.38	.405	19.4	5.70	62.2	13.1	3.30	4.22	3.7	1.4	0.81	0.68
BA 311 8 x 3½ ©	.58	.55	24.3	7.14	57.0	12.7	2.83	3.53	5.2	1.9	0.85	0.78
	.52	.52	22.3	6.55	53.0	11.8	2.85	3.52	4.7	1.7	0.84	0.76
	.46	.43	20.0	5.87	48.9	11.1	2.89	3.61	4.2	1.5	0.85	0.72
	.40	.40	18.0	5.28	44.9	10.2	2.92	3.61	3.7	1.3	0.84	0.70
	.34	.37	16.0	4.70	40.9	9.4	2.95	3.62	3.3	1.2	0.84	0.69
BA 310 8 x 3 ©	.58	.55	23.3	6.85	53.9	12.4	2.80	3.67	3.4	1.4	0.70	0.68
	.52	.52	21.4	6.28	50.1	11.5	2.82	3.66	3.0	1.3	0.70	0.66
	.46	.43	19.2	5.64	46.2	10.8	2.86	3.74	2.8	1.1	0.70	0.63
	.40	.40	17.3	5.07	42.4	10.0	2.89	3.75	2.4	1.0	0.69	0.61
	.34	.37	15.4	4.50	38.5	9.2	2.92	3.77	2.1	0.90	0.69	0.59
BA 309 7 x 3½ ©	.56	.54	21.1	6.19	37.5	9.2	2.46	2.95	4.8	1.8	0.88	0.80
	.50	.51	19.3	5.67	34.7	8.6	2.48	2.93	4.3	1.6	0.87	0.78
	.44	.41	17.1	5.03	32.0	8.0	2.52	3.03	3.9	1.4	0.88	0.74
	.38	.38	15.3	4.50	29.2	7.3	2.55	3.02	3.4	1.2	0.87	0.72
	.32	.35	13.6	3.98	26.4	6.7	2.58	3.01	3.0	1.1	0.87	0.71
BA 308 7 x 3 ©	.56	.54	20.2	5.91	35.4	9.0	2.45	3.08	3.1	1.3	0.72	0.69
	.50	.51	18.4	5.40	32.8	8.3	2.46	3.07	2.8	1.2	0.72	0.67
	.44	.41	16.4	4.81	30.2	7.8	2.50	3.15	2.5	1.0	0.72	0.64
	.38	.38	14.7	4.30	27.5	7.1	2.53	3.15	2.2	0.93	0.72	0.62
	.32	.35	12.9	3.79	24.9	6.5	2.56	3.15	1.9	0.82	0.71	0.60
BA 307 6 x 3½ ©	.52	.49	17.4	5.12	22.7	6.3	2.10	2.42	4.3	1.6	0.92	0.82
	.46	.46	15.9	4.65	20.8	5.8	2.12	2.40	3.9	1.4	0.91	0.80
	.40	.365	13.9	4.06	19.0	5.3	2.16	2.47	3.4	1.2	0.91	0.76
	.34	.335	12.3	3.60	17.2	4.8	2.19	2.46	3.0	1.1	0.91	0.74
	.28	.305	10.7	3.13	15.3	4.4	2.21	2.45	2.6	0.94	0.91	0.73

© Carnegie Steel Company only.



BULB ANGLES

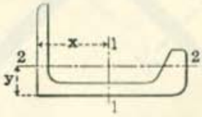
SHIP BUILDING

ELEMENTS

ELEMENTS OF SECTIONS

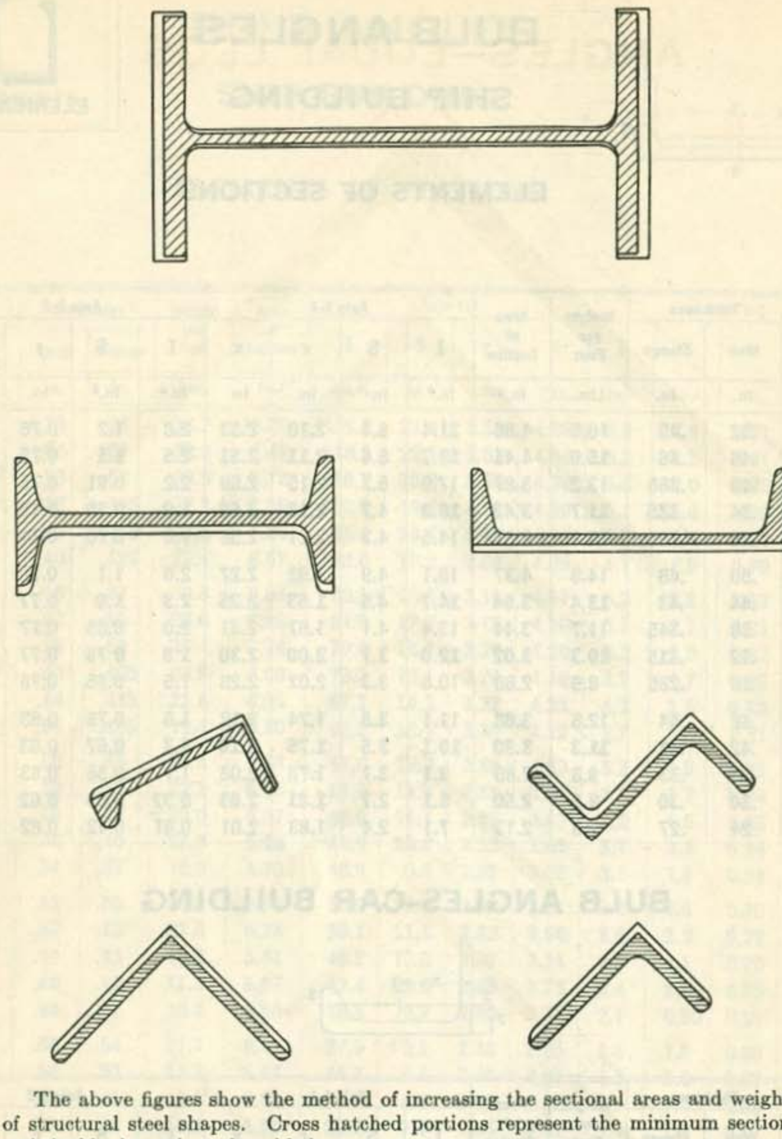
Section Index and Nominal Size	Thickness		Weight per Foot	Area of Section	Axis 1-1				Axis 2-2			
	Web	Flange			I	S	r	x	I	S	r	y
	In.	In.	Lbs.	In.^{2}	In.^{4}	In.^{3}	In.	In.	In.^{4}	In.^{3}	In.	In.
BA 306 6 x 3 [C]	.52	.49	16.6	4.86	21.4	6.1	2.10	2.53	2.8	1.2	0.76	0.70
	.46	.46	15.0	4.41	19.7	5.6	2.11	2.51	2.5	1.1	0.75	0.68
	.40	.365	13.2	3.87	17.9	5.2	2.15	2.59	2.2	0.91	0.75	0.64
	.34	.335	11.7	3.42	16.2	4.7	2.18	2.58	1.9	0.80	0.75	0.63
	.28	.305	10.1	2.97	14.5	4.3	2.21	2.58	1.6	0.70	0.74	0.61
BA 305 5½ x 3 [C]	.50	.46	14.9	4.37	16.1	4.9	1.92	2.27	2.6	1.1	0.78	0.71
	.44	.43	13.4	3.94	14.7	4.5	1.93	2.25	2.3	1.0	0.77	0.69
	.38	.345	11.7	3.44	13.4	4.1	1.97	2.31	2.0	0.85	0.77	0.65
	.32	.315	10.3	3.02	12.0	3.7	2.00	2.30	1.8	0.75	0.77	0.63
	.26	.285	8.9	2.60	10.6	3.3	2.02	2.28	1.5	0.65	0.76	0.62
BA 303 5 x 2½ [C]	.48	.44	12.6	3.68	11.1	3.8	1.74	2.12	1.5	0.75	0.63	0.61
	.42	.41	11.3	3.30	10.1	3.5	1.75	2.10	1.3	0.67	0.63	0.58
	.36	.33	9.8	2.88	9.1	3.1	1.78	2.06	1.1	0.56	0.63	0.55
	.30	.30	8.5	2.50	8.1	2.7	1.81	2.03	0.97	0.49	0.62	0.53
	.24	.27	7.3	2.13	7.1	2.4	1.83	2.01	0.81	0.42	0.62	0.51

BULB ANGLES-CAR BUILDING



Section Index and Nominal Size	Thickness		Weight per Foot	Area of Section	Axis 1-1				Axis 2-2			
	Web	Flange			I	S	r	x	I	S	r	y
	In.	In.	Lbs.	In.^{2}	In.^{4}	In.^{3}	In.	In.	In.^{4}	In.^{3}	In.	In.
BA 125 5 x 4½	.438	.438	19.3	5.66	20.8	7.9	1.91	2.39	7.9	2.4	1.18	1.23
BA 124 5 x 3½	.375	.375	13.2	3.82	13.5	4.9	1.88	2.22	3.3	1.2	0.92	0.86
BA 122 4 x 3½ [C]	.500	.500	14.3	4.21	8.7	3.7	1.44	1.65	3.9	1.5	0.96	0.99
BA 123 4 x 3½	.375	.375	11.9	3.48	7.9	3.5	1.50	1.77	3.1	1.2	0.94	0.94

[C] Carnegie Steel Company only.

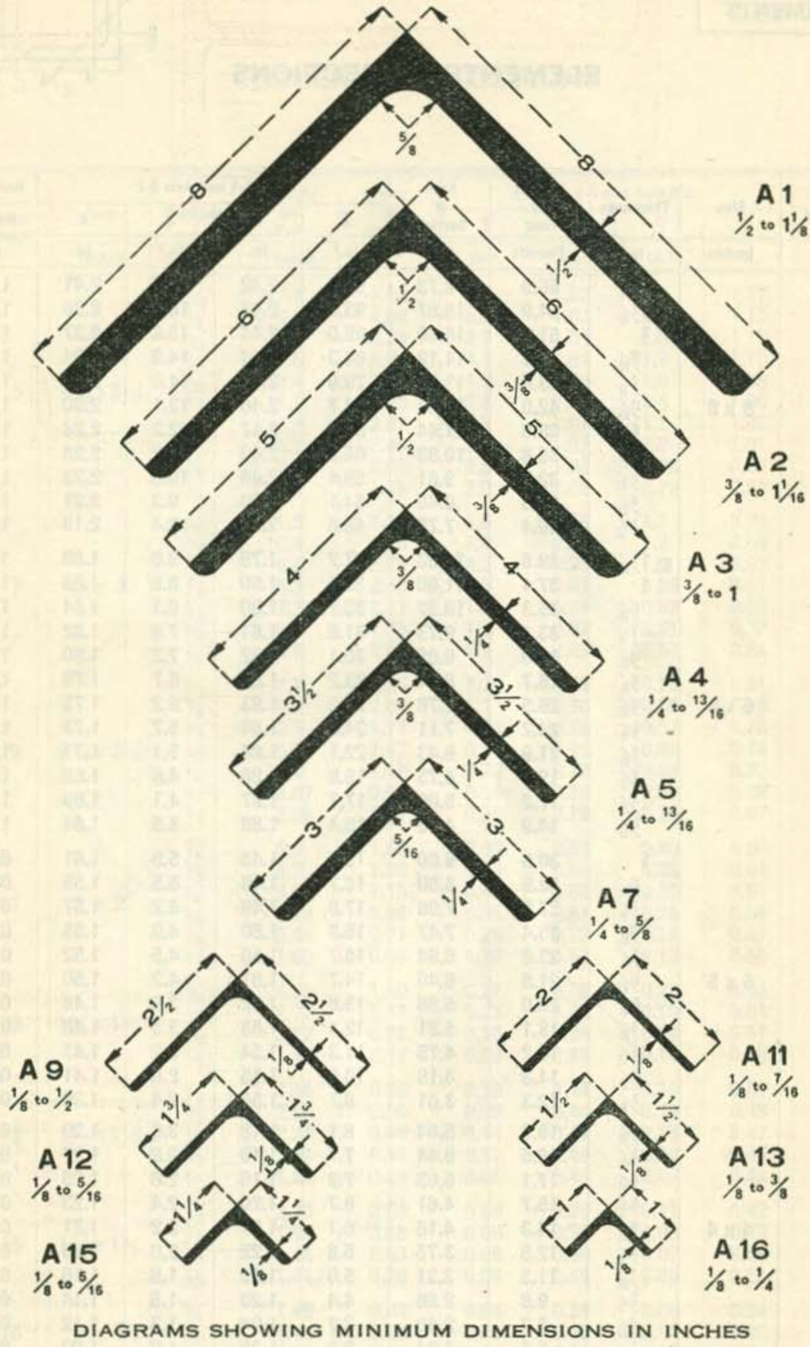


The above figures show the method of increasing the sectional areas and weights of structural steel shapes. Cross hatched portions represent the minimum sections and the blank portions the added areas.

In the case of Channels and Standard Beams the enlargement of the section adds an equal amount to the thickness of the web and the width of the flanges. In the case of CB Sections equal thicknesses of metal are added to the web thickness and flange width and proportional additions to the flange thickness. In the case of Angles and Zees, the effect of spreading the rolls is slightly to increase the length of the legs. In the case of Ship Building Bulb Angles, as a rule each increase or decrease in web thickness carries with it about one-half that increase or decrease in the flange thickness.

Inasmuch as the roll passes are modified in the wear of the rolls, the actual dimensions will not always conform to the theoretical, even in the case of the minimum weight sections. Designers and detailers of structural work should arrange for ample clearances.

ANGLES—EQUAL LEGS

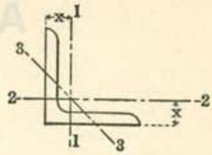


DIAGRAMS SHOWING MINIMUM DIMENSIONS IN INCHES

ELEMENTS

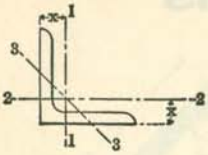
EQUAL ANGLES

ELEMENTS OF SECTIONS



Section Index	Size	Thickness	Weight per Foot	Area of Section	Axis 1-1 and Axis 2-2				Axis 3-3
					I	r	S	x	r min.
	Inches	In.	Pounds	In.^{2}	In.^{4}	In.	In.^{3}	In.	In.
		1 1/8	56.9	16.73	98.0	2.42	17.5	2.41	1.55
		1 1/16	54.0	15.87	93.5	2.43	16.7	2.39	1.56
		1	51.0	15.00	89.0	2.44	15.8	2.37	1.56
		15/16	48.1	14.12	84.3	2.44	14.9	2.34	1.56
		7/8	45.0	13.23	79.6	2.45	14.0	2.32	1.56
A 1	8 x 8	13/16	42.0	12.34	74.7	2.46	13.1	2.30	1.57
		3/4	38.9	11.44	69.7	2.47	12.2	2.28	1.57
		11/16	35.8	10.53	64.6	2.48	11.2	2.25	1.58
		5/8	32.7	9.61	59.4	2.49	10.3	2.23	1.58
		9/16	29.6	8.68	54.1	2.50	9.3	2.21	1.58
		1/2	26.4	7.75	48.6	2.51	8.4	2.19	1.58
		© 1 1/16	39.6	11.62	37.2	1.79	9.0	1.89	1.16
		1	37.4	11.00	35.5	1.80	8.6	1.86	1.16
		15/16	35.3	10.37	33.7	1.80	8.1	1.84	1.16
		7/8	33.1	9.73	31.9	1.81	7.6	1.82	1.17
		13/16	31.0	9.09	30.1	1.82	7.2	1.80	1.17
		3/4	28.7	8.44	28.2	1.83	6.7	1.78	1.17
A 2	6 x 6	11/16	26.5	7.78	26.2	1.83	6.2	1.75	1.17
		5/8	24.2	7.11	24.2	1.84	5.7	1.73	1.17
		9/16	21.9	6.43	22.1	1.85	5.1	1.71	1.18
		1/2	19.6	5.75	19.9	1.86	4.6	1.68	1.18
		7/16	17.2	5.06	17.7	1.87	4.1	1.66	1.19
		3/8	14.9	4.36	15.4	1.88	3.5	1.64	1.19
		1	30.6	9.00	19.6	1.48	5.8	1.61	0.96
		15/16	28.9	8.50	18.7	1.48	5.5	1.59	0.96
		7/8	27.2	7.98	17.8	1.49	5.2	1.57	0.96
		13/16	25.4	7.47	16.8	1.50	4.9	1.55	0.97
		3/4	23.6	6.94	15.7	1.50	4.5	1.52	0.97
A 3	5 x 5	11/16	21.8	6.40	14.7	1.51	4.2	1.50	0.97
		5/8	20.0	5.86	13.6	1.52	3.9	1.48	0.97
		9/16	18.1	5.31	12.4	1.53	3.5	1.46	0.98
		1/2	16.2	4.75	11.3	1.54	3.2	1.43	0.98
		7/16	14.3	4.18	10.0	1.55	2.8	1.41	0.98
		3/8	12.3	3.61	8.7	1.56	2.4	1.39	0.99
		13/16	19.9	5.84	8.1	1.18	3.0	1.29	0.77
		3/4	18.5	5.44	7.7	1.19	2.8	1.27	0.77
		11/16	17.1	5.03	7.2	1.19	2.6	1.25	0.77
		5/8	15.7	4.61	6.7	1.20	2.4	1.23	0.77
A 4	4 x 4	9/16	14.3	4.18	6.1	1.21	2.2	1.21	0.78
		1/2	12.8	3.75	5.6	1.22	2.0	1.18	0.78
		7/16	11.3	3.31	5.0	1.23	1.8	1.16	0.78
		3/8	9.8	2.86	4.4	1.23	1.5	1.14	0.79
		5/16	8.2	2.40	3.7	1.24	1.3	1.12	0.79
		1/4	6.6	1.94	3.0	1.25	1.0	1.09	0.79

© Carnegie Steel Company only.



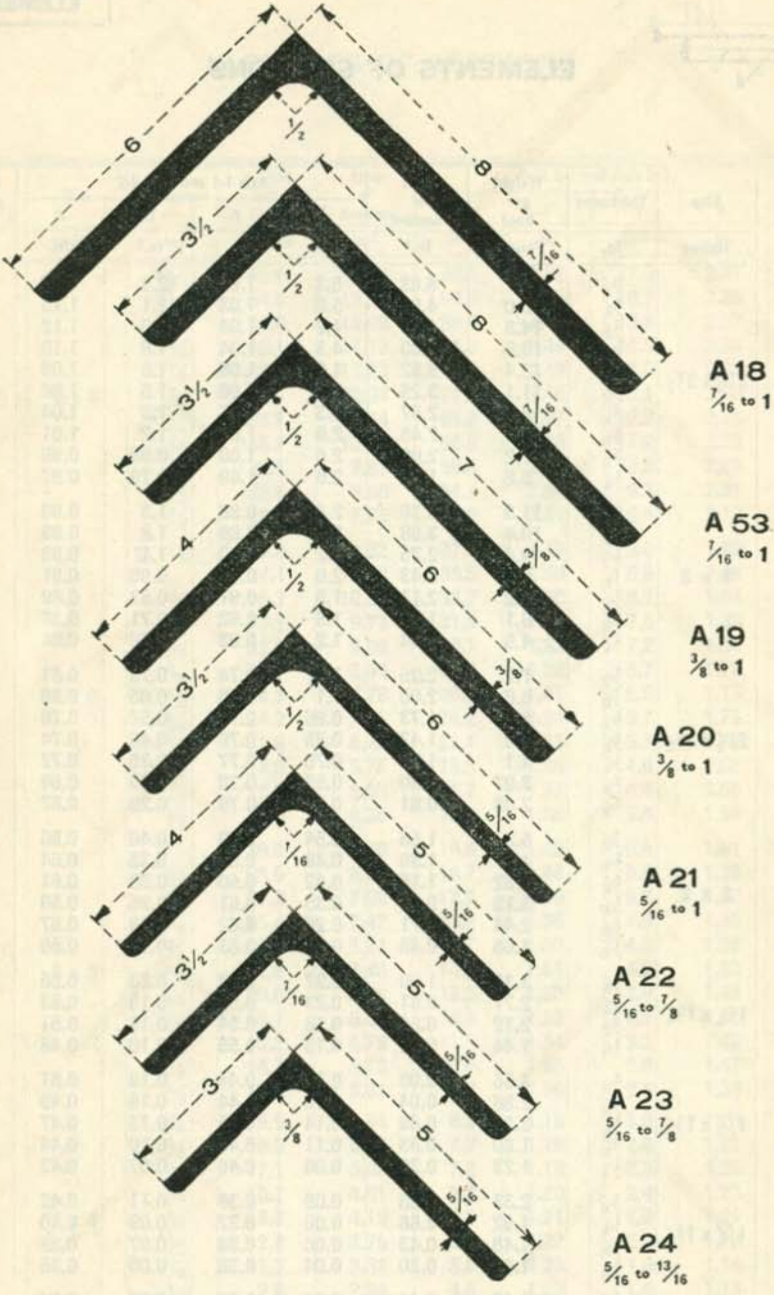
EQUAL ANGLES

L ELEMENTS

ELEMENTS OF SECTIONS

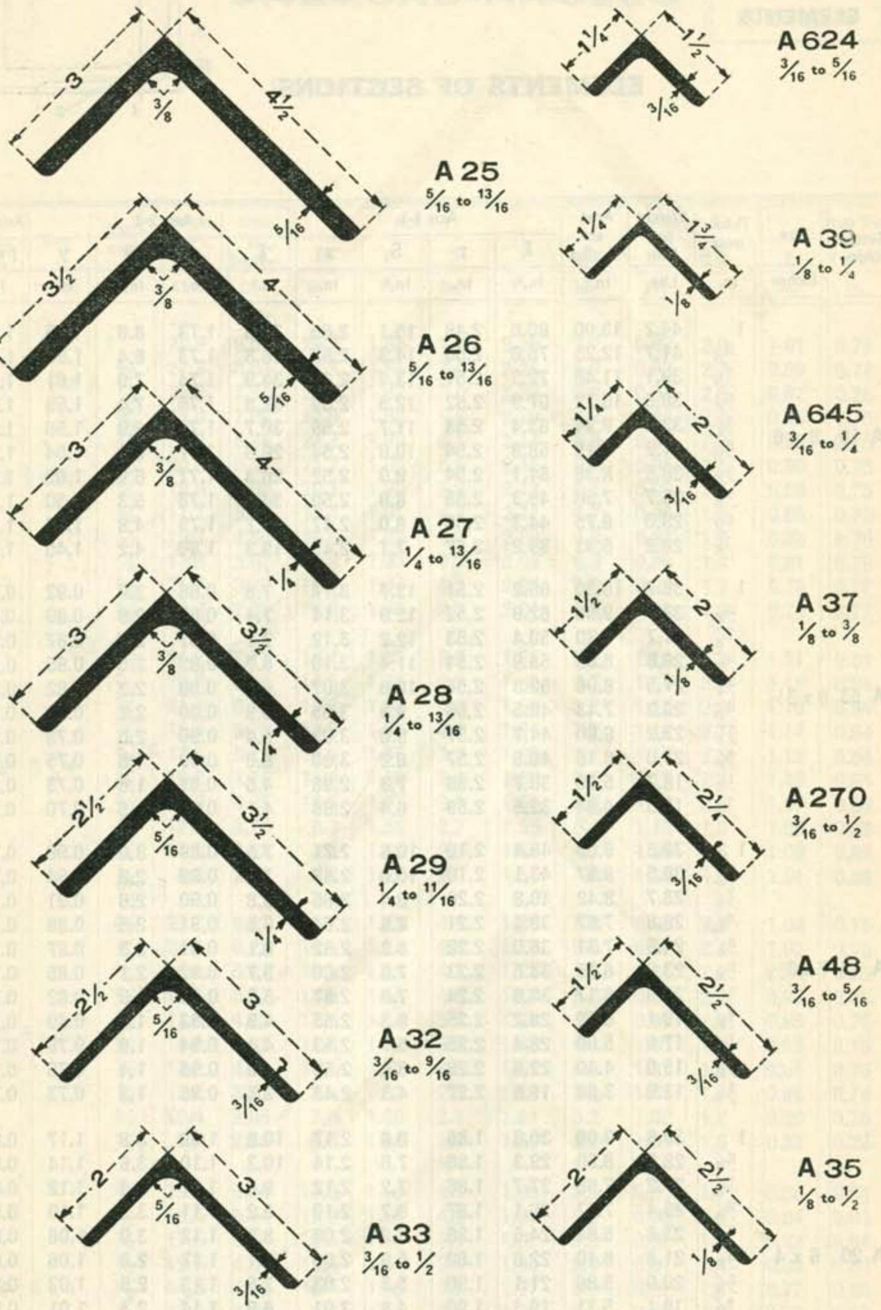
Section Index	Size	Thickness	Weight per Foot	Area of Section	Axis 1-1 and Axis 2-2 I	Axis 1-1 and Axis 2-2 r	Axis 1-1 and Axis 2-2 S	Axis 1-1 and Axis 2-2 x	Axis 3-3 r min.
	Inches	In.	Pounds	In.^{2}	In.^{4}	In.	In.^{3}	In.	In.
A 5	3½ x 3½	13/16	17.1	5.03	5.3	1.02	2.3	1.17	0.67
		3/4	16.0	4.69	5.0	1.03	2.1	1.15	0.67
		11/16	14.8	4.34	4.7	1.04	2.0	1.12	0.67
		5/8	13.6	3.98	4.3	1.04	1.8	1.10	0.68
		9/16	12.4	3.62	4.0	1.05	1.6	1.08	0.68
		1/2	11.1	3.25	3.6	1.06	1.5	1.06	0.68
		7/16	9.8	2.87	3.3	1.07	1.3	1.04	0.68
		3/8	8.5	2.48	2.9	1.07	1.2	1.01	0.69
		5/16	7.2	2.09	2.5	1.08	0.98	0.99	0.69
		1/4	5.8	1.69	2.0	1.09	0.79	0.97	0.69
A 7	3 x 3	5/8	11.5	3.36	2.6	0.88	1.3	0.98	0.57
		9/16	10.4	3.06	2.4	0.89	1.2	0.95	0.58
		1/2	9.4	2.75	2.2	0.90	1.1	0.93	0.58
		7/16	8.3	2.43	2.0	0.91	0.95	0.91	0.58
		3/8	7.2	2.11	1.8	0.91	0.83	0.89	0.58
		5/16	6.1	1.78	1.5	0.92	0.71	0.87	0.59
		1/4	4.9	1.44	1.2	0.93	0.58	0.84	0.59
A 9	2½ x 2½	1/2	7.7	2.25	1.2	0.74	0.73	0.81	0.47
		7/16	6.8	2.00	1.1	0.75	0.65	0.78	0.48
		3/8	5.9	1.73	0.98	0.75	0.57	0.76	0.48
		5/16	5.0	1.47	0.85	0.76	0.48	0.74	0.49
		1/4	4.1	1.19	0.70	0.77	0.39	0.72	0.49
		3/16	3.07	0.90	0.55	0.78	0.30	0.69	0.49
		1/8	2.08	0.61	0.38	0.79	0.20	0.67	0.50
A 11	2 x 2	7/16	5.3	1.56	0.54	0.59	0.40	0.66	0.39
		3/8	4.7	1.36	0.48	0.59	0.35	0.64	0.39
		5/16	3.92	1.15	0.42	0.60	0.30	0.61	0.39
		1/4	3.19	0.94	0.35	0.61	0.25	0.59	0.39
		3/16	2.44	0.71	0.28	0.62	0.19	0.57	0.40
		1/8	1.65	0.48	0.19	0.63	0.13	0.55	0.40
A 12	1¾ x 1¾	5/16	3.39	1.00	0.27	0.52	0.23	0.55	0.34
		1/4	2.77	0.81	0.23	0.53	0.19	0.53	0.34
		3/16	2.12	0.62	0.18	0.54	0.14	0.51	0.35
		1/8	1.44	0.42	0.13	0.55	0.10	0.48	0.35
A 13	1½ x 1½	3/8	3.35	0.98	0.19	0.44	0.19	0.51	0.29
		5/16	2.86	0.84	0.16	0.44	0.16	0.49	0.29
		1/4	2.34	0.69	0.14	0.45	0.13	0.47	0.29
		3/16	1.80	0.53	0.11	0.46	0.10	0.44	0.29
		1/8	1.23	0.36	0.08	0.46	0.07	0.42	0.30
A 15	1¼ x 1¼	5/16	2.33	0.68	0.09	0.36	0.11	0.42	0.24
		1/4	1.92	0.56	0.08	0.37	0.09	0.40	0.24
		3/16	1.48	0.43	0.06	0.38	0.07	0.38	0.24
		1/8	1.01	0.30	0.04	0.38	0.05	0.35	0.25
A 16	1 x 1	1/4	1.49	0.44	0.04	0.29	0.06	0.34	0.19
		3/16	1.16	0.34	0.03	0.30	0.04	0.32	0.19
		1/8	0.80	0.23	0.02	0.31	0.03	0.30	0.19

ANGLES—UNEQUAL LEGS



DIAGRAMS SHOWING MINIMUM DIMENSIONS IN INCHES

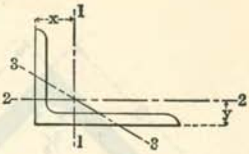
ANGLES—UNEQUAL LEGS



DIAGRAMS SHOWING MINIMUM DIMENSIONS IN INCHES

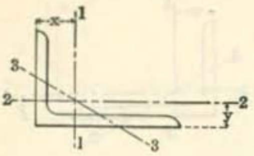
L
ELEMENTS

UNEQUAL ANGLES



ELEMENTS OF SECTIONS

Section Index	Size	Thickness	Weight per Foot	Area of Section	Axis 1-1 I	Axis 1-1 r	Axis 1-1 S	Axis 1-1 x	Axis 2-2 I	Axis 2-2 r	Axis 2-2 S	Axis 2-2 y	Axis 3-3 r min.
	Inches	In.	Lbs.	In.^{2}	In.^{4}	In.	In.^{3}	In.	In.^{4}	In.	In.^{3}	In.	In.
A 18	8 x 6	1	44.2	13.00	80.8	2.49	15.1	2.65	38.8	1.73	8.9	1.65	1.28
		15/16	41.7	12.25	76.6	2.50	14.3	2.63	36.8	1.73	8.4	1.63	1.28
		7/8	39.1	11.48	72.3	2.51	13.4	2.61	34.9	1.74	7.9	1.61	1.28
		13/16	36.5	10.72	67.9	2.52	12.5	2.59	32.8	1.75	7.4	1.59	1.29
		3/4	33.8	9.94	63.4	2.53	11.7	2.56	30.7	1.76	6.9	1.56	1.29
		11/16	31.2	9.15	58.8	2.54	10.8	2.54	28.6	1.77	6.4	1.54	1.29
		5/8	28.5	8.36	54.1	2.54	9.9	2.52	26.3	1.77	5.9	1.52	1.30
		9/16	25.7	7.56	49.3	2.55	8.9	2.50	24.0	1.78	5.3	1.50	1.30
		1/2	23.0	6.75	44.3	2.56	8.0	2.47	21.7	1.79	4.8	1.47	1.30
		7/16	20.2	5.93	39.2	2.57	7.1	2.45	19.3	1.80	4.2	1.45	1.30
A 53	8 x 3½	1	35.7	10.50	66.2	2.51	13.7	3.17	7.8	0.86	3.0	0.92	0.73
		15/16	33.7	9.90	62.9	2.52	12.9	3.14	7.4	0.87	2.9	0.89	0.73
		7/8	31.7	9.30	59.4	2.53	12.2	3.12	7.1	0.87	2.7	0.87	0.73
		13/16	29.6	8.68	55.9	2.54	11.4	3.10	6.7	0.88	2.5	0.85	0.73
		3/4	27.5	8.06	52.3	2.55	10.6	3.07	6.3	0.88	2.3	0.82	0.73
		11/16	25.3	7.43	48.5	2.56	9.8	3.05	5.9	0.89	2.2	0.80	0.73
		5/8	23.2	6.80	44.7	2.57	9.0	3.03	5.4	0.90	2.0	0.78	0.74
		9/16	21.0	6.15	40.8	2.57	8.2	3.00	5.0	0.90	1.8	0.75	0.74
		1/2	18.7	5.50	36.7	2.58	7.3	2.98	4.5	0.91	1.6	0.73	0.74
		7/16	16.5	4.84	32.5	2.59	6.4	2.95	4.1	0.92	1.5	0.70	0.74
A 19	7 x 3½	1	32.3	9.50	45.4	2.19	10.6	2.71	7.5	0.89	3.0	0.96	0.74
		15/16	30.5	8.97	43.1	2.19	10.0	2.69	7.2	0.89	2.8	0.94	0.74
		7/8	28.7	8.42	40.8	2.20	9.4	2.66	6.8	0.90	2.6	0.91	0.74
		13/16	26.8	7.87	38.4	2.21	8.8	2.64	6.5	0.91	2.5	0.89	0.74
		3/4	24.9	7.31	36.0	2.22	8.2	2.62	6.1	0.91	2.3	0.87	0.74
		11/16	23.0	6.75	33.5	2.23	7.6	2.60	5.7	0.92	2.1	0.85	0.74
		5/8	21.0	6.17	30.9	2.24	7.0	2.57	5.3	0.93	2.0	0.82	0.75
		9/16	19.1	5.59	28.2	2.25	6.3	2.55	4.9	0.93	1.8	0.80	0.75
		1/2	17.0	5.00	25.4	2.25	5.7	2.53	4.4	0.94	1.6	0.78	0.75
		7/16	15.0	4.40	22.6	2.26	5.0	2.50	4.0	0.95	1.4	0.75	0.76
		3/8	13.0	3.80	19.6	2.27	4.3	2.48	3.5	0.96	1.3	0.73	0.76
A 20	6 x 4	1	30.6	9.00	30.8	1.85	8.0	2.17	10.8	1.09	3.8	1.17	0.85
		15/16	28.9	8.50	29.3	1.86	7.6	2.14	10.3	1.10	3.6	1.14	0.85
		7/8	27.2	7.98	27.7	1.86	7.2	2.12	9.8	1.11	3.4	1.12	0.86
		13/16	25.4	7.47	26.1	1.87	6.7	2.10	9.2	1.11	3.2	1.10	0.86
		3/4	23.6	6.94	24.5	1.88	6.2	2.08	8.7	1.12	3.0	1.08	0.86
		11/16	21.8	6.40	22.8	1.89	5.8	2.06	8.1	1.13	2.8	1.06	0.86
		5/8	20.0	5.86	21.1	1.90	5.3	2.03	7.5	1.13	2.5	1.03	0.86
		9/16	18.1	5.31	19.3	1.90	4.8	2.01	6.9	1.14	2.3	1.01	0.87
		1/2	16.2	4.75	17.4	1.91	4.3	1.99	6.3	1.15	2.1	0.99	0.87
		7/16	14.3	4.18	15.5	1.92	3.8	1.96	5.6	1.16	1.8	0.96	0.87
		3/8	12.3	3.61	13.5	1.93	3.3	1.94	4.9	1.17	1.6	0.94	0.88



UNEQUAL ANGLES

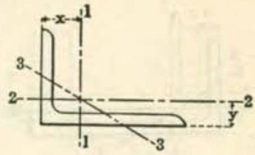
L
ELEMENTS

ELEMENTS OF SECTIONS

Section Index	Size	Thickness	Weight per Foot	Area of Section	Axis 1-1 I	Axis 1-1 r	Axis 1-1 S	Axis 1-1 x	Axis 2-2 I	Axis 2-2 r	Axis 2-2 S	Axis 2-2 y	Axis 3-3 r min.
	Inches	In.	Lbs.	In.^{2}	In.^{4}	In.	In.^{3}	In.	In.^{4}	In.	In.^{3}	In.	In.
A 21	6 x 3½	1	28.9	8.50	29.2	1.85	7.8	2.26	7.2	0.92	2.9	1.01	0.74
		15/16	27.3	8.03	27.8	1.86	7.4	2.24	6.9	0.93	2.7	0.99	0.74
		7/8	25.7	7.55	26.4	1.87	7.0	2.22	6.6	0.93	2.6	0.97	0.75
		13/16	24.0	7.06	24.9	1.88	6.6	2.20	6.2	0.94	2.4	0.95	0.75
		3/4	22.4	6.56	23.3	1.89	6.1	2.18	5.8	0.94	2.3	0.93	0.75
		11/16	20.6	6.06	21.7	1.89	5.6	2.15	5.5	0.95	2.1	0.90	0.75
		5/8	18.9	5.55	20.1	1.90	5.2	2.13	5.1	0.96	1.9	0.88	0.75
		9/16	17.1	5.03	18.4	1.91	4.7	2.11	4.7	0.96	1.8	0.86	0.75
		1/2	15.3	4.50	16.6	1.92	4.2	2.08	4.3	0.97	1.6	0.83	0.76
		7/16	13.5	3.97	14.8	1.93	3.7	2.06	3.8	0.98	1.4	0.81	0.76
		3/8	11.7	3.42	12.9	1.94	3.3	2.04	3.3	0.99	1.2	0.79	0.77
		5/16	9.8	2.87	10.9	1.95	2.7	2.01	2.9	1.00	1.0	0.76	0.77
A 22	5 x 4	7/8	24.2	7.11	16.4	1.52	5.0	1.71	9.2	1.14	3.3	1.21	0.84
		13/16	22.7	6.65	15.5	1.53	4.7	1.68	8.7	1.15	3.1	1.18	0.84
		3/4	21.1	6.19	14.6	1.54	4.4	1.66	8.2	1.15	2.9	1.16	0.84
		11/16	19.5	5.72	13.6	1.54	4.1	1.64	7.7	1.16	2.7	1.14	0.84
		5/8	17.8	5.23	12.6	1.55	3.7	1.62	7.1	1.17	2.5	1.12	0.84
		9/16	16.2	4.75	11.6	1.56	3.4	1.60	6.6	1.18	2.3	1.10	0.85
		1/2	14.5	4.25	10.5	1.57	3.1	1.57	6.0	1.18	2.0	1.07	0.85
		7/16	12.8	3.75	9.3	1.58	2.7	1.55	5.3	1.19	1.8	1.05	0.85
		3/8	11.0	3.23	8.1	1.59	2.3	1.53	4.7	1.20	1.6	1.03	0.86
		5/16	9.3	2.72	6.9	1.60	2.0	1.51	4.0	1.21	1.3	1.01	0.86
A 23	5 x 3½	7/8	22.7	6.67	15.7	1.53	4.9	1.79	6.2	0.96	2.5	1.04	0.75
		13/16	21.3	6.25	14.8	1.54	4.6	1.77	5.9	0.97	2.4	1.02	0.75
		3/4	19.8	5.81	13.9	1.55	4.3	1.75	5.6	0.98	2.2	1.00	0.75
		11/16	18.3	5.37	13.0	1.56	4.0	1.72	5.2	0.98	2.1	0.97	0.75
		5/8	16.8	4.92	12.0	1.56	3.7	1.70	4.8	0.99	1.9	0.95	0.75
		9/16	15.2	4.47	11.0	1.57	3.3	1.68	4.4	1.00	1.7	0.93	0.75
		1/2	13.6	4.00	10.0	1.58	3.0	1.66	4.0	1.01	1.6	0.91	0.75
		7/16	12.0	3.53	8.9	1.59	2.6	1.63	3.6	1.01	1.4	0.88	0.76
		3/8	10.4	3.05	7.8	1.60	2.3	1.61	3.2	1.02	1.2	0.86	0.76
		5/16	8.7	2.56	6.6	1.61	1.9	1.59	2.7	1.03	1.0	0.84	0.76
A 24	5 x 3	13/16	19.9	5.84	14.0	1.55	4.5	1.86	3.7	0.80	1.7	0.86	0.64
		3/4	18.5	5.44	13.2	1.55	4.2	1.84	3.5	0.80	1.6	0.84	0.64
		11/16	17.1	5.03	12.3	1.56	3.9	1.82	3.3	0.81	1.5	0.82	0.64
		5/8	15.7	4.61	11.4	1.57	3.5	1.80	3.1	0.81	1.4	0.80	0.64
		9/16	14.3	4.18	10.4	1.58	3.2	1.77	2.8	0.82	1.3	0.77	0.65
		1/2	12.8	3.75	9.5	1.59	2.9	1.75	2.6	0.83	1.1	0.75	0.65
		7/16	11.3	3.31	8.4	1.60	2.6	1.73	2.3	0.84	1.0	0.73	0.65
		3/8	9.8	2.86	7.4	1.61	2.2	1.70	2.0	0.84	0.89	0.70	0.65
		5/16	8.2	2.40	6.3	1.61	1.9	1.68	1.8	0.85	0.75	0.68	0.66

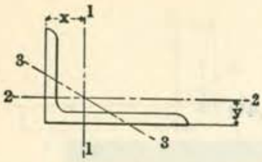
ELEMENTS

UNEQUAL ANGLES



ELEMENTS OF SECTIONS

Section Index	Size	Thickness	Weight per Foot	Area of Section	Axis 1-1 I	Axis 1-1 r	Axis 1-1 S	Axis 1-1 x	Axis 2-2 I	Axis 2-2 r	Axis 2-2 S	Axis 2-2 y	Axis 3-3 r min.
	Inches	In.	Lbs.	In.^{2}	In.^{4}	In.	In.^{3}	In.	In.^{4}	In.	In.^{3}	In.	In.
A 25	4½ x 3	13/16	18.5	5.43	10.3	1.38	3.6	1.65	3.6	0.81	1.7	0.90	0.64
		3/4	17.3	5.06	9.7	1.39	3.4	1.63	3.4	0.82	1.6	0.88	0.64
		11/16	16.0	4.68	9.1	1.39	3.1	1.60	3.2	0.83	1.5	0.85	0.64
		5/8	14.7	4.30	8.4	1.40	2.9	1.58	3.0	0.83	1.4	0.83	0.64
		9/16	13.3	3.90	7.8	1.41	2.6	1.56	2.8	0.85	1.3	0.81	0.64
		1/2	11.9	3.50	7.0	1.42	2.4	1.54	2.5	0.85	1.1	0.79	0.65
		7/16	10.6	3.09	6.3	1.43	2.1	1.51	2.3	0.85	1.0	0.76	0.65
		3/8	9.1	2.67	5.5	1.44	1.8	1.49	2.0	0.86	0.88	0.74	0.66
		5/16	7.7	2.25	4.7	1.44	1.5	1.47	1.7	0.87	0.75	0.72	0.66
A 26	4 x 3½	13/16	18.5	5.43	7.8	1.19	2.9	1.36	5.5	1.01	2.3	1.11	0.72
		3/4	17.3	5.06	7.3	1.20	2.8	1.34	5.2	1.01	2.1	1.09	0.72
		11/16	16.0	4.68	6.9	1.21	2.6	1.32	4.9	1.02	2.0	1.07	0.72
		5/8	14.7	4.30	6.4	1.22	2.4	1.29	4.5	1.03	1.8	1.04	0.72
		9/16	13.3	3.90	5.9	1.23	2.1	1.27	4.2	1.03	1.7	1.02	0.72
		1/2	11.9	3.50	5.3	1.23	1.9	1.25	3.8	1.04	1.5	1.00	0.72
		7/16	10.6	3.09	4.8	1.24	1.7	1.23	3.4	1.05	1.3	0.98	0.72
		3/8	9.1	2.67	4.2	1.25	1.5	1.21	3.0	1.06	1.2	0.96	0.73
		5/16	7.7	2.25	3.6	1.26	1.3	1.18	2.6	1.07	1.0	0.93	0.73
A 27	4 x 3	13/16	17.1	5.03	7.3	1.21	2.9	1.44	3.5	0.83	1.7	0.94	0.64
		3/4	16.0	4.69	6.9	1.22	2.7	1.42	3.3	0.84	1.6	0.92	0.64
		11/16	14.8	4.34	6.5	1.22	2.5	1.39	3.1	0.84	1.5	0.89	0.64
		5/8	13.6	3.98	6.0	1.23	2.3	1.37	2.9	0.85	1.4	0.87	0.64
		9/16	12.4	3.62	5.6	1.24	2.1	1.35	2.7	0.86	1.2	0.85	0.64
		1/2	11.1	3.25	5.0	1.25	1.9	1.33	2.4	0.86	1.1	0.83	0.64
		7/16	9.8	2.87	4.5	1.25	1.7	1.30	2.2	0.87	1.0	0.80	0.64
		3/8	8.5	2.48	4.0	1.26	1.5	1.28	1.9	0.88	0.87	0.78	0.64
		5/16	7.2	2.09	3.4	1.27	1.2	1.26	1.7	0.89	0.74	0.76	0.65
		1/4	5.8	1.69	2.8	1.28	1.0	1.24	1.4	0.89	0.60	0.74	0.65
A 28	3½ x 3	13/16	15.8	4.62	5.0	1.04	2.2	1.23	3.3	0.85	1.7	0.98	0.62
		3/4	14.7	4.31	4.7	1.04	2.1	1.21	3.1	0.85	1.5	0.96	0.62
		11/16	13.6	4.00	4.4	1.05	1.9	1.19	3.0	0.86	1.4	0.94	0.62
		5/8	12.5	3.67	4.1	1.06	1.8	1.17	2.8	0.87	1.3	0.92	0.62
		9/16	11.4	3.34	3.8	1.07	1.6	1.15	2.5	0.87	1.2	0.90	0.62
		1/2	10.2	3.00	3.5	1.07	1.5	1.13	2.3	0.88	1.1	0.88	0.62
		7/16	9.1	2.65	3.1	1.08	1.3	1.10	2.1	0.89	0.98	0.85	0.62
		3/8	7.9	2.30	2.7	1.09	1.1	1.08	1.8	0.90	0.85	0.83	0.62
		5/16	6.6	1.93	2.3	1.10	0.96	1.06	1.6	0.90	0.72	0.81	0.63
		1/4	5.4	1.56	1.9	1.11	0.78	1.04	1.3	0.91	0.58	0.79	0.63
A 29	3½x2½	11/16	12.5	3.65	4.1	1.06	1.9	1.27	1.7	0.69	0.99	0.77	0.53
		5/8	11.5	3.36	3.8	1.07	1.7	1.25	1.6	0.69	0.92	0.75	0.53
		9/16	10.4	3.06	3.6	1.08	1.6	1.23	1.5	0.70	0.84	0.73	0.53
		1/2	9.4	2.75	3.2	1.09	1.4	1.20	1.4	0.70	0.76	0.70	0.53
		7/16	8.3	2.43	2.9	1.09	1.3	1.18	1.2	0.71	0.68	0.68	0.54
		3/8	7.2	2.11	2.6	1.10	1.1	1.16	1.1	0.72	0.59	0.66	0.54
		5/16	6.1	1.78	2.2	1.11	0.93	1.14	0.94	0.73	0.50	0.64	0.54
		1/4	4.9	1.44	1.8	1.12	0.75	1.11	0.78	0.74	0.41	0.61	0.54



UNEQUAL ANGLES

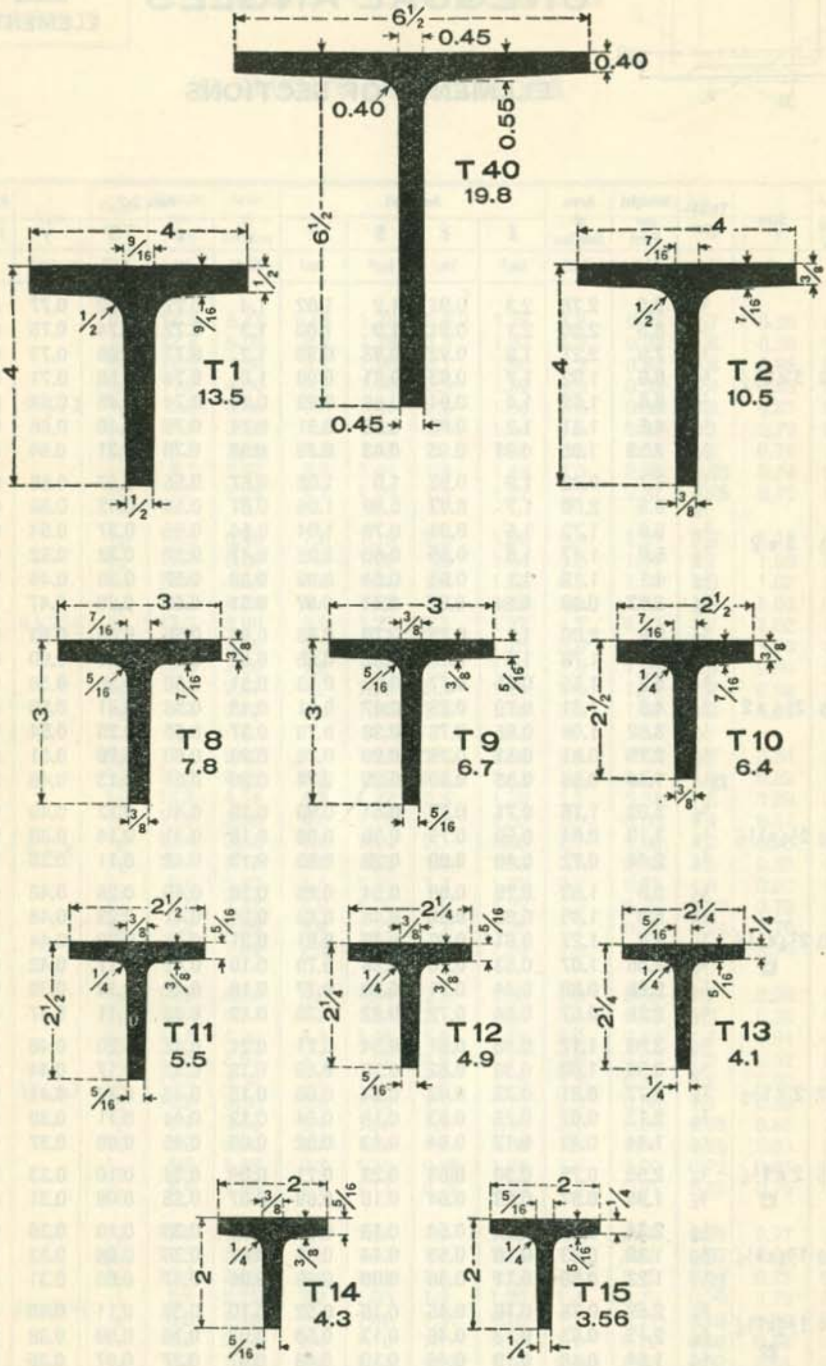
L ELEMENTS

ELEMENTS OF SECTIONS

Section Index	Size	Thickness	Weight per Foot	Area of Section	Axis 1-1 I	Axis 1-1 r	Axis 1-1 S	Axis 1-1 x	Axis 2-2 I	Axis 2-2 r	Axis 2-2 S	Axis 2-2 y	Axis 3-3 r min.
	Inches	In.	Lbs.	In.	$In.^4$	In.	$In.^3$	In.	$In.^4$	In.	$In.^3$	In.	In.
A 32	3 x 2½	9/16	9.5	2.78	2.3	0.91	1.2	1.02	1.4	0.72	0.82	0.77	0.52
		1/2	8.5	2.50	2.1	0.91	1.0	1.00	1.3	0.72	0.74	0.75	0.52
		7/16	7.6	2.21	1.9	0.92	0.93	0.98	1.2	0.73	0.66	0.73	0.52
		3/8	6.6	1.92	1.7	0.93	0.81	0.96	1.0	0.74	0.58	0.71	0.52
		5/16	5.6	1.62	1.4	0.94	0.69	0.93	0.90	0.74	0.49	0.68	0.53
		1/4	4.5	1.31	1.2	0.95	0.56	0.91	0.74	0.75	0.40	0.66	0.53
		3/16	3.39	1.00	0.91	0.95	0.43	0.89	0.58	0.76	0.31	0.64	0.53
A 33	3 x 2	1/2	7.7	2.25	1.9	0.92	1.0	1.08	0.67	0.55	0.47	0.58	0.43
		7/16	6.8	2.00	1.7	0.93	0.89	1.06	0.61	0.55	0.42	0.56	0.43
		3/8	5.9	1.73	1.5	0.94	0.78	1.04	0.54	0.56	0.37	0.54	0.43
		5/16	5.0	1.47	1.3	0.95	0.66	1.02	0.47	0.57	0.32	0.52	0.43
		1/4	4.1	1.19	1.1	0.95	0.54	0.99	0.39	0.57	0.26	0.49	0.43
		3/16	3.07	0.90	0.84	0.97	0.41	0.97	0.31	0.58	0.20	0.47	0.44
A 35	2½ x 2	1/2	6.8	2.00	1.1	0.75	0.70	0.88	0.64	0.56	0.46	0.63	0.42
		7/16	6.1	1.78	1.0	0.76	0.62	0.85	0.58	0.57	0.41	0.60	0.42
		3/8	5.3	1.55	0.91	0.77	0.55	0.83	0.51	0.58	0.36	0.58	0.42
		5/16	4.5	1.31	0.79	0.78	0.47	0.81	0.45	0.58	0.31	0.56	0.42
		1/4	3.62	1.06	0.65	0.78	0.38	0.79	0.37	0.59	0.25	0.54	0.42
		3/16	2.75	0.81	0.51	0.79	0.29	0.76	0.29	0.60	0.20	0.51	0.43
		(C) 1/8	1.86	0.55	0.35	0.80	0.20	0.74	0.20	0.61	0.13	0.49	0.43
A 48	2½x1½	5/16	3.92	1.15	0.71	0.79	0.44	0.90	0.19	0.41	0.17	0.40	0.32
		1/4	3.19	0.94	0.59	0.79	0.36	0.88	0.16	0.41	0.14	0.38	0.32
		3/16	2.44	0.72	0.46	0.80	0.28	0.85	0.13	0.42	0.11	0.35	0.33
A 270	2¼x1½ (C)	1/2	5.6	1.63	0.75	0.68	0.54	0.86	0.26	0.40	0.26	0.48	0.32
		7/16	5.0	1.45	0.68	0.69	0.48	0.83	0.24	0.41	0.23	0.46	0.32
		3/8	4.4	1.27	0.61	0.69	0.42	0.81	0.21	0.41	0.20	0.44	0.32
		5/16	3.66	1.07	0.53	0.70	0.36	0.79	0.19	0.42	0.17	0.42	0.32
		1/4	2.98	0.88	0.44	0.71	0.30	0.77	0.16	0.42	0.14	0.39	0.32
		3/16	2.28	0.67	0.34	0.72	0.23	0.75	0.12	0.43	0.11	0.37	0.33
A 37	2 x 1½	3/8	3.99	1.17	0.43	0.61	0.34	0.71	0.21	0.42	0.20	0.46	0.32
		5/16	3.39	1.00	0.38	0.62	0.29	0.69	0.18	0.42	0.17	0.44	0.32
		1/4	2.77	0.81	0.32	0.62	0.24	0.66	0.15	0.43	0.14	0.41	0.32
		3/16	2.12	0.62	0.25	0.63	0.18	0.64	0.12	0.44	0.11	0.39	0.32
		1/8	1.44	0.42	0.17	0.64	0.13	0.62	0.09	0.45	0.08	0.37	0.33
A 645	2 x 1¼ (C)	1/4	2.55	0.75	0.30	0.63	0.23	0.71	0.09	0.34	0.10	0.33	0.27
		3/16	1.96	0.57	0.23	0.64	0.18	0.69	0.07	0.35	0.08	0.31	0.27
A 39	1¾x1¼	1/4	2.34	0.69	0.20	0.54	0.18	0.60	0.09	0.35	0.10	0.35	0.27
		3/16	1.80	0.53	0.16	0.55	0.14	0.58	0.07	0.36	0.08	0.33	0.27
		(C) 1/8	1.23	0.36	0.11	0.56	0.09	0.56	0.05	0.37	0.05	0.31	0.27
A 624	1½x1¼ (C)	5/16	2.59	0.76	0.16	0.45	0.16	0.52	0.10	0.35	0.11	0.40	0.26
		1/4	2.13	0.63	0.13	0.46	0.13	0.50	0.08	0.36	0.09	0.38	0.26
		3/16	1.64	0.48	0.10	0.46	0.10	0.48	0.07	0.37	0.07	0.35	0.26

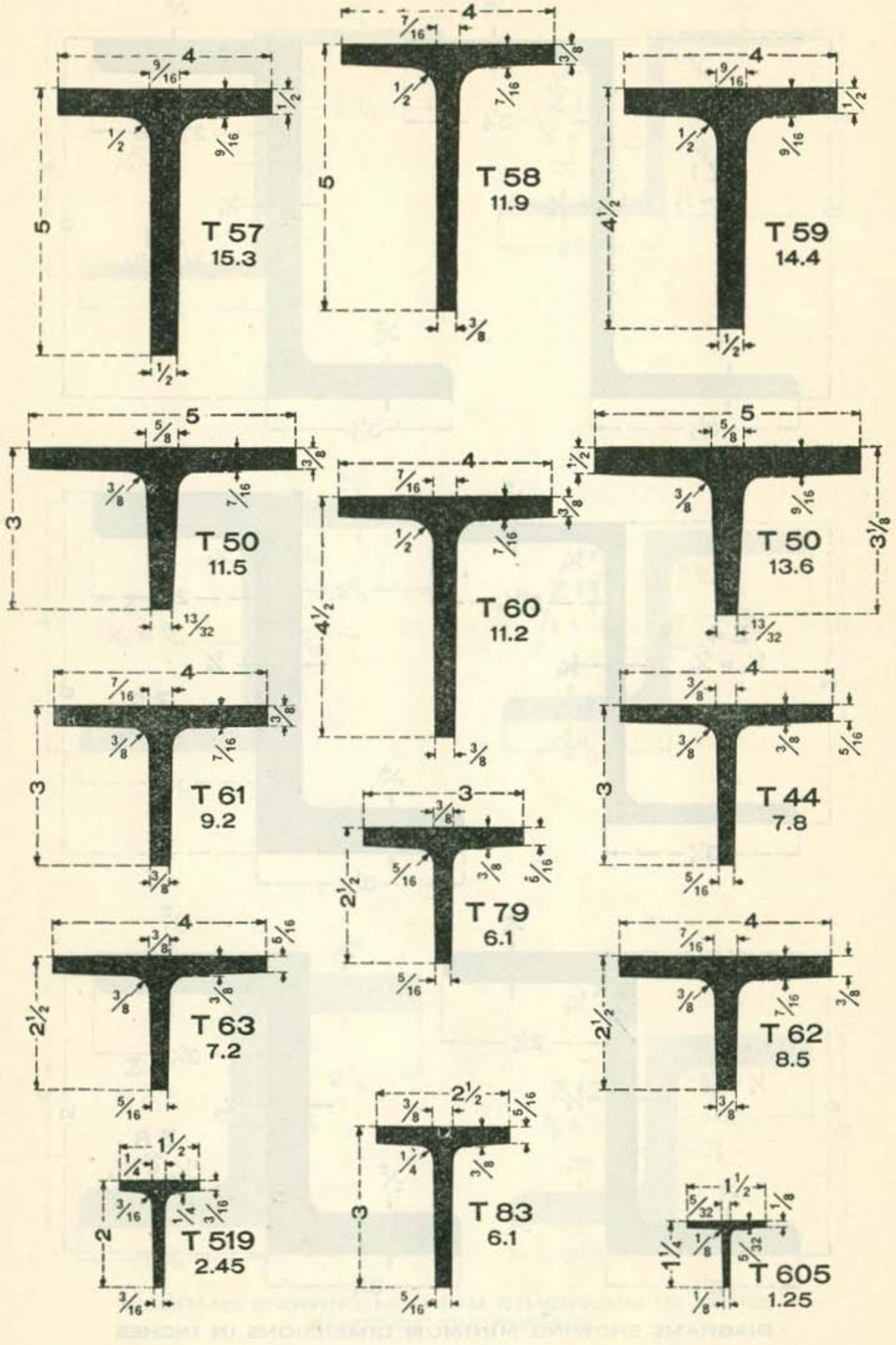
(C) Carnegie Steel Company only.

EQUAL TEES

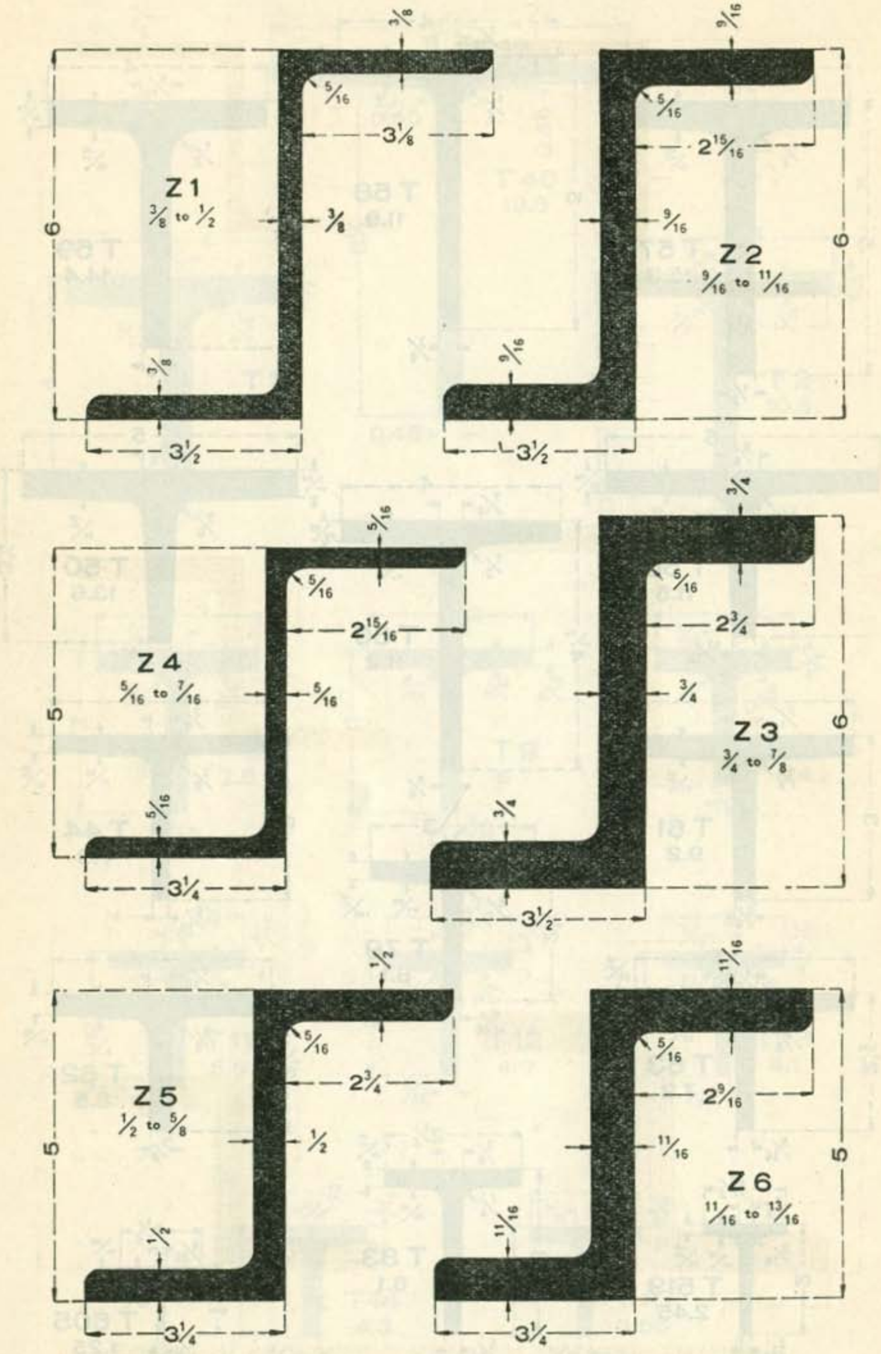


T 40
19.8
T 1
13.5
T 2
10.5
T 8
7.8
T 9
6.7
T 10
6.4
T 11
5.5
T 12
4.9
T 13
4.1
T 14
4.3
T 15
3.56

UNEQUAL TEES

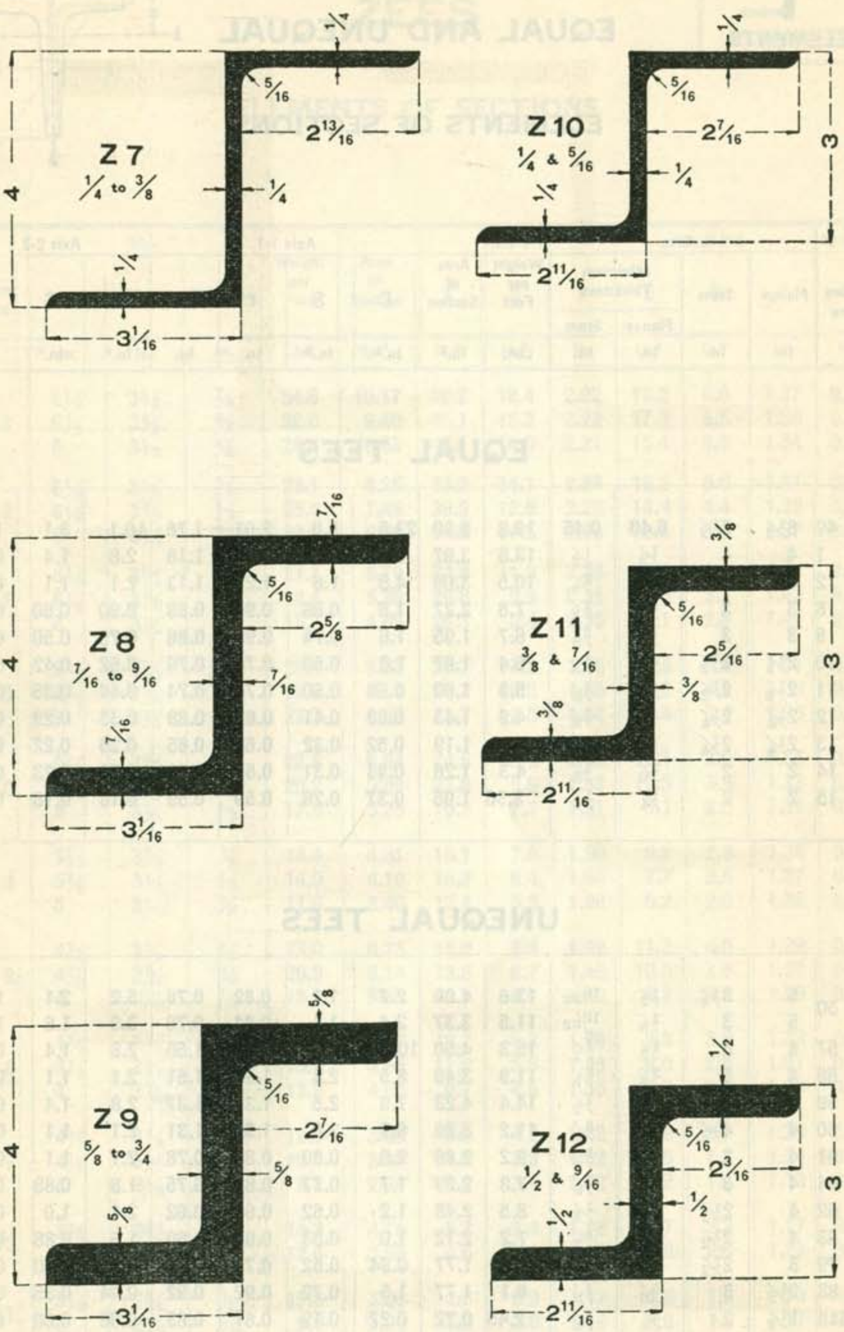


ZEES



DIAGRAMS SHOWING MINIMUM DIMENSIONS IN INCHES

ZEES

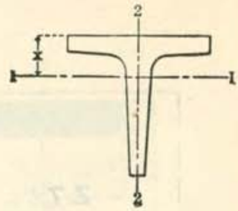


DIAGRAMS SHOWING MINIMUM DIMENSIONS IN INCHES
RANGE OF THICKNESSES

T
ELEMENTS

TEES

EQUAL AND UNEQUAL



ELEMENTS OF SECTIONS

EQUAL TEES

Section Index	Size: Flange	Size: Stem	Minimum Thickness: Flange	Minimum Thickness: Stem	Weight per Foot	Area of Section	Axis 1-1: I	Axis 1-1: S	Axis 1-1: r	Axis 1-1: x	Axis 2-2: I	Axis 2-2: S	Axis 2-2: r
	In.	In.	In.	In.	Lbs.	In.²	In.⁴	In.³	In.	In.	In.⁴	In.³	In.
©T 40	6½	6½	0.40	0.45	19.8	5.80	23.5	5.0	2.01	1.76	10.1	3.1	1.32
T 1	4	4	½	½	13.5	3.97	5.7	2.0	1.20	1.18	2.8	1.4	0.84
T 2	4	4	⅜	⅜	10.5	3.09	4.5	1.6	1.21	1.13	2.1	1.1	0.83
T 8	3	3	⅜	⅜	7.8	2.27	1.8	0.86	0.90	0.88	0.90	0.60	0.63
T 9	3	3	5/16	5/16	6.7	1.95	1.6	0.74	0.90	0.86	0.75	0.50	0.62
T 10	2½	2½	⅜	⅜	6.4	1.87	1.0	0.59	0.74	0.76	0.52	0.42	0.53
T 11	2½	2½	5/16	5/16	5.5	1.60	0.88	0.50	0.74	0.74	0.44	0.35	0.52
T 12	2¼	2¼	5/16	5/16	4.9	1.43	0.65	0.41	0.67	0.68	0.33	0.29	0.48
T 13	2¼	2¼	¼	¼	4.1	1.19	0.52	0.32	0.66	0.65	0.25	0.22	0.46
T 14	2	2	5/16	5/16	4.3	1.26	0.44	0.31	0.59	0.61	0.23	0.23	0.43
T 15	2	2	¼	¼	3.56	1.05	0.37	0.26	0.59	0.59	0.18	0.18	0.42

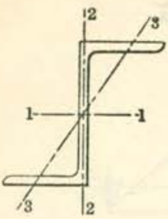
UNEQUAL TEES

Section Index	Size: Flange	Size: Stem	Minimum Thickness: Flange	Minimum Thickness: Stem	Weight per Foot	Area of Section	Axis 1-1: I	Axis 1-1: S	Axis 1-1: r	Axis 1-1: x	Axis 2-2: I	Axis 2-2: S	Axis 2-2: r
©T 50	5	3⅛	½	13/32	13.6	4.00	2.7	1.1	0.82	0.76	5.2	2.1	1.14
	5	3	⅜	13/32	11.5	3.37	2.4	1.1	0.84	0.76	3.9	1.6	1.10
T 57	4	5	½	½	15.3	4.50	10.8	3.1	1.55	1.56	2.8	1.4	0.79
T 58	4	5	⅜	⅜	11.9	3.49	8.5	2.4	1.56	1.51	2.1	1.1	0.78
©T 59	4	4½	½	½	14.4	4.23	7.9	2.5	1.37	1.37	2.8	1.4	0.81
©T 60	4	4½	⅜	⅜	11.2	3.29	6.3	2.0	1.39	1.31	2.1	1.1	0.80
T 61	4	3	⅜	⅜	9.2	2.68	2.0	0.90	0.86	0.78	2.1	1.1	0.89
©T 44	4	3	5/16	5/16	7.8	2.29	1.7	0.77	0.87	0.75	1.8	0.88	0.88
T 62	4	2½	⅜	⅜	8.5	2.48	1.2	0.62	0.69	0.62	2.1	1.0	0.92
©T 63	4	2½	5/16	5/16	7.2	2.12	1.0	0.53	0.69	0.60	1.8	0.88	0.91
©T 79	3	2½	5/16	5/16	6.1	1.77	0.94	0.52	0.73	0.68	0.75	0.50	0.65
T 83	2½	3	5/16	5/16	6.1	1.77	1.5	0.72	0.92	0.92	0.44	0.35	0.50
©T519	1½	2	3/16	3/16	2.45	0.72	0.27	0.19	0.61	0.63	0.06	0.08	0.92
©T605	1½	1¼	⅛	⅛	1.25	0.37	0.05	0.05	0.37	0.33	0.04	0.05	0.32

© Carnegie Steel Company only.

ELEMENTS

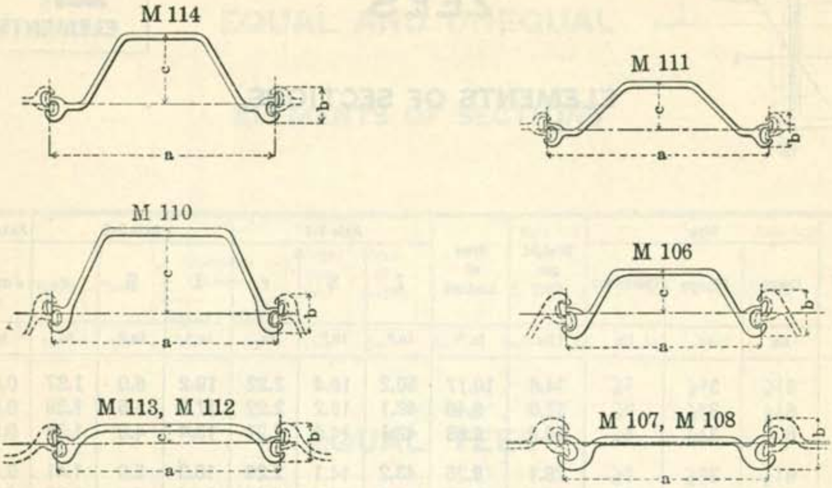
ZEES



ELEMENTS OF SECTIONS

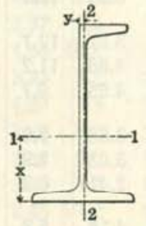
Section Index	Size: Depth	Size: Flange	Size: Thickness	Weight per Foot	Area of Section	Axis 1-1: I	Axis 1-1: S	Axis 1-1: r	Axis 2-2: I	Axis 2-2: S	Axis 2-2: r	Axis 3-3: r min.
	In.	In.	In.	Lbs.	In.^{2}	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}	In.	In.
Z 3	6 1/8	3 5/8	7/8	34.6	10.17	50.2	16.4	2.22	19.2	6.0	1.37	0.83
	6 1/16	3 9/16	13/16	32.0	9.40	46.1	15.2	2.22	17.3	5.5	1.36	0.82
	6	3 1/2	3/4	29.4	8.63	42.1	14.0	2.21	15.4	4.9	1.34	0.81
Z 2	6 1/8	3 5/8	11/16	28.1	8.25	43.2	14.1	2.29	16.3	5.0	1.41	0.84
	6 1/16	3 9/16	5/8	25.4	7.46	38.9	12.8	2.28	14.4	4.4	1.39	0.82
	6	3 1/2	9/16	22.8	6.68	34.6	11.5	2.28	12.6	3.9	1.37	0.81
Z 1	6 1/8	3 5/8	1/2	21.1	6.19	34.4	11.2	2.36	12.9	3.8	1.44	0.84
	6 1/16	3 9/16	7/16	18.4	5.39	29.8	9.8	2.35	11.0	3.3	1.43	0.83
	6	3 1/2	3/8	15.7	4.59	25.3	8.4	2.35	9.1	2.8	1.41	0.83
Z 6	5 1/8	3 3/8	13/16	28.4	8.33	28.7	11.2	1.86	14.4	4.8	1.31	0.76
	5 1/16	3 5/16	3/4	26.0	7.64	26.2	10.3	1.85	12.8	4.4	1.30	0.74
	5	3 1/4	11/16	23.7	6.96	23.7	9.5	1.84	11.4	3.9	1.28	0.73
Z 5	5 1/8	3 3/8	5/8	22.6	6.64	24.5	9.6	1.92	12.1	3.9	1.35	0.76
	5 1/16	3 5/16	9/16	20.2	5.94	21.8	8.6	1.91	10.5	3.5	1.33	0.75
	5	3 1/4	1/2	17.9	5.25	19.2	7.7	1.91	9.1	3.0	1.31	0.74
Z 4	5 1/8	3 3/8	7/16	16.4	4.81	19.1	7.4	1.99	9.2	2.9	1.38	0.77
	5 1/16	3 5/16	3/8	14.0	4.10	16.2	6.4	1.99	7.7	2.5	1.37	0.76
	5	3 1/4	5/16	11.6	3.40	13.4	5.3	1.98	6.2	2.0	1.35	0.75
Z 9	4 1/8	3 3/16	3/4	23.0	6.75	15.0	7.3	1.49	11.2	4.0	1.29	0.68
	4 1/16	3 1/8	11/16	20.9	6.14	13.5	6.7	1.48	10.0	3.6	1.27	0.67
	4	3 1/16	5/8	18.9	5.55	12.1	6.1	1.48	8.7	3.2	1.25	0.66
Z 8	4 1/8	3 3/16	9/16	18.0	5.27	12.7	6.2	1.55	9.3	3.2	1.33	0.68
	4 1/16	3 1/8	1/2	15.9	4.66	11.2	5.5	1.55	8.0	2.8	1.31	0.67
	4	3 1/16	7/16	13.8	4.05	9.7	4.8	1.55	6.7	2.4	1.29	0.66
Z 7	4 1/8	3 3/16	3/8	12.5	3.66	9.6	4.7	1.62	6.8	2.3	1.36	0.69
	4 1/16	3 1/8	5/16	10.3	3.03	7.9	3.9	1.62	5.5	1.8	1.34	0.68
	4	3 1/16	1/4	8.2	2.41	6.3	3.1	1.62	4.2	1.4	1.33	0.67
Z 12	3 1/16	2 3/4	9/16	14.3	4.18	5.3	3.4	1.12	5.7	2.3	1.17	0.54
	3	2 11/16	1/2	12.6	3.69	4.6	3.1	1.12	4.9	2.0	1.15	0.53
Z 11	3 1/16	2 3/4	7/16	11.5	3.36	4.6	3.0	1.17	4.8	1.9	1.19	0.55
	3	2 11/16	3/8	9.8	2.86	3.9	2.6	1.16	3.9	1.6	1.17	0.54
Z 10	3 1/16	2 3/4	5/16	8.5	2.48	3.6	2.4	1.21	3.6	1.4	1.21	0.56
	3	2 11/16	1/4	6.7	1.97	2.9	1.9	1.21	2.8	1.1	1.19	0.55

CARNEGIE STEEL SHEET PILING



Section Index	Nominal Width	Web Thickness	Weight per Foot	Area of Section	Single Section					Per Foot of Wall	
					I	S	Dimensions			S	Weight Lbs. per Sq. Ft.
	In.	In.	Lbs.	In.²	In.⁴	In.³	a	b	c	In.³	
🄲M 114	16	⅜	33.3	9.80	46.10	14.60	16	2 9/16	5	10.95	25.0
🄲M 111	16	⅜	29.3	8.63	18.66	7.74	16	2 9/16	3⅜	5.80	22.0
🄲M 110	16	31/64	42.6	12.51	86.84	20.34	16	2 11/16	6	15.26	32.0
🄲M 106	14	⅜	35.5	10.84	25.74	10.34	14	3¼	3⅛	8.86	30.4
🄲M 112	16	⅜	30.6	8.99	4.51	2.50	16	2 11/16	1 11/32	1.88	23.0
🄲M 113	16	½	36.2	10.65	6.06	3.28	16	2 11/16	1 11/32	2.46	27.2
🄲M 107	15	⅜	38.4	11.29	6.23	4.10	15	3 11/16	.....	3.28	30.7
🄲M 108	15	½	42.8	12.58	6.25	4.10	15	3 11/16	.....	3.28	34.2

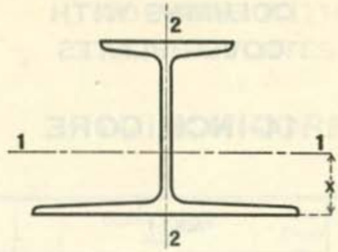
CAR CENTER SILL SECTION



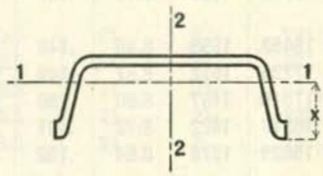
Section Index	Depth	Weight per Foot	Area	Width of Flange	Thickness of Web	Axis 1-1				Axis 2-2			
						I	S	r	x	I	S	r	y
	In.	Lbs.	In.²	In.	In.	In.⁴	In.³	In.	In.	In.⁴	In.³	In.	In.
B 112	12	40.3	11.72	3¼.7	15/32	238.1	31.9	4.51	4.54	21.8	5.9	1.36	0.43

🄲Carnegie Steel Company only.

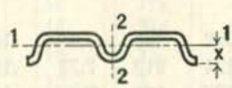
CROSS TIES



Section Index	Depth of Section	Weight per Foot	Area of Section	Width of Flange		Thickness of Web	Axis 1-1				Axis 2-2		
				Top	Bottom		I	S	r	x	I	S	r
	In.	Lbs.	In.²	In.	In.	In.	In.⁴	In.³	In.	In.	In.⁴	In.³	In.
Ⓒ M 29	5.50	24.0	7.01	5.0	8.0	.375	35.4	11.3	2.25	2.38	16.8	4.2	1.55
Ⓒ M 21	5.50	20.0	5.71	4.5	8.0	.250	30.9	9.7	2.33	2.33	14.9	3.7	1.62
Ⓒ M 25	4.25	14.5	4.10	4.0	6.0	.250	13.0	5.5	1.78	1.88	6.1	2.0	1.22
Ⓒ M 24	3.00	9.4	2.77	3.0	4.5	.203	4.2	2.5	1.24	1.32	2.9	1.3	1.03



Section Index	Depth of Section	Weight per Foot	Area of Section	Width of Section		Thickness of Web	Axis 1-1				Axis 2-2		
				Top	Bottom		I	S	r	x	I	S	r
	In.	Lbs.	In.²	In.	In.	In.	In.⁴	In.³	In.	In.	In.⁴	In.³	In.
Ⓒ M 27	2.25	9.0	2.62	5.5	7.0	.250	1.28	0.79	0.70	1.62	16.8	4.8	2.53
Ⓒ M 20	2.00	6.0	1.72	4.5	6.0	.188	0.71	0.51	0.64	1.41	8.4	2.8	2.22
Ⓒ M 18	1.50	4.2	1.21	3.4	5.0	.156	0.31	0.31	0.50	1.00	3.6	1.5	1.73



Section Index	Depth of Section	Weight per Foot	Area of Section	Width of Section	Thickness	Axis 1-1				Axis 2-2		
						I	S	r	x	I	S	r
	In.	Lbs.	In.²	In.	In.	In.⁴	In.³	In.	In.	In.⁴	In.³	In.
Ⓒ M 26A	13/16	3.25	0.95	4¾	.141	0.068	0.136	0.27	0.50	1.94	0.82	1.43
Ⓒ M 19A	11/16	2.50	0.74	4¼	.125	0.034	0.077	0.21	0.44	1.23	0.58	1.29

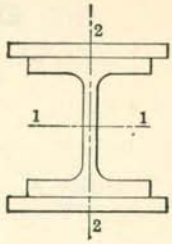
Ⓒ Carnegie Steel Company only.

ELEMENTS

CB SECTIONS

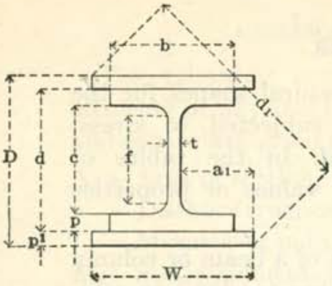
COLUMNS WITH COVER PLATES

14-INCH CORE



Total Depth of Column "D"	Weight of Column per Foot, Lbs.	Area Sq. In.	Axis 1-1				Axis 2-2			
			I In.^{4}	S In.^{3}	r In.	Bending Factor A÷S	I In.^{4}	S In.^{3}	r In.	Bending Factor A÷S
25 3/16	912.2	268.3	23946	1901	9.45	.141	8129	739	5.50	.363
24 15/16	893.5	262.8	23084	1851	9.37	.142	7907	719	5.49	.366
24 11/16	874.8	257.3	22235	1801	9.30	.143	7685	699	5.47	.368
24 7/16	856.1	251.8	21407	1752	9.22	.144	7463	678	5.44	.371
24 3/16	837.4	246.3	20593	1703	9.14	.145	7242	658	5.42	.374
23 15/16	818.7	240.8	19798	1654	9.07	.146	7020	638	5.40	.377
23 11/16	800.0	235.3	19017	1605	8.99	.147	6798	618	5.37	.381
23 11/16	783.0	230.3	18453	1558	8.95	.148	6220	592	5.20	.389
23 7/16	765.2	225.0	17725	1512	8.87	.149	6027	574	5.18	.392
23 3/16	747.3	219.8	17010	1467	8.80	.150	5834	556	5.15	.396
22 15/16	729.5	214.5	16313	1422	8.72	.151	5641	537	5.13	.399
22 11/16	711.6	209.3	15629	1378	8.64	.152	5448	519	5.10	.403
22 11/16	698.0	205.3	15200	1340	8.60	.153	5028	503	4.95	.408
22 7/16	681.0	200.3	14564	1298	8.53	.154	4861	486	4.93	.412
22 3/16	664.0	195.3	13941	1256	8.45	.155	4695	469	4.90	.416
21 15/16	647.0	190.3	13333	1215	8.37	.157	4528	453	4.88	.420
21 11/16	630.0	185.3	12737	1174	8.29	.158	4361	436	4.85	.425
21 11/16	609.6	179.3	12125	1118	8.22	.160	3819	424	4.62	.423
21 7/16	594.3	174.8	11602	1082	8.15	.162	3698	411	4.60	.425
21 3/16	579.0	170.3	11090	1047	8.07	.163	3576	397	4.58	.429
20 15/16	563.7	165.8	10592	1012	7.99	.164	3455	384	4.56	.432
20 11/16	548.4	161.3	10104	977	7.91	.165	3333	370	4.55	.436
20 5/16	534.1	157.1	9582	944	7.81	.166	3336	371	4.61	.424
20 1/16	518.8	152.6	9124	910	7.73	.168	3214	357	4.59	.427
19 13/16	503.5	148.1	8677	876	7.65	.169	3093	344	4.57	.431
19 9/16	488.2	143.6	8241	843	7.58	.170	2972	330	4.55	.435
19 5/16	472.9	139.1	7816	810	7.50	.172	2850	317	4.53	.439
19 1/16	457.6	134.6	7402	777	7.42	.173	2729	303	4.50	.444
18 13/16	442.3	130.1	6998	744	7.33	.175	2607	290	4.48	.449

NOTE.—Weights do not include rivets.



CB SECTIONS

COLUMNS WITH COVER PLATES

DIMENSIONS

14-INCH CORE

Core Section Index Weight per Foot	Weight of Column per Foot	Area	COVER PLATE SIZE Width W	COVER PLATE SIZE Thickness p_1	Total Depth of Column "D"	Diagonal d_1	Dimensions
	Lbs.	Sq. In.	In.	In.	In.	In.	Inches
CB 146 N 426 lbs.	912.2	268.3	22	3¼	25³⁄₁₆	33⁷⁄₁₆	a_1 = 10.0605
	893.5	262.8	22	3⅛	24¹⁵⁄₁₆	33¼	t = 1.879
	874.8	257.3	22	3	24¹¹⁄₁₆	33¹⁄₁₆	f = 11.324
	856.1	251.8	22	2⅞	24⁷⁄₁₆	32⅞	c = 12.624
	837.4	246.3	22	2¾	24³⁄₁₆	32¹¹⁄₁₆	d = 18.690
	818.7	240.8	22	2⅝	23¹⁵⁄₁₆	32½	b = 16.699
	800.0	235.3	22	2½	23¹¹⁄₁₆	32⁵⁄₁₆	p = 3.033
CB 146 N 426 lbs.							a_1 = 9.5605
	783.0	230.3	21	2½	23¹¹⁄₁₆	31¹¹⁄₁₆	t = 1.879
	765.2	225.0	21	2⅜	23⁷⁄₁₆	31½	f = 11.324
	747.3	219.8	21	2¼	23³⁄₁₆	31⁵⁄₁₆	c = 12.624
	729.5	214.5	21	2⅛	22¹⁵⁄₁₆	31⅛	d = 18.690
	711.6	209.3	21	2	22¹¹⁄₁₆	30¹⁵⁄₁₆	b = 16.699
							p = 3.033
CB 146 N 426 lbs.							a_1 = 9.0605
	698.0	205.3	20	2	22¹¹⁄₁₆	30¼	t = 1.879
	681.0	200.3	20	1⅞	22⁷⁄₁₆	30¹⁄₁₆	f = 11.324
	664.0	195.3	20	1¾	22³⁄₁₆	29⅞	c = 12.624
	647.0	190.3	20	1⅝	21¹⁵⁄₁₆	29¹¹⁄₁₆	d = 18.690
	630.0	185.3	20	1½	21¹¹⁄₁₆	29½	b = 16.699
							p = 3.033
?t							a_1 = 8.0605
CB 146 N 426 lbs.	609.6	179.3	18	1½	21¹¹⁄₁₆	28³⁄₁₆	t = 1.879
	594.3	174.8	18	1⅜	21⁷⁄₁₆	28	f = 11.324
	579.0	170.3	18	1¼	21³⁄₁₆	27¹³⁄₁₆	c = 12.624
	563.7	165.8	18	1⅛	20¹⁵⁄₁₆	27⅝	d = 18.690
	548.4	161.3	18	1	20¹¹⁄₁₆	27⁷⁄₁₆	b = 16.699
							p = 3.033
CB 146 N 320 lbs.	534.1	157.1	18	1¾	20⁵⁄₁₆	27⅛	a_1 = 8.055
	518.8	152.6	18	1⅝	20¹⁄₁₆	26¹⁵⁄₁₆	t = 1.890
	503.5	148.1	18	1½	19¹³⁄₁₆	26¾	f = 11.324
	488.2	143.6	18	1⅜	19⁹⁄₁₆	26⁹⁄₁₆	c = 12.624
	472.9	139.1	18	1¼	19⁵⁄₁₆	26⅜	d = 16.810
	457.6	134.6	18	1⅛	19¹⁄₁₆	26³⁄₁₆	b = 16.710
	442.3	130.1	18	1	18¹³⁄₁₆	26¹⁄₁₆	p = 2.093

ELEMENTS OF SECTIONS

In the computation of the values of structural shapes for the various conditions under which they are subjected to stress, certain mathematical expressions are used. In the tables of Elements of Sections, which precede, these values or properties are given in inch-units.

Neutral Axis. The line, in the cross section of a beam or column in a state of flexure, on which there is neither tension nor compression. The neutral axis passes through the center of gravity of the section when unit stresses do not exceed the elastic limit of the material. In the usual position of structural sections there are two neutral axes, perpendicular to each other, their normal position with relation to the section being designated by x and y.

Moment of Inertia—I. The sum of the products obtained by multiplying each of the elementary areas of which the section is composed, by the square of its normal distance from a neutral axis of the section or from any axis of moments assumed for purposes of calculation.

Section Modulus—S. The moment of inertia divided by the normal distance from the axis to which it refers to extreme fiber of the section. For the two moments of inertia, corresponding to the two principal axes of a section, there are also two section moduli.

The section modulus is used to determine the stress in the extreme fiber of a section, subjected to bending stresses, by dividing the bending moment by the section modulus referred to neutral axis normal to line of force, both values being expressed in like units of measure. The section modulus of a section, is obtained by dividing the bending stress by the allowable fiber stress, both values also in like units of measure. The proper section is then obtained from this section modulus by reference to the tables of Elements of Sections.

Radius of Gyration—r. The normal distance from a neutral axis to the center of gyration, the point where the entire area is considered to be concentrated and have the same moment of inertia as the actual area. The radius of gyration of a section referred to a neutral axis, or any axis of moments, is equal to the square root of the quotient obtained by dividing the moment of inertia, referred to that axis, by the area.

The radius of gyration of a section is used to ascertain the safe load this section will sustain when used in compression, as a strut or column. The unbraced length of the section in compression, divided by the least radius of gyration l/r, is denominated the ratio of slenderness.

GENERAL NOTATION IN FORMULAS

The following notation applies to formulas and tables for elements or physical properties of sections, also to flexure formulas and other data given for beams under various loading conditions:

A = Area of section, in square inches.
n = Distance from center line of gravity to extreme fiber, in inches.
I = Moment of inertia about center line of gravity, in inches^4.
M_s = Static moment, in inches^3.
S = Section modulus, in inches^3.
r = Radius of gyration, in inches.
f = Bending stress in extreme fiber, in pounds per square inch.
fb = Resistance of web, in pounds per square inch.
E = Modulus of elasticity, in pounds per square inch.
L = Length of section, in feet.
l = Length of section, in inches.
W, W_1, W_2 = Superimposed loads supported by beam, in pounds.
w = Superimposed load, in pounds per unit length or area.
W_{max} = Maximum safe load at point given, in pounds.
R, R_1 = Reactions at points of support, in pounds.
V = Vertical shear, in pounds.
M, M_1, M_2 = Bending moments at points given, in inch pounds.
M_{max} = Maximum bending moment, in inch pounds.
M_r = Maximum resisting moment, in inch pounds.
D, D_1 = Deflections at points given, in inches.
D_{max} = Maximum deflection at point given, in inches.

The common relations existing between the properties of any shape of uniform cross section are the following:

$$I = Ar^2 \qquad r = \sqrt{\frac{I}{A}} \qquad S = \frac{I}{n}$$

The moment of inertia, I_1, referred to an axis not coincident with but parallel to the neutral axis of the section, when z is the perpendicular distance between these two axes, is: $I_1 = I + Az^2$

The moment of resistance to the internal stresses of a beam resisting flexure must be equal to the moment of the external forces producing bending.

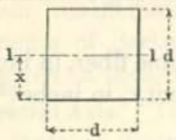
$$M_r = M_{max} = f\frac{I}{n} = f\,S.$$

The moment of resistance and the bending moment must, therefore, be expressed in same units of moment, force times length, generally in inch-pounds.

The modulus of elasticity is the ratio between unit stress and the elongation caused by that stress in one unit of length, up to the elastic limit; for steel the modulus of elasticity is 29,000,000 pounds per square inch.

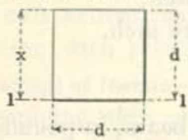
ELEMENTS OF SECTIONS

SQUARE
Axis of moments through center



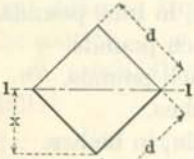
$$A = d^2$$
$$x = \frac{d}{2}$$
$$I_{1\text{-}1} = \frac{d^4}{12}$$
$$S_{1\text{-}1} = \frac{d^3}{6}$$
$$r_{1\text{-}1} = \frac{d}{\sqrt{12}} = 0.288675\,d$$

SQUARE
Axis of moments on base



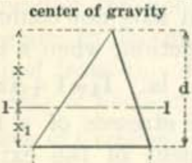
$$A = d^2$$
$$x = d$$
$$I_{1\text{-}1} = \frac{d^4}{3}$$
$$S_{1\text{-}1} = \frac{d^3}{3}$$
$$r_{1\text{-}1} = \frac{d}{\sqrt{3}} = 0.577350\,d$$

SQUARE
Axis of moments on diagonal



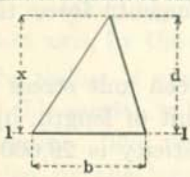
$$A = d^2$$
$$x = \frac{d}{\sqrt{2}} = 0.707107\,d$$
$$I_{1\text{-}1} = \frac{d^4}{12}$$
$$S_{1\text{-}1} = \frac{d^3}{6\sqrt{2}} = 0.117851\,d^3$$
$$r_{1\text{-}1} = \frac{d}{\sqrt{12}} = 0.288675\,d$$

TRIANGLE
Axis of moments through center of gravity



$$A = \frac{bd}{2}$$
$$x = \frac{2d}{3} \qquad x_1 = \frac{d}{3}$$
$$I_{1\text{-}1} = \frac{bd^3}{36}$$
$$S_{1\text{-}1} = \frac{bd^2}{24}$$
$$r_{1\text{-}1} = \frac{d}{\sqrt{18}} = 0.235702\,d$$

TRIANGLE
Axis of moments on base

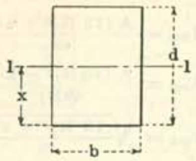


$$A = \frac{bd}{2}$$
$$x = d$$
$$I_{1\text{-}1} = \frac{bd^3}{12}$$
$$S_{1\text{-}1} = \frac{bd^2}{12}$$
$$r_{1\text{-}1} = \frac{d}{\sqrt{6}} = 0.408248\,d$$

ELEMENTS OF SECTIONS

RECTANGLE

Axis of moments through center



$$A = bd$$

$$x = \frac{d}{2}$$

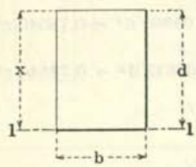
$$I_{1\text{-}1} = \frac{bd^3}{12}$$

$$S_{1\text{-}1} = \frac{bd^2}{6}$$

$$r_{1\text{-}1} = \frac{d}{\sqrt{12}} = 0.288675\,d$$

RECTANGLE

Axis of moments on base



$$A = bd$$

$$x = d$$

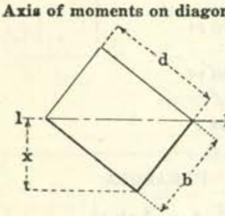
$$I_{1\text{-}1} = \frac{bd^3}{3}$$

$$S_{1\text{-}1} = \frac{bd^2}{3}$$

$$r_{1\text{-}1} = \frac{d}{\sqrt{3}} = 0.577350\,d$$

RECTANGLE

Axis of moments on diagonal



$$A = bd$$

$$x = \frac{bd}{\sqrt{b^2+d^2}}$$

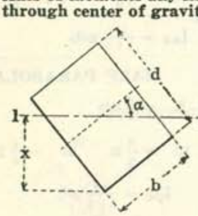
$$I_{1\text{-}1} = \frac{b^3\,d^3}{6\,(b^2+d^2)}$$

$$S_{1\text{-}1} = \frac{b^2\,d^2}{6\sqrt{b^2+d^2}}$$

$$r_{1\text{-}1} = \frac{bd}{\sqrt{6\,(b^2+d^2)}}$$

RECTANGLE

Axis of moments any line through center of gravity



$$A = bd$$

$$x = \frac{b\sin\alpha + d\cos\alpha}{2}$$

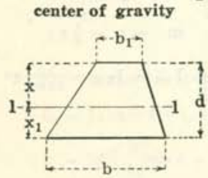
$$I_{1\text{-}1} = \frac{bd\,(b^2\sin^2\alpha + d^2\cos^2\alpha)}{12}$$

$$S_{1\text{-}1} = \frac{bd\,(b^2\sin^2\alpha + d^2\cos^2\alpha)}{6\,(b\sin\alpha + d\cos\alpha)}$$

$$r_{1\text{-}1} = \sqrt{\frac{b^2\sin^2\alpha + d^2\cos^2\alpha}{12}}$$

TRAPEZOID

Axis of moments through center of gravity



$$A = \frac{d(b + b_1)}{2}$$

$$x = \frac{d(b_1 + 2b)}{3(b + b_1)} \qquad x_1 = \frac{d\,(b + 2b_1)}{3\,(b + b_1)}$$

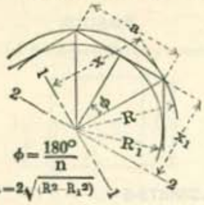
$$I_{1\text{-}1} = \frac{d^3\,(b^2 + 4\,bb_1 + b_1^2)}{36\,(b + b_1)}$$

$$S_{1\text{-}1} = \frac{d^2\,(b^2 + 4\,bb_1 + b_1^2)}{12\,(b_1 + 2\,b)}$$

$$r_{1\text{-}1} = \frac{d}{6\,(b + b_1)}\sqrt{2\,(b^2 + 4\,bb_1 + b_1^2)}$$

ELEMENTS OF SECTIONS

REGULAR POLYGON
Axis of moments through center



$\phi = \frac{180^\circ}{n}$

$a = 2\sqrt{(R^2 - R_1^2)}$

n = Number of Sides

$$A = \tfrac{1}{4}\, na^2 \cot\phi = \tfrac{1}{2}\, nR^2 \sin 2\phi = n\, R_1^2 \tan\phi$$

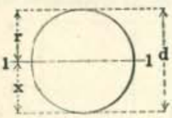
$$x = R = \frac{a}{2\sin\phi} \qquad x_1 = R_1 = \frac{a}{2\tan\phi}$$

$$I_{1\text{-}1} = \frac{A\,(6\,R^2 - a^2)}{24} = I_{2\text{-}2} = \frac{A\,(12\,R_1^2 + a^2)}{48}$$

$$S_{1\text{-}1} = \frac{A\,(6\,R^2 - a^2)}{24R} \qquad S_{2\text{-}2} = \frac{A\,(12\,R_1^2 + a^2)}{48R_1}$$

$$r_{1\text{-}1} = \sqrt{\frac{6\,R^2 - a^2}{24}} = r_{2\text{-}2} = \sqrt{\frac{12\,R_1^2 + a^2}{48}}$$

CIRCLE
Axis of moments through center



$$A = \frac{\pi d^2}{4} = \pi r^2 \qquad 0.78540\, d^2 = 3.14159\, r^2$$

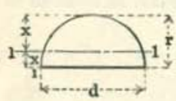
$$x = \frac{d}{2} = r$$

$$I_{1\text{-}1} = \frac{\pi d^4}{64} = \frac{\pi r^4}{4} \qquad 0.04909\, d^4 = 0.78540\, r^4$$

$$S_{1\text{-}1} = \frac{\pi d^3}{32} = \frac{\pi r^3}{4} \qquad 0.09818\, d^3 = 0.78540\, r^3$$

$$r_{1\text{-}1} = \frac{d}{4} = \frac{r}{2}$$

HALF CIRCLE
Axis of moments through center of gravity



$$A = \frac{\pi r^2}{2} = 1.57080\, r^2$$

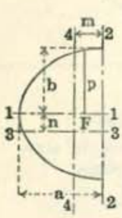
$$x = r\left(1 - \frac{4}{3\pi}\right) = 0.57559\, r \qquad x_1 = \frac{4r}{3\pi} = 0.42441\, r$$

$$I_{1\text{-}1} = r^4\left(\frac{\pi}{8} - \frac{8}{9\pi}\right) = 0.10976\, r^4$$

$$S_{1\text{-}1} = \frac{r^3}{24}\,\frac{(9\pi^2 - 64)}{(3\pi - 4)} = 0.19069\, r^3$$

$$r_{1\text{-}1} = r\,\frac{\sqrt{9\pi^2 - 64}}{6\pi} = 0.26434\, r$$

HALF ECLIPSE



$$A = \tfrac{1}{2}\,\pi ab$$

$$m = \tfrac{4}{3}\,\frac{a}{\pi}$$

$$I_{1\text{-}1} = \tfrac{1}{8}\,\pi ab^3 \qquad I_{2\text{-}2} = \tfrac{1}{8}\,\pi a^3 b$$

$$I_{4\text{-}4} = a^3 b\left(\tfrac{\pi}{8} - \tfrac{8}{9}\pi\right)$$

p = parameter

$$y^2 = 2px - \frac{px^2}{a}$$

QUARTER ECLIPSE

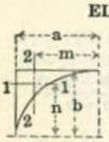
$$A = \tfrac{1}{4}\,\pi ab$$

$$m = \tfrac{4}{3}\,\frac{a}{\pi} \qquad n = \tfrac{4}{3}\,\frac{b}{\pi}$$

$$I_{1\text{-}1} = \tfrac{1}{16}\,\pi ab^3 \qquad I_{2\text{-}2} = \tfrac{1}{16}\,\pi a^3 b$$

$$I_{3\text{-}3} = ab^3\left(\tfrac{\pi}{16} - \tfrac{4}{9\pi}\right) \qquad I_{4\text{-}4} = a^3 b\left(\tfrac{\pi}{16} - \tfrac{4}{9\pi}\right)$$

ELLIPTIC COMPLEMENT



Circular Complement
Radius, r = a = b

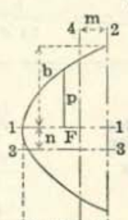
$$A = ab\left(1 - \frac{\pi}{4}\right)$$

$$m = \frac{a}{6\left(1 - \frac{\pi}{4}\right)} \qquad n = \frac{b}{6\left(1 - \frac{\pi}{4}\right)}$$

$$I_{1\text{-}1} = ab^3\left(\frac{1}{3} - \frac{\pi}{16} - \frac{1}{36\left(1 - \frac{\pi}{4}\right)}\right)$$

$$I_{2\text{-}2} = a^3 b\left(\frac{1}{3} - \frac{\pi}{16} - \frac{1}{36\left(1 - \frac{\pi}{4}\right)}\right)$$

PARABOLA



p = parameter
$y^2 = 2px$

$$A = \tfrac{4}{3}\,ab$$

$$m = \tfrac{2}{5}\,a$$

$$I_{1\text{-}1} = \tfrac{4}{15}\,ab^3 \qquad I_{2\text{-}2} = \tfrac{32}{105}\,a^3 b$$

$$I_{4\text{-}4} = \tfrac{16}{175}\,a^3 b$$

HALF PARABOLA

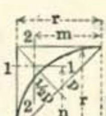
$$A = \tfrac{2}{3}\,ab$$

$$m = \frac{2}{5}\,a \qquad n = \tfrac{3}{8}\,b$$

$$I_{1\text{-}1} = \tfrac{2}{15}\,ab^3 \qquad I_{2\text{-}2} = \tfrac{16}{105}\,a^3 b$$

$$I_{3\text{-}3} = \tfrac{19}{480}\,ab^3 \qquad I_{4\text{-}4} = \tfrac{8}{175}\,a^3 b$$

PARABOLIC COMPLEMENT



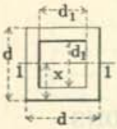
$$A = \tfrac{1}{6}\,r^2$$

$$m = n = \tfrac{4}{5}\,r$$

$$I_{1\text{-}1} = I_{2\text{-}2} = \tfrac{11}{2100}\,r^4$$

ELEMENTS OF SECTIONS

Axis of Moments through Center of Gravity



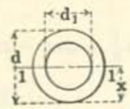
$A = d^2 - d_1^2$

$x = \frac{d}{2}$

$I_{1\text{-}1} = \frac{d^4 - d_1^4}{12}$

$S_{1\text{-}1} = \frac{d^4 - d_1^4}{6d}$

$r_{1\text{-}1} = \sqrt{\frac{d^2 + d_1^2}{12}}$



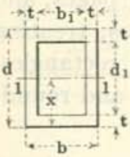
$A = \frac{\pi(d^2 - d_1^2)}{4}$

$x = \frac{d}{2}$

$I_{1\text{-}1} = \frac{\pi(d^4 - d_1^4)}{64}$

$S_{1\text{-}1} = \frac{\pi(d^4 - d_1^4)}{32d}$

$r_{1\text{-}1} = \frac{\sqrt{d^2 + d_1^2}}{4}$



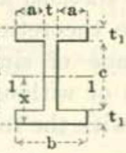
$A = bd - b_1 d_1$

$x = \frac{d}{2}$

$I_{1\text{-}1} = \frac{bd^3 - b_1 d_1^3}{12}$

$S_{1\text{-}1} = \frac{bd^3 - b_1 d_1^3}{6d}$

$r_{1\text{-}1} = \sqrt{\frac{bd^3 - b_1 d_1^3}{12A}}$



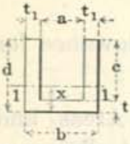
$A = bd - 2ac$

$x = \frac{d}{2}$

$I_{1\text{-}1} = \frac{bd^3 - 2ac^3}{12}$

$S_{1\text{-}1} = \frac{bd^3 - 2ac^3}{6d}$

$r_{1\text{-}1} = \sqrt{\frac{bd^3 - 2ac^3}{12A}}$



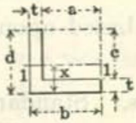
$A = 2dt_1 + at$

$x = \frac{d^2 t_1 + \frac{1}{2}t^2 a}{A}$

$I_{1\text{-}1} = \frac{2t_1 d^3 + at^3}{3} - Ax^2$

$S_{1\text{-}1} = \frac{I}{d - x}$

$r_{1\text{-}1} = \sqrt{\frac{I}{A}}$



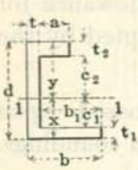
$A = t(a + b)$

$x = \frac{\frac{1}{2}d^2 t + \frac{1}{2}t^2 a}{A}$

$I_{1\text{-}1} = \frac{td^3 + at^3}{3} - Ax^2$

$S_{1\text{-}1} = \frac{I}{d - x}$

$r_{1\text{-}1} = \sqrt{\frac{I}{A}}$



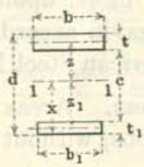
$A = dt + b_1 t_1 + at_2$

$x = \frac{\frac{1}{2}d^2 t + \frac{1}{2}t_1^2 b_1 + at_2(d - \frac{1}{2}t_2)}{A}$

$I_{1\text{-}1} = \frac{bx^3 - b_1 c_1^3 + (a+t)y^3 - ac_2^3}{3}$

$S_{1\text{-}1} = \frac{I}{d - x}$

$r_{1\text{-}1} = \sqrt{\frac{I}{A}}$



$A = bt + b_1 t_1$

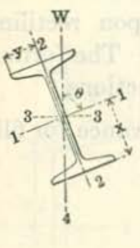
$x = \frac{bt(d - \frac{1}{2}t) + \frac{1}{2}b_1 t_1^2}{A}$

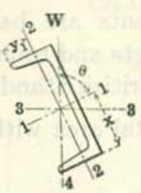
$I_{1\text{-}1} = \frac{bt^3}{12} + btz^2 + \frac{b_1 t_1^3}{12} + b_1 t_1 z_1^2$

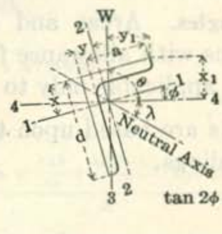
$S_{1\text{-}1} = \frac{I}{x}$

$r_{1\text{-}1} = \sqrt{\frac{I}{A}}$

Transverse Force oblique through Center of Gravity







$\tan 2\phi = \frac{2J}{I_2 - I_1}$

$I_3 = I_1 \sin^2\theta + I_2 \cos^2\theta$

$I_4 = I_1 \cos^2\theta + I_2 \sin^2\theta$

$f = M\left(\frac{x}{I_1}\sin\theta + \frac{y}{I_2}\cos\theta\right)$

$J = \frac{t[d(2y - t)(d - 2x) + a(2x - t)(a + 2t - 2y)]}{4}$

$I_3 = I_2 - J\tan\phi \qquad I_4 = I_1 + J\tan\phi$

$\tan\lambda = \frac{x_1}{y_1} = -\frac{I_4}{I_3}\cot\theta$

$f = M\left(\frac{x_1}{I_4}\sin\theta + \frac{y_1}{I_3}\cos\theta\right)$

FORMULAS FOR ELEMENTS OF ROLLED SECTIONS

The formulas on the following pages are for the computation of the elements of the sections as tabulated on preceding pages, and are based upon the theoretical straight-line dimensions, treating the sections as made of simple geometrical figures, rectangles, triangles, etc., with or without an allowance for fillets and roundings in accordance with the following rules:

C B Sections. Areas and Elements are based upon rectilinear dimensions, with allowance for fillets, which with these sections are assumed to be of parabolic contour.

The weights are based upon the total area with allowance for fillets.

Beams and Channels. Standard American Sections. Areas and Elements are based upon rectilinear dimensions, without allowance for fillets and roundings.

The weights are based upon the total area with allowance for fillets and roundings, in accordance with the rules adopted by the Association of American Steel Manufacturers.

Angles, Tees and Zees. Areas and Elements are based upon rectilinear dimensions, without allowance for fillets and roundings.

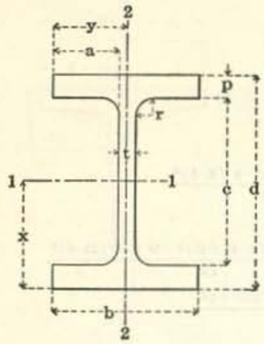
Weights are based upon the net area with a certain allowance for fillets and roundings, in accordance with the rules adopted by the Association of American Steel Manufacturers.

Bulb Angles. Areas and Elements are based upon rectilinear dimensions with allowance for fillets and roundings. The formulas given are applicable only to the British Standard Sections.

Weights are based upon the total area with allowance for fillets and roundings.

ELEMENTS OF SECTIONS

C B SECTIONS



$$A = dt + 4ap + \frac{2}{3}r^2$$

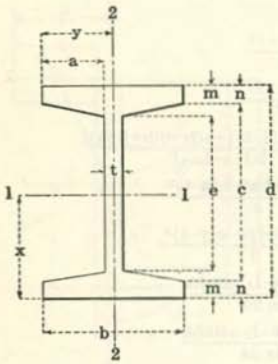
$$x = \frac{d}{2}$$

$$y = \frac{b}{2}$$

$$I_{1\text{-}1} = \frac{bd^3 - 2ac^3}{12} + 4\left[\frac{11}{2100}r^4 + \frac{1}{6}r^2\left(\frac{c}{2} - \frac{r}{5}\right)^2\right]$$

$$I_{2\text{-}2} = \frac{2pb^3 + ct^3}{12} + 4\left[\frac{11}{2100}r^4 + \frac{1}{6}r^2\left(\frac{t}{2} + \frac{r}{5}\right)^2\right]$$

BEAMS



$$A = dt + 2a(m+n)$$

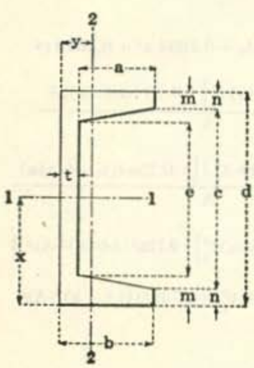
$$x = \frac{d}{2}$$

$$y = \frac{b}{2}$$

$$I_{1\text{-}1} = \frac{bd^3 - \frac{a}{4(m-n)}(c^4 - e^4)}{12}$$

$$I_{2\text{-}2} = \frac{2nb^3 + et^3 + \frac{m-n}{4a}(b^4 - t^4)}{12}$$

CHANNELS



$$A = dt + a(m+n)$$

$$x = \frac{d}{2}$$

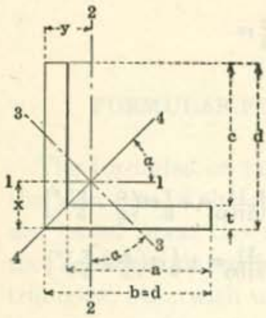
$$y = \frac{b^2n + \frac{ct^2}{2} + \frac{a(m-n)}{3}(b+2t)}{A}$$

$$I_{1\text{-}1} = \frac{bd^3 - \frac{a}{8(m-n)}(c^4 - e^4)}{12}$$

$$I_{2\text{-}2} = \frac{2nb^3 + et^3 + \frac{m-n}{2a}(b^4 - t^4)}{3} - Ay^2$$

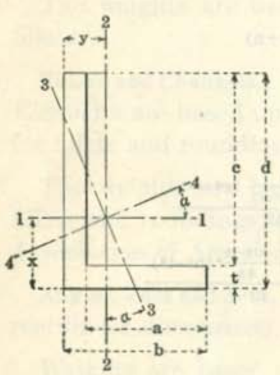
ELEMENTS OF SECTIONS

EQUAL ANGLES



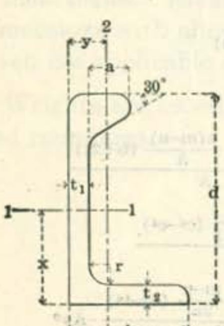
$$A = t(b+c)$$
$$x = \frac{b^2+ct}{2(b+c)}$$
$$y = x$$
$$\alpha = 45^\circ$$
$$I_{1-1} = \frac{t(b-x)^3+bx^3-a\,(x-t)^3}{3}$$
$$I_{2-2} = I_{1-1}$$
$$I_{3-3} = \frac{ct^3+c^3t+3ct(b-4x+2t)^2+t^4+6t^2(2x-t)^2}{12}$$
$$I_{4-4} = \frac{ct^3+c^3t+3ctb^2+t^4}{12}$$

UNEQUAL ANGLES



$$A = t(b+c)$$
$$x = \frac{t(b+2c)+c^2}{2(b+c)}$$
$$y = \frac{t(2a+d)+a^2}{2(a+d)}$$
$$\operatorname{Tan} 2\alpha = \frac{t[(2y-t)d(d-2x)+a(2x-t)(b+t-2y)]}{2(I_{1-1}-I_{2-2})}$$
$$I_{1-1} = \frac{t(d-x)^3+bx^3-a(x-t)^3}{3}$$
$$I_{2-2} = \frac{t(b-y)^3+dy^3-c(y-t)^3}{3}$$
$$I_{3-3} = \frac{I_{2-2}\cos^2\alpha-I_{1-1}\sin^2\alpha}{\cos 2\alpha}$$
$$I_{4-4} = \frac{I_{1-1}\cos^2\alpha-I_{2-2}\sin^2\alpha}{\cos 2\alpha}$$

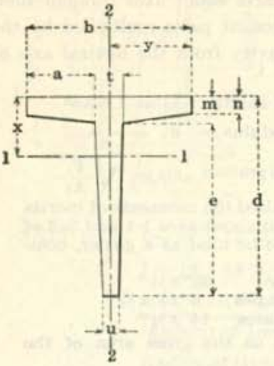
BULB ANGLES—British Standard



$$A = dt_1 + (b-t_1)\,t_2 + 0.7334\,a^2 + 0.1610\,r^2$$
$$x = \frac{\frac{1}{2}\left[d^2t_1 + (b-t_1)\,t_2^2\right] + 0.73\,(d-0.4a)a^2}{A}$$
$$y = \frac{\frac{1}{2}\left[dt_1^2 + t_2\left(b^2-t_1^2\right)\right] + 0.73a^2(t_1 + 0.44a)}{A}$$
$$I_{1-1} = 0.34\left(\left[d^3t_1+(b-t_1)t_2^3\right]+0.72a^2(d-0.4a)^2-Ax^2\right)$$
$$I_{2-2} = \frac{1}{3}\left[b^3t^2+(d-t^2)t_1^3\right]+0.73a^2(t_1+\tfrac{1}{2}\,a)^2-Ay^2$$

ELEMENTS OF SECTIONS

TEES



$$A = \frac{e(t+u)}{2} + mt + a(m+n)$$

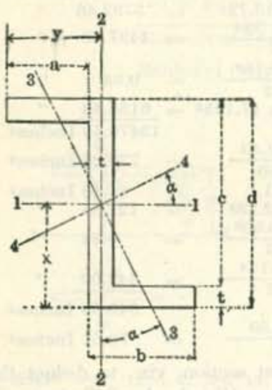
$$x = \frac{6an^2 + 2a(m-n)(m+2n) + 3td^2 - e(t-u)(3d-e)}{6A}$$

$$y = \frac{b}{2}$$

$$I_{1\text{-}1} = \frac{e^3(3u+t) + 4bm^3 - 2a(m-n)^3}{12} - A(x-m)^2$$

$$I_{2\text{-}2} = \frac{nb^3 + (m-n)t^3 + eu^3}{12} + \frac{a(m-n)[2a^2 + (2a+3t)^2]}{36} + \frac{e(t-u)[(t-u)^2 + 2(t+2u)^2]}{144}$$

ZEES



$$A = t(d+2a)$$

$$x = \frac{d}{2}$$

$$y = \frac{2b-t}{2}$$

$$\tan 2\alpha = \frac{(dt-t^2)\,(b^2-bt)}{I_{1\text{-}1} - I_{2\text{-}2}}$$

$$I_{1\text{-}1} = \frac{bd^3 - a(d-2t)^3}{12}$$

$$I_{2\text{-}2} = \frac{d(b+a)^3 - 2a^3c - 6ab^2c}{12}$$

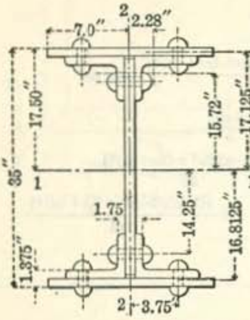
$$I_{3\text{-}3} = \frac{I_{2\text{-}2}\cos^2\alpha - I_{1\text{-}1}\sin^2\alpha}{\cos 2\alpha}$$

$$I_{4\text{-}4} = \frac{I_{1\text{-}1}\cos^2\alpha - I_{2\text{-}2}\sin^2\alpha}{\cos 2\alpha}$$

COMPOUND SECTIONS

Moments of Inertia, Section Moduli, and Radii of Gyration

The moment of inertia of a compound section about its neutral axis is equal to the sum of the moment of inertia, I, of the component parts about axes through their own centers of gravity, plus the areas A, of the component parts multiplied by the squares of the distances z, of their own centers of gravity from the neutral axis of the compound section, or



Moment of Inertia $I_1 = I + Az^2$

Section Modulus $S_1 = \frac{I_1}{n}$

Radius of Gyration $r_1 = \sqrt{\frac{I_1}{A_1}}$

EXAMPLE 1. Required the moments of inertia and the section moduli about axes 1-1 and 2-2 of a compound section to be used as a girder, composed of

1 Web Plate	33"x½"
4 Flange Angles	6"x4"x⅝"
2 Flange Plates	14"x¾"

basing the properties on the gross area of the section.

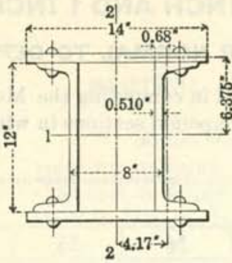
Determine the distances, z, of the center lines of gravity of plates and angles, from the neutral axes of the compound section, from the dimensions given, then for

AXIS 1-1	I_{1-1} of 4-6"x4"x⅝" Angles	$= 4 \times 7.5$	=	30.00 Inches^4
	Az^2 of 4-6"x4"x⅝" "	$= 4 \times 5.86 \times 15.72^2$	=	5792.46 "
	I_{1-1} of 1-33"x½" Plate	$= 1 \times \frac{0.50 \times 33^3}{12}$	=	1497.38 "
	I_{1-1} of 2-14"x¾" "	$= 2 \times \frac{14 \times 0.75^3}{12}$	=	0.98 "
	Az^2 of 2-14"x¾" "	$= 2 \times 10.50 \times 17.125^2$	=	6158.58 "
	Moment of Inertia, gross section			13479.40 Inches^4
	Section Modulus, " "	$= \frac{13479.40}{17.50}$	=	770.26 Inches^3
AXIS 2-2	I_{2-2} of 4-6"x4"x⅝" Angles	$= 4 \times 21.1$	=	84.40 Inches^4
	Az^2 of 4-6"x4"x⅝" "	$= 4 \times 5.86 \times 2.28^2$	=	121.85 "
	I_{2-2} of 1-33"x½" Plate	$= 1 \times \frac{33 \times 0.50^3}{12}$	=	0.34 "
	I_{2-2} of 2-14"x¾" "	$= 2 \times \frac{0.75 \times 14^3}{12}$	=	343.00 "
	Moment of Inertia, gross section			549.59 Inches^4
	Section Modulus, " "	$= \frac{549.59}{7}$	=	78.51 Inches^3

If it is desired to calculate the properties of the net section, viz., to deduct the area of the rivet holes, proceed as follows, assuming that 1" holes for ⅞" rivets are to be deducted and that not more than one rivet will be driven in any one leg of the angles in the same plane of the section.

AXIS 1-1	I_{1-1} of gross section		=	13479.40 Inches^4
Deduct	I_{1-1} of 4-1"x1.375" Rectangles	$= 4 \times \frac{1 \times 1.375^3}{12}$	=	0.87 "
"	Az^2 of 4-1"x1.375" "	$= 4 \times 1.375 \times 16.8125^2$	=	1554.63 "
"	I_{1-1} of 2-1"x1.75" "	$= 2 \times \frac{1.75 \times 1^3}{12}$	=	0.29 "
"	Az^2 of 2-1"x1.75" "	$= 2 \times 1.75 \times 14.25^2$	=	710.72 "
	Moment of Inertia, net section			11212.89 Inches^4
	Section Modulus, " "	$= \frac{11212.89}{17.50}$	=	640.74 Inches^3
AXIS 2-2	I_{2-2} of gross section		=	549.59 Inches^4
Deduct	I_{2-2} of 4-1"x1.375" Rectangles	$= 4 \times \frac{1.375 \times 1^3}{12}$	=	0.46 "
"	Az^2 of 4-1"x1.375" "	$= 4 \times 1.375 \times 3.75^2$	=	77.34 "
"	I_{2-2} of 2-1"x1.75" "	$= 2 \times \frac{1 \times 1.75^3}{12}$	=	0.89 "
	Moment of Inertia, net section			470.90 Inches^4
	Section Modulus, " "	$= \frac{470.90}{7}$	=	67.27 Inches^3

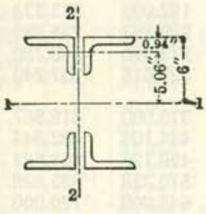
COMPOUND SECTIONS—Concluded



EXAMPLE 2. Required the moments of inertia and radii of gyration about axes 1-1 and 2-2 of a column section composed as follows:—
2 Channels 12" x 30 pounds per foot,
2 Flange Plates 14" x ¾",
properties to be based on the gross section, no deduction being made for holes.

Determine the distances, z, of center lines of gravity for the various sections from the neutral axes 1-1 and 2-2, in accordance with the dimensions given, then for

AXIS 1-1	I_{1-1} of 2-12" Channels 30 lbs.	$= 2 \times 161.2$	=	322.40 Inches^4
	I_{1-1} of 2-14"x¾" Plates	$= 2 \times \frac{14 \times 0.75^3}{12}$	=	0.98 "
	Az^2 of 2-14"x¾" "	$= 2 \times 10.5 \times 6.375^2$	=	853.45 "
	Moment of Inertia, gross section			1176.83 Inches^4
	Radius of Gyration, " "	$= \sqrt{\frac{1176.83}{38.58}}$	=	5.52 Inches
AXIS 2-2	I_{2-2} of 2-12" Channels 30 lbs.	$= 2 \times 5.2$	=	10.40 Inches^4
	Az^2 of 2-12" Channels 30 lbs.	$= 2 \times 8.79 \times 4.17^2$	=	305.70 "
	I_{2-2} of 2-14"x¾" Plates	$= 2 \times \frac{0.75 \times 14^3}{12}$	=	343.00 "
	Moment of Inertia, gross section			659.10 Inches^4
	Radius of Gyration, " "	$= \sqrt{\frac{659.10}{38.58}}$	=	4.13 Inches



EXAMPLE 3. Required the radii of gyration about axes 1-1 and 2-2 of a strut section composed as follows:—
4-6" x 4" x ⅜" Angles latticed by 5/16" bars, properties to be based on the gross section of angles, no deductions being made for rivet holes nor any allowance for lattice bars.

Determine the distances, z, of center lines of gravity of angles from neutral axes 1-1 and 2-2 in accordance with the dimensions given, then for

AXIS 1-1	I_{1-1} of 4-6"x4"x⅜" Angles	$= 4 \times 4.9$	=	19.60 Inches^4
	Az^2 of 4-6"x4"x⅜" "	$= 4 \times 3.61 \times 5.06^2$	=	369.72 "
	Moment of Inertia, gross section			389.32 Inches^4
	Radius of Gyration, " "	$= \sqrt{\frac{389.32}{14.44}}$	=	5.19 Inches

AXIS 2-2 From tables of radii of gyration for 2 angles placed back to back axis 2-2, ⅜" apart, r_{2-2} of 4-6" x 4" x ⅜" angles = 2.97 Inches.

Where sections are assembled without any web or flange plates, as, for example, latticed channel columns or latticed angle struts, the radius of gyration, r_{1-1} can be readily obtained, without considering the moment of inertia from the radius of gyration, r of one section about its neutral axis, and the distance, z, between the center of gravity of the section and the neutral axis parallel to the axis of section.

$$r_{1-1} = \sqrt{\frac{I + Az^2}{A}}, \text{ where } \frac{I}{A} = r^2, \text{ and } r_{1-1} = \sqrt{r^2 + z^2}$$

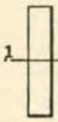
Thus, in the above example,

$$r_{1-1} = \sqrt{1.17^2 + 5.06^2} = 5.19 \text{ Inches.}$$

MOMENTS OF INERTIA OF RECTANGLES

IN WIDTHS FROM 1/4 TO 5/8 INCH AND 1 INCH

NEUTRAL AXIS THROUGH CENTER NORMAL TO DEPTH



This and the following table may be used in computing the Moments of Inertia of Plate Girders, Columns and other compound sections in which plates are used.

Depth, Inches	Width, Inches							
	1/4	5/16	3/8	7/16	1/2	9/16	5/8	1
1	.021	.026	.031	.037	.042	.047	.052	.083
2	.167	.208	.250	.292	.333	.375	.417	.667
3	.563	.703	.844	.984	1.125	1.266	1.406	2.250
4	1.333	1.667	2.000	2.333	2.667	3.000	3.333	5.333
5	2.604	3.255	3.906	4.557	5.208	5.859	6.510	10.417
6	4.500	5.625	6.750	7.875	9.000	10.125	11.250	18.000
7	7.146	8.932	10.719	12.505	14.292	16.078	17.865	28.583
8	10.667	13.333	16.000	18.667	21.333	24.000	26.667	42.667
9	15.188	18.984	22.781	26.578	30.375	34.172	37.969	60.750
10	20.833	26.042	31.250	36.458	41.667	46.875	52.083	83.333
11	27.729	34.662	41.594	48.526	55.458	62.391	69.323	110.917
12	36.000	45.000	54.000	63.000	72.000	81.000	90.000	144.000
13	45.771	57.214	68.656	80.099	91.542	102.984	114.427	183.083
14	57.167	71.458	85.750	100.042	114.333	128.625	142.917	228.667
15	70.313	87.891	105.469	123.047	140.625	158.203	175.781	281.250
16	85.333	106.667	128.000	149.333	170.667	192.000	213.333	341.333
17	102.354	127.943	153.531	179.120	204.708	230.297	255.885	409.417
18	121.500	151.875	182.250	212.625	243.000	273.375	303.750	486.000
19	142.896	178.620	214.344	250.068	285.792	321.516	357.240	571.583
20	166.667	208.333	250.000	291.667	333.333	375.000	416.667	666.667
21	192.938	241.172	289.406	337.641	385.875	434.109	482.344	771.750
22	221.833	277.292	332.750	388.208	443.667	499.125	554.583	887.333
23	253.479	316.849	380.219	443.589	506.958	570.328	633.698	1013.917
24	288.000	360.000	432.000	504.000	576.000	648.000	720.000	1152.000
25	325.521	406.901	488.281	569.662	651.042	732.422	813.802	1302.083
26	366.167	457.708	549.250	640.792	732.333	823.875	915.417	1464.667
27	410.063	512.578	615.094	717.609	820.125	922.641	1025.156	1640.250
28	457.333	571.667	686.000	800.333	914.667	1029.000	1143.333	1829.333
29	508.104	635.130	762.156	889.182	1016.208	1143.234	1270.260	2032.417
30	562.500	703.125	843.750	984.375	1125.000	1265.625	1406.250	2250.000
32	682.667	853.333	1024.000	1194.667	1365.333	1536.000	1706.667	2730.667
34	818.833	1023.542	1228.250	1432.958	1637.667	1842.375	2047.083	3275.333
36	972.000	1215.000	1458.000	1701.000	1944.000	2187.000	2430.000	3888.000
38	1143.167	1428.958	1714.750	2000.542	2286.333	2572.125	2857.917	4572.667
40	1333.333	1666.667	2000.000	2333.333	2666.667	3000.000	3333.333	5333.333
42	1543.500	1929.375	2315.250	2701.125	3087.000	3472.875	3858.750	6174.000
44	1774.667	2218.333	2662.000	3105.667	3549.333	3993.000	4436.667	7098.667
46	2027.833	2534.792	3041.750	3548.708	4055.667	4562.625	5069.583	8111.333
48	2304.000	2880.000	3456.000	4032.000	4608.000	5184.000	5760.000	9216.000
50	2604.167	3255.208	3906.250	4557.292	5208.333	5859.375	6510.417	10416.667
52	2929.333	3661.667	4394.000	5126.333	5858.667	6591.000	7323.333	11717.333
54	3280.500	4100.625	4920.750	5740.875	6561.000	7381.125	8201.250	13122.000
56	3658.667	4573.333	5488.000	6402.667	7317.333	8232.000	9146.667	14634.667
58	4064.833	5081.042	6097.250	7113.458	8129.667	9145.875	10162.083	16259.333
60	4500.000	5625.000	6750.000	7875.000	9000.000	10125.000	11250.000	18000.000

MOMENTS OF INERTIA OF RECTANGLES

IN WIDTHS OF 1 INCH

NEUTRAL AXIS THROUGH CENTER NORMAL TO DEPTH

To obtain the Moment of Inertia of any rectangle, multiply the tabular value for its depth by its width in inches. For deeper rectangles of tabular thickness, multiply the tabular values for half their depth by 8; or for one-third their depth by 27, etc.

Depth, Inches	I_{1-1} Inches^4	Depth, Inches	I_{1-1} Inches^4	Depth, Inches	I_{1-1} Inches^4	Depth, Inches	I_{1-1} Inches^4	Depth, Inches	I_{1-1} Inches^4	Depth, Inches	I_{1-1} Inches^4
0	.000	6	18.000	12	144.000	18	486.000	24	1152.000	30	2250.000
⅛	.000	⅛	19.149	⅛	148.547	⅛	496.195	⅛	1170.094	⅛	2278.243
¼	.001	¼	20.345	¼	153.189	¼	506.533	¼	1188.376	¼	2306.721
⅜	.004	⅜	21.590	⅜	157.926	⅜	517.012	⅜	1206.848	⅜	2335.434
½	.010	½	22.885	½	162.760	½	527.635	½	1225.510	½	2364.385
⅝	.020	⅝	24.231	⅝	167.692	⅝	538.403	⅝	1244.364	⅝	2393.575
¾	.035	¾	25.629	¾	172.723	¾	549.317	¾	1263.410	¾	2423.004
⅞	.056	⅞	27.079	⅞	177.853	⅞	560.376	⅞	1282.650	⅞	2452.674
1	.083	7	28.583	13	183.083	19	571.583	25	1302.083	31	2482.583
⅛	.119	⅛	30.142	⅛	188.416	⅛	582.939	⅛	1321.713	⅛	2512.737
¼	.163	¼	31.757	¼	193.850	¼	594.444	¼	1341.538	¼	2543.132
⅜	.217	⅜	33.428	⅜	199.389	⅜	606.099	⅜	1361.561	⅜	2573.771
½	.281	½	35.156	½	205.031	½	617.906	½	1381.781	½	2604.656
⅝	.358	⅝	36.944	⅝	210.779	⅝	629.866	⅝	1402.202	⅝	2635.787
¾	.447	¾	38.790	¾	216.634	¾	641.978	¾	1422.821	¾	2667.165
⅞	.549	⅞	40.698	⅞	222.596	⅞	654.245	⅞	1443.644	⅞	2698.792
2	.667	8	42.667	14	228.667	20	666.667	26	1464.667	32	2730.667
⅛	.800	⅛	44.698	⅛	234.847	⅛	679.245	⅛	1485.893	⅛	2762.792
¼	.949	¼	46.793	¼	241.137	¼	691.840	¼	1507.324	¼	2795.168
⅜	1.116	⅜	48.952	⅜	247.538	⅜	704.874	⅜	1528.961	⅜	2827.797
½	1.302	½	51.177	½	254.052	½	717.927	½	1550.802	½	2860.677
⅝	1.507	⅝	53.468	⅝	260.679	⅝	731.141	⅝	1572.851	⅝	2893.812
¾	1.733	¾	55.827	¾	267.421	¾	744.514	¾	1595.108	¾	2927.202
⅞	1.980	⅞	58.254	⅞	274.277	⅞	758.051	⅞	1617.575	⅞	2960.849
3	2.250	9	60.750	15	281.250	21	771.750	27	1640.250	33	2994.750
⅛	2.543	⅛	63.317	⅛	288.340	⅛	785.613	⅛	1663.136	⅛	3028.911
¼	2.861	¼	65.954	¼	295.548	¼	799.652	¼	1686.236	¼	3063.329
⅜	3.204	⅜	68.665	⅜	302.875	⅜	813.836	⅜	1709.547	⅜	3098.009
½	3.573	½	71.448	½	310.323	½	828.198	½	1733.073	½	3132.948
⅝	3.970	⅝	74.305	⅝	317.891	⅝	842.727	⅝	1756.814	⅝	3168.150
¾	4.395	¾	77.238	¾	325.582	¾	857.426	¾	1780.770	¾	3203.614
⅞	4.849	⅞	80.247	⅞	333.396	⅞	872.294	⅞	1804.943	⅞	3239.341
4	5.333	10	83.333	16	341.333	22	887.333	28	1829.333	34	3275.333
⅛	5.849	⅛	86.498	⅛	349.396	⅛	902.545	⅛	1853.943	⅛	3311.592
¼	6.397	¼	89.741	¼	357.585	¼	917.928	¼	1878.773	¼	3348.117
⅜	6.978	⅜	93.064	⅜	365.900	⅜	933.486	⅜	1903.823	⅜	3384.909
½	7.594	½	96.469	½	374.344	½	949.219	½	1929.094	½	3421.969
⅝	8.244	⅝	99.955	⅝	382.916	⅝	965.127	⅝	1954.588	⅝	3459.300
¾	8.931	¾	103.525	¾	391.618	¾	981.212	¾	1980.305	¾	3496.900
⅞	9.655	⅞	107.178	⅞	400.452	⅞	997.475	⅞	2006.249	⅞	3534.772
5	10.417	11	110.917	17	409.417	23	1013.917	29	2032.417	35	3572.917
⅛	11.218	⅛	114.741	⅛	418.515	⅛	1030.538	⅛	2058.811	⅛	3611.334
¼	12.059	¼	118.652	¼	427.746	¼	1047.340	¼	2085.434	¼	3650.027
⅜	12.941	⅜	122.652	⅜	437.113	⅜	1064.323	⅜	2112.285	⅜	3688.994
½	13.865	½	126.740	½	446.615	½	1081.490	½	2139.365	½	3728.240
⅝	14.832	⅝	130.918	⅝	456.253	⅝	1098.839	⅝	2166.676	⅝	3767.763
¾	15.843	¾	135.186	¾	466.030	¾	1116.374	¾	2194.218	¾	3807.561
⅞	16.898	⅞	139.547	⅞	475.945	⅞	1134.094	⅞	2221.992	⅞	3847.641
6	18.000	12	144.000	18	486.000	24	1152.000	30	2250.000	36	3888.000

RADII OF GYRATION FOR TWO ANGLES

The following tables of Radii of Gyration for Two Angles are used for computing the safe resistance to compressive stress of two angles, back to back, when used as a strut or a compression chord of a roof truss or a similar member.

The two angles must be held together securely by stay rivets, so spaced that the two angles act as a unit.

The resistance of a compressive member is determined by its ratio of slenderness, l/r, that is the ratio of the unbraced length of the compression member to its least radius of gyration, see page 70.

To obtain the allowable compressive stress, compute, from the compression formula in use, the allowable unit stress corresponding to the ratio of slenderness derived from the least radius of gyration of the two angles in consideration, and multiply that value by the area of the two angles.

In the two examples which follow the least radius of the two angles in Example 1 is taken about axis 1-1, and the least radius of the two angles in Example 2 is taken about axis 2-2.

Example 1. Section given. Required the safe load in compression on a strut composed of two angles 4″ x 4″ x ⅜″, back to back, with an unsupported length of 9 feet.

Area of Section, A = 2 x 2.86 = 5.72 square inches.

Least Radius, Axis 1-1, r = 1.23, by interpolation.

Ratio of Slenderness, l/r = 9 x 12 ÷ 1.23 = 87.8.

Allowed Unit Stress f, by A. I. S C. formula = 12,603 pounds per sq. inch.

Safe Load, A x f = 5.72 x 12,603 = 72,100 pounds.

Example 2. Load given. Required a section for a member in compression 12′-3″ long, made of two angles separated by ½ inch gusset plates, to resist a total load of 68,000 pounds; ratio of slenderness not to exceed 120.

A. I. S. C. formula, Unit Stress f = 10,000 pounds for l/r = 120.

Approximate Area of Angles, A = 68,000 ÷ 10,000 = 6.80 square inches.

Assume 2 Angles, 5″ x 3″ x 7/16″, 5-inch legs, back to back.

Area of Section, A = 2 x 3.31 = 6.62 square inches.

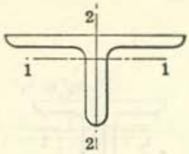
Least Radius, Axis 2-2, r = 1.29 inches, by interpolation.

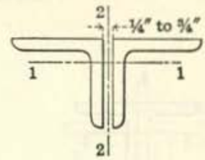
Ratio of Slenderness, l/r = 12.25 x 12 ÷ 1.29 = 114.0.

Allowed Unit Stress f, by A. I. S. C. formula = 10,453 pounds per sq. inch.

Safe Load, A x f = 6.62 x 10,453 = 69,200 pounds.

RADII OF GYRATION FOR TWO EQUAL ANGLES



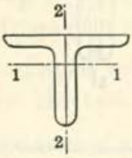


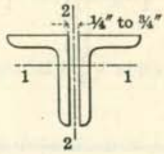
Single Angle			Area of Two Angles Inches²	Radii of Gyration of Two Angles, Inches					
Size, Inches	Thickness, Inches	Weight, Pounds per Foot		Axis 1-1	Axis 2-2				
					In Contact	¼" Apart	⅜" Apart	½" Apart	¾" Apart
	1⅛	56.9	33.46	2.42	3.42	3.51	3.55	3.60	3.69
8 x 8	13/16	42.0	24.68	2.46	3.37	3.46	3.50	3.55	3.64
	½	26.4	15.50	2.50	3.33	3.41	3.45	3.50	3.59
	1	37.4	22.00	1.80	2.59	2.68	2.72	2.77	2.87
6 x 6	11/16	26.5	15.56	1.83	2.54	2.63	2.67	2.71	2.81
	⅜	14.9	8.72	1.88	2.49	2.58	2.62	2.66	2.75
	1	30.6	18.00	1.48	2.19	2.28	2.33	2.38	2.47
5 x 5	11/16	21.8	12.80	1.51	2.13	2.22	2.26	2.31	2.40
	⅜	12.3	7.22	1.56	2.09	2.17	2.21	2.26	2.35
	13/16	19.9	11.68	1.18	1.75	1.85	1.89	1.94	2.04
4 x 4	½	12.8	7.50	1.22	1.70	1.78	1.83	1.88	1.98
	¼	6.6	3.88	1.25	1.66	1.75	1.79	1.84	1.93
	13/16	17.1	10.06	1.02	1.55	1.65	1.70	1.75	1.85
3½ x 3½	½	11.1	6.50	1.06	1.50	1.59	1.64	1.69	1.78
	¼	5.8	3.38	1.09	1.46	1.55	1.59	1.64	1.73
3 x 3	⅝	11.5	6.72	0.88	1.32	1.41	1.46	1.51	1.61
	¼	4.9	2.88	0.93	1.25	1.34	1.38	1.43	1.53
2½ x 2½	½	7.7	4.50	0.74	1.09	1.19	1.24	1.29	1.39
	¼	4.1	2.38	0.77	1.05	1.14	1.19	1.24	1.34
2 x 2	7/16	5.3	3.12	0.59	0.88	0.98	1.03	1.08	1.19
	¼	3.19	1.88	0.61	0.85	0.94	0.99	1.04	1.14

Values of Radii of Gyration for intermediate thicknesses of angles in above and preceding tables may be obtained by interpolation.

RADII OF GYRATION FOR TWO UNEQUAL ANGLES

Long Legs Vertical

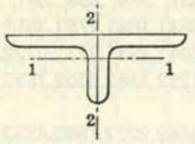


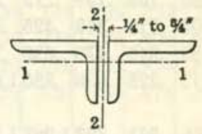


Single Angle: Size, Inches	Single Angle: Thickness, Inches	Single Angle: Weight, Pounds per Foot	Area of Two Angles, Inches^2	Radii of Gyration of Two Angles, Inches: Axis 1-1	Axis 2-2: In Contact	Axis 2-2: ¼" Apart	Axis 2-2: ⅜" Apart	Axis 2-2: ½" Apart	Axis 2-2: ¾" Apart
8 x 6	1	44.2	26.00	2.49	2.39	2.48	2.52	2.57	2.66
	¾	33.8	19.88	2.53	2.35	2.44	2.48	2.52	2.61
	7/16	20.2	11.86	2.57	2.31	2.39	2.43	2.48	2.56
8 x 3½	1	35.7	21.00	2.51	1.26	1.35	1.40	1.45	1.55
	¾	27.5	16.12	2.55	1.20	1.29	1.34	1.39	1.49
	7/16	16.5	9.68	2.59	1.15	1.23	1.28	1.32	1.41
7 x 3½	1	32.3	19.00	2.19	1.31	1.40	1.45	1.50	1.60
	11/16	23.0	13.50	2.23	1.25	1.34	1.39	1.44	1.53
	⅜	13.0	7.60	2.27	1.20	1.28	1.33	1.37	1.46
6 x 4	1	30.6	18.00	1.85	1.60	1.69	1.74	1.79	1.89
	11/16	21.8	12.80	1.89	1.55	1.63	1.68	1.73	1.82
	⅜	12.3	7.22	1.93	1.50	1.58	1.62	1.67	1.76
6 x 3½	1	28.9	17.00	1.85	1.37	1.47	1.51	1.56	1.66
	11/16	20.6	12.12	1.89	1.31	1.41	1.45	1.49	1.60
	5/16	9.8	5.74	1.95	1.25	1.33	1.37	1.42	1.50
5 x 4	⅞	24.2	14.22	1.52	1.66	1.76	1.80	1.85	1.95
	⅜	11.0	6.46	1.59	1.58	1.66	1.70	1.75	1.85
5 x 3½	⅞	22.7	13.34	1.53	1.42	1.51	1.56	1.61	1.71
	5/16	8.7	5.12	1.61	1.33	1.41	1.45	1.50	1.59
5 x 3	13/16	19.9	11.68	1.55	1.18	1.27	1.32	1.37	1.47
	5/16	8.2	4.80	1.61	1.09	1.17	1.22	1.26	1.35
4½ x 3	13/16	18.5	10.86	1.38	1.21	1.31	1.36	1.41	1.51
	5/16	7.7	4.50	1.44	1.13	1.22	1.26	1.30	1.40
4 x 3½	13/16	18.5	10.86	1.19	1.50	1.59	1.64	1.69	1.79
	5/16	7.7	4.50	1.26	1.42	1.51	1.55	1.60	1.69
4 x 3	13/16	17.1	10.06	1.21	1.25	1.35	1.40	1.45	1.55
	¼	5.8	3.38	1.28	1.16	1.24	1.28	1.33	1.43
3½ x 3	13/16	15.8	9.24	1.04	1.30	1.40	1.45	1.50	1.60
	¼	5.4	3.12	1.11	1.20	1.29	1.34	1.38	1.48
3½ x 2½	11/16	12.5	7.30	1.06	1.03	1.13	1.18	1.23	1.33
	¼	4.9	2.88	1.12	0.95	1.04	1.09	1.13	1.23
3 x 2½	9/16	9.5	5.56	0.91	1.05	1.15	1.20	1.25	1.35
	¼	4.5	2.64	0.95	1.00	1.09	1.13	1.18	1.28
3 x 2	½	7.7	4.50	0.92	0.80	0.89	0.94	1.00	1.10
	¼	4.1	2.38	0.95	0.74	0.84	0.88	0.93	1.03
2½ x 2	½	6.8	4.00	0.75	0.84	0.94	0.99	1.04	1.15
	¼	3.62	2.12	0.78	0.80	0.89	0.93	0.98	1.08

RADII OF GYRATION FOR TWO UNEQUAL ANGLES

Short Legs Vertical





Single Angle		Weight, Pounds per Foot	Area of Two Angles Inches²	Radii of Gyration of Two Angles, Inches					
Size, Inches	Thickness, Inches			Axis 1-1	Axis 2-2				
					In Contact	¼" Apart	⅜" Apart	½" Apart	¾" Apart
8 x 6	1	44.2	26.00	1.73	3.64	3.73	3.78	3.83	3.92
	¾	33.8	19.88	1.76	3.60	3.69	3.73	3.78	3.87
	7/16	20.2	11.86	1.80	3.55	3.64	3.68	3.73	3.82
8 x 3½	1	35.7	21.00	0.86	4.04	4.14	4.19	4.24	4.34
	¾	27.5	16.12	0.88	3.99	4.09	4.13	4.18	4.28
	7/16	16.5	9.68	0.92	3.93	4.02	4.07	4.12	4.22
7 x 3½	1	32.3	19.00	0.89	3.48	3.58	3.63	3.68	3.78
	11/16	23.0	13.50	0.92	3.42	3.52	3.57	3.62	3.72
	⅜	13.0	7.60	0.96	3.36	3.46	3.50	3.55	3.65
6 x 4	1	30.6	18.00	1.09	2.85	2.95	2.99	3.04	3.14
	11/16	21.8	12.80	1.13	2.79	2.89	2.93	2.98	3.08
	⅜	12.3	7.22	1.17	2.74	2.83	2.87	2.92	3.02
6 x 3½	1	28.9	17.00	0.92	2.92	3.02	3.07	3.12	3.22
	11/16	20.6	12.12	0.95	2.87	2.96	3.01	3.06	3.16
	5/16	9.8	5.74	1.00	2.81	2.90	2.95	3.00	3.09
5 x 4	⅞	24.2	14.22	1.14	2.29	2.38	2.43	2.48	2.58
	⅜	11.0	6.46	1.20	2.20	2.29	2.34	2.38	2.48
5 x 3½	⅞	22.7	13.34	0.96	2.36	2.45	2.50	2.55	2.65
	5/16	8.7	5.12	1.03	2.26	2.35	2.39	2.44	2.54
5 x 3	13/16	19.9	11.68	0.80	2.42	2.52	2.57	2.62	2.72
	5/16	8.2	4.80	0.85	2.33	2.42	2.47	2.52	2.61
4½ x 3	13/16	18.5	10.86	0.81	2.15	2.25	2.30	2.35	2.45
	5/16	7.7	4.50	0.87	2.06	2.15	2.20	2.25	2.34
4 x 3½	13/16	18.5	10.86	1.01	1.81	1.91	1.96	2.01	2.11
	5/16	7.7	4.50	1.07	1.73	1.81	1.86	1.91	2.00
4 x 3	13/16	17.1	10.06	0.83	1.88	1.98	2.03	2.08	2.18
	¼	5.8	3.38	0.89	1.78	1.87	1.92	1.96	2.06
3½ x 3	13/16	15.8	9.24	0.85	1.61	1.71	1.76	1.81	1.91
	¼	5.4	3.12	0.91	1.52	1.61	1.65	1.70	1.80
3½ x 2½	11/16	12.5	7.30	0.69	1.66	1.75	1.80	1.86	1.96
	¼	4.9	2.88	0.74	1.58	1.67	1.71	1.76	1.86
3 x 2½	9/16	9.5	5.56	0.72	1.37	1.46	1.51	1.56	1.66
	¼	4.5	2.64	0.75	1.31	1.40	1.45	1.50	1.59
3 x 2	½	7.7	4.50	0.55	1.42	1.52	1.57	1.62	1.72
	¼	4.1	2.38	0.57	1.38	1.47	1.52	1.57	1.67
2½ x 2	½	6.8	4.00	0.56	1.15	1.25	1.30	1.35	1.46
	¼	3.62	2.12	0.59	1.11	1.20	1.25	1.30	1.40

WEIGHTS OF RECTANGULAR SECTIONS

POUNDS PER LINEAL FOOT

Width, Inches	Thickness, Inches															
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
1/4	.053	.106	.159	.213	.266	.319	.372	.425	.478	.531	.584	.638	.691	.744	.797	.850
1/2	.106	.213	.319	.425	.531	.638	.744	.850	.956	1.063	1.169	1.275	1.381	1.488	1.594	1.700
3/4	.159	.319	.478	.638	.797	.956	1.116	1.275	1.434	1.594	1.753	1.913	2.072	2.231	2.391	2.550
1	.213	.425	.638	.850	1.063	1.275	1.488	1.700	1.913	2.125	2.338	2.550	2.763	2.975	3.188	3.400
1 1/4	.266	.531	.797	1.063	1.328	1.594	1.859	2.125	2.391	2.656	2.922	3.188	3.453	3.719	3.984	4.250
1 1/2	.319	.638	.956	1.275	1.594	1.913	2.231	2.550	2.869	3.188	3.506	3.825	4.144	4.463	4.781	5.100
1 3/4	.372	.744	1.116	1.488	1.859	2.231	2.603	2.975	3.347	3.719	4.091	4.463	4.834	5.206	5.578	5.950
2	.425	.850	1.275	1.700	2.125	2.550	2.975	3.400	3.825	4.250	4.675	5.100	5.525	5.950	6.375	6.800
2 1/4	.478	.956	1.434	1.913	2.391	2.869	3.347	3.825	4.303	4.781	5.259	5.738	6.216	6.694	7.172	7.650
2 1/2	.531	1.063	1.594	2.125	2.656	3.188	3.719	4.250	4.781	5.313	5.844	6.375	6.906	7.438	7.969	8.500
2 3/4	.584	1.169	1.753	2.338	2.922	3.506	4.091	4.675	5.259	5.844	6.428	7.013	7.597	8.181	8.766	9.350
3	.638	1.275	1.913	2.550	3.188	3.825	4.463	5.100	5.738	6.375	7.013	7.650	8.288	8.925	9.563	10.20
3 1/4	.691	1.381	2.072	2.763	3.453	4.144	4.834	5.525	6.216	6.906	7.597	8.288	8.978	9.669	10.36	11.05
3 1/2	.744	1.488	2.231	2.975	3.719	4.463	5.206	5.950	6.694	7.438	8.181	8.925	9.669	10.41	11.16	11.90
3 3/4	.797	1.594	2.391	3.188	3.984	4.781	5.578	6.375	7.172	7.969	8.766	9.563	10.36	11.16	11.95	12.75
4	.850	1.700	2.550	3.400	4.250	5.100	5.950	6.800	7.650	8.500	9.350	10.20	11.05	11.90	12.75	13.60
4 1/4	.903	1.806	2.709	3.613	4.516	5.419	6.322	7.225	8.128	9.031	9.934	10.84	11.74	12.64	13.55	14.45
4 1/2	.956	1.913	2.869	3.825	4.781	5.738	6.694	7.650	8.606	9.563	10.52	11.48	12.43	13.39	14.34	15.30
4 3/4	1.000	2.019	3.028	4.038	5.047	6.056	7.066	8.075	9.084	10.09	11.10	12.11	13.12	14.13	15.14	16.15
5	1.063	2.125	3.188	4.250	5.313	6.375	7.438	8.500	9.563	10.63	11.69	12.75	13.81	14.88	15.94	17.00
5 1/4	1.116	2.231	3.347	4.463	5.578	6.694	7.809	8.925	10.04	11.16	12.27	13.39	14.50	15.62	16.73	17.85
5 1/2	1.169	2.338	3.506	4.675	5.844	7.013	8.181	9.350	10.52	11.69	12.86	14.03	15.19	16.36	17.53	18.70
5 3/4	1.222	2.444	3.666	4.888	6.109	7.331	8.553	9.775	11.00	12.22	13.44	14.66	15.88	17.11	18.33	19.55
6	1.275	2.550	3.825	5.100	6.375	7.650	8.925	10.20	11.48	12.75	14.03	15.30	16.58	17.85	19.13	20.40
6 1/4	1.328	2.656	3.984	5.313	6.641	7.969	9.297	10.63	11.95	13.28	14.61	15.94	17.27	18.59	19.92	21.25
6 1/2	1.381	2.763	4.144	5.525	6.906	8.288	9.669	11.05	12.43	13.81	15.19	16.58	17.96	19.34	20.72	22.10
6 3/4	1.434	2.869	4.303	5.738	7.172	8.606	10.04	11.48	12.91	14.34	15.78	17.21	18.65	20.08	21.52	22.95
7	1.488	2.975	4.463	5.950	7.438	8.925	10.41	11.90	13.39	14.88	16.36	17.85	19.34	20.83	22.31	23.80
7 1/4	1.541	3.081	4.622	6.163	7.703	9.244	10.78	12.33	13.87	15.41	16.95	18.49	20.03	21.57	23.11	24.65
7 1/2	1.594	3.188	4.781	6.375	7.969	9.563	11.16	12.75	14.34	15.94	17.53	19.13	20.72	22.31	23.91	25.50
7 3/4	1.647	3.294	4.941	6.588	8.234	9.881	11.53	13.18	14.82	16.47	18.12	19.76	21.41	23.06	24.70	26.35
8	1.700	3.400	5.100	6.800	8.500	10.20	11.90	13.60	15.30	17.00	18.70	20.40	22.10	23.80	25.50	27.20
8 1/4	1.753	3.506	5.259	7.013	8.766	10.52	12.27	14.03	15.78	17.53	19.28	21.04	22.79	24.54	26.30	28.05
8 1/2	1.806	3.613	5.419	7.225	9.031	10.84	12.64	14.45	16.26	18.06	19.87	21.68	23.48	25.29	27.09	28.90
8 3/4	1.859	3.719	5.578	7.438	9.297	11.16	13.02	14.88	16.73	18.59	20.45	22.31	24.17	26.03	27.89	29.75
9	1.913	3.825	5.738	7.650	9.563	11.48	13.39	15.30	17.21	19.13	21.04	22.95	24.86	26.78	28.69	30.60
9 1/4	1.966	3.931	5.897	7.863	9.828	11.79	13.76	15.73	17.69	19.66	21.62	23.59	25.55	27.52	29.48	31.45
9 1/2	2.019	4.038	6.056	8.075	10.09	12.11	14.13	16.15	18.17	20.19	22.21	24.23	26.24	28.26	30.28	32.30
9 3/4	2.072	4.144	6.216	8.288	10.36	12.43	14.50	16.58	18.65	20.72	22.79	24.86	26.93	29.01	31.08	33.15
10	2.125	4.250	6.375	8.500	10.63	12.75	14.88	17.00	19.13	21.25	23.38	25.50	27.63	29.75	31.88	34.00

AREAS OF RECTANGULAR SECTIONS

SQUARE INCHES

Width, Inches	Thickness, Inches															
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
1/4	.016	.031	.047	.063	.078	.094	.109	.125	.141	.156	.172	.188	.203	.219	.234	.250
1/2	.031	.063	.094	.125	.156	.188	.219	.250	.281	.313	.344	.375	.406	.438	.469	.500
3/4	.047	.094	.141	.188	.234	.281	.328	.375	.422	.469	.516	.563	.609	.656	.703	.750
1	.063	.125	.188	.250	.313	.375	.438	.500	.563	.625	.688	.750	.813	.875	.938	1.000
1 1/4	.078	.156	.234	.313	.391	.469	.547	.625	.703	.781	.859	.938	1.016	1.094	1.172	1.250
1 1/2	.094	.188	.281	.375	.469	.563	.656	.750	.844	.938	1.031	1.125	1.219	1.313	1.406	1.500
1 3/4	.109	.219	.328	.438	.547	.656	.766	.875	.984	1.094	1.203	1.313	1.422	1.531	1.641	1.750
2	.125	.250	.375	.500	.625	.750	.875	1.000	1.125	1.250	1.375	1.500	1.625	1.750	1.875	2.000
2 1/4	.141	.281	.422	.563	.703	.844	.984	1.125	1.266	1.406	1.547	1.688	1.828	1.969	2.109	2.250
2 1/2	.156	.313	.469	.625	.781	.938	1.094	1.250	1.406	1.563	1.719	1.875	2.031	2.188	2.344	2.500
2 3/4	.172	.344	.516	.688	.859	1.031	1.203	1.375	1.547	1.719	1.891	2.063	2.234	2.406	2.578	2.750
3	.188	.375	.563	.750	.938	1.125	1.313	1.500	1.688	1.875	2.063	2.250	2.438	2.625	2.813	3.000
3 1/4	.203	.406	.609	.813	1.016	1.219	1.422	1.625	1.828	2.031	2.234	2.438	2.641	2.844	3.047	3.250
3 1/2	.219	.438	.656	.875	1.094	1.313	1.531	1.750	1.969	2.188	2.406	2.625	2.844	3.063	3.281	3.500
3 3/4	.234	.469	.703	.938	1.172	1.406	1.641	1.875	2.109	2.344	2.578	2.813	3.047	3.281	3.516	3.750
4	.250	.500	.750	1.000	1.250	1.500	1.750	2.000	2.250	2.500	2.750	3.000	3.250	3.500	3.750	4.000
4 1/4	.266	.531	.797	1.063	1.328	1.594	1.859	2.125	2.391	2.656	2.922	3.188	3.453	3.719	3.984	4.250
4 1/2	.281	.563	.844	1.125	1.406	1.688	1.969	2.250	2.531	2.813	3.094	3.375	3.656	3.938	4.219	4.500
4 3/4	.297	.594	.891	1.188	1.484	1.781	2.078	2.375	2.672	2.969	3.266	3.563	3.859	4.156	4.453	4.750
5	.313	.625	.938	1.250	1.563	1.875	2.188	2.500	2.813	3.125	3.438	3.750	4.063	4.375	4.688	5.000
5 1/4	.328	.656	.984	1.313	1.641	1.969	2.297	2.625	2.953	3.281	3.609	3.938	4.266	4.594	4.922	5.250
5 1/2	.344	.688	1.031	1.375	1.719	2.063	2.406	2.750	3.094	3.438	3.781	4.125	4.469	4.813	5.156	5.500
5 3/4	.359	.719	1.078	1.438	1.797	2.156	2.516	2.875	3.234	3.594	3.953	4.313	4.672	5.031	5.391	5.750
6	.375	.750	1.125	1.500	1.875	2.250	2.625	3.000	3.375	3.750	4.125	4.500	4.875	5.250	5.625	6.000
6 1/4	.391	.781	1.172	1.563	1.953	2.344	2.734	3.125	3.516	3.906	4.297	4.688	5.078	5.469	5.859	6.250
6 1/2	.406	.813	1.219	1.625	2.031	2.438	2.844	3.250	3.656	4.063	4.469	4.875	5.281	5.688	6.094	6.500
6 3/4	.422	.844	1.266	1.688	2.109	2.531	2.953	3.375	3.797	4.219	4.641	5.063	5.484	5.906	6.328	6.750
7	.438	.875	1.313	1.750	2.188	2.625	3.063	3.500	3.938	4.375	4.813	5.250	5.688	6.125	6.563	7.000
7 1/4	.453	.906	1.359	1.813	2.266	2.719	3.172	3.625	4.078	4.531	4.984	5.438	5.891	6.344	6.797	7.250
7 1/2	.469	.938	1.406	1.875	2.344	2.813	3.281	3.750	4.219	4.688	5.156	5.625	6.094	6.563	7.031	7.500
7 3/4	.484	.969	1.453	1.938	2.422	2.906	3.391	3.875	4.359	4.844	5.328	5.813	6.297	6.781	7.266	7.750
8	.500	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500	5.000	5.500	6.000	6.500	7.000	7.500	8.000
8 1/4	.516	1.031	1.547	2.063	2.578	3.094	3.609	4.125	4.641	5.156	5.672	6.188	6.703	7.219	7.734	8.250
8 1/2	.531	1.063	1.594	2.125	2.656	3.188	3.719	4.250	4.781	5.313	5.844	6.375	6.906	7.438	7.969	8.500
8 3/4	.547	1.094	1.641	2.188	2.734	3.281	3.828	4.375	4.922	5.469	6.016	6.563	7.109	7.656	8.203	8.750
9	.563	1.125	1.688	2.250	2.813	3.375	3.938	4.500	5.063	5.625	6.188	6.750	7.313	7.875	8.438	9.000
9 1/4	.578	1.156	1.734	2.313	2.891	3.469	4.047	4.625	5.203	5.781	6.359	6.938	7.516	8.094	8.672	9.250
9 1/2	.594	1.188	1.781	2.375	2.969	3.563	4.156	4.750	5.344	5.938	6.531	7.125	7.719	8.313	8.906	9.500
9 3/4	.609	1.219	1.828	2.438	3.047	3.656	4.266	4.875	5.484	6.094	6.703	7.313	7.922	8.531	9.141	9.750
10	.625	1.250	1.875	2.500	3.125	3.750	4.375	5.000	5.625	6.250	6.875	7.500	8.125	8.750	9.375	10.00

WEIGHTS OF RECTANGULAR SECTIONS

POUNDS PER LINEAL FOOT

Width, Inches	Thickness, Inches															
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
10¼	2.178	4.356	6.534	8.713	10.89	13.07	15.25	17.43	19.60	21.78	23.96	26.14	28.32	30.49	32.67	34.85
10½	2.231	4.463	6.694	8.925	11.16	13.39	15.62	17.85	20.08	22.31	24.54	26.78	29.01	31.24	33.47	35.70
10¾	2.284	4.569	6.853	9.138	11.42	13.71	15.99	18.28	20.56	22.84	25.13	27.41	29.70	31.98	34.27	36.55
11	2.338	4.675	7.013	9.350	11.69	14.03	16.36	18.70	21.04	23.38	25.71	28.05	30.39	32.73	35.06	37.40
11¼	2.391	4.781	7.172	9.563	11.95	14.34	16.73	19.13	21.52	23.91	26.30	28.69	31.08	33.47	35.86	38.25
11½	2.444	4.888	7.331	9.775	12.22	14.66	17.11	19.55	21.99	24.44	26.88	29.33	31.77	34.21	36.66	39.10
11¾	2.497	4.994	7.491	9.988	12.48	14.98	17.48	19.98	22.47	24.97	27.47	29.96	32.46	34.96	37.45	39.95
12	2.550	5.100	7.650	10.200	12.75	15.30	17.85	20.40	22.95	25.50	28.05	30.60	33.15	35.70	38.25	40.80
12½	2.660	5.310	7.970	10.630	13.28	15.94	18.59	21.25	23.91	26.56	29.20	31.90	34.50	37.20	39.80	42.50
13	2.760	5.530	8.290	11.050	13.81	16.58	19.34	22.10	24.86	27.63	30.40	33.20	35.90	38.70	41.40	44.20
13½	2.870	5.740	8.610	11.480	14.34	17.21	20.08	22.95	25.82	28.69	21.60	34.40	37.30	40.20	43.00	45.90
14	2.980	5.950	8.930	11.900	14.88	17.85	20.83	23.80	26.78	29.75	32.70	35.70	38.70	41.70	44.60	47.60
14½	3.080	6.160	9.240	12.330	15.41	18.49	21.57	24.65	27.73	30.81	33.90	37.00	40.10	43.10	46.20	49.30
15	3.190	6.380	9.560	12.750	15.94	19.13	22.31	25.50	28.69	31.88	35.10	38.30	41.40	44.60	47.80	51.00
15½	3.290	6.590	9.880	13.180	16.47	19.76	23.06	26.35	29.64	32.94	36.20	39.50	42.80	46.10	49.40	52.70
16	3.400	6.800	10.200	13.600	17.00	20.40	23.80	27.20	30.60	34.00	37.40	40.80	44.20	47.60	51.00	54.40
16½	3.510	7.010	10.520	14.030	17.53	21.04	24.54	28.05	31.56	35.06	38.60	42.10	45.60	49.10	52.60	56.10
17	3.610	7.230	10.840	14.450	18.06	21.68	25.29	28.90	32.51	36.13	39.70	43.40	47.00	50.60	54.20	57.80
17½	3.720	7.440	11.160	14.880	18.59	22.31	26.03	29.75	33.47	37.19	40.90	44.60	48.30	52.10	55.80	59.50
18	3.830	7.650	11.480	15.300	19.13	22.95	26.78	30.60	34.43	38.25	42.10	45.90	49.70	53.60	57.40	61.20
18½	3.930	7.860	11.790	15.730	19.66	23.59	27.52	31.45	35.38	39.31	43.20	47.20	51.10	55.00	59.00	62.90
19	4.040	8.080	12.110	16.150	20.19	24.23	28.26	32.30	36.34	40.38	44.40	48.50	52.50	56.50	60.60	64.60
19½	4.140	8.290	12.430	16.580	20.72	24.86	29.01	33.15	37.29	41.44	45.60	49.70	53.90	58.00	62.20	66.30
20	4.250	8.500	12.750	17.000	21.25	25.50	29.75	34.00	38.25	42.50	46.80	51.00	55.30	59.50	63.80	68.00
20½	4.360	8.710	13.070	17.430	21.78	26.14	30.49	34.85	39.21	43.56	47.90	52.30	56.60	61.00	65.30	69.70
21	4.460	8.930	13.390	17.850	22.31	26.78	31.24	35.70	40.16	44.63	49.10	53.60	58.00	62.50	66.90	71.40
21½	4.570	9.140	13.710	18.280	22.84	27.41	31.98	36.55	41.12	45.69	50.30	54.80	59.40	64.00	68.50	73.10
22	4.680	9.350	14.030	18.700	23.38	28.05	32.73	37.40	42.08	46.75	51.40	56.10	60.80	65.50	70.10	74.80
22½	4.780	9.560	14.340	19.130	23.91	28.69	33.47	38.25	43.03	47.81	52.60	57.40	62.20	66.90	71.70	76.50
23	4.890	9.780	14.660	19.550	24.44	29.33	34.21	39.10	43.99	48.88	53.80	58.70	63.50	68.40	73.30	78.20
23½	4.990	9.990	14.980	19.980	24.97	29.96	34.96	39.95	44.94	49.94	54.90	59.90	64.90	69.90	74.90	79.90
24	5.100	10.200	15.300	20.400	25.50	30.60	35.70	40.80	45.90	51.00	56.10	61.20	66.30	71.40	76.50	81.60
25	5.310	10.630	15.940	21.250	26.56	31.88	37.19	42.50	47.81	53.13	58.40	63.80	69.10	74.40	79.70	85.00
26	5.530	11.050	16.580	22.100	27.63	33.15	38.68	44.20	49.73	55.25	60.80	66.30	71.80	77.40	82.90	88.40
27	5.740	11.480	17.210	22.950	28.69	34.43	40.16	45.90	51.64	57.38	63.10	68.90	74.60	80.30	86.10	91.80
28	5.950	11.900	17.850	23.800	29.75	35.70	41.65	47.60	53.55	59.50	65.50	71.40	77.40	83.30	89.30	95.20
29	6.160	12.330	18.490	24.650	30.81	36.98	43.14	49.30	55.46	61.63	67.80	74.00	80.10	86.30	92.40	98.60
30	6.380	12.750	19.130	25.500	31.88	38.25	44.63	51.00	57.38	63.75	70.10	76.50	82.90	89.30	95.60	102.00
31	6.590	13.180	19.760	26.350	32.94	39.53	46.11	52.70	59.29	65.88	72.50	79.10	85.60	92.20	98.80	105.40
32	6.800	13.600	20.400	27.200	34.00	40.80	47.60	54.40	61.20	68.00	74.80	81.60	88.40	95.20	102.00	108.80

AREAS OF RECTANGULAR SECTIONS

SQUARE INCHES

Width, Inches	Thickness, Inches															
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
10¼	.641	1.281	1.922	2.563	3.203	3.844	4.484	5.125	5.766	6.406	7.047	7.688	8.328	8.969	9.609	10.25
10½	.656	1.313	1.969	2.625	3.281	3.938	4.594	5.250	5.906	6.563	7.219	7.875	8.531	9.188	9.844	10.50
10¾	.672	1.344	2.016	2.688	3.359	4.031	4.703	5.375	6.047	6.719	7.391	8.063	8.734	9.406	10.08	10.75
11	.688	1.375	2.063	2.750	3.438	4.125	4.813	5.500	6.188	6.875	7.563	8.250	8.938	9.625	10.31	11.00
11¼	.703	1.406	2.109	2.813	3.516	4.219	4.922	5.625	6.328	7.031	7.734	8.438	9.141	9.844	10.55	11.25
11½	.719	1.438	2.156	2.875	3.594	4.313	5.031	5.750	6.469	7.188	7.906	8.625	9.344	10.06	10.78	11.50
11¾	.734	1.469	2.203	2.938	3.672	4.406	5.141	5.875	6.609	7.344	8.078	8.813	9.547	10.28	11.02	11.75
12	.750	1.500	2.250	3.000	3.750	4.500	5.250	6.000	6.750	7.500	8.250	9.000	9.750	10.50	11.25	12.00
12½	.781	1.563	2.344	3.125	3.906	4.688	5.469	6.250	7.031	7.813	8.594	9.375	10.16	10.94	11.72	12.50
13	.813	1.625	2.438	3.250	4.063	4.875	5.688	6.500	7.313	8.125	8.938	9.750	10.56	11.38	12.19	13.00
13½	.844	1.688	2.531	3.375	4.219	5.063	5.906	6.750	7.594	8.438	9.281	10.13	10.97	11.81	12.66	13.50
14	.875	1.750	2.625	3.500	4.375	5.250	6.125	7.000	7.875	8.750	9.625	10.50	11.38	12.25	13.13	14.00
14½	.906	1.813	2.719	3.625	4.531	5.438	6.344	7.250	8.156	9.063	9.969	10.88	11.78	12.69	13.59	14.50
15	.938	1.875	2.813	3.750	4.688	5.625	6.563	7.500	8.438	9.375	10.31	11.25	12.19	13.13	14.06	15.00
15½	.969	1.938	2.906	3.875	4.844	5.813	6.781	7.750	8.719	9.688	10.66	11.63	12.59	13.56	14.53	15.50
16	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.00	11.00	12.00	13.00	14.00	15.00	16.00
16½	1.031	2.063	3.094	4.125	5.156	6.188	7.219	8.250	9.281	10.31	11.34	12.38	13.41	14.44	15.47	16.50
17	1.063	2.125	3.188	4.250	5.313	6.375	7.438	8.500	9.563	10.63	11.69	12.75	13.81	14.88	15.94	17.00
17½	1.094	2.188	3.281	4.375	5.469	6.563	7.656	8.750	9.844	10.94	12.03	13.13	14.22	15.31	16.41	17.50
18	1.125	2.250	3.375	4.500	5.625	6.750	7.875	9.000	10.13	11.25	12.38	13.50	14.63	15.75	16.88	18.00
18½	1.156	2.313	3.469	4.625	5.781	6.938	8.094	9.250	10.41	11.56	12.72	13.88	15.03	16.19	17.34	18.50
19	1.188	2.375	3.563	4.750	5.938	7.125	8.313	9.500	10.69	11.88	13.06	14.25	15.44	16.63	17.81	19.00
19½	1.219	2.438	3.656	4.875	6.094	7.313	8.531	9.750	10.97	12.19	13.41	14.63	15.84	17.06	18.28	19.50
20	1.250	2.500	3.750	5.000	6.250	7.500	8.750	10.00	11.25	12.50	13.75	15.00	16.25	17.50	18.75	20.00
20½	1.281	2.563	3.844	5.125	6.406	7.688	8.969	10.25	11.53	12.81	14.09	15.38	16.66	17.94	19.22	20.50
21	1.313	2.625	3.938	5.250	6.563	7.875	9.188	10.50	11.81	13.13	14.44	15.75	17.06	18.38	19.69	21.00
21½	1.344	2.688	4.031	5.375	6.719	8.063	9.406	10.75	12.09	13.44	14.78	16.13	17.47	18.81	20.16	21.50
22	1.375	2.750	4.125	5.500	6.875	8.250	9.625	11.00	12.38	13.75	15.13	16.50	17.88	19.25	20.63	22.00
22½	1.406	2.813	4.219	5.625	7.031	8.438	9.844	11.25	12.66	14.06	15.47	16.88	18.28	19.69	21.09	22.50
23	1.438	2.875	4.313	5.750	7.188	8.625	10.06	11.50	12.94	14.38	15.81	17.25	18.69	20.13	21.56	23.00
23½	1.469	2.938	4.406	5.875	7.344	8.813	10.28	11.75	13.22	14.69	16.16	17.63	19.09	20.56	22.03	23.50
24	1.500	3.000	4.500	6.000	7.500	9.000	10.50	12.00	13.50	15.00	16.50	18.00	19.50	21.00	22.50	24.00
25	1.563	3.125	4.688	6.250	7.813	9.375	10.94	12.50	14.06	15.63	17.19	18.75	20.31	21.88	23.44	25.00
26	1.625	3.250	4.875	6.500	8.125	9.750	11.38	13.00	14.63	16.25	17.88	19.50	21.13	22.75	24.38	26.00
27	1.688	3.375	5.063	6.750	8.438	10.13	11.81	13.50	15.19	16.88	18.56	20.25	21.94	23.63	25.31	27.00
28	1.750	3.500	5.250	7.000	8.750	10.50	12.25	14.00	15.75	17.50	19.25	21.00	22.75	24.50	26.25	28.00
29	1.813	3.625	5.438	7.250	9.063	10.88	12.69	14.50	16.31	18.13	19.94	21.75	23.56	25.38	27.19	29.00
30	1.875	3.750	5.625	7.500	9.375	11.25	13.13	15.00	16.88	18.75	20.63	22.50	24.38	26.25	28.13	30.00
31	1.938	3.875	5.813	7.750	9.688	11.63	13.56	15.50	17.44	19.38	21.31	23.25	25.19	27.13	29.06	31.00
32	2.000	4.000	6.000	8.000	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00	32.00

WEIGHTS OF RECTANGULAR SECTIONS

POUNDS PER LINEAL FOOT

Width, Inches	Thickness, Inches															
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
33	7.013	14.03	21.04	28.05	35.06	42.08	49.09	56.10	63.11	70.13	77.14	84.15	91.16	98.18	105.2	112.2
34	7.225	14.45	21.68	28.90	36.13	43.35	50.58	57.80	65.03	72.25	79.48	86.70	93.93	101.2	108.4	115.6
35	7.438	14.88	22.31	29.75	37.19	44.63	52.06	59.50	66.94	74.38	81.81	89.25	96.69	104.1	111.6	119.0
36	7.650	15.30	22.95	30.60	38.25	45.90	53.55	61.20	68.85	76.50	84.15	91.80	99.45	107.1	114.8	122.4
37	7.863	15.73	23.59	31.45	39.31	47.18	55.04	62.90	70.76	78.63	86.49	94.35	102.2	110.1	117.9	125.8
38	8.075	16.15	24.23	32.30	40.38	48.45	56.53	64.60	72.68	80.75	88.83	96.90	105.0	113.1	121.1	129.2
39	8.288	16.58	24.86	33.15	41.44	49.73	58.01	66.30	74.59	82.88	91.16	99.45	107.7	116.0	124.3	132.6
40	8.500	17.00	25.50	34.00	42.50	51.00	59.50	68.00	76.50	85.00	93.50	102.0	110.5	119.0	127.5	136.0
41	8.713	17.43	26.14	34.85	43.56	52.28	60.99	69.70	78.41	87.13	95.84	104.6	113.3	122.0	130.7	139.4
42	8.925	17.85	26.78	35.70	44.63	53.55	62.48	71.40	80.33	89.25	98.18	107.1	116.0	125.0	133.9	142.8
43	9.138	18.28	27.41	36.55	45.69	54.83	63.96	73.10	82.24	91.38	100.5	109.7	118.8	127.9	137.1	146.2
44	9.350	18.70	28.05	37.40	46.75	56.10	65.45	74.80	84.15	93.50	102.9	112.2	121.6	130.9	140.3	149.6
45	9.563	19.13	28.69	38.25	47.81	57.38	66.94	76.50	86.06	95.63	105.2	114.8	124.3	133.9	143.4	153.0
46	9.775	19.55	29.33	39.10	48.88	58.65	68.43	78.20	87.98	97.75	107.5	117.3	127.1	136.9	146.6	156.4
47	9.988	19.98	29.96	39.95	49.94	59.93	69.91	79.90	89.89	99.88	109.9	119.9	129.8	139.8	149.8	159.8
48	10.20	20.40	30.60	40.80	51.00	61.20	71.40	81.60	91.80	102.00	112.2	122.4	132.6	142.8	153.0	163.2
49	10.40	20.80	31.20	41.70	52.10	62.50	72.90	83.30	93.70	104.10	114.5	125.0	135.4	145.8	156.2	166.6
50	10.60	21.30	31.90	42.50	53.10	63.80	74.40	85.00	95.60	106.30	116.9	127.5	138.1	148.8	159.4	170.0
51	10.80	21.70	32.50	43.40	54.20	65.00	75.90	86.70	97.50	108.40	119.2	130.1	140.9	151.7	162.6	173.4
52	11.10	22.10	33.20	44.20	55.30	66.30	77.40	88.40	99.50	110.50	121.6	132.6	143.7	154.7	165.8	176.8
53	11.30	22.50	33.80	45.10	56.30	67.60	78.80	90.10	101.40	112.60	123.9	135.2	146.4	157.7	168.9	180.2
54	11.50	23.00	34.40	45.90	57.40	68.90	80.30	91.80	103.30	114.80	126.2	137.7	149.2	160.7	172.1	183.6
55	11.70	23.40	35.10	46.80	58.40	70.10	81.80	93.50	105.20	116.90	128.6	140.3	151.9	163.6	175.3	187.0
56	11.90	23.80	35.70	47.60	59.50	71.40	83.30	95.20	107.10	119.00	130.9	142.8	154.7	166.6	178.5	190.4
57	12.10	24.20	36.30	48.50	60.60	72.70	84.80	96.90	109.00	121.10	133.2	145.4	157.5	169.6	181.7	193.8
58	12.30	24.70	37.00	49.30	61.60	74.00	86.30	98.60	110.90	123.30	135.6	147.9	160.2	172.6	184.9	197.2
59	12.50	25.10	37.60	50.20	62.70	75.20	87.80	100.30	112.80	125.40	137.9	150.5	163.0	175.5	188.1	200.6
60	12.80	25.50	38.30	51.00	63.80	76.50	89.30	102.00	114.80	127.50	140.3	153.0	165.8	178.5	191.3	204.0
61	13.00	25.90	38.90	51.90	64.80	77.80	90.70	103.70	116.70	129.60	142.6	155.6	168.5	181.5	194.4	207.4
62	13.20	26.40	39.50	52.70	65.90	79.10	92.20	105.40	118.60	131.80	144.9	158.1	171.3	184.5	197.6	210.8
63	13.40	26.80	40.20	53.60	66.90	80.30	93.70	107.10	120.50	133.90	147.3	160.7	174.0	187.4	200.8	214.2
64	13.60	27.20	40.80	54.40	68.00	81.60	95.20	108.80	122.40	136.00	149.6	163.2	176.8	190.4	204.0	217.6
65	13.80	27.60	41.40	55.30	69.10	82.90	96.70	110.50	124.30	138.10	151.9	165.8	179.6	193.4	207.2	221.0
66	14.00	28.10	42.10	56.10	70.10	84.20	98.20	112.20	126.20	140.30	154.3	168.3	182.3	196.4	210.4	224.4
67	14.20	28.50	42.70	57.00	71.20	85.40	99.70	113.90	128.10	142.40	156.6	170.9	185.1	199.3	213.6	227.8
68	14.50	28.90	43.40	57.80	72.30	86.70	101.20	115.60	130.10	144.50	159.0	173.4	187.9	202.3	216.8	231.2
69	14.70	29.30	44.00	58.70	73.30	88.00	102.60	117.30	132.00	146.60	161.3	176.0	190.6	205.3	219.9	234.6
70	14.90	29.80	44.60	59.50	74.40	89.30	104.10	119.00	133.90	148.80	163.6	178.5	193.4	208.3	223.1	238.0
71	15.10	30.20	45.30	60.40	75.40	90.50	105.60	120.70	135.80	150.90	166.0	181.1	196.1	211.2	226.3	241.4
72	15.30	30.60	45.90	61.20	76.50	91.80	107.10	122.40	137.70	153.00	168.3	183.6	198.9	214.2	229.5	244.8

AREAS OF RECTANGULAR SECTIONS

SQUARE INCHES

Width, Inches	Thickness, Inches															
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
33	2.063	4.125	6.188	8.250	10.31	12.38	14.44	16.50	18.56	20.63	22.69	24.75	26.81	28.88	30.94	33.00
34	2.125	4.250	6.375	8.500	10.63	12.75	14.88	17.00	19.13	21.25	23.38	25.50	27.63	29.75	31.88	34.00
35	2.188	4.375	6.563	8.750	10.94	13.13	15.31	17.50	19.69	21.88	24.06	26.25	28.44	30.63	32.81	35.00
36	2.250	4.500	6.750	9.000	11.25	13.50	15.75	18.00	20.25	22.50	24.75	27.00	29.25	31.50	33.75	36.00
37	2.313	4.625	6.938	9.250	11.56	13.88	16.19	18.50	20.81	23.13	25.44	27.75	30.06	32.38	34.69	37.00
38	2.375	4.750	7.125	9.500	11.88	14.25	16.63	19.00	21.38	23.75	26.13	28.50	30.88	33.25	35.63	38.00
39	2.438	4.875	7.313	9.750	12.19	14.63	17.06	19.50	21.94	24.38	26.81	29.25	31.69	34.13	36.56	39.00
40	2.500	5.000	7.500	10.00	12.50	15.00	17.50	20.00	22.50	25.00	27.50	30.00	32.50	35.00	37.50	40.00
41	2.563	5.125	7.688	10.25	12.81	15.38	17.94	20.50	23.06	25.63	28.19	30.75	33.31	35.88	38.44	41.00
42	2.625	5.250	7.875	10.50	13.13	15.75	18.38	21.00	23.63	26.25	28.88	31.50	34.13	36.75	39.38	42.00
43	2.688	5.375	8.063	10.75	13.44	16.13	18.81	21.50	24.19	26.88	29.56	32.25	34.94	37.63	40.31	43.00
44	2.750	5.500	8.250	11.00	13.75	16.50	19.25	22.00	24.75	27.50	30.25	33.00	35.75	38.50	41.25	44.00
45	2.813	5.625	8.438	11.25	14.06	16.88	19.69	22.50	25.31	28.13	30.94	33.75	36.56	39.38	42.19	45.00
46	2.875	5.750	8.625	11.50	14.38	17.25	20.13	23.00	25.88	28.75	31.63	34.50	37.38	40.25	43.13	46.00
47	2.938	5.875	8.813	11.75	14.69	17.63	20.56	23.50	26.44	29.38	32.31	35.25	38.19	41.13	44.06	47.00
48	3.000	6.000	9.000	12.00	15.00	18.00	21.00	24.00	27.00	30.00	33.00	36.00	39.00	42.00	45.00	48.00
49	3.060	6.130	9.190	12.25	15.31	18.38	21.44	24.50	27.56	30.63	33.69	36.75	39.81	42.88	45.94	49.00
50	3.130	6.250	9.380	12.50	15.63	18.75	21.88	25.00	28.13	31.25	34.38	37.50	40.63	43.75	46.88	50.00
51	3.190	6.380	9.560	12.75	15.94	19.13	22.31	25.50	28.69	31.88	35.06	38.25	41.44	44.63	47.81	51.00
52	3.250	6.500	9.750	13.00	16.25	19.50	22.75	26.00	29.25	32.50	35.75	39.00	42.25	45.50	48.75	52.00
53	3.310	6.630	9.940	13.25	16.56	19.88	23.19	26.50	29.81	33.13	36.44	39.75	43.06	46.38	49.69	53.00
54	3.380	6.750	10.130	13.50	16.88	20.25	23.63	27.00	30.38	33.75	37.13	40.50	43.88	47.25	50.63	54.00
55	3.440	6.880	10.310	13.75	17.19	20.63	24.06	27.50	30.94	34.38	37.81	41.25	44.69	48.13	51.56	55.00
56	3.500	7.000	10.500	14.00	17.50	21.00	24.50	28.00	31.50	35.00	38.50	42.00	45.50	49.00	52.50	56.00
57	3.560	7.130	10.690	14.25	17.81	21.38	24.94	28.50	32.06	35.63	39.19	42.75	46.31	49.88	53.44	57.00
58	3.630	7.250	10.880	14.50	18.13	21.75	25.38	29.00	32.63	36.25	39.88	43.50	47.13	50.75	54.38	58.00
59	3.690	7.380	11.060	14.75	18.44	22.13	25.81	29.50	33.19	36.88	40.56	44.25	47.94	51.63	55.31	59.00
60	3.750	7.500	11.250	15.00	18.75	22.50	26.25	30.00	33.75	37.50	41.25	45.00	48.75	52.50	56.25	60.00
61	3.810	7.630	11.440	15.25	19.06	22.88	26.69	30.50	34.31	38.13	41.94	45.75	49.56	53.38	57.19	61.00
62	3.880	7.750	11.630	15.50	19.38	23.25	27.13	31.00	34.88	38.75	42.63	46.50	50.38	54.25	58.13	62.00
63	3.940	7.880	11.810	15.75	19.69	23.63	27.56	31.50	35.44	39.38	43.31	47.25	51.19	55.13	59.06	63.00
64	4.000	8.000	12.000	16.00	20.00	24.00	28.00	32.00	36.00	40.00	44.00	48.00	52.00	56.00	60.00	64.00
65	4.060	8.130	12.190	16.25	20.31	24.38	28.44	32.50	36.56	40.63	44.69	48.75	52.81	56.88	60.94	65.00
66	4.130	8.250	12.380	16.50	20.63	24.75	28.88	33.00	37.13	41.25	45.38	49.50	53.63	57.75	61.88	66.00
67	4.190	8.380	12.560	16.75	20.94	25.13	29.31	33.50	37.69	41.88	46.06	50.25	54.44	58.63	62.81	67.00
68	4.250	8.500	12.750	17.00	21.25	25.50	29.75	34.00	38.25	42.50	46.75	51.00	55.25	59.50	63.75	68.00
69	4.310	8.630	12.940	17.25	21.56	25.88	30.19	34.50	38.81	43.13	47.44	51.75	56.06	60.38	64.69	69.00
70	4.380	8.750	13.130	17.50	21.88	26.25	30.63	35.00	39.38	43.75	48.13	52.50	56.88	61.25	65.63	70.00
71	4.440	8.880	13.310	17.75	22.19	26.63	31.06	35.50	39.94	44.38	48.81	53.25	57.69	62.13	66.56	71.00
72	4.500	9.000	13.500	18.00	22.50	27.00	31.50	36.00	40.50	45.00	49.50	54.00	58.50	63.00	67.50	72.00

WEIGHTS OF RECTANGULAR SECTIONS

POUNDS PER LINEAL FOOT

Width Inches	Thickness, Inches															
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
73	15.51	31.03	46.54	62.05	77.56	93.08	108.6	124.1	139.6	155.1	170.6	186.2	201.7	217.2	232.7	248.2
74	15.73	31.45	47.18	62.90	78.63	94.35	110.1	125.8	141.5	157.3	173.0	188.7	204.4	220.2	235.9	251.6
75	15.94	31.88	47.81	63.75	79.69	95.63	111.6	127.5	143.4	159.4	175.3	191.3	207.2	223.1	239.1	255.0
76	16.15	32.30	48.45	64.60	80.75	96.90	113.1	129.2	145.4	161.5	177.7	193.8	210.0	226.1	242.3	258.4
77	16.36	32.73	49.09	65.45	81.81	98.18	114.5	130.9	147.3	163.6	180.0	196.4	212.7	229.1	245.4	261.8
78	16.58	33.15	49.73	66.30	82.88	99.45	116.0	132.6	149.2	165.8	182.3	198.9	215.5	232.1	248.6	265.2
79	16.79	33.58	50.36	67.15	83.94	100.7	117.5	134.3	151.1	167.9	184.7	201.5	218.2	235.0	251.8	268.6
80	17.00	34.00	51.00	68.00	85.00	102.0	119.0	136.0	153.0	170.0	187.0	204.0	221.0	238.0	255.0	272.0
81	17.21	34.43	51.64	68.85	86.06	103.3	120.5	137.7	154.9	172.1	189.3	206.6	223.8	241.0	258.2	275.4
82	17.43	34.85	52.28	69.70	87.13	104.6	122.0	139.4	156.8	174.3	191.7	209.1	226.5	244.0	261.4	278.8
83	17.64	35.28	52.91	70.55	88.19	105.8	123.5	141.1	158.7	176.4	194.0	211.7	229.3	246.9	264.6	282.2
84	17.85	35.70	53.55	71.40	89.25	107.1	125.0	142.8	160.7	178.5	196.4	214.2	232.1	249.9	267.8	285.6
85	18.06	36.13	54.19	72.25	90.31	108.4	126.4	144.5	162.6	180.6	198.7	216.8	234.8	252.9	270.9	289.0
86	18.28	36.55	54.83	73.10	91.38	109.7	127.9	146.2	164.5	182.8	201.0	219.3	237.6	255.9	274.1	292.4
87	18.49	36.98	55.46	73.95	92.44	110.9	129.4	147.9	166.4	184.9	203.4	221.9	240.3	258.8	277.3	295.8
88	18.70	37.40	56.10	74.80	93.50	112.2	130.9	149.6	168.3	187.0	205.7	224.4	243.1	261.8	280.5	299.2
89	18.91	37.83	56.74	75.65	94.56	113.5	132.4	151.3	170.2	189.1	208.0	227.0	245.9	264.8	283.7	302.6
90	19.13	38.25	57.38	76.50	95.63	114.8	133.9	153.0	172.1	191.3	210.4	229.5	248.6	267.8	286.9	306.0
91	19.34	38.68	58.01	77.35	96.69	116.0	135.4	154.7	174.0	193.4	212.7	232.1	251.4	270.7	290.1	309.4
92	19.55	39.10	58.65	78.20	97.75	117.3	136.9	156.4	176.0	195.5	215.1	234.6	254.2	273.7	293.3	312.8
93	19.76	39.53	59.29	79.05	98.81	118.6	138.3	158.1	177.9	197.6	217.4	237.2	256.9	276.7	296.4	316.2
94	19.98	39.95	59.93	79.90	99.88	119.9	139.8	159.8	179.8	199.8	219.7	239.7	259.7	279.7	299.6	319.6
95	20.19	40.38	60.56	80.75	100.9	121.1	141.3	161.5	181.7	201.9	222.1	242.3	262.4	282.6	302.8	323.0
96	20.40	40.80	61.20	81.60	102.0	122.4	142.8	163.2	183.6	204.0	224.4	244.8	265.2	285.6	306.0	326.4
97	20.61	41.23	61.84	82.45	103.1	123.7	144.3	164.9	185.5	206.1	226.7	247.4	268.0	288.6	309.2	329.8
98	20.83	41.65	62.48	83.30	104.1	125.0	145.8	166.6	187.4	208.3	229.1	249.9	270.7	291.6	312.4	333.2
99	21.04	42.08	63.11	84.15	105.2	126.2	147.3	168.3	189.3	210.4	231.4	252.5	273.5	294.5	315.6	336.6
100	21.25	42.50	63.75	85.00	106.3	127.5	148.8	170.0	191.3	212.5	233.8	255.0	276.3	297.5	318.8	340.0

AREAS OF RECTANGULAR SECTIONS

SQUARE INCHES

Width, Inches	Thickness, Inches															
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
73	4.563	9.125	13.69	18.25	22.81	27.38	31.94	36.50	41.06	45.63	50.19	54.75	59.31	63.88	68.44	73.00
74	4.625	9.250	13.88	18.50	23.13	27.75	32.38	37.00	41.63	46.25	50.88	55.50	60.13	64.75	69.38	74.00
75	4.688	9.375	14.06	18.75	23.44	28.13	32.81	37.50	42.19	46.88	51.56	56.25	60.94	65.63	70.31	75.00
76	4.750	9.500	14.25	19.00	23.75	28.50	33.25	38.00	42.75	47.50	52.25	57.00	61.75	66.50	71.25	76.00
77	4.813	9.625	14.44	19.25	24.06	28.88	33.69	38.50	43.31	48.13	52.94	57.75	62.56	67.38	72.19	77.00
78	4.875	9.750	14.63	19.50	24.38	29.25	34.13	39.00	43.88	48.75	53.63	58.50	63.38	68.25	73.13	78.00
79	4.938	9.875	14.81	19.75	24.69	29.63	34.56	39.50	44.44	49.38	54.31	59.25	64.19	69.13	74.06	79.00
80	5.000	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00	55.00	60.00	65.00	70.00	75.00	80.00
81	5.063	10.13	15.19	20.25	25.31	30.38	35.44	40.50	45.56	50.63	55.69	60.75	65.81	70.88	75.94	81.00
82	5.125	10.25	15.38	20.50	25.63	30.75	35.88	41.00	46.13	51.25	56.38	61.50	66.63	71.75	76.88	82.00
83	5.188	10.38	15.56	20.75	25.94	31.13	36.31	41.50	46.69	51.88	57.06	62.25	67.44	72.63	77.81	83.00
84	5.250	10.50	15.75	21.00	26.25	31.50	36.75	42.00	47.25	52.50	57.75	63.00	68.25	73.50	78.75	84.00
85	5.313	10.63	15.94	21.25	26.56	31.88	37.19	42.50	47.81	53.13	58.44	63.75	69.06	74.38	79.69	85.00
86	5.375	10.75	16.13	21.50	26.88	32.25	37.63	43.00	48.38	53.75	59.13	64.50	69.88	75.25	80.63	86.00
87	5.438	10.88	16.31	21.75	27.19	32.63	38.06	43.50	48.94	54.38	59.81	65.25	70.69	76.13	81.56	87.00
88	5.500	11.00	16.50	22.00	27.50	33.00	38.50	44.00	49.50	55.00	60.50	66.00	71.50	77.00	82.50	88.00
89	5.563	11.13	16.69	22.25	27.81	33.38	38.94	44.50	50.06	55.63	61.19	66.75	72.31	77.88	83.44	89.00
90	5.625	11.25	16.88	22.50	28.13	33.75	39.38	45.00	50.63	56.25	61.88	67.50	73.13	78.75	84.38	90.00
91	5.688	11.38	17.06	22.75	28.44	34.13	39.81	45.50	51.19	56.88	62.56	68.25	73.94	79.63	85.31	91.00
92	5.750	11.50	17.25	23.00	28.75	34.50	40.25	46.00	51.75	57.50	63.25	69.00	74.75	80.50	86.25	92.00
93	5.813	11.63	17.44	23.25	29.06	34.88	40.69	46.50	52.31	58.13	63.94	69.75	75.56	81.38	87.19	93.00
94	5.875	11.75	17.63	23.50	29.38	35.25	41.13	47.00	52.88	58.75	64.63	70.50	76.38	82.25	88.13	94.00
95	5.938	11.88	17.81	23.75	29.69	35.63	41.56	47.50	53.44	59.38	65.31	71.25	77.19	83.13	89.06	95.00
96	6.000	12.00	18.00	24.00	30.00	36.00	42.00	48.00	54.00	60.00	66.00	72.00	78.00	84.00	90.00	96.00
97	6.063	12.13	18.19	24.25	30.31	36.38	42.44	48.50	54.56	60.63	66.69	72.75	78.81	84.88	90.94	97.00
98	6.125	12.25	18.38	24.50	30.63	36.75	42.88	49.00	55.13	61.25	67.38	73.50	79.63	85.75	91.88	98.00
99	6.188	12.38	18.56	24.75	30.94	37.13	43.31	49.50	55.69	61.88	68.06	74.25	80.44	86.63	92.81	99.00
100	6.250	12.50	18.75	25.00	31.25	37.50	43.75	50.00	56.25	62.50	68.75	75.00	81.25	87.50	93.75	100.00

SQUARE AND ROUND BARS

WEIGHTS AND AREAS

Size, Inches	Weight, Lbs. per Foot □	Weight, Lbs. per Foot ○	Area, Square Inches □	Area, Square Inches ○	Size, Inches	Weight, Lbs. per Foot □	Weight, Lbs. per Foot ○	Area, Square Inches □	Area, Square Inches ○
0					3	30.60	24.03	9.000	7.069
1/16	.013	.010	.0039	.0031	1/16	31.89	25.05	9.379	7.366
1/8	.053	.042	.0156	.0123	1/8	33.20	26.08	9.766	7.670
3/16	.120	.094	.0352	.0276	3/16	34.54	27.13	10.160	7.980
1/4	.213	.167	.0625	.0491	1/4	35.91	28.21	10.563	8.296
5/16	.332	.261	.0977	.0767	5/16	37.31	29.30	10.973	8.618
3/8	.478	.376	.1406	.1105	3/8	38.73	30.42	11.391	8.946
7/16	.651	.511	.1914	.1503	7/16	40.18	31.55	11.816	9.281
1/2	.850	.668	.2500	.1963	1/2	41.65	32.71	12.250	9.621
9/16	1.076	.845	.3164	.2485	9/16	43.15	33.89	12.691	9.968
5/8	1.328	1.043	.3906	.3068	5/8	44.68	35.09	13.141	10.321
11/16	1.607	1.262	.4727	.3712	11/16	46.23	36.31	13.598	10.680
3/4	1.913	1.502	.5625	.4418	3/4	47.81	37.55	14.063	11.045
13/16	2.245	1.763	.6602	.5185	13/16	49.42	38.81	14.535	11.416
7/8	2.603	2.044	.7656	.6013	7/8	51.05	40.10	15.016	11.793
15/16	2.988	2.347	.8789	.6903	15/16	52.71	41.40	15.504	12.177
1	3.400	2.670	1.0000	.7854	4	54.40	42.73	16.000	12.566
1/16	3.838	3.015	1.1289	.8866	1/16	56.11	44.07	16.504	12.962
1/8	4.303	3.380	1.2656	.9940	1/8	57.85	45.44	17.016	13.364
3/16	4.795	3.766	1.4102	1.1075	3/16	59.62	46.83	17.535	13.772
1/4	5.313	4.172	1.5625	1.2272	1/4	61.41	48.23	18.063	14.186
5/16	5.857	4.600	1.7227	1.3530	5/16	63.23	49.66	18.598	14.607
3/8	6.428	5.049	1.8906	1.4849	3/8	65.08	51.11	19.141	15.033
7/16	7.026	5.518	2.0664	1.6230	7/16	66.95	52.58	19.691	15.466
1/2	7.650	6.008	2.2500	1.7671	1/2	68.85	54.07	20.250	15.904
9/16	8.301	6.519	2.4414	1.9175	9/16	70.78	55.59	20.816	16.349
5/8	8.978	7.051	2.6406	2.0739	5/8	72.73	57.12	21.391	16.800
11/16	9.682	7.604	2.8477	2.2365	11/16	74.71	58.67	21.973	17.257
3/4	10.413	8.178	3.0625	2.4053	3/4	76.71	60.25	22.563	17.721
13/16	11.170	8.773	3.2852	2.5802	13/16	78.74	61.85	23.160	18.190
7/8	11.953	9.388	3.5156	2.7612	7/8	80.80	63.46	23.766	18.665
15/16	12.763	10.024	3.7539	2.9483	15/16	82.89	65.10	24.379	19.147
2	13.600	10.681	4.0000	3.1416	5	85.00	66.76	25.000	19.635
1/16	14.463	11.359	4.2539	3.3410	1/16	87.14	68.44	25.629	20.129
1/8	15.353	12.058	4.5156	3.5466	1/8	89.30	70.14	26.266	20.629
3/16	16.270	12.778	4.7852	3.7583	3/16	91.49	71.86	26.910	21.135
1/4	17.213	13.519	5.0625	3.9761	1/4	93.71	73.60	27.563	21.648
5/16	18.182	14.280	5.3477	4.2000	5/16	95.96	75.36	28.223	22.166
3/8	19.178	15.062	5.6406	4.4301	3/8	98.23	77.15	28.891	22.691
7/16	20.201	15.866	5.9414	4.6664	7/16	100.53	78.95	29.566	23.221
1/2	21.250	16.690	6.2500	4.9087	1/2	102.85	80.78	30.250	23.758
9/16	22.326	17.534	6.5664	5.1572	9/16	105.20	82.62	30.941	24.301
5/8	23.428	18.400	6.8906	5.4119	5/8	107.58	84.49	31.641	24.850
11/16	24.557	19.287	7.2227	5.6727	11/16	109.98	86.38	32.348	25.406
3/4	25.713	20.195	7.5625	5.9396	3/4	112.41	88.29	33.063	25.967
13/16	26.895	21.123	7.9102	6.2126	13/16	114.87	90.22	33.785	26.535
7/8	28.103	22.072	8.2656	6.4918	7/8	117.35	92.17	34.516	27.109
15/16	29.338	23.042	8.6289	6.7771	15/16	119.86	94.14	35.254	27.688
3	30.600	24.033	9.0000	7.0686	6	122.40	96.13	36.000	28.274

SQUARE AND ROUND BARS

WEIGHTS AND AREAS

Size, Inches	Weight, Lbs. per Foot □	Weight, Lbs. per Foot ○	Area, Square Inches □	Area, Square Inches ○	Size, Inches	Weight, Lbs. per Foot □	Weight, Lbs. per Foot ○	Area, Square Inches □	Area, Square Inches ○
6	122.40	96.13	36.000	28.274	9	275.40	216.30	81.000	63.617
1/16	124.96	98.15	36.754	28.866	1/16	279.24	219.31	82.129	64.504
1/8	127.55	100.18	37.516	29.465	1/8	283.10	222.35	83.266	65.397
3/16	130.17	102.23	38.285	30.069	3/16	286.99	225.41	84.410	66.296
1/4	132.81	104.31	39.063	30.680	1/4	290.91	228.48	85.563	67.201
5/16	135.48	106.41	39.848	31.296	5/16	294.86	231.58	86.723	68.112
3/8	138.18	108.53	40.641	31.919	3/8	298.83	234.70	87.891	69.029
7/16	140.90	110.66	41.441	32.548	7/16	302.83	237.84	89.066	69.953
1/2	143.65	112.82	42.250	33.183	1/2	306.85	241.00	90.250	70.882
9/16	146.43	115.00	43.066	33.824	9/16	310.90	244.18	91.441	71.818
5/8	149.23	117.20	43.891	34.472	5/8	314.98	247.38	92.641	72.760
11/16	152.06	119.43	44.723	35.125	11/16	319.08	250.61	93.848	73.708
3/4	154.91	121.67	45.563	35.785	3/4	323.21	253.85	95.063	74.662
13/16	157.79	123.93	46.410	36.450	13/16	327.37	257.12	96.285	75.622
7/8	160.70	126.22	47.266	37.122	7/8	331.55	260.40	97.516	76.589
15/16	163.64	128.52	48.129	37.800	15/16	335.76	263.71	98.754	77.561
7	166.60	130.85	49.000	38.485	10	340.00	267.04	100.000	78.540
1/16	169.59	133.19	49.879	39.175	1/16	344.26	270.38	101.254	79.525
1/8	172.60	135.56	50.766	39.871	1/8	348.55	273.75	102.516	80.516
3/16	175.64	137.95	51.660	40.574	3/16	352.87	277.14	103.785	81.513
1/4	178.71	140.36	52.563	41.282	1/4	357.21	280.55	105.063	82.516
5/16	181.81	142.79	53.473	41.997	5/16	361.58	283.99	106.348	83.525
3/8	184.93	145.24	54.391	42.718	3/8	365.98	287.44	107.641	84.541
7/16	188.07	147.71	55.316	43.445	7/16	370.40	290.91	108.941	85.563
1/2	191.25	150.21	56.250	44.179	1/2	374.85	294.41	110.250	86.590
9/16	194.45	152.72	57.191	44.918	9/16	379.33	297.92	111.566	87.624
5/8	197.68	155.26	58.141	45.664	5/8	383.83	301.46	112.891	88.664
11/16	200.93	157.81	59.098	46.415	11/16	388.36	305.02	114.223	89.710
3/4	204.21	160.39	60.063	47.173	3/4	392.91	308.59	115.563	90.763
13/16	207.52	162.99	61.035	47.937	13/16	397.49	312.19	116.910	91.821
7/8	210.85	165.60	62.016	48.707	7/8	402.10	315.81	118.266	92.886
15/16	214.21	168.24	63.004	49.483	15/16	406.74	319.45	119.629	93.957
8	217.60	170.90	64.000	50.265	11	411.40	323.11	121.000	95.033
1/16	221.01	173.58	65.004	51.054	1/16	416.09	326.80	122.379	96.116
1/8	224.45	176.29	66.016	51.849	1/8	420.80	330.50	123.766	97.205
3/16	227.92	179.01	67.035	52.649	3/16	425.54	334.22	125.160	98.301
1/4	231.41	181.75	68.063	53.456	1/4	430.31	337.97	126.563	99.402
5/16	234.93	184.52	69.098	54.269	5/16	435.11	341.73	127.973	100.510
3/8	238.48	187.30	70.141	55.088	3/8	439.93	345.52	129.391	101.623
7/16	242.05	190.11	71.191	55.914	7/16	444.78	349.33	130.816	102.743
1/2	245.65	192.93	72.250	56.745	1/2	449.65	353.16	132.250	103.869
9/16	249.28	195.78	73.316	57.583	9/16	454.55	357.00	133.691	105.001
5/8	252.93	198.65	74.391	58.426	5/8	459.48	360.87	135.141	106.139
11/16	256.61	201.54	75.473	59.276	11/16	464.43	364.76	136.598	107.284
3/4	260.31	204.45	76.563	60.132	3/4	469.41	368.68	138.063	108.434
13/16	264.04	207.38	77.660	60.994	13/16	474.42	372.61	139.535	109.591
7/8	267.80	210.33	78.766	61.863	7/8	479.45	376.56	141.016	110.754
15/16	271.59	213.31	79.879	62.737	15/16	484.51	380.54	142.504	111.923
9	275.40	216.30	81.000	63.617	12	489.60	384.53	144.000	113.098

PLATES ROLLED BY CARNEGIE STEEL COMPANY

RECTANGULAR UNIVERSAL PLATES—CARBON STEEL

UNIVERSAL MILL PLATES, ONE-FOURTH INCH AND OVER—EXTREME SIZES

Thickness, Inches	Weight, Lbs. per Sq. Ft.	Widths and Lengths in Inches												
		48-46	45-41	40-39	38-37	36-35	34-31	30-26	25-20	19-17	16-15	14-12	11-10	9⅞-6⅛
¼	10.20					702	840	1080	1080	1080	1080	1080	1080	1080
5/16	12.75	1200	1200	1260	1320	1320	1320	1380	1380	1200	1200	1200	1200	1080
⅜	15.30	1320	1320	1380	1440	1500	1500	1500	1500	1308	1308	1200	1200	1080
7/16	17.85	1428	1428	1500	1500	1500	1500	1500	1500	1356	1356	1356	1356	1080
½	20.40	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1080
9/16	22.95	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1080
⅝	25.50	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1080
¾	30.60	1248	1332	1500	1476	1500	1320	1500	1500	1500	1500	1500	1500	1080
⅞	35.70	1068	1140	1284	1260	1332	1128	1332	1392	1416	1452	1500	1500	1080
1	40.80	936	996	1128	1104	1164	996	1164	1212	1248	1260	1452	1500	1020
1⅛	45.90	828	888	996	984	1032	876	1032	1090	1104	1128	1284	1500	960
1¼	51.00	744	804	900	876	924	792	924	972	996	1008	1152	1476	900
1⅜	56.10	684	720	816	804	840	720	840	888	900	924	1056	1344	780
1½	61.20	624	660	744	732	768	660	768	804	828	840	960	1224	720
1⅝	66.30	576	612	696	672	708	612	708	744	768	780	888	1128	660
1¾	71.40	528	564	636	624	660	564	660	696	708	720	828	1056	600
1⅞	76.50	492	528	600	588	624	528	624	648	660	672	768	984	600
2	81.60	468	492	564	552	576	492	576	600	624	624	720	924	540

Plates of greater dimensions than shown in above table may be submitted for special consideration.

PLATES ROLLED BY ILLINOIS STEEL COMPANY

RECTANGULAR UNIVERSAL PLATES—CARBON STEEL

UNIVERSAL MILL PLATES, THREE-SIXTEENTH INCH AND OVER—EXTREME SIZES

Thickness, Inches	Weight, Lbs. per Sq. Ft.	Widths and Lengths in Inches										
		57-60	53-56	49-52	43-48	31-42	25-30	20-24	10-19	9	8	7	6⅛
3/16	7.65							960	960	960	960	960	960
¼	10.20	780	840	1000	1200	1500	1500	1500	1080	960	960	960	960
5/16	12.75	1000	1080	1200	1440	1500	1500	1500	1080	960	960	960	960
⅜	15.30	1080	1200	1380	1500	1500	1500	1500	1080	960	960	960	960
7/16	17.85	1080	1200	1380	1440	1500	1500	1500	1080	960	960	960	960
½	20.40	1080	1200	1380	1440	1500	1500	1500	1080	960	960	960	960
9/16	22.95	1080	1080	1260	1400	1440	1440	1440	1080	960	960	960	960
⅝	25.50	1080	1080	1200	1380	1440	1440	1440	1080	960	960	960	720
¾	30.60	1080	1080	1200	1380	1440	1380	1380	1080	960	960	840	720
⅞	35.70	960	960	1080	1200	1380	1260	1260	1080	960	960	800	720
1	40.80	840	900	960	1080	1380	1260	1260	1080	960	960	720	600
1⅛	45.90	780	780	840	960	1260	1140	1140	960	960	840	720	600
1¼	51.00	720	720	720	840	1140	1080	1080	960	840	720	560	480
1⅜	56.10	660	660	660	720	1080	960	960	720	660	600	560	420
1½	61.20	600	600	600	660	960	840	840	640	600	600	540	420
1⅝	66.30	570	570	570	630	830	780	780	600	600	540	480	360
1¾	71.40	540	540	540	600	700	720	720	540	480	480	430	320
1⅞	76.50	510	520	520	570	650	660	660	480	480	450	420	300
2	81.60	480	500	500	540	600	600	600	480	480	420	360	300

Plates of greater dimensions than shown in above table may be submitted for special consideration.

PLATES ROLLED BY CARNEGIE STEEL COMPANY

RECTANGULAR AND CIRCULAR PLATES—CARBON STEEL

SHEARED PLATES, THREE-SIXTEENTH INCH AND OVER—EXTREME SIZES

Thickness, Inches	Weight, Lbs. per Sq. Ft.	Widths and Lengths in Inches																			Diam., Inches
		128	126	120	114	108	102	96	90	84	78	72	66	60	54	48	42	36	30	24	
3/16	7.65								270	320	345	375	420	470	480	480	480	480	480	480	90
1/4	10.20				175	250	280	300	330	375	400	430	475	525	530	530	530	530	530	500	115
5/16	12.75			240	270	320	360	380	420	440	460	480	500	560	550	575	550	550	550	550	120
3/8	15.30	220	240	270	320	365	380	410	450	500	550	600	600	620	620	620	600	600	600	550	130
7/16	17.85	240	270	300	360	370	410	430	460	510	550	600	630	630	640	640	600	600	600	600	130
1/2	20.40	260	270	320	365	400	450	480	510	550	580	610	630	630	640	640	600	600	600	600	130
9/16	22.95	260	270	330	373	420	470	500	530	570	600	620	640	640	640	640	600	600	600	600	130
5/8	25.50	260	300	350	390	450	500	520	540	600	620	620	640	640	640	640	600	600	600	600	130
11/16	28.05	260	300	360	420	450	500	520	540	600	620	620	640	640	640	640	600	600	600	580	130
3/4	30.60	260	300	360	400	450	490	520	540	600	620	620	640	640	640	640	600	600	600	580	130
13/16	33.15	260	300	340	385	440	490	510	530	600	620	620	640	640	640	640	600	580	570	550	130
7/8	35.70	260	300	330	375	440	480	510	530	600	620	620	640	640	640	640	600	580	550	550	130
1	40.80	250	300	300	340	440	460	500	530	580	600	600	630	630	640	640	580	580	520	500	130
1 1/8	45.90	250	300	300	330	410	440	450	500	550	580	580	620	620	640	640	580	580	520	500	130
1 1/4	51.00	240	270	300	310	380	400	420	490	530	550	550	600	600	600	600	560	560	520	450	130
1 1/2	61.20	220	230	260	280	330	320	340	420	440	480	530	600	600	600	600	540	540	470	430	130
1 3/4	71.40	200	200	220	240	280	270	300	380	380	410	450	490	550	550	550	540	540	430	380	130
2	81.60	180	180	190	210	240	240	260	320	330	360	400	440	480	500	500	500	500	400	350	130
2 1/4	91.80	150	160	170	190	210	210	230	280	295	320	350	390	420	450	450	450	450	300	200	130

Plates 36″ wide and under by 1/4″ thick and heavier, also plates up to 48″ wide and 5/16″ thick and heavier, can be rolled on Universal Mills.
For greater length and Universal Mill Sizes, see Universal Mill Plate Table.
Plates of greater dimensions than shown in above table may be submitted for special consideration.

PLATES ROLLED BY ILLINOIS STEEL COMPANY

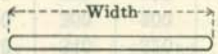
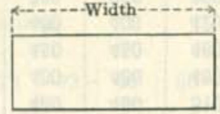
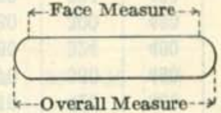
RECTANGULAR AND CIRCULAR PLATES—CARBON STEEL

SHEARED PLATES THREE-SIXTEENTH INCH AND OVER—EXTREME SIZES

Thickness, Inches	Weight, Lbs. per Sq. Ft.	Widths and Lengths in Inches														Diam., Inches
		150	144	138	132	126	120	108	96	90	84	72	60	48	30	
3/16	7.65								240	300	420	480	480	480	480	96
1/4	10.20		300	325	350	360	400	400	440	480	500	600	600	540	480	148
5/16	12.75	250	300	325	350	360	400	450	480	480	520	600	600	540	480	150
3/8	15.30	250	300	360	350	360	400	480	480	480	540	600	600	600	480	150
7/16	17.85	300	300	360	350	360	400	480	480	500	560	600	600	600	480	150
1/2	20.40	360	350	360	350	375	400	485	480	500	560	600	600	600	480	150
9/16	22.95	360	350	360	350	375	400	480	510	530	570	630	630	600	480	150
5/8	25.50	300	350	360	360	375	400	460	530	540	570	630	630	600	480	150
11/16	28.05	300	350	360	360	375	440	490	530	540	570	630	630	600	480	150
3/4	30.60	340	360	360	360	370	440	480	520	540	560	630	630	600	480	150
13/16	33.15	340	360	360	360	360	400	480	510	540	560	630	630	540	480	150
7/8	35.70	325	360	360	360	360	400	480	510	540	550	630	630	540	480	150
1	40.80	325	360	360	360	360	380	480	500	510	530	600	620	480	480	150
1 1/8	45.90	300	350	340	340	340	360	420	480	490	510	590	610	420	480	150
1 1/4	51.00	300	325	340	340	320	350	400	480	480	480	540	570	360	480	150
1 1/2	61.20	275	300	320	300	300	300	360	450	450	460	500	560	324	480	150
1 3/4	71.40	200	250	300	275	230	300	325	400	400	420	450	480	300	480	150
2	81.60	200	200	200	200	200	250	300	360	360	380	400	400	264	480	150
2 1/4	91.80	180	180	180	180	180	225	225	260	280	300	350	360			150

Plates 24″ wide and under by 3/16″ thick and heavier, also plates up to 60″ wide by 1/4″ thick and heavier, can be rolled on Universal Mills.
For greater lengths and Universal Mill Sizes, see Universal Mill Plate Table.
Plates of greater dimensions than shown in above table may be submitted for special consideration.

FLAT ROLLED STEEL

Width, Inches	BAND EDGE		SQUARE EDGE		ROUND EDGE
					
	Thickness, B. W. G.		Thickness, Inches		Thickness, Inches
3/8 to 7/16	No. 23 to No. 10		1/8 to 5/16		1/8 to 1/4—Face Measure only
Over 7/16 to 1	No. 23 to No. 6		1/8 to 7/8		1/8 to 5/8—Face or Overall Measure
Over 1 to 2	No. 23 to No. 6		3/16 to 1 3/4		3/16 to 1 — " " " "
Over 2 to 3½	No. 22 to No. 6		1/4 to 2½		1/4 to 1 — " " " "
Over 3½ to 5	No. 18 to No. 6		1/4 to 2½		1/4 to 1 — " " " "
Over 5 to 6	No. 16 to No. 1		1/4 to 2½		5/16 to 1 — " " " "
Over 6 to 8	No. 16 to No. 1		1/4 to 3½		5/16 to 3/4— " " " "
Over 8 to 10	No. 14 to No. 1		1/4 to 3½	*	The Over-all Measure is determined by adding to Face Measure:
Over 10 to 15½	No. 13 to No. 1		1/4 to 2	*	One-half of the thickness for all sizes up to 1/2", inclusive, in thickness.
Over 15½ to 18	No. 12 to No. 1		1/4 to 2	*	5/16" for all sizes over 1/2" to 3/4", inclusive, in thickness.
Over 18 to 18 5/8	No. 11 to No. 1		1/4 to 2	*	
Over 18 5/8 to 24			1/4 to 2	*	3/8" for all sizes over 3/4" in thickness.

*Sizes 10 inches and wider are furnished with Universal Mill Edges.
Sizes not listed will be considered.

STRESSES IN BEAMS

In the application of the principles of structural mechanics to determine what sections should be used safely to sustain superimposed loads under specified conditions of loading, it is necessary to ascertain, first, the effects produced on the structure by the loads under those conditions; second, to decide what unit strength the material, the use of which is contemplated, has to resist the stresses produced within the structure by the loading; and, third, to select a section whose section modulus is equivalent to the ratio found to exist between the stresses tending to cause deformation within the structure and the unit strength of the material to resist them.

Reactions. In the simple case of a beam supported at both ends, each support reacts with an upward pressure called the reaction of the support. The sum of these two reactions is equal to the total load on the beam.

Shear. The loads and the reactions of the supports are vertical forces tending to shear or cut the beam across and the stresses they produce within the beam are, therefore, called shearing stresses. The shear at each support is equal to the reaction of the support; the shear at any point between the supports is equal to the reaction of a support less the total load between that support and the point; or, if the reaction acting upward is considered as positive and the loads, acting downwards, as negative, the shear at any point is the algebraic sum of the vertical forces acting on the beam between that point and either support.

If such a simple beam supported at both ends carries a load uniformly distributed over its entire length, the reaction and the shear at each support is equal to one-half the total load on the beam, but the shear decreases uniformly to zero at the center of the span; if the load is concentrated at the center of the span, the reaction and the shear at each support are also equal to one-half the total load, but the shear is uniform throughout the entire length of the beam.

Bending Moment. The loads on the beam and the reactions of the supports constitute external forces which produce bending stress in the beam. The summation of the moments of the external forces about any point is called the bending moment and varies from point to point. It attains a maximum value at a point where the shear is either zero or changes from positive to negative or vice versa. If the loads are concentrated at several points, the maximum bending moment always occurs at the point of application of one of the loads so located that the sum of all the loads on the beam between one support up to and including that load is equal to or greater than the reaction of the support.

Vertical Deflection. Bending stress within a beam produces flexure, and the deflection, or the amount of its departure from a straight line, is the measure of the deformation which the beam has undergone in its resistance to bending stress. So long as the stress is within the safe limits allowed for the material, the deflection is negligible so far as concerns the beam itself; it may, however, be of sufficient magnitude to cause the disruption of other materials in contact with or supported by the beam but of less strength, such as plaster. In such cases the limit of allowable deflection may determine or at least influence the choice of a section.

Lateral Deflection. The stresses within a beam under transverse loading are compressive on one side of the neutral axis and tensile on the other. The tensile stresses tend to hold the beam in a straight line between the supports, while the compressive stresses tend to deflect it in a lateral direction, just as the bending stresses as a whole tend to deflect it in a vertical plane. On long spans unsupported against sidewise deflection, this consideration may influence the choice of sections.

Method of Computation. A complete investigation of the strength of beams under transverse loading must take into account all the elements, the bending moment, the vertical deflection, the lateral deflection and the shearing stress; though under the usual loading conditions the first alone determines the size and weight of section.

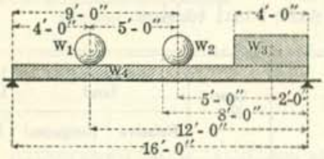
In the calculation of bending stresses, the loads are usually expressed in pounds, the span length and the distance between the loads in feet; the resulting bending moments are in terms of foot pounds, which necessitates conversion to inch pounds before the section can be selected from the tables. The section modulus of the required section is obtained by dividing the maximum bending moment in inch pounds by the allowed unit stress in pounds per square inch. In such calculations it is assumed that the neutral axis of the section is normal to the line of action of the load. When this is not the case, correction must be made for the eccentricity of the loading.

In the pages which immediately follow are given general formulas for the bending moments and vertical deflections of beams under the usual conditions of loading, and also diagrams illustrative of those conditions. The general method for the computation of the maximum bending moment of a beam supported at its ends and loaded at various points is as follows:—

First. Find the reaction at the left (right) support by multiplying each load by its distance from the right (left) support and dividing the sum of these products by the length of the span.

Second. Starting from the left (right) end of the beam, add the successive loads until a point is reached where the sum of the loads equals or exceeds the reaction of the left (right) support; the point of maximum bending moment is located at this point.

Third. Multiply the reaction at the left (right) support by its distance from the point of maximum bending moment and subtract the sum of the products of all loads to the left (right) of this point by the corresponding distance from this point; the difference between these moments is then the maximum bending moment.



Example: Required the size of a steel beam to support the following quiescent loads over a clear span of 16 feet between supports, at a maximum unit stress not to exceed 18000 pounds per square inch.

W_1 = 16000 pounds, 4 feet from left support.
W_2 = 18000 " 9 " " " "
W_3 = 2000 " per foot, uniform up to 4 feet from right support.
W_4 = 60 " " " assumed weight of beam uniformly distributed over entire span.

Left Reaction, $\frac{16000 \times 12 + (60 \times 16) 8 + 18000 \times 7 + (2000 \times 4) \times 2}{16} = 21355$ lbs.

Right Reaction, $\frac{16000 \times 4 + (60 \times 16) 8 + 18000 \times 9 + (2000 \times 4) \times 14}{16} = 21605$ lbs.

Sum of reactions = sum of loads = $W_1 + W_2 + W_3 + W_4$ = 42960 lbs.

Points of maximum moment $(60 \times 4) + 16000 = 16240 < 21355$

$(60 \times 9) + 16000 + 18000 = 34540 > 21355$

therefore the point of maximum bending moment is at point of load W_2.

Maximum bending moment, $21355 \times 9 - 16000 \times 5 - (60 \times 9) \times 4.5 = 109765$ ft. lbs.

or, $21605 \times 7 - (2000 \times 4) \times 5 - (60 \times 7) \times 3.5 = 109765$ ft. lbs.

Required section modulus $= \frac{109765 \times 12}{18000} = \frac{1317180}{18000} = 73.2$ in.^{3}

As the section modulus of the 18 inch 54.7 pound, American Standard, or the 16 inch 45 pound Carnegie Beam is greater than this, either of these sections may be used.

If the allowed unit stress were 16000 pounds per square inch, the required section modulus would be $\frac{109765 \times 12}{16000} = \frac{1317180}{16000} = 82.4$ in.^{3}

COMPARISON OF VARIOUS LOADING CONDITIONS

The formulas and diagrams on the following pages give the various stresses in sections used as beams, resulting from usual conditions of loading.

Taking as a unit of comparison a uniformly distributed safe load on beams of equal length and section, supported at the extreme ends, the following table gives the relative maximum safe loads or bending moments and deflections.

As a check on the accuracy of a computation, the safe load obtained from the formula for any condition of loading may be multiplied by the reciprocal given in the table corresponding to such loading condition; the result should be the maximum allowable uniform load as taken from beam safe load tables.

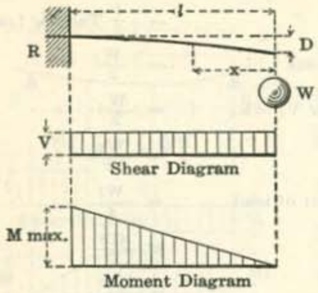
Conditions of Loading	Case No.	Maximum Safe Load		Maximum Deflection
		Relative	Reciprocal	Relative
BEAM SUPPORTED AT ENDS				
Load uniformly distributed over span	X	1	1	1
Load concentrated at center of span	IV	½	2	.80
Two equal loads symmetrically concentrated	VI	$l/4a$	$4a/l$	
Load increasing uniformly to one end	XII	.9743	1.0264	.976
Load increasing uniformly to center	XI	¾	1⅓	.96
Load decreasing uniformly to center	VIII	3/2	⅔	1.08
BEAM FIXED AT ONE END, CANTILEVER				
Load uniformly distributed over span	II	¼	4	2.40
Load concentrated at end	I	⅛	8	3.20
Load increasing uniformly to fixed end	III	⅜	2⅔	1.92
BEAM CONTINUOUS OVER TWO SUPPORTS EQUIDISTANT FROM ENDS				
Load uniformly distributed over span	XVIII			
1. If distance $a > 0.2071\ l$		$l^2/4a^2$	$4a^2/l^2$	
2. If distance $a < 0.2071\ l$		$\frac{l}{l-4a}$	$\frac{l-4a}{l}$	
3. If distance $a = 0.2071\ l$		5.8285	.1716	
Two equal loads concentrated at ends	IX	$l/4a$	$4a/l$	

BEAMS UNDER VARIOUS LOADING CONDITIONS

DIAGRAMS AND FORMULAS

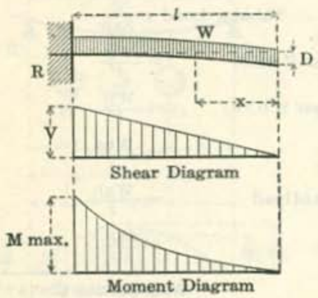
STATIC LOADS ON BEAMS

I. CANTILEVER BEAM—Concentrated load at free end



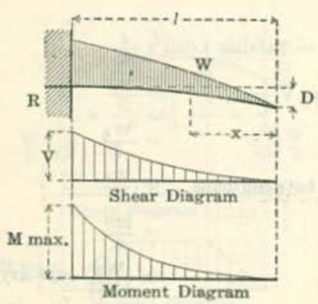
Safe Load	$= \frac{1}{8}$ Tabular Load
Shear at any point	$= W$
R = (max. shear V)	$= W$
M, distance x	$= Wx$
M max. at R	$= Wl$
W max.	$= \frac{fS}{l}$
D max.	$= \frac{Wl^3}{3EI}$

II. CANTILEVER BEAM—Uniformly distributed load



Safe Load	$= \frac{1}{4}$ Tabular Load
Shear at any point	$= W\frac{x}{l}$
R = (max. shear V)	$= W$
M, distance x	$= \frac{Wx^2}{2l}$
M max. at R	$= \frac{Wl}{2}$
W max.	$= \frac{2fS}{l}$
D max.	$= \frac{Wl^3}{8EI}$

III. CANTILEVER BEAM—Load increasing uniformly to fixed end



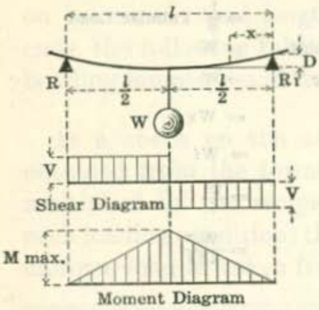
Safe Load	$= \frac{3}{8}$ Tabular Load
Shear at any point	$= \frac{Wx^2}{l^2}$
R = (max. shear V)	$= W$
M, distance x	$= \frac{Wx^3}{3l^2}$
M max. at R	$= \frac{Wl}{3}$
W max.	$= \frac{3fS}{l}$
D max.	$= \frac{Wl^3}{15EI}$

BEAMS UNDER VARIOUS LOADING CONDITIONS

DIAGRAMS AND FORMULAS

STATIC LOADS ON BEAMS

IV. BEAM SUPPORTED AT ENDS—Concentrated load at center



Safe Load $= \frac{1}{2}$ Tabular Load

Shear at any point $= \frac{W}{2}$

R = (max. shear V) = R_1 $= \frac{W}{2}$

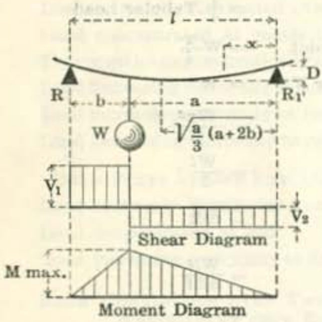
M, distance x $= \frac{Wx}{2}$

M max. at point of load $= \frac{Wl}{4}$

W max. $= \frac{4fS}{l}$

D max. $= \frac{Wl^3}{48EI}$

V. BEAM SUPPORTED AT ENDS—Concentrated load near one end



Safe Load = Tabular Load x $\frac{l^2}{8ab}$

R = (max. shear if a>b) $= \frac{Wa}{l}$

R_1 = (max. shear if b>a) $= \frac{Wb}{l}$

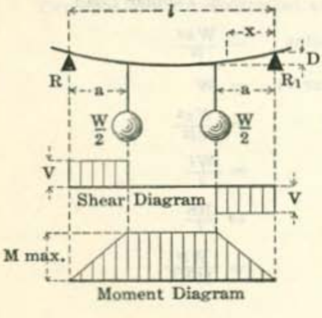
M, distance x $= \frac{Wbx}{l}$

M max. at point of load $= \frac{Wab}{l}$

W max. $= \frac{fSl}{ab}$

D max. $= \frac{Wab\,(a+2b)\sqrt{3a\,(a+2b)}}{27EI\,l}$

VI. BEAM SUPPORTED AT ENDS—Two symmetrical concentrated loads



Safe Load = Tabular Load x $\frac{l}{4a}$

R = (max. shear V) = R_1 $= \frac{W}{2}$

M, distance x $= \frac{Wx}{2}$

M max. at and between loads $= \frac{Wa}{2}$

W max. $= \frac{2fS}{a}$

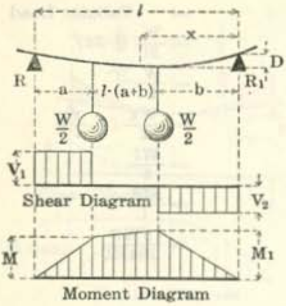
D max. $= \frac{Wa}{12EI}\left(\frac{3}{4}l^2 - a^2\right)$

BEAMS UNDER VARIOUS LOADING CONDITIONS

DIAGRAMS AND FORMULAS

STATIC LOADS ON BEAMS

VII. BEAM SUPPORTED AT ENDS—Two unsymmetrical concentrated loads



R = (max. shear V_1 if a<b) $= \frac{W}{2l}(l-a+b)$

R_1 $= \frac{W}{2l}(l+a-b)$

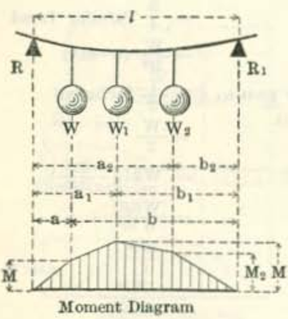
M, distance a $= Ra = \frac{Wa}{2l}(l-a+b)$

M_1 max. distance b (b>a) $= R_1 b = \frac{Wb}{2l}(l+a-b)$

M_2, distance x $= Rx - \frac{W}{2}(x-a)$

W max. (b>a) $= \frac{2lfS}{b(l+a-b)}$

VIII. BEAM SUPPORTED AT ENDS—Three concentrated loads



R $= \frac{Wb + W_1 b_1 + W_2 b_2}{l}$

R_1 $= \frac{Wa + W_1 a_1 + W_2 a_2}{l}$

M at W $= Ra$

M max. if W $= R$ or $> R$

M at W_1 $= Ra_1 - W(a_1 - a)$

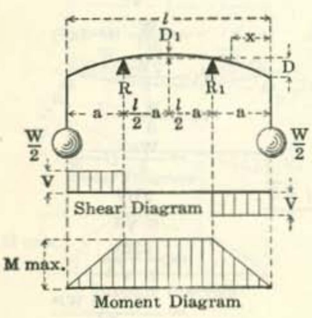
M max. if $W_1 + W$ $= R$ or $> R$

M max. if $W_1 + W_2$ $= R_1$ or $> R_1$

M at W_2 $= Ra_2 - W(a_2 - a) - W_1(a_2 - a_1)$

M max. if W_2 $= R_1$ or $> R_1$

IX. BEAM CONTINUOUS OVER TWO SUPPORTS—Two exterior symmetrical loads



Safe Load = Tabular Load x $\frac{l}{4a}$

R = (max. shear V) = R_1 $= \frac{W}{2}$

M, distance x $= \frac{Wx}{2}$

M max. from R to R_1 $= \frac{Wa}{2}$

W max. $= \frac{2fS}{a}$

D, distance a $= \frac{Wa(3al - 4a^2)}{12EI}$

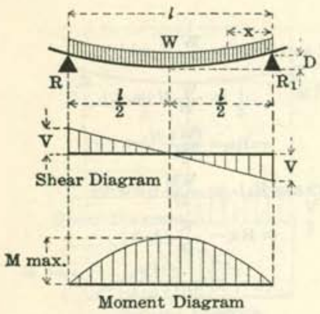
D_1, distance $\frac{l}{2} - a$ $= \frac{Wa(l-2a)^2}{16EI}$

BEAMS UNDER VARIOUS LOADING CONDITIONS

DIAGRAMS AND FORMULAS

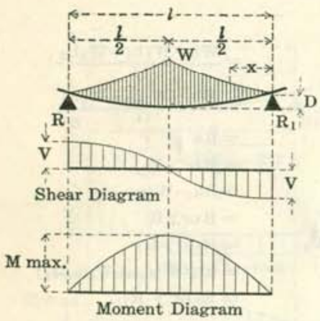
STATIC LOADS ON BEAMS

X. BEAM SUPPORTED AT ENDS—Uniformly distributed load



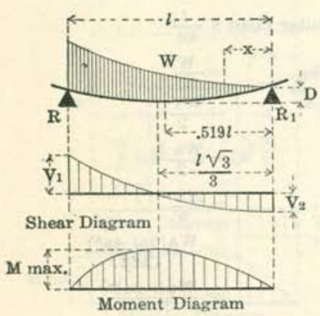
Safe Load	= Tabular Load
Shear at any point	$= \frac{W}{2l}(l-2x)$
R(max. shear V)=R_1	$= \frac{W}{2}$
M, distance x	$= \frac{Wx}{2}(l-\frac{x}{l})$
M max. at center	$= \frac{Wl}{8}$
W max.	$= \frac{8fS}{l}$
D max.	$= \frac{5Wl^3}{384EI}$

XI. BEAM SUPPORTED AT ENDS—Load increasing uniformly to center



Safe Load	$= \frac{3}{4}$ Tabular Load
Shear at any point	$= \frac{W}{2l^2}(l^2-4x^2)$
For $x=0$ to $x = \frac{l}{2}$ inclusive	
R(max. shear V)=R_1	$= \frac{W}{2}$
M, distance x	$= Wx(\frac{1}{2}-\frac{2x^2}{3l^2})$
M max. distance $\frac{l}{2}$	$= \frac{Wl}{6}$
W max.	$= \frac{6fS}{l}$
D max.	$= \frac{Wl^3}{60EI}$

XII. BEAM SUPPORTED AT ENDS—Load increasing uniformly to one end



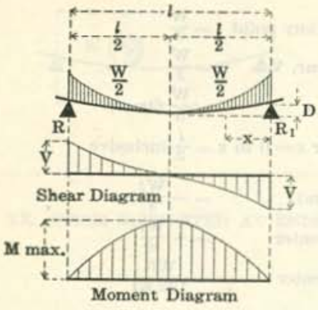
Safe Load	$=$ Tabular Load x $\frac{16}{9\sqrt{3}}$
Shear at any point	$= \frac{W}{3l^2}(l^2-3x^2)$
R (max. shear)	$V_1 = \frac{2W}{3}$
R_1	$V_2 = \frac{W}{3}$
M, distance x	$= \frac{Wx}{3}(l-\frac{x^2}{l^2})$
M max. distance $\frac{l\sqrt{3}}{3}$	$= \frac{2Wl}{9\sqrt{3}}$
W max.	$= \frac{27fS}{2l\sqrt{3}}$
D max.	$= \frac{.013044\ Wl^3}{EI}$

BEAMS UNDER VARIOUS LOADING CONDITIONS

DIAGRAMS AND FORMULAS

STATIC LOADS ON BEAMS

XIII. BEAM SUPPORTED AT ENDS—Load decreasing uniformly to center



Safe Load $= \frac{3}{2}$ Tabular Load

Shear at x $= W\left(\frac{2x}{l} - \frac{2x^2}{l^2} - \frac{1}{2}\right)$

R = (max. shear) = R_1 $= \frac{W}{2}$

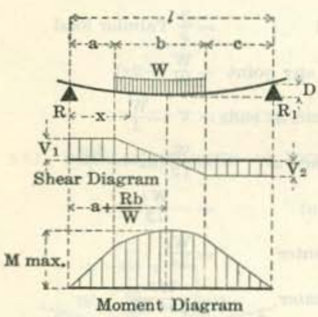
M, distance x $= Wx\left(\frac{1}{2} - \frac{x}{l} + \frac{2x^2}{3l^2}\right)$

M max. $\left(x = \frac{l}{2}\right)$ $= \frac{Wl}{12}$

W max. $= \frac{12fS}{l}$

D max. $= \frac{3Wl^3}{320EI}$

XIV. BEAM SUPPORTED AT ENDS—Uniform load partially distributed



R = (max. shear if a>c) $= \frac{W(2c+b)}{2l}$

Shear at x $= R - \frac{W}{b}(x-a)$

R_1 = (max. shear if a>c) $= \frac{W(2a+b)}{2l}$

M, distance x = a or <a $= Rx$

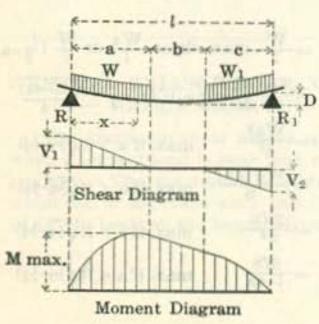
M_1, distance x >a $= Rx - \frac{W(x-a)^2}{2b}$

M_2, distance x >(a + b) $= Rx - \frac{W(2x-2a-b)}{2}$

M max. distance $a + \frac{Rb}{W}$ $= \frac{W(2c+b)[4al+b(2c+b)]}{8l^2}$

W max. $= \frac{8l^2fS}{(2c+b)[4al+b(2c+b)]}$

XV. BEAM SUPPORTED AT ENDS—Uniform load partially discontinuous



R = (max. shear if W>W_1) $= \frac{W(2l-a)+W_1c}{2l}$

R_1 $= \frac{W_1(2l-c)+Wa}{2l}$

M, distance x <a $= Rx - \frac{Wx^2}{2a}$

M_1, distance x >a $= Rx - \frac{W(2x-a)}{2}$

M max. distance x $= \frac{2Wal - Wa^2 + W_1ca}{2Wl} = \frac{R^2a}{2W}$

when $Wa > W_1c$

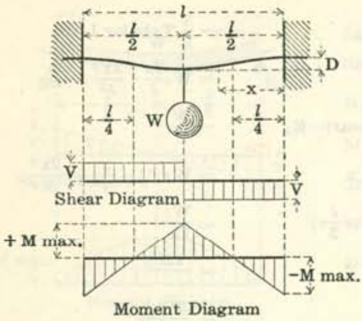
W max. $= \frac{R^2a}{2fS}$

BEAMS UNDER VARIOUS LOADING CONDITIONS

DIAGRAMS AND FORMULAS

STATIC LOADS ON BEAMS

XVI. BEAM FIXED AT ENDS—Single Load at Center.



Safe load $=$ Tabular load

Shear at any point $= \frac{W}{2}$

Max. shear, V $= \frac{W}{2}$

M, distance x $= \frac{W}{8}(4x-l)$

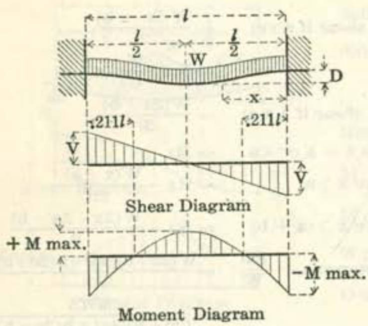
For $x = 0$ to $x = \frac{l}{2}$ inclusive

−M max. at end $= -\frac{Wl}{8}$

+M max. at center $= +\frac{Wl}{8}$

D max. at center $= \frac{Wl^3}{192\,EI}$

XVII. BEAM FIXED AT ENDS—Uniformly Distributed Load.



Safe load $= \frac{3}{2}$ Tabular load

Shear at any point $= \frac{W}{2l}(l-2x)$

Max. shear, at ends $= V = \frac{W}{2}$

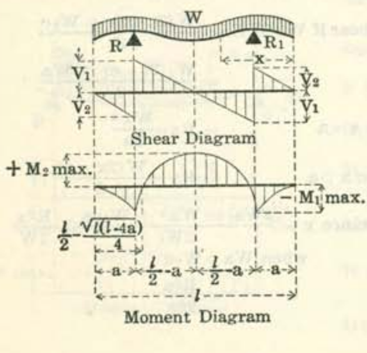
M, distance x $= \frac{W}{12}\left(6x - l - \frac{6x^2}{l}\right)$

−M max. at end $= -\frac{Wl}{12}$

+M max. at center $= \frac{Wl}{24}$

D max. at center $= \frac{Wl^3}{384\,EI}$

XVIII. BEAM CONTINUOUS OVER TWO SUPPORTS—Uniformly Distributed Load.



$R = R_1 = \frac{W}{2}$, max. shear $\frac{Wa}{l}$ or $\frac{W}{l}\left(\frac{l}{2}-a\right)$

M, distance x $= \frac{W(x^2 - lx + al)}{2l} = 0$ if $x = \frac{l}{2} \pm \sqrt{\frac{l(l-4a)}{4}}$

M_1 at R and $R_1 = \frac{Wa^2}{2l}$ max. if $a > l(\sqrt{\tfrac{1}{2}} - \tfrac{1}{2})$

M_2 at center $= \frac{W(l-4a)}{8}$ max. if $a < l(\sqrt{\tfrac{1}{2}} - \tfrac{1}{2})$

W_1 max. $= \frac{2lfS}{a^2}$ max. if $a > l(\sqrt{\tfrac{1}{2}} - \tfrac{1}{2})$

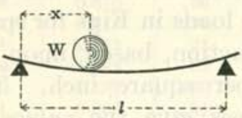
W_2 max. $= \frac{8fS}{l-4a}$ max. if $a < l(\sqrt{\tfrac{1}{2}} - \tfrac{1}{2})$

BEAMS UNDER VARIOUS LOADING CONDITIONS

DIAGRAMS AND FORMULAS

STATIC LOADS ON BEAMS

XIX. BEAM SUPPORTED AT ENDS—Single Concentrated Moving Load.



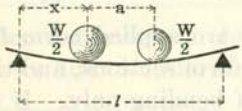
Max. shear $= W$

Occurs at end for $x = o$

M max. $= \frac{Wl}{4}$

Occurs at center for $x = \frac{l}{2}$

XX. BEAM SUPPORTED AT ENDS—Two Equal Concentrated Moving Loads.



Max. shear $= \frac{W}{l}\left(l - \frac{a}{2}\right)$

Occurs at end for $x = o$

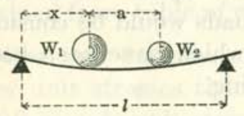
M max. $= \frac{W}{4l}\left(l - \frac{a}{2}\right)^2$

Occurs under load at

Distance x $= \frac{1}{2}\left(l - \frac{a}{2}\right)$ from support

If a is greater than 0.586 l, Case No. XIX will give the Max. Moment.

XXI. BEAM SUPPORTED AT ENDS—Two Unequal Concentrated Moving Loads.



Max. shear $= W_1 + W_2 \frac{l-a}{l}$

Occurs at end for $x = o$

M max. $= (W_1 + W_2)\frac{x^2}{l}$

Occurs under W_1 at distance.

$x = \frac{1}{2}\left(l - \frac{W_2\,a}{W_1 + W_2}\right)$ from left support.

Max. Moment may occur for one load, as in Case No. XIX.

GENERAL RULES FOR MAXIMUM SHEARS AND MOMENTS IN SIMPLE BEAMS CARRYING MOVING CONCENTRATED LOADS.

The maximum shear due to moving concentrated loads always occurs at a support when a certain load is near that support. The maximum shear there equals the total reaction. The maximum bending moment due to moving concentrated loads occurs under one of the loads when this load is as far from one support as the center of gravity of all the loads on the beam is from the other support.

SAFE LOADS FOR SECTIONS USED AS BEAMS

EXPLANATION OF TABLES

The tables of safe loads for structural beams, channels, H-beams and cross tie sections, used as beams under conditions of transverse loading, give the uniformly distributed safe loads in Kips for spans customary in bridge and building construction, based upon an extreme unit stress of 18,000 pounds per square inch. The tables of safe loads for angles, tees and zees give the values at the same unit stresses on spans of one foot, from which the safe load for any length may be obtained by direct division, and also the values for those spans at which the allowed safe load will produce a deflection of 1/360 of the span length. The loads in all cases include the weight of the section, which should be deducted in order to arrive at the net load which the section will support.

It is assumed in all cases that the loads are applied normal to the axis 1-1 as shown in the tables of elements of sections, and that the beam deflects vertically in the plane of bending only. If the conditions of loading involve the introduction of forces outside this plane of loading, the allowable safe loads must be determined from the general theory of flexure, in accordance with the mode of application of the load and its character. This applies particularly to unsymmetrical sections, such as zee bars and angles, which should be used only under those conditions of loading where the section can deflect vertically only, being rigidly secured against lateral deflection or twisting throughout the entire span. In all such cases of eccentric loading, the actual safe loads would be considerably lower than the tabulated safe loads which have been based upon the most favorable conditions of loading.

Vertical Deflection. The vertical deflection of a section under a uniformly distributed load is determined from formula:

$$\text{Deflection, } D=\frac{5}{384}\,\frac{Wl^3}{EI}\ ;\ Wl=8\,f\,\frac{I}{n}$$

$$\text{"}\quad D=\frac{40}{384}\,\frac{f\,l^2}{En};\ \text{for span length in feet, } l=12\,L$$

$$\text{"}\quad D=\frac{15\,fL^2}{En}\ \text{inches}$$

Steel, E=29,000,000; for unit stress of 18,000 pounds:

$$\text{Deflection, } D=\frac{0.01862L^2}{2n} \qquad \text{Deflection, } D=\frac{\text{Coefficient}}{2n}$$

n=distance from center line of gravity to extreme fiber.

DEFLECTION COEFFICIENTS FOR UNIT STRESS OF 18,000 POUNDS

Span, Feet	Coefficient 18,000	Span, Feet	Coefficient 18,000	Span, Feet	Coefficient 18,000	Span, Feet	Coefficient 18,000
1	0.019	21	8.212	41	31.301	61	69.288
2	0.074	22	9.012	42	32.847	62	71.578
3	0.168	23	9.850	43	34.430	63	73.906
4	0.298	24	10.726	44	36.050	64	76.270
5	0.466	25	11.638	45	37.707	65	78.672
6	0.670	26	12.588	46	39.401	66	81.112
7	0.912	27	13.574	47	41.133	67	83.588
8	1.192	28	14.599	48	42.902	68	86.102
9	1.508	29	15.660	49	44.708	69	88.653
10	1.862	30	16.759	50	46.552	70	91.241
11	2.253	31	17.894	51	48.432	71	83.867
12	2.681	32	19.068	52	50.350	72	96.530
13	3.147	33	20.278	53	52.306	73	99.230
14	3.650	34	21.526	54	54.298	74	101.967
15	4.190	35	22.810	55	56.328	75	104.741
16	4.767	36	24.132	56	58.395	76	107.553
17	5.381	37	25.492	57	60.499	77	110.402
18	6.033	38	26.888	58	62.640	78	113.288
19	6.722	39	28.322	59	64.819	79	116.212
20	7.448	40	29.793	60	67.035	80	119.172

The deflection, in inches, of sections subjected to transverse stresses due to uniformly distributed loads are obtained as follows:

Symmetrical Sections. To find the deflection in inches of a section symmetrical about the neutral axis, such as beams, channels, zees, etc., divide the coefficient in the table corresponding to given span and fiber stress by the depth of the section in inches.

Unsymmetrical Sections. To find the deflection in inches of a section not symmetrical about the neutral axis, such as angles, tees, etc., divide the coefficient corresponding to given span and unit stress by twice the distance of extreme fiber from neutral axis obtained from table of elements of sections.

Other Unit Stresses. To find the deflection of any section for other unit stresses than those given, multiply the coefficient for 18000 pounds unit stress corresponding to the span given by the ratio of desired unit stress and 18000.

Limits of Deflection. The deflection of floor beams carrying plastered ceilings should be limited to not more than 1/360 of the span length; this limit is indicated in the safe load tables by lower zig-zag line, is derived from the following formulas:

$$\text{Deflection, } D_{max} = \frac{12L}{360} = \frac{15fL^2}{En}. \qquad f = 18{,}000,\ L_{max.} = 3.580n$$

Lateral Deflection of Beams. In the usual construction of buildings the compression flanges of beams are secured against lateral deflection by the floor system, by tie rods placed at proper intervals, or by other means, and upon this assumption the full tabular loads may be applied.

When lateral bracing is not provided and the unbraced span length as compared with the flange width of the beam is excessive, it may be found economical to use two beams or a beam and channel securely fastened together; in crane girder construction a channel with flanges turned downward and riveted to the top flange of a beam will make a very efficient construction.

If, however, a single section is to be used for an excessive ratio of span length to flange width, the full tabular safe loads must be reduced, various permissible ratios of span length to flange width, l/b, and formulas for reduction of stresses being in use.

The table below gives the reduction in per cent of the tabular safe loads is accordance with the Specification of the American Institute of Steel Construction. The maximum allowable ratio of l/b is limited to 40.

thus:

$$f_c = \frac{20{,}000}{1 + \frac{1}{2000}(l/b)^2}$$

Full stress 18,000 lbs., up to ratio, $l/b = 15$

Maximum allowable ratio, $l/b = 40$

In addition to lateral deflection due to vertical loading, lateral deflection may be induced by the thrust of floor arches or by other forces not coincident with axis of principal bending stress.

Stresses due to horizontal thrust should either be neutralized by tie rods, or the safe resistance of the beam should be computed to provide for the combined stresses due to the action of both vertical and horizontal forces, so as not to exceed the allowable fiber stress.

Reduction of Tabular Safe Loads due to Lateral Deflection

Various Ratios of Span Length to Flange Width of Beam, l/b.

American Institute of Steel Construction Code.

Ratio, Length to Width l/b	Per Cent. Tabular Safe Load A. I. S. C. 18,000	Ratio, Length to Width l/b	Per Cent. Tabular Safe Load A. I. S. C. 18,000	Ratio, Length to Width l/b	Per Cent. Tabular Safe Load A. I. S. C. 18,000	Ratio, Length to Width l/b	Per Cent. Tabular Safe Load A. I. S. C. 18,000
	100	21	91.0	27.5	80.6	34	70.4
15	100.0	21.5	90.3	28	79.8	34.5	69.7
15.5	99.2	22	89.5	28.5	79.0	35	68.9
16	98.5	22.5	88.7	29	78.2	35.5	68.2
16.5	97.8	23	87.9	29.5	77.4	36	67.4
17	97.1	23.5	87.1	30	76.6	36.5	66.7
17.5	96.4	24	86.3	30.5	75.8	37	66.0
18	95.6	24.5	85.5	31	75.1	37.5	65.2
18.5	94.9	25	84.7	31.5	74.3	38	64.5
19	94.1	25.5	83.9	32	73.5	38.5	63.8
19.5	93.4	26	83.0	32.5	72.7	39	63.1
20	92.6	26.5	82.2	33	71.9	39.5	62.4
20.5	91.8	27	81.4	33.5	71.2	40	61.7

Shearing Stresses. The safe load tables for beams and channels are computed solely with reference to safe unit stresses due to flexure, and the safe loads uniformly distributed on the spans given will not produce excessive shearing stresses in the web.

Web Shear Limited by Buckling. The shearing stresses acting in the web of a beam produce two stresses of equal intensity, compression and tension, respectively, acting at right angles to each other and at angles of 45 degrees with the Neutral Axis. The intensity of each of these stresses is equal to the intensity of the vertical shearing stress. The compressive stresses tend to buckle the web, which, however, is not entirely free to buckle, because the tensile stresses acting at right angles have the effect of stiffening it. The web may therefore, be figured as composed of a series of columns of length equal to its diagonal depth.

The following formula may be used to calculate the total safe buckling resistance V due to web shear:—

$$V = \frac{18{,}000\ dt}{1 + \frac{c^2}{5{,}000\ t^2}} = f_s\ dt$$

V = Maximum allowable web shear in pounds.

d = Depth of beam in inches.

t = Web thickness in inches.

c = Distance between flanges in inches.

f_s = Unit fiber stress for shear in pounds per square inch.

$f_{s\,max.} = 12000$ for ratios of $\frac{c}{t}$ up to 50.

For web crippling at ends of beam or at points of concentrated loading, see discussion on following pages.

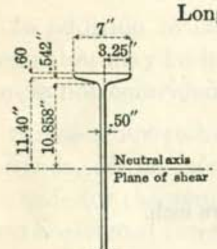
When, however, beams must support heavy loads which are concentrated near the supports, or when beams of short span are loaded with uniformly distributed loads to their full carrying capacity as regards flexure, the bending moments may be small in comparison with the reactions at the supports, and the beams may fail along the neutral plane as a result of longitudinal shearing stresses, or may buckle as a result of the combined longitudinal and vertical web stresses. On such spans the safe shearing or buckling strength of the web may limit the carrying capacity of the beam, so that the deciding factor will often be the resistance of the web to shearing stresses, rather than the resistance of the flanges to bending stresses.

Longitudinal Shear. At any point in any section of a beam, the horizontal and vertical components of the web stress are equal to each other and proportional to the vertical shear; their intensities are dependent upon the distance of the point from the neutral axis. In order to determine the intensity of the vertical shearing stress at a given point in a vertical section of the beam, therefore, it is sufficient to find the equal intensity of the horizontal shearing stress at the same point in the horizontal plane.

The longitudinal unit shear is zero at the upper and lower flanges of the beam and a maximum at the neutral plane. It is greatest at the supports and zero where there is no vertical shear.

The intensity of the longitudinal shear at any point in any section is the product of the vertical shear, V, for that section and the static moment, M_s, of the section included between the horizontal plane of shear through that point and the extreme fibers on the same side of the neutral plane divided by the product of the moment of inertia of the beam and the thickness at the plane of shear; or

$$\text{Longitudinal unit shear} = \frac{V\,M_s}{t\,I}.$$



Example—Required the maximum longitudinal shear per square inch in a 24" 79.9 lb. beam loaded with two symmetrical loads of 100,000 pounds each, disregarding the weight of the beam.

M_s of Flange Rectangle	$= 7 \times .60 \times 11.7$	$= 49.1$
M_s of Flange Triangles	$= 3.25 \times .542 \times 11.22$	$= 19.8$
M_s of Web	$= 11.40 \times .50 \times 5.70$	$= 32.5$
Total Static Moment		101.4 in.^{3}
Moment of Inertia of Beam, Axis 1-1,		$I = 2087.2$ in.^{4}

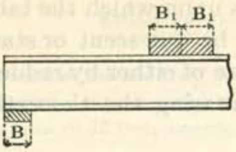
$$\text{Longitudinal Shear} = \frac{100000 \times 101.4}{2087.2 \times .50} = 9716 \text{ lb. per sq. in.}$$

Under usual conditions of loading, the longitudinal shear need not be taken into consideration.

Buckling Values of Beam Webs. The vertical shearing stresses or the vertical compressive components of the web stress may, under some conditions, exceed the safe resistance of the beam to buckling, so that a web, which is amply secure as against the safe allowed shear, will not be of sufficient strength when considered as a column.

In such cases provision must be made for security against buckling either by web stiffeners or by increasing the thickness of the web.

Experiments with beams of various depths and web thicknesses have demonstrated that the length of the web which can be assumed to resist buckling stresses is equal to the end bearing plus one-fourth of the depth of the beam; the following formulas have been deduced:



Safe end reaction $R = f_b \times t \,(B + \frac{d}{4})$

Safe interior load $W = 2\, f_b \times t \,(B_1 + \frac{d}{4})$

In the formulas R is the end reaction, W the concentrated load, t the web thickness, d the depth of the beam, B_1 half the distance over which the concentrated load is applied and B the whole distance over which the end reaction is applied, while f_b is the safe resistance of the web to buckling.

The first formula is general and applies to any condition of loading. The second formula is for a single load concentrated at the center of a span; it can be extended for a system of concentrated loads, provided the sum of the distances at B_1 is not less than B.

For computation of f_b the following formulas are used in the tables, corresponding to a maximum shearing stress of 12,000 pounds, f_b maximum not to exceed 15,000 pounds per square inch.

$$f_b = \frac{18000}{1 + \frac{1}{18000}(l/r)^2}, \quad l = .7d \quad r^2 = \frac{1}{12}t^2, \quad f_b = \frac{18000}{1 + \frac{1}{3000}(d/t)^2}$$

The tables give for beams and channels with unsupported webs:

1. The allowable shear V, on the gross area of the beam or channel webs $= f_s\, dt$.

Unit shear $f_s = 12{,}000$ pounds per square inch when $\frac{c}{t}$ is equal to or less than 50.

$$f_s = \frac{18000}{1 + \frac{c^2}{5000\, t^2}} \text{ when } \frac{c}{t} \text{ is greater than 50.}$$

2. Span limit to develop V.

3. The allowable web resistance f_b, in pounds per square inch.

4. The distance B, or the distance over which the end reaction must be distributed when the shearing stress, V, in the web is the maximum allowable.

5. The allowable end reaction (R) when B is taken at 3½″, which is the usual bearing of beam on the 4″ angles, ordinarily used in building construction for beam seats.

Maximum Bending Moments. In addition to data referring to maximum loads on beams and channels as computed from the web resistance, the tables also give the maximum bending moment in foot pounds, which may be used instead of the section moduli to ascertain the proper size section in any particular instance.

Effect of Impact on Stresses. The formulas upon which the tables of safe loads are based assume all loads to be quiescent or static. The effect of moving loads may be taken care of either by reducing the allowable unit stresses, or else by increasing the theoretical loads.

When a load is suddenly applied, the resultant stresses are twice as great as those due to an equal quiescent load.

When an instantaneously applied load produces impact or percussion, the resultant stresses are dynamic and are measured by the laws governing the energy of bodies in motion.

The following formulas give the unit stress and deflection due to a load falling on center of a beam rigidly supported at both ends when the weight of beam is negligible as compared with that of falling load, and when no account is taken of the local distortion due to impact or percussion at point of application of load.

W = Weight of falling load, in pounds.

h = Height of fall, in inches.

f = Extreme unit stress due to static effect of load, W, in pounds per square inch.

f_d = Extreme unit stress due to impact of load, W, in pounds per square inch.

D = Deflection due to static effect of load, W, in inches.

D_d = Deflection due to impact of load, W, in inches.

$$f_d = f\left(1 + \sqrt{\frac{2h}{D} + 1}\right) \qquad D_d = D\left(1 + \sqrt{\frac{2h}{D} + 1}\right)$$

It must be noted, however, that when the weight of the beam is a real factor, theoretical formulas do not agree with observed results and practical tests give values which are far less than those indicated by theoretical formulas; this is notably true in drop-tests of axles.

Examples of the Use of Beam Safe Load Tables

Transverse Loads—Fixed Spans. Required the proper size of a beam laterally braced to support a superimposed or net load of 88,000 pounds uniformly distributed over a clear span of 42 feet, assuming a unit stress of 18,000 pounds.

From the table of safe loads on page 136, it is found that beam CB 301N, 30″ x 10½″—115 pounds, will support a gross load of 93,300 pounds. The weight of beam is 42 x 115=4830 pounds. The net safe load is, therefore, 93,300—4800=88,470 pounds.

Transverse Loads—Free Spans. Required the reduced safe load on beam CB 212N, 21″ x 9″—77 pounds, for a span of 21 feet without any lateral support or bracing, in accordance with A. I. S. C. formula for 18,000 pounds.

Tabular load, page 142, = 94,300 pounds. Ratio, $l/b = \frac{21 \times 12}{9} = 28.0$

Reduced safe load, page 116, 94,300 x 0.798=75,250 pounds.

Vertical Shear. Required the maximum load which beam B 5, 15″ x 85 pounds, can support without exceeding web resistance of 12,000 pounds.

From tables on page 127, the maximum end reaction is 156,960 pounds and the maximum load is 2 x 156,960=313,920 pounds.

Vertical Deflection. 1. Required the proper size and the deflection of a beam supporting a net load of 12,500 pounds, concentrated in the middle of a 21-foot span, for a unit stress of 18,000 pounds, assuming that the beam is braced against lateral deflection.

The specified concentrated load is equivalent to a uniformly distributed load of 2 x 12,500=25,000 pounds.

In table on page 156, it is found that beam CB 141N, 14″ x 6¾″—33 pounds, will support a gross load of 27,300 pounds or a net load of 27,300−21 x 33=26,600 pounds.

The deflection produced by a uniformly distributed load of 27,300 pounds is found from the coefficient given in the same table and on page 115 to be 8.21÷14=0.59″. The deflection for the specified load concentrated in the middle of the span, page 106, is approximately 0.59 x 4/5=0.47″.

2. Required the deflection of a riveted girder, 37 inches deep, for a span of 35 feet and a unit stress of 14,000 pounds.

Required deflection, table on page 115, $= \frac{22.81}{37} \times \frac{14000}{18000} = 0.48''$.

3. Required the deflection of angle 6″ x 4″ x 7/16″ about an axis parallel to the short leg, rigidly secured laterally, and loaded to capacity of 3287 pounds, for a span of 14 feet and a unit stress of 18,000 pounds.

Required deflection, page 115, is $\frac{3.65}{2 \times (6-1.96)} = 0.45'$.

4. Required the deflection of channel C 3, 10″ x 15.3 pounds, laid flat and loaded to capacity of 1300 pounds, for a span of 12 feet and a unit stress of 20,000 pounds.

Required deflection, page 115, $= \frac{2.68}{2\ (2.60-0.64)} \times \frac{20,000}{18,000} = 0.76'$.

BEAM

VALUES

CB SECTIONS

MAXIMUM BENDING MOMENTS AND WEB RESISTANCES

Bending Stress 18,000 Pounds—Shearing Stress 12,000 Pounds

Section Index and Nominal Depth	Depth of Beam	Weight per Foot	Web Thickness	Maximum Bending Moment	VALUES FOR END REACTION V — WEB SHEARING: End Reaction	WEB SHEARING: Span Limit	WEB BUCKLING: Unit Stress	WEB BUCKLING: End Bearing	End Reaction $B = 3\frac{1}{2}''$
	d		t	M max.	V max.	L min.	fb	B min.	R max.
	Inches	Pounds	Inches	Foot Pounds	Pounds	Feet	Pounds per Sq. In.	Inches	Pounds
CB 362 N 36	36.720	300	.947	1658700	417290	15.90	11990	27.57	143980
	36.500	280	.886	1547550	388070	15.95	11496	28.98	128590
	36.240	260	.843	1426350	366600	15.56	11139	29.98	117940
	36.120	250	.817	1368600	354120	15.46	10899	30.74	111570
	36.000	240	.790	1310700	341280	15.36	10637	31.61	105040
	35.880	230	.763	1252950	328510	15.26	10362	32.58	98590
CB 361 N 36	36.500	192	.744	994200	325870	12.20	9988	34.73	93820
	36.250	176	.698	903150	303640	11.90	9479	36.83	83120
	36.120	167	.668	853950	286310	11.93	9116	37.99	76300
	36.000	158	.635	807000	261760	12.33	8690	38.44	68980
	35.880	150	.609	762450	242500	12.58	8345	38.75	63370
CB 332 N 33	33.750	260	.893	1322850	361670	14.63	12193	24.78	129980
	33.500	240	.836	1215900	336070	14.47	11725	25.91	116400
	33.250	220	.778	1109400	310430	14.30	11188	27.35	102820
	33.120	210	.752	1055400	298870	14.13	10932	28.08	96840
	33.000	200	.720	1003500	285120	14.08	10587	29.15	89570
CB 331 N 33	33.500	152	.636	729300	255670	11.41	9352	34.61	70630
	33.310	141	.605	669600	235800	11.36	8953	35.20	64070
	33.150	132	.581	620100	218890	11.33	8632	35.36	59120
	33.000	125	.570	577050	210760	10.95	8502	35.24	56940
CB 302 N 30	30.750	240	.882	1114950	325460	13.70	12810	21.12	126400
	30.500	220	.814	1020600	297920	13.70	12262	22.22	111040
	30.250	200	.745	926550	270430	13.71	11616	23.69	95740
	30.120	190	.712	878700	257340	13.66	11274	24.53	88540
	30.000	180	.675	833100	243000	13.71	10854	25.67	80590
CB 301 N 30	30.310	131	.602	568650	218960	10.39	9756	29.71	65060
	30.120	122	.580	521700	209640	9.95	9479	30.60	60640
	30.000	115	.555	489600	197170	9.93	9119	31.46	55670
	29.880	108	.528	457200	180350	10.14	8706	31.76	50430
CB 272 N 27	27.452	175	.671	747300	221040	13.52	11553	21.65	80330
	27.328	166	.638	708600	209220	13.55	11169	22.53	73630
	27.192	156	.600	665850	195780	13.60	10685	23.74	66020
	27.000	145	.580	612150	187920	13.03	10451	24.25	62140
CB 271 N 27	27.582	112	.527	454950	174430	10.43	9409	28.28	51550
	27.450	104	.490	422700	156260	10.82	8798	29.38	44680
	27.326	97	.460	393300	139370	11.29	8271	29.80	39310
	27.162	91	.455	361200	135870	10.63	8227	29.51	38520
	27.000	85	.450	329400	132430	9.95	8182	29.22	37740

CB SECTIONS

BEAM

VALUES

MAXIMUM BENDING MOMENTS AND WEB RESISTANCES

Bending Stress 18,000 Pounds—Shearing Stress 12,000 Pounds

Section Index and Nominal Depth	Depth of Beam	Weight per Foot	Web Thickness	Maximum Bending Moment	VALUES FOR END REACTION V: WEB SHEARING: End Reaction	WEB SHEARING: Span Limit	WEB BUCKLING: Unit Stress	WEB BUCKLING: End Bearing	End Reaction B = 3½″
	d		t	M max.	V max.	L min.	fb	B min.	R max.
	Inches	Pounds	Inches	Foot Pounds	Pounds	Feet	Pounds per Sq. In.	Inches	Pounds
CB 244 N 24	24.714	160	.665	618150	197220	12.54	12325	17.88	79330
	24.562	150	.633	577350	186580	12.38	11986	18.45	73150
	24.406	140	.601	535950	176020	12.18	11616	19.11	67030
	24.250	130	.570	494700	165880	11.93	11226	19.86	61190
CB 243 N 24	24.310	120	.559	448050	163070	10.99	11040	20.35	59110
	24.160	110	.513	411000	148730	11.05	10348	21.97	50650
	24.000	100	.470	372600	135360	11.01	9630	23.90	43000
CB 242 N 24	24.260	93	.481	337050	140030	9.63	9740	23.82	44810
	24.100	85	.450	305550	129600	9.43	9202	25.27	39440
CB 241 N 24	24.120	81	.453	285150	131110	8.70	9254	25.25	39950
	24.000	74	.412	261000	110970	9.41	8446	25.89	33060
	23.880	70	.408	242400	108540	8.93	8404	25.68	32470
CB 213 N 21	21.264	116	.507	397800	129370	12.30	11346	17.18	50710
	21.138	108	.473	370200	119980	12.34	10806	18.19	44900
	21.016	101	.450	344550	113480	12.14	10423	18.94	41060
CB 212 N 21	21.376	96	.524	308250	134410	9.17	11577	16.81	53650
	21.240	89	.485	286050	123610	9.26	10981	17.90	46920
	21.122	83	.452	266850	114560	9.32	10417	19.05	41350
	21.000	77	.420	247500	105840	9.35	9818	20.41	36090
CB 211 N 21	21.334	73	.427	232050	109320	8.49	9825	20.73	37060
	21.210	67	.393	213000	99530	8.56	9132	22.43	31590
	21.098	62	.367	196500	88110	8.92	8565	22.76	27580
	21.000	58	.350	182700	80680	9.06	8182	22.92	25060
CB 203 N 20	20.380	146	.710	457650	173640	10.54	14122	12.22	86180
	20.180	135	.669	421050	162000	10.40	13812	12.49	78960
	20.000	125	.630	388200	151200	10.27	13473	12.81	72150
	19.820	115	.591	355500	140570	10.12	13093	13.21	65430
CB 202 N 20	20.380	98	.577	295800	141110	8.39	12714	14.14	63050
	20.180	88	.521	265350	126170	8.41	12000	15.14	53420
	20.000	80	.485	239400	116400	8.23	11488	15.89	47360
	19.880	74	.451	221400	107590	8.23	10925	16.87	41730
CB 201 N 20	20.250	65	.416	194100	101090	7.68	10057	19.10	35830
	20.120	60	.395	177300	95360	7.44	9653	19.98	32530
	20.000	55	.370	161400	87620	7.37	9119	20.97	28680

BEAM VALUES

CB SECTIONS

MAXIMUM BENDING MOMENTS AND WEB RESISTANCES

Bending Stress 18,000 Pounds—Shearing Stress 12,000 Pounds

Section Index and Nominal Depth	Depth of Beam	Weight per Foot	Web Thickness	Maximum Bending Moment	VALUES FOR END REACTION V — WEB SHEARING — End Reaction	VALUES FOR END REACTION V — WEB SHEARING — Span Limit	VALUES FOR END REACTION V — WEB BUCKLING — Unit Stress	VALUES FOR END REACTION V — WEB BUCKLING — End Bearing	End Reaction B = 3½″
	d		t	M max.	V max.	L min.	fb	B min.	R max.
	Inches	Pounds	Inches	Foot Pounds	Pounds	Feet	Pounds per Sq. In.	Inches	Pounds
CB 183 N 18	18.274	99	.485	291750	106360	10.97	12218	13.38	47820
	18.138	92	.460	269850	100120	10.78	11856	13.82	43820
	18.018	86	.440	250800	95140	10.55	11546	14.22	40670
	17.898	80	.420	231900	90200	10.28	11212	14.68	37550
CB 182 N 18	18.152	77	.480	212250	104560	8.12	12189	13.33	47030
	18.000	70	.440	192600	95040	8.11	11555	14.19	40672
	17.870	64	.405	175800	86840	8.10	10916	15.18	35230
CB 181 N 18	18.250	57	.378	156450	82790	7.56	10129	17.06	30870
	18.120	52	.351	141900	76320	7.44	9532	18.28	26870
	18.060	49	.327	134250	69290	7.75	8925	19.23	23390
	18.000	47	.320	128100	66560	7.70	8761	19.24	22430
CB 164 N 16	16.250	90	.480	237300	93600	10.14	13025	10.91	47280
	16.120	83	.450	218100	87050	10.02	12607	11.31	42720
	16.000	76	.410	199800	78720	10.15	11940	12.08	36710
CB 163 N 16	16.230	68	.436	170850	84910	8.05	12314	11.76	40580
	16.120	63	.403	158550	77950	8.14	11739	12.45	35620
	16.000	58	.375	145650	72000	8.09	11202	13.14	31510
CB 162 N 16	16.250	50	.360	123300	70200	7.03	10719	14.13	29190
	16.120	45	.328	110700	63440	6.98	9971	15.37	24620
	16.000	40	.292	98550	55060	7.16	8996	16.96	19700
	15.880	37	.290	88800	54010	6.58	9002	16.62	19500
CB 153 N 15	15.320	108	.617	258600	113420	9.12	14930	8.48	67520
	15.160	99	.559	237600	101690	9.35	14456	8.79	58910
	15.000	91	.520	217800	93600	9.31	14091	9.02	53120
	14.880	85	.490	203100	87490	9.29	13768	9.25	48710
CB 152 N 15	15.310	72	.522	164250	95900	6.85	13988	9.31	53510
	15.160	66	.480	150450	87320	6.89	13507	9.68	47260
	15.000	60	.442	136200	79560	6.85	13008	10.09	41690
	14.880	55	.405	125100	72310	6.92	12414	10.66	36300
CB 151 N 15	15.250	49	.382	112050	69910	6.41	11755	11.76	32840
	15.120	44	.343	100650	62230	6.47	10924	12.83	27280
	15.000	39	.300	89700	54000	6.64	9818	14.59	21350
	14.880	35	.275	79950	48650	6.57	9109	15.70	18090

BEAM

VALUES

CB SECTIONS

MAXIMUM BENDING MOMENTS AND WEB RESISTANCES

Bending Stress 18,000 Pounds—Shearing Stress 12,000 Pounds

Section Index and Nominal Depth	Depth of Beam d Inches	Weight per Foot Pounds	Web Thickness t Inches	Maximum Bending Moment M max. Foot Pounds	Values for End Reaction V: Web Shearing: End Reaction V max. Pounds	Web Shearing: Span Limit L min. Feet	Web Buckling: Unit Stress fb Pounds per Sq. In.	Web Buckling: End Bearing B min. Inches	End Reaction B = 3½" R max. Pounds
CB 145 N 14	14.500	119	.571	283950	99360	11.43	14815	8.12	60270
	14.370	111	.540	264150	93120	11.35	14563	8.25	55780
	14.250	103	.498	245400	85160	11.53	14140	8.53	49740
	14.120	95	.466	225750	78960	11.44	13783	8.76	45150
	14.000	87	.422	207000	70900	11.68	13169	9.26	38900
CB 144 N 14	14.180	84	.451	196200	76740	10.23	13538	9.02	43020
	14.060	78	.430	181500	72550	10.01	13270	9.20	40280
CB 143 N 14	14.190	74	.451	168300	76800	8.77	13534	9.03	43020
	14.060	68	.420	154350	70860	8.71	13104	9.36	38610
	13.910	61	.380	138150	63430	8.71	12443	9.94	32990
CB 142 N 14	14.060	58	.406	127350	68500	7.44	12859	9.60	36630
	13.940	53	.370	116400	61900	7.52	12218	10.21	31580
	13.810	48	.340	105150	56340	7.47	11613	10.82	27450
	13.680	43	.310	93900	50890	7.38	10914	11.62	23410
CB 141 N 14	14.250	42	.333	91650	56940	6.44	11177	11.74	26290
	14.120	37	.291	80850	49310	6.56	10085	13.27	20630
	14.000	33	.265	71700	44520	6.44	9324	14.52	17300
	13.880	30	.260	63600	43100	5.90	9231	14.49	16730
CB 125 N 12	12.500	85	.501	173250	75160	9.22	14906	6.94	49480
	12.380	79	.476	160350	70720	9.07	14689	7.02	46110
	12.250	72	.436	145950	64090	9.11	14250	7.25	40780
	12.120	65	.395	131700	57440	9.17	13701	7.58	35340
CB 124 N 12	12.310	64	.409	128550	60420	8.51	13825	7.61	37190
	12.190	58	.363	117000	53100	8.81	13083	8.13	31100
	12.060	53	.349	105750	50510	8.38	12876	8.22	29280
CB 123 N 12	12.190	50	.375	96750	54850	7.06	13312	7.94	32690
	12.060	45	.340	86850	49200	7.06	12681	8.40	28090
	11.940	40	.298	77550	42700	7.27	11725	9.24	22660
CB 122 N 12	12.250	36	.300	69150	44100	6.27	11570	9.64	22780
	12.120	32	.275	61200	40000	6.12	10926	10.28	19620
	12.000	28	.240	53400	34560	6.18	9818	11.67	15310
	11.868	25	.240	46200	34180	5.41	9917	11.39	15390

BEAM

VALUES

CB SECTIONS

MAXIMUM BENDING MOMENTS AND WEB RESISTANCES

Bending Stress 18,000 Pounds—Shearing Stress 12,000 Pounds

Section Index and Nominal Depth	Depth of Beam	Weight per Foot	Web Thickness	Maximum Bending Moment	VALUES FOR END REACTION V: WEB SHEARING: End Reaction	Span Limit	WEB BUCKLING: Unit Stress	End Bearing	End Reaction B = 3½″
	d		t	M max.	V max.	L min.	fb	B min.	R max.
	Inches	Pounds	Inches	Foot Pounds	Pounds	Feet	Pounds per Sq. In.	Inches	Pounds
	10.380	66	.460	110550	57300	7.72	15000	5.71	42060
CB 103 N	10.250	60	.415	100500	51050	7.88	14958	5.66	37640
10	10.120	54	.370	90600	44930	8.07	14407	5.90	32150
	10.000	49	.340	81750	40800	8.02	13971	6.09	28500
	10.120	45	.350	73650	42500	6.93	14078	6.10	29710
CB 102 N	10.000	41	.330	66750	39600	6.74	13783	6.21	27290
10	9.880	37	.305	59700	36160	6.61	13335	6.42	24280
	9.750	33	.295	52500	34510	6.09	13195	6.43	23120
	10.240	29	.279	46650	34280	5.44	12422	7.33	21000
CB 101 N	10.120	26	.260	41400	31570	5.25	11960	7.62	18750
10	10.000	23	.240	36150	28800	5.02	11402	8.03	16420
	9.900	21	.240	32250	28510	4.52	11485	7.87	16470
CB 83 N	8.182	35	.315	46950	30920	6.07	14696	4.63	25670
8	8.124	33	.300	44250	29240	6.05	14465	4.71	24010
	8.060	31	.290	41250	28040	5.88	14315	4.74	22890
CB 82 N	8.196	30	.298	39450	29300	5.39	14375	4.79	23770
8	8.098	27	.268	35550	26040	5.46	13799	5.02	20430
	8.000	24	.239	31650	22940	5.52	13106	5.33	17230
BEAMS-STANDARD MILL									
B 40 N	9.000	23	.316	30600	34130	3.59	14169	5.37	25740
9 Ⓒ	9.000	20	.218	28500	23540	4.84	11478	7.16	14390
B 39 N	8.000	21	.360	23850	34560	2.76	15000	4.40	29700
8	8.000	19	.287	22650	27550	3.29	14297	4.72	22570
Ⓒ	8.000	17	.213	21450	20450	4.20	12243	5.84	14340
H-BEAMS									
H 4	8.000	37.7	.500	45300	48000	3.78	15000	4.40	41250
8	8.000	34.3	.375	43350	36000	4.82	15000	4.40	30940
	8.000	32.6	.313	42300	30050	5.63	14781	4.50	25440
H 3A	6.000	27.5	.438	24600	31540	3.12	15000	3.30	32850
6	6.000	25.0	.313	23550	22540	4.18	15000	3.30	23480
H 3	6.000	22.5	.375	20550	27000	3.04	15000	3.30	28130
6	6.000	20.0	.250	19350	18000	4.30	15000	3.30	18750
H 2 5 Ⓒ	5.000	18.9	.313	14250	18780	3.04	15000	2.75	22300
H 1 4 Ⓒ	4.000	13.8	.313	7950	15020	2.12	15000	2.20	21130

Ⓒ Carnegie Steel Company only.

BEAMS
AMERICAN STANDARD

MAXIMUM BENDING MOMENTS AND WEB RESISTANCES

Bending Stress 18,000 Pounds—Shearing Stress 12,000 Pounds

BEAM

VALUES

Section Index	Depth of Beam	Weight per Foot	Web Thickness	Maximum Bending Moment	Values for End Reaction V: Web Shearing: End Reaction	Web Shearing: Span Limit	Web Buckling: Unit Stress	Web Buckling: End Bearing	End Reaction B = 3½″
	d		t	M max.	V max.	L min.	fb	B min.	R max.
	Inches	Pounds	Inches	Foot Pounds	Pounds	Feet	Pounds per Sq. In.	Inches	Pounds
B 18	24	120.0	.798	376350	229820	6.55	13829	14.83	104840
		115.0	.737	367550	212260	6.93	13300	15.65	93120
		110.0	.675	358650	194400	7.38	12664	16.74	81210
		105.9	.625	351450	180000	7.81	12068	17.86	71660
B 1	24	100.0	.747	296400	215140	5.51	13393	15.50	95050
		95.0	.686	287700	197570	5.82	12784	16.53	83320
		90.0	.624	278700	179710	6.20	12055	17.89	71460
		85.0	.563	270000	162140	6.66	11209	19.69	59960
		79.9	.500	260850	144000	7.25	10181	22.29	48360
B 2	20	100.0	.873	247200	209520	4.72	15000	11.00	111310
		95.0	.800	240000	192000	5.00	14896	11.11	101290
		90.0	.726	232500	174240	5.34	14366	11.71	88660
		85.0	.653	225300	156720	5.75	13713	12.50	76120
		81.4	.600	219900	144000	6.11	13135	13.27	66990
B 3	20	7.50	.641	189450	153840	4.93	13589	12.66	74040
		70.0	.567	182100	136080	5.35	12723	13.86	61320
		65.4	.500	175350	120000	5.85	11739	15.44	49900
B 19 Ⓒ	18	90.0	.796	209400	171940	4.87	15000	9.90	95520
		85.0	.714	202800	154220	5.26	14854	10.04	84850
		80.0	.632	196200	136510	5.75	14169	10.74	71640
		75.6	.560	190350	120960	6.29	13389	11.63	59980
B 4	18	70.0	.711	152850	153580	3.98	14832	10.06	84370
		65.0	.629	146250	135860	4.31	14140	10.78	71150
		60.0	.547	139650	118150	4.73	13226	11.83	57880
		54.7	.460	132600	99360	5.34	11917	13.63	43860
B 5	15	100.0	1.167	178500	210060	3.40	15000	8.25	126910
		95.0	1.068	172950	192240	3.60	15000	8.25	116150
		90.0	.970	167400	174600	3.84	15000	8.25	105490
		85.0	.872	161850	156960	4.12	15000	8.25	94830
		81.3	.800	157800	144000	4.38	15000	8.25	87000
B 6	15	75.0	.868	137400	156240	3.52	15000	8.25	94400
		70.0	.770	131850	138600	3.81	15000	8.25	83740
		65.0	.672	126450	120960	4.18	15000	8.25	73080
		60.8	.590	121800	106200	4.59	14810	8.40	63350
B 7	15	55.0	.648	101700	116640	3.49	15000	8.25	70470
		50.0	.550	96300	99000	3.89	14423	8.73	57510
		45.0	.452	90750	81360	4.46	13166	9.92	43140
		42.9	.410	88350	73800	4.79	12446	10.71	37000

Ⓒ Carnegie Steel Company only.

BEAM

VALUES

BEAMS
AMERICAN STANDARD
MAXIMUM BENDING MOMENTS AND WEB RESISTANCES
Bending Stress 18,000 Pounds—Shearing Stress 12,000 Pounds

Section Index	Depth of Beam	Weight per Foot	Web Thickness	Maximum Bending Moment	VALUES FOR END REACTION V: WEB SHEARING: End Reaction	Span Limit	WEB BUCKLING: Unit Stress	End Bearing	End Reaction $B = 3\frac{1}{2}''$
	d		t	M max.	V max.	L min.	fb	B min.	R max.
	Inches	Pounds	Inches	Foot Pounds	Pounds	Feet	Pounds per Sq. In.	Inches	Pounds
B 8	12	55.0	.810	79800	116640	2.74	15000	6.60	78980
		50.0	.687	75450	98930	3.05	15000	6.60	66980
		45.0	.565	70950	81360	3.49	15000	6.60	55090
		40.8	.460	67200	66240	4.06	14672	6.82	43870
B 9	12	35.0	.428	56700	61630	3.68	14263	7.10	39680
		31.8	.350	54000	50400	4.28	12933	8.13	29430
B 10	10	40.0	.741	47400	88920	2.13	15000	5.50	66690
		35.0	.594	43800	71280	2.45	15000	5.50	53460
		30.0	.447	40050	53640	2.99	15000	5.50	40230
		25.4	.310	36600	37200	3.94	13364	6.48	24860
B 11	9	35.0	.724	37050	78190	1.90	15000	4.95	62450
		30.0	.561	33750	60590	2.23	15000	4.95	48390
		25.0	.397	30450	42880	2.84	15000	4.95	34240
		21.8	.290	28350	31320	3.62	13626	5.68	22720
B 12	8	25.5	.532	25500	51070	2.00	15000	4.40	43890
		23.0	.441	24000	42340	2.27	15000	4.40	36380
		20.5	.349	22650	33500	2.70	15000	4.40	28790
		18.4	.270	21300	25920	3.29	13925	4.89	20680
B 13	7	20.0	.450	18000	37800	1.90	15000	3.85	35440
		17.5	.345	16650	28980	2.30	15000	3.85	27170
		15.3	.250	15600	21000	2.96	14271	4.14	18730
B 14	6	17.25	.465	13050	33480	1.55	15000	3.30	34880
		14.75	.343	11850	24700	1.93	15000	3.30	25730
		12.50	.230	10950	16650	2.63	14672	3.43	16880
B 15	5	14.75	.494	9000	29640	1.22	15000	2.75	35200
		12.25	.347	8100	20820	1.56	15000	2.75	24720
		10.0	.210	7200	12600	2.30	15000	2.75	14960
B 16	4	10.5	.400	5250	19200	1.11	15000	2.20	27000
		9.5	.326	4950	15650	1.28	15000	2.20	22010
		8.5	.253	4800	12140	1.56	15000	2.20	17080
		7.7	.190	4500	9120	1.96	15000	2.20	12830
B 17	3	7.5	.349	2850	12560	0.92	15000	1.65	22250
		6.5	.251	2700	9040	1.18	15000	1.65	16000
		5.7	.170	2550	6120	1.62	15000	1.65	10840

BEAMS
ILLINOIS-SPECIAL LIGHT

MAXIMUM BENDING MOMENTS AND WEB RESISTANCES

Bending Stress 18,000 Pounds—Shearing Stress 12,000 Pounds

Section Index	Depth of Beam	Weight per Foot	Web Thickness	Maximum Bending Moment	VALUES FOR END REACTION V — WEB SHEARING — End Reaction	Span Limit	WEB BUCKLING — Unit Stress	End Bearing	End Reaction B = 3½″
	d		t	M max.	V max.	L min.	fb	B min.	R max.
	Inches	Pounds	Inches	Foot Pounds	Pounds	Feet	Pounds per Sq. In.	Inches	Pounds
B 20 Φ	24	71	.480	226800	138240	6.56	9818	23.33	44770
B 21 Φ	21	75	.520	217650	131040	6.64	11661	16.36	53060
B 22 Φ	21	58	.430	163200	108360	6.02	10028	19.88	37730
B 23 Φ	18	46	.380	112650	82080	5.49	10298	16.48	31300
B 24 Φ	15	35	.330	73500	59400	4.95	10659	13.14	25500
B 25 Φ	12	25	.270	43800	38880	4.51	10854	10.27	19050
B 26 Φ	10	22	.250	33150	30000	4.42	11739	7.72	17610

Φ Illinois Steel Company only.

CHANNEL

VALUES

CHANNELS
AMERICAN STANDARD
MAXIMUM BENDING MOMENTS AND WEB RESISTANCES
Bending Stress 18,000 Pounds—Shearing Stress 12,000 Pounds

Section Index	Depth of Beam	Weight per Foot	Web Thickness	Maximum Bending Moment	VALUES FOR END REACTION V				End Reaction B = 3½″
					WEB SHEARING		WEB BUCKLING		
					End Reaction	Span Limit	Unit Stress	End Bearing	
	d		t	M max.	V max.	L min.	fb	B min.	R max.
	Inches	Pounds	Inches	Foot Pounds	Pounds	Feet	Pounds per Sq. In.	Inches	Pounds
*C 60	18	58.0	.700	111750	151200	2.96	14749	10.15	82590
Ⓒ		51.9	.600	103650	129600	3.20	13846	11.10	66460
		45.8	.500	95550	108000	3.54	12570	12.68	50280
		42.7	.450	91500	97200	3.77	11739	13.90	42260
C 1	15	55.0	.814	85800	146520	2.34	15000	8.25	88520
		50.0	.716	80400	128880	2.50	15000	8.25	77870
		45.0	.618	74700	111240	2.69	15000	8.25	67210
		40.0	.520	69300	93600	2.96	14091	9.03	53120
		35.0	.422	63750	75960	3.36	12666	10.46	38750
		33.9	.400	62550	72000	3.48	12255	10.94	35540
C 20	13	50.0	.787	72150	122770	2.35	15000	7.15	79680
		45.0	.673	67350	104990	2.57	15000	7.15	68140
		40.0	.560	62550	87360	2.86	15000	7.15	56700
		37.0	.492	59700	76750	3.11	14602	7.43	48490
		35.0	.447	57900	69730	3.32	14042	7.86	42360
		31.8	.375	54750	58500	3.74	12852	8.89	32540
C 2	12	40.0	.755	49200	108720	1.81	15000	6.60	73610
		35.0	.632	44700	91010	1.97	15000	6.60	61620
		30.0	.510	40350	73440	2.20	15000	6.60	49730
		25.0	.387	35850	55730	2.57	13631	7.56	34290
		20.7	.280	32100	40320	3.19	11165	9.90	20320
C 3	10	35.0	.820	34500	98400	1.40	15000	5.50	73800
		30.0	.673	30900	80760	1.53	15000	5.50	60570
		25.0	.526	27150	63120	1.72	15000	5.50	47340
		20.0	.379	23550	45480	2.07	14609	5.71	33220
		15.3	.240	20100	28800	2.79	11401	8.03	16420
C 4	9	25.0	.612	23550	66100	1.43	15000	4.95	52790
		20.0	.448	20250	48380	1.67	15000	4.95	38640
		15.0	.285	16950	30780	2.20	13509	5.75	22140
		13.4	.230	15750	24840	2.54	11917	6.81	15760
C 5	8	21.25	.579	17850	55580	1.29	15000	4.40	47770
		18.75	.487	16350	46750	1.40	15000	4.40	40180
		16.25	.395	14850	37920	1.57	15000	4.40	32590
		13.75	.303	13500	29090	1.86	14606	4.57	24340
		11.5	.220	12150	21120	2.30	12493	5.69	15110

*C 60–18″ Channel, is a Ship Building Channel, not American Standard.

Ⓒ Carnegie Steel Company only.

CHANNELS

VALUES

CHANNELS
AMERICAN STANDARD
MAXIMUM BENDING MOMENTS AND WEB RESISTANCES
Bending Stress 18,000 Pounds—Shearing Stress 12,000 Pounds

Section Index	Depth of Beam	Weight per Foot	Web Thickness	Maximum Bending Moment	VALUES FOR END REACTION V — WEB SHEARING: End Reaction	VALUES FOR END REACTION V — WEB SHEARING: Span Limit	VALUES FOR END REACTION V — WEB BUCKLING: Unit Stress	VALUES FOR END REACTION V — WEB BUCKLING: End Bearing	End Reaction B = 3½″
	d		t	M max.	V max.	L min.	fb	B min.	R max.
	Inches	Pounds	Inches	Foot Pounds	Pounds	Feet	Pounds per Sq. In.	Inches	Pounds
C 6	7	19.75	.629	14100	52840	1.07	15000	3.85	49530
		17.25	.524	12900	44020	1.17	15000	3.85	41270
		14.75	.419	11550	35200	1.31	15000	3.85	33000
		12.25	.314	10350	26380	1.57	15000	3.85	24730
		9.8	.210	9000	17640	2.04	13135	4.65	14480
C 7	6	15.5	.559	9750	40250	0.97	15000	3.30	41930
		13.0	.437	8700	31460	1.11	15000	3.30	32780
		10.5	.314	7500	22610	1.33	15000	3.30	23550
		8.2	.200	6450	14400	1.79	13846	3.70	13850
C 8	5	11.5	.472	6150	28320	0.87	15000	2.75	33630
		9.0	.325	5250	19500	1.08	15000	2.75	23160
		6.7	.190	4500	11400	1.58	14625	2.85	13200
C 9	4	7.25	.320	3450	15360	0.90	15000	2.20	21600
		6.25	.247	3150	11860	1.06	15000	2.20	16670
		5.4	.180	2850	8640	1.32	15000	2.20	12150
C 10	3	6.0	.356	2100	12820	0.66	15000	1.65	22700
		5.0	.258	1800	9290	0.78	15000	1.65	16450
		4.1	.170	1650	6120	1.08	15000	1.65	10840

BEAM
36″
LOADS

CB SECTIONS

ALLOWABLE UNIFORM LOADS IN KIPS

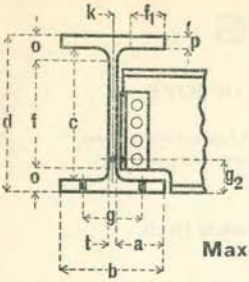
Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116.

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot											Coefficient of Deflection
	CB 362N 36″ x 16½″						CB 361N 36″ x 12″					
	300 Lbs.	280 Lbs.	260 Lbs.	250 Lbs.	240 Lbs.	230 Lbs.	192 Lbs.	176 Lbs.	167 Lbs.	158 Lbs.	150 Lbs.	
								607.3	572.6			
12							651.7	602.1	569.3	523.5	485.0	2.68
13							611.8	555.8	525.5	496.6	469.2	3.15
14							568.1	516.1	488.0	461.1	435.7	3.65
15	834.6	776.1	733.2	708.2	682.6	657.0	530.2	481.7	455.4	430.4	406.6	4.19
16	829.4	773.8	713.2	684.3	655.4	626.5	497.1	451.6	427.0	403.5	381.2	4.77
17	780.6	728.3	671.2	644.1	616.8	589.6	467.9	425.0	401.9	379.8	358.8	5.38
18	737.2	687.8	634.0	608.3	582.6	556.9	441.9	401.4	379.6	358.7	338.9	6.03
19	698.4	651.6	600.6	576.3	551.9	527.6	418.6	380.3	359.6	339.8	321.0	6.72
20	663.5	619.0	570.5	547.4	524.3	501.2	397.7	361.3	341.6	322.8	305.0	7.45
21	631.9	589.5	543.3	521.4	499.3	477.3	378.7	344.0	325.3	307.4	290.4	8.21
22	603.2	562.8	518.7	497.7	476.7	455.7	361.6	328.5	310.6	293.5	277.3	9.01
23	576.9	538.2	496.1	476.0	455.9	435.8	345.8	314.1	297.0	280.7	265.2	9.85
24	552.9	515.9	475.5	456.2	436.9	417.7	331.4	301.1	284.7	269.0	254.2	10.73
25	530.8	495.2	456.4	438.0	419.4	400.9	318.1	289.0	273.3	258.2	244.0	11.64
26	510.4	476.2	438.9	421.2	403.4	385.6	305.9	277.9	262.8	248.3	234.6	12.59
27	491.4	458.5	422.6	405.5	388.3	371.2	294.6	267.6	253.0	239.1	225.9	13.57
28	474.0	442.2	407.6	391.1	374.5	358.0	284.1	258.1	244.0	230.6	217.9	14.60
29	457.6	426.9	393.5	377.6	361.6	345.7	274.3	249.2	235.6	222.6	210.3	15.66
30	442.3	412.7	380.4	365.0	349.5	334.1	265.1	240.8	227.7	215.2	203.2	16.76
31	~~428.1~~	~~399.4~~	~~368.1~~	~~353.2~~	~~338.3~~	~~323.3~~	~~256.6~~	~~233.1~~	~~220.4~~	~~208.3~~	~~196.8~~	17.89
32	414.7	386.9	356.6	342.2	327.7	313.2	248.6	225.8	213.5	201.8	190.6	19.07
33	~~402.1~~	~~375.1~~	~~345.8~~	~~331.8~~	~~317.7~~	~~303.7~~	~~241.0~~	~~218.9~~	~~207.0~~	~~195.6~~	~~184.8~~	20.28
34	390.2	364.1	335.6	322.0	308.4	294.8	233.9	212.5	200.9	189.9	179.4	21.53
35	~~379.2~~	~~353.8~~	~~326.1~~	~~312.9~~	~~299.6~~	~~286.4~~	~~227.3~~	~~206.5~~	~~195.2~~	~~184.5~~	~~174.3~~	22.81
36	368.6	343.9	316.9	304.1	291.2	278.4	220.9	200.7	189.8	179.3	169.4	24.13
37	~~358.6~~	~~334.6~~	~~308.4~~	~~295.9~~	~~283.4~~	~~270.9~~	~~215.0~~	~~195.3~~	~~184.6~~	~~174.5~~	~~164.8~~	25.49
38	349.2	325.8	300.3	288.1	276.0	263.8	209.3	190.1	179.8	169.9	160.5	26.89
39	~~340.3~~	~~317.5~~	~~292.6~~	~~280.8~~	~~268.9~~	~~257.0~~	~~203.9~~	~~185.3~~	~~175.2~~	~~165.5~~	~~156.4~~	28.32
40	331.7	309.5	285.3	273.7	262.1	250.6	198.8	180.6	170.8	161.4	152.5	29.79
42	315.9	294.8	271.7	260.7	249.6	238.7	189.4	172.0	162.7	153.7	145.2	32.85
44	301.7	281.5	259.4	248.9	238.4	227.9	180.8	154.3	155.3	146.8	138.7	36.05
46	288.5	269.2	248.1	238.1	228.0	217.9	172.9	157.1	148.5	140.4	132.6	39.40
48	276.5	257.9	237.7	228.1	218.5	208.8	165.7	150.5	142.3	134.5	127.1	42.90
50	265.4	247.6	228.2	219.0	209.7	200.5	159.1	144.5	136.6	129.1	122.0	46.55
52	255.2	238.1	219.5	210.6	201.7	192.8	153.0	139.0	131.4	124.2	117.3	50.35
54	245.7	229.2	211.3	202.7	194.2	185.6	147.3	133.8	126.5	119.5	112.9	54.30
56	237.0	221.1	203.8	195.5	187.3	179.0	142.0	129.0	122.0	115.3	108.9	58.40
58	228.8	213.5	196.7	188.8	180.8	172.8	137.1	124.6	117.8	111.3	105.2	62.64
60	221.2	206.3	190.2	182.5	174.8	167.1	132.6	120.4	113.9	107.6	101.7	67.04
62	214.0	199.6	184.0	176.6	169.1	161.6	128.3	116.5	110.2	104.1	98.4	71.58
64	207.3	193.4	178.3	171.1	163.8	156.6	124.3	112.9	106.7	100.9	95.3	76.27
66	201.0	187.6	172.9	165.9	158.9	151.9	120.5	109.5	103.5	97.8	92.4	81.11
68	195.2	182.1	167.8	161.0	154.2	147.4	117.0	106.3	100.5	95.0	89.7	86.10

164.3

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 36″ DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Nominal Depth and Flange Width—Weight per Foot

Notation	CB 362N 36″ x 16½″						CB 361N 36″ x 12″				
	300 Lbs.	280 Lbs.	260 Lbs.	250 Lbs.	240 Lbs.	230 Lbs.	192 Lbs.	176 Lbs.	167 Lbs.	158 Lbs.	150 Lbs.
ELEMENTS											
I_{1-1}	20303.4	18828.3	17230.8	16478.7	15729.0	14985.6	12096.6	10912.6	10281.5	9683.8	9118.7
S_{1-1}	**1105.8**	**1031.7**	**950.9**	**912.4**	**873.8**	**835.3**	**662.8**	**602.1**	**569.3**	**538.0**	**508.3**
I_{2-2}	1296.7	1198.3	1090.5	1040.1	989.9	940.2	377.1	336.1	314.6	294.6	275.4
S_{2-2}	155.7	144.4	131.8	125.9	120.0	114.2	62.3	55.7	52.3	49.1	46.0
DIMENSIONS AND GAGES IN INCHES											
d	36¾	36½	36¼	36⅛	36	35⅞	36½	36¼	36⅛	36	35⅞
b	16⅝	16⅝	16½	16½	16½	16½	12⅛	12⅛	12	12	12
t	15/16	⅞	⅞	13/16	13/16	¾	¾	11/16	11/16	⅝	⅝
p	1 11/16	1 9/16	1 7/16	1⅜	1 5/16	1¼	1¼	1⅛	1 1/16	1	15/16
a	7⅞	7⅞	7⅞	7⅞	7⅞	7⅞	5⅝	5⅝	5⅝	5⅝	5⅝
c	33⅜	33⅜	33⅜	33⅜	33⅜	33⅜	34	34	34	34	34
f	31⅜	31⅜	31⅜	31⅜	31⅜	31⅜	32⅜	32⅜	32⅜	32⅜	32⅜
f_1	6 13/16	6 13/16	6 13/16	6 13/16	6 13/16	6 13/16	4⅞	4⅞	4⅞	4⅞	4⅞
o	2 11/16	2 9/16	2 7/16	2⅜	2 5/16	2¼	2 1/16	1 15/16	1⅞	1 13/16	1¾
k	1½	1 7/16	1 7/16	1 7/16	1 7/16	1⅜	1 3/16	1 3/16	1 3/16	1⅛	1⅛
g usual	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½
g_2	3½	3½	3¼	3¼	3¼	3	3	3	3	3	3

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

	300	280	260	250	240	230	192	176	167	158	150
M max	1659	1548	1426	1369	1311	1253	994	903	854	807	762
V max	417	388	367	354	341	329	326	304	286	262	243
L min	15.90	15.95	15.56	15.46	15.36	15.26	12.20	11.90	11.93	12.33	12.58
fb	11990	11496	11139	10899	10637	10362	9988	9479	9116	8690	8345
fbt	11355	10185	9390	8904	8403	7906	7431	6616	6089	5518	5082
B min	27.57	28.98	29.98	30.74	31.61	32.58	34.73	36.83	37.99	38.44	38.75
R max	144	129	118	112	105	99	94	83	76	69	63
RA	162	162	162	162	162	162	162	162	162	162	160
LRA	40.96	38.21	35.22	33.79	32.36	30.94	24.55	22.30	21.09	19.93	19.06
Wt.CA	61	61	61	61	61	61	61	61	61	61	61
RH	260	260	260	260	260	260	260	260	260	260	256
LRH	25.52	23.81	21.94	21.06	20.16	19.28	15.30	13.89	13.14	12.42	11.91
Wt.CH	94	94	94	94	94	94	94	94	94	94	94
Q	13270	12380	11411	10949	10486	10024	7954	7225	6832	6456	6100

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM 33" LOADS

CB SECTIONS

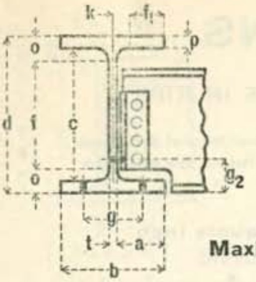
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection. For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot: CB 332N 33" x 15¾"					CB 331N 33" x 11½"				Coefficient of Deflection
	260 Lbs.	240 Lbs.	220 Lbs.	210 Lbs.	200 Lbs.	152 Lbs.	141 Lbs.	132 Lbs.	125 Lbs.	
									421.5	
11						511.3	471.6	437.8	419.6	2.25
12						486.2	446.4	413.4	384.7	2.68
13						448.8	412.1	381.6	355.1	3.15
14	723.3	672.1	620.9	597.7	570.2	416.7	382.6	354.3	329.7	3.65
15	705.5	648.5	591.7	562.9	535.2	389.0	357.1	330.7	307.8	4.19
16	661.4	608.0	554.7	527.7	501.8	364.7	334.8	310.1	288.5	4.77
17	622.5	572.2	522.1	496.7	472.3	343.2	315.1	291.8	271.6	5.38
18	588.0	540.4	493.1	469.1	446.0	324.2	297.6	275.6	256.5	6.03
19	557.0	512.0	467.1	444.4	422.5	307.1	282.0	261.1	243.0	6.72
20	529.1	486.4	443.8	422.2	401.4	291.7	267.8	248.0	230.8	7.45
21	503.9	463.2	422.6	402.0	382.3	277.8	255.1	236.2	219.8	8.21
22	481.1	442.2	403.5	383.8	364.9	265.2	243.5	225.5	209.9	9.01
23	460.1	422.9	385.9	367.1	349.0	253.7	232.9	215.7	200.7	9.85
24	441.0	405.3	369.8	351.8	334.5	243.1	223.2	206.7	192.4	10.73
25	423.3	389.1	355.0	337.7	321.1	233.4	214.3	198.4	184.7	11.64
26	407.0	374.1	341.3	324.7	308.7	224.4	206.0	190.8	177.5	12.59
27	391.9	360.2	328.7	312.7	297.3	216.1	198.4	183.7	171.0	13.57
28	378.0	347.4	317.0	301.6	286.7	208.4	191.3	177.2	164.9	14.60
29	364.9	335.4	306.1	291.2	276.8	201.2	184.7	171.1	159.2	15.66
30	352.8	324.2	295.8	281.4	267.6	194.5	178.6	165.4	153.9	16.76
31	341.4	313.8	286.3	272.4	259.0	188.2	172.8	160.0	148.9	17.89
32	330.7	304.0	277.4	263.9	250.9	182.3	167.4	155.0	144.3	19.07
33	320.7	294.7	268.9	255.8	243.3	176.8	162.3	150.3	139.9	20.28
34	311.2	286.1	261.0	248.3	236.1	171.6	157.5	145.9	135.8	21.53
35	302.4	278.0	253.6	241.3	229.4	166.7	153.1	141.8	131.9	22.81
36	293.9	270.2	246.5	234.5	223.0	162.1	148.8	137.8	128.2	24.13
37	286.0	262.9	239.9	228.2	217.0	157.7	144.8	134.1	124.8	25.49
38	278.5	256.0	233.6	222.2	211.3	153.5	141.0	130.6	121.5	26.89
39	271.4	249.4	227.6	216.5	205.9	149.6	137.4	127.2	118.4	28.32
40	264.6	243.2	221.9	211.1	200.7	145.9	133.9	124.0	115.4	29.79
42	252.0	231.6	211.3	201.0	191.1	138.9	127.5	118.1	109.9	32.85
44	240.5	221.1	201.7	191.9	182.4	132.6	121.7	112.7	104.9	36.05
46	230.1	211.5	193.0	183.6	174.5	126.9	116.5	107.9	100.4	39.40
48	220.5	202.7	184.9	175.9	167.3	121.6	111.6	103.4	96.2	42.90
50	211.7	194.5	177.5	168.9	160.6	116.7	107.1	99.2	92.3	46.55
52	203.5	187.1	170.7	162.4	154.4	112.2	103.0	95.4	88.8	50.35
54	196.0	180.1	164.3	156.3	148.7	108.0	99.2	91.9	85.5	54.30
56	189.0	173.7	158.5	150.8	143.4	104.2	95.7	88.6	82.4	58.40
58	182.5	167.7	153.0	145.6	138.4	100.6	92.4	85.5	79.6	62.64
60	176.4	162.1	147.9	140.7	133.8	97.2	89.3	82.7	76.9	67.04
62	170.7	156.9	143.1	136.2	129.5	94.1	86.4	80.0	74.4	71.58
64	165.4	152.0	138.7	131.9	125.4	91.2	83.7	77.5	72.1	76.27

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 33" DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot								
	CB 332N 33" x 15 3/4"					CB 331N 33" x 11 1/2"			
	260 Lbs.	240 Lbs.	220 Lbs.	210 Lbs.	200 Lbs.	152 Lbs.	141 Lbs.	132 Lbs.	125 Lbs.
ELEMENTS									
I_{1-1}	14881.7	13578.0	12295.7	11651.2	11037.9	8143.0	7434.5	6852.1	6347.0
S_{1-1}	881.9	810.6	739.6	703.6	669.0	486.2	446.4	413.4	384.7
I_{2-2}	1028.1	933.6	840.8	794.0	749.9	272.8	246.2	224.3	204.6
S_{2-2}	129.1	117.7	106.4	100.6	95.2	47.2	42.7	39.0	35.6
DIMENSIONS AND GAGES IN INCHES									
d	33 3/4	33 1/2	33 1/4	33 1/8	33	33 1/2	33 1/4	33 1/8	33
b	15 7/8	15 7/8	15 3/4	15 3/4	15 3/4	11 5/8	11 1/2	11 1/2	11 1/2
t	15/16	7/8	13/16	3/4	3/4	5/8	5/8	5/8	9/16
p	1 1/2	1 3/8	1 1/4	1 3/16	1 1/8	1 1/16	15/16	7/8	13/16
a	7 1/2	7 1/2	7 1/2	7 1/2	7 1/2	5 1/2	5 1/2	5 1/2	5 1/2
c	30 3/4	30 3/4	30 3/4	30 3/4	30 3/4	31 3/8	31 3/8	31 3/8	31 3/8
f	29	29	29	29	29	30	30	30	30
f_1	6 5/8	6 5/8	6 5/8	6 5/8	6 5/8	4 3/4	4 3/4	4 3/4	4 3/4
o	2 3/8	2 1/4	2 1/8	2 1/16	2	1 3/4	1 5/8	1 9/16	1 1/2
k	1 5/16	1 5/16	1 1/4	1 1/4	1 1/4	1	1	1	1
g usual	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
g_2	3 1/2	3 1/4	3 1/4	3	3	3	2 3/4	2 3/4	2 3/4

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

	260 Lbs.	240 Lbs.	220 Lbs.	210 Lbs.	200 Lbs.	152 Lbs.	141 Lbs.	132 Lbs.	125 Lbs.
M max	1323	1216	1109	1055	1004	729	670	620	577
V max	362	336	310	299	285	256	236	219	211
L min	14.63	14.47	14.30	14.13	14.08	11.41	11.36	11.33	10.95
fb	12193	11725	11188	10932	10587	9352	8953	8632	8502
fbt	10888	9802	8704	8221	7623	5948	5417	5015	4846
B min	24.78	25.91	27.35	28.08	29.15	34.61	35.20	35.36	35.24
R max	130	116	103	97	90	71	64	59	57
RA	146	146	146	146	146	146	143	137	135
LRA	36.24	33.31	30.39	28.92	27.49	19.98	18.73	18.11	17.10
Wt.CA	54	54	54	54	54	54	54	54	54
RH	227	227	227	227	227	227	222	213	209
LRH	23.31	21.43	19.55	18.60	17.68	12.85	12.06	11.65	11.04
Wt.CH	75	75	75	75	75	75	75	75	75
Q	10583	9727	8875	8443	8028	5834	5357	4961	4616

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
R max = Max. End Reaction in Kips when $B = 3\frac{1}{4}$ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM 30″ LOADS

CB SECTIONS

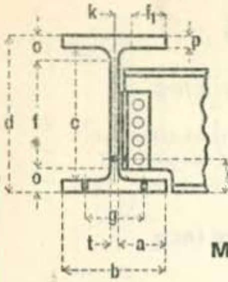
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, **see page 116**

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot: CB 302 N 30″ x 15″					CB 301 N 30″ x 10½″				Coefficient of Deflection
	240 Lbs.	220 Lbs.	200 Lbs.	190 Lbs.	180 Lbs.	131 Lbs.	122 Lbs.	115 Lbs.	108 Lbs.	
							419.3	394.3		
10						437.9	417.4	391.7	380.7	1.86
11						413.6	379.4	356.1	332.5	2.25
12						379.1	347.8	326.4	304.8	2.68
13	650.9	595.9	540.9	514.7	486.0	350.0	321.1	301.3	281.4	3.15
14	637.1	583.2	529.4	502.1	476.0	324.9	298.1	279.8	261.2	3.65
15	594.6	544.3	494.2	468.6	444.3	303.3	278.2	261.1	243.8	4.19
16	557.5	510.3	463.3	439.4	416.6	284.3	260.9	244.8	228.6	4.77
17	524.7	480.3	436.0	413.5	392.1	267.6	245.5	230.4	215.2	5.38
18	495.6	453.6	411.8	390.6	370.3	252.8	231.9	217.6	203.2	6.03
19	469.5	429.7	390.1	370.0	350.8	239.4	219.8	206.2	192.5	6.72
20	446.0	408.2	370.6	351.5	333.2	227.5	208.7	195.8	182.9	7.45
21	424.7	388.8	353.0	334.7	317.4	216.6	198.7	186.5	174.2	8.21
22	405.5	371.2	337.0	319.6	303.0	206.8	189.7	178.1	166.3	9.01
23	387.8	355.0	322.3	305.6	289.8	197.8	181.5	170.3	159.0	9.85
24	371.7	340.2	308.9	292.9	277.7	189.6	173.9	163.2	152.4	10.73
25	356.8	326.6	296.5	281.2	266.6	182.0	166.9	156.7	146.3	11.64
26	343.0	314.0	285.1	270.4	256.3	175.0	160.5	150.6	140.7	12.59
27	330.3	302.4	274.5	260.3	246.8	168.5	154.6	145.1	135.5	13.57
28	318.6	291.6	264.8	251.1	238.0	162.5	149.1	139.9	130.6	14.60
29	307.6	281.6	255.6	242.4	229.8	156.9	143.9	135.1	126.1	15.66
30	297.3	272.2	247.1	234.3	222.2	151.6	139.1	130.6	121.9	16.76
31	287.7	263.4	239.1	226.8	215.0	146.8	134.6	126.4	118.0	17.89
32	278.7	255.2	231.6	219.7	208.3	142.2	130.4	122.4	114.3	19.07
33	270.3	247.4	224.6	213.0	201.9	137.8	126.5	118.7	110.8	20.28
34	262.3	240.1	218.0	206.7	196.0	133.8	122.7	115.2	107.6	21.53
35	254.9	233.3	211.8	200.9	190.5	130.0	119.3	111.9	104.5	22.81
36	247.7	226.8	205.9	195.3	185.1	126.4	115.9	108.8	101.6	24.13
37	241.1	220.7	200.3	190.0	180.1	122.9	112.8	105.9	98.9	25.49
38	234.7	214.9	195.1	185.0	175.4	119.7	109.8	103.1	96.3	26.89
39	228.7	209.4	190.1	180.3	170.9	116.7	107.0	100.4	93.8	28.32
40	223.0	204.1	185.3	175.7	166.6	113.7	104.3	97.9	91.4	29.79
42	212.4	194.4	176.5	167.4	158.7	108.3	99.4	93.3	87.1	32.85
44	202.7	185.6	168.5	159.8	151.5	103.4	94.9	89.0	83.1	36.05
46	193.9	177.5	161.2	152.8	144.9	98.9	90.7	85.2	79.5	39.40
48	185.8	170.1	154.4	146.5	138.9	94.8	87.0	81.6	76.2	42.90
50	178.4	163.3	148.3	140.6	133.3	91.0	83.5	78.3	73.2	46.55
52	171.6	157.0	142.6	135.2	128.2	87.5	80.3	75.3	70.4	50.35
54	165.2	151.2	137.3	130.2	123.4	84.2	77.3	72.5	67.7	54.30
56	159.3	145.8	132.4	125.5	119.0	81.2	74.5	70.0	65.3	58.40
58	153.8	140.8	127.8	121.2	114.9	78.4	72.0	67.5	63.1	62.64
60	148.7	136.1	123.5			75.8				67.04

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 30" DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot								
	CB 302 N 30" x 15"					CB 301 N 30" x 10 1/2"			
	240 Lbs.	220 Lbs.	200 Lbs.	190 Lbs.	180 Lbs.	131 Lbs.	122 Lbs.	115 Lbs.	108 Lbs.
ELEMENTS									
I_{1-1}	11427.6	10375.4	9343.2	8821.8	8331.0	5745.6	5238.2	4896.6	4554.2
S_{1-1}	743.3	680.4	617.7	585.8	555.4	379.1	347.8	326.4	304.8
I_{2-2}	880.9	796.6	714.1	672.5	633.7	197.1	177.3	164.5	151.6
S_{2-2}	115.9	105.2	94.8	89.4	84.5	37.4	33.7	31.3	29.0
DIMENSIONS AND GAGES IN INCHES									
d	30 3/4	30 1/2	30 1/4	30 1/8	30	30 1/4	30 1/8	30	29 7/8
b	15 1/4	15 1/8	15 1/8	15	15	10 1/2	10 1/2	10 1/2	10 1/2
t	7/8	13/16	3/4	3/4	11/16	5/8	5/8	9/16	9/16
p	1 1/2	1 3/8	1 1/4	1 3/16	1 1/8	1	15/16	7/8	13/16
a	7 1/8	7 1/8	7 1/8	7 1/8	7 1/8	5	5	5	5
c	27 3/4	27 3/4	27 3/4	27 3/4	27 3/4	28 1/4	28 1/4	28 1/4	28 1/4
f	26	26	26	26	26	27	27	27	27
f_1	6 1/4	6 1/4	6 1/4	6 1/4	6 1/4	4 5/16	4 5/16	4 5/16	4 5/16
o	2 3/8	2 1/4	2 1/8	2 1/16	2	1 5/8	1 9/16	1 1/2	1 7/16
k	1 5/16	1 5/16	1 1/4	1 1/4	1 1/4	15/16	15/16	15/16	7/8
g usual	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
g_2	3 1/2	3 1/4	3 1/4	3 1/4	3	3	2 3/4	2 3/4	2 3/4

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.									
M max	1115	1021	927	879	833	569	522	490	457
V max	325	298	270	257	243	219	210	197	180
L min	13.70	13.70	13.71	13.66	13.71	10.39	9.95	9.93	10.14
fb	12810	12262	11616	11274	10854	9756	9479	9119	8706
fbt	11298	9981	8654	8027	7326	5873	5498	5061	4597
B min	21.12	22.22	23.69	24.53	25.67	29.71	30.60	31.46	31.76
R max	126	111	96	89	81	65	61	56	50
RA	130	130	130	130	130	126	122	117	111
LRA	34.31	31.40	28.51	27.04	25.63	18.05	17.10	16.74	16.48
Wt.CA	48	48	48	48	48	48	48	48	48
RH	195	195	195	195	195	190	183	175	166
LRH	22.87	20.94	19.01	18.02	17.09	11.97	11.40	11.19	11.02
Wt.CH	66	66	66	66	66	66	66	66	66
Q	8920	8165	7412	7030	6665	4549	4174	3917	3658

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
R max = Max. End Reaction in Kips when B = 3 1/2 inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM 27″ LOADS

CB SECTIONS

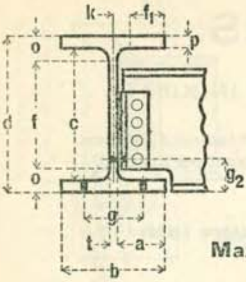
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot									Coefficient of Deflection
	CB 272N 27″ x 14″				CB 271N 27″ x 10″					
	175 Lbs.	166 Lbs.	156 Lbs.	145 Lbs.	112 Lbs.	104 Lbs.	97 Lbs.	91 Lbs.	85 Lbs.	
									264.9	
10					348.9	312.5		271.7	263.5	1.86
11					330.9	307.4	273.7	262.7	239.6	2.25
12					303.3	281.8	262.2	240.8	219.6	2.68
13	442.1	418.4	391.6	375.8	280.0	260.1	242.0	222.3	202.7	3.15
14	427.0	404.9	380.5	349.8	260.0	241.5	224.7	206.4	188.2	3.65
15	398.6	377.9	355.1	326.5	242.6	225.4	209.8	192.6	175.7	4.19
16	373.7	354.3	332.9	306.1	227.5	211.4	196.7	180.6	164.7	4.77
17	351.7	333.5	313.4	288.1	214.1	198.9	185.1	170.0	155.0	5.38
18	332.2	315.0	296.0	272.1	202.2	187.9	174.8	160.5	146.4	6.03
19	314.7	298.4	280.4	257.8	191.6	178.0	165.6	152.1	138.7	6.72
20	298.9	283.4	266.3	244.9	182.0	169.1	157.3	144.5	131.8	7.45
21	284.7	269.9	253.6	233.2	173.3	161.0	149.8	137.6	125.5	8.21
22	271.8	257.7	242.2	222.6	165.5	153.7	143.0	131.4	119.8	9.01
23	259.9	246.5	231.6	212.9	158.2	147.0	136.8	125.6	114.6	9.85
24	249.1	236.2	222.0	204.1	151.7	140.9	131.1	120.4	109.8	10.73
25	239.1	226.8	213.1	195.9	145.6	135.3	125.9	115.6	105.4	11.64
26	230.0	218.1	204.9	188.4	140.0	130.1	121.0	111.2	101.4	12.59
27	221.4	209.9	197.3	181.4	134.8	125.2	116.5	107.0	97.6	13.57
28	213.5	202.5	190.3	174.9	130.0	120.8	112.4	103.2	94.1	14.60
29	206.2	195.5	183.7	168.9	125.5	116.6	108.5	99.6	90.9	15.66
30	199.3	189.0	177.6	163.2	121.3	112.7	104.9	96.3	87.8	16.76
31	192.9	182.9	171.8	158.0	117.4	109.1	101.5	93.2	85.0	17.89
32	186.8	177.2	166.5	153.0	113.7	105.7	98.3	90.3	82.4	19.07
33	181.2	171.8	161.4	148.4	110.3	102.5	95.3	87.6	79.9	20.28
34	175.8	166.7	156.7	144.0	107.0	99.5	92.5	85.0	77.5	21.53
35	170.8	162.0	152.2	139.9	104.0	96.6	89.9	82.6	75.3	22.81
36	166.1	157.5	148.0	136.0	101.1	93.9	87.4	80.3	73.2	24.13
37	161.6	153.2	144.0	132.4	98.4	91.4	85.0	78.1	71.2	25.49
38	157.3	149.2	140.2	128.9	95.8	89.0	82.8	76.0	69.4	26.89
39	153.3	145.4	136.6	125.6	93.3	86.7	80.7	74.1	67.6	28.32
40	149.5	141.7	133.2	122.4	91.0	84.5	78.7	72.2	65.9	29.79
42	142.3	135.0	126.8	116.6	86.7	80.5	74.9	68.8	62.7	32.85
44	135.9	128.9	121.1	111.3	82.7	76.9	71.5	65.7	59.9	36.05
46	130.0	123.3	115.8	106.5	79.1	73.5	68.4	62.8	57.3	39.40
48	124.6	118.1	111.0	102.0	75.8	70.5	65.6	60.2	54.9	42.90
50	119.6	113.4	106.5	97.9	72.8	67.6	62.9	57.8	52.7	46.55
52	115.0	109.0	102.5	94.2	70.0	65.0	60.5	55.6	50.7	50.35

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM 27″ DATA

Notation	CB 272 N 27″ x 14″ 175 Lbs.	166 Lbs.	156 Lbs.	145 Lbs.	CB 271 N 27″ x 10″ 112 Lbs.	104 Lbs.	97 Lbs.	91 Lbs.	85 Lbs.
ELEMENTS									
I_{1-1}	6838.3	6454.5	6035.6	5508.7	4182.7	3867.1	3582.6	3269.7	2964.3
S_{1-1}	498.2	472.4	443.9	408.1	303.3	281.8	262.2	240.8	219.6
I_{2-2}	565.5	532.7	497.1	451.0	162.2	149.2	137.5	123.6	109.9
S_{2-2}	80.3	75.8	70.9	64.4	32.2	29.7	27.5	24.7	22.0
DIMENSIONS AND GAGES IN INCHES									
d	27 1/2	27 3/8	27 1/4	27	27 5/8	27 1/2	27 3/8	27 1/8	27
b	14 1/8	14	14	14	10 1/8	10	10	10	10
t	11/16	5/8	5/8	5/8	9/16	1/2	1/2	1/2	7/16
p	1 3/16	1 1/8	1 1/16	1	15/16	7/8	13/16	3/4	11/16
a	6 3/4	6 3/4	6 3/4	6 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4
c	25	25	25	25	25 5/8	25 5/8	25 5/8	25 5/8	25 5/8
f	23 1/4	23 1/4	23 1/4	23 1/4	24 3/8	24 3/8	24 3/8	24 3/8	24 3/8
f_1	5 3/4	5 3/4	5 3/4	5 3/4	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8
o	2 1/16	2	1 15/16	1 7/8	1 9/16	1 1/2	1 7/16	1 3/8	1 5/16
k	1 1/4	1 3/16	1 3/16	1 3/16	7/8	7/8	7/8	7/8	7/8
g usual	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
g_2	3	3	3	2 3/4	2 3/4	2 3/4	2 3/4	2 1/2	2 1/2
f, f_1, o and k—Provide usual working clearances.									
MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.									
M max	747	709	666	612	455	423	393	361	329
V max	221	209	196	188	174	156	139	136	132
L min	13.52	13.55	13.60	13.03	10.43	10.82	11.29	10.63	9.95
fb	11553	11169	10685	10451	9409	8798	8271	8227	8182
fbt	7752	7126	6411	6062	4959	4311	3805	3743	3682
B min	21.65	22.53	23.74	24.25	28.28	29.38	29.80	29.51	29.22
R max	80	74	66	62	52	45	39	39	38
RA	114	114	110	107	97	90	85	84	83
LRA	26.22	24.86	24.21	22.88	18.76	18.79	18.51	17.20	15.87
Wt.CA	42	42	42	42	42	42	42	42	42
RH	179	179	173	168	152	141	133	131	130
LRH	16.70	15.83	15.40	14.58	11.97	11.99	11.83	11.03	10.14
Wt.CH	58	58	58	58	58	58	58	58	58
Q	5978	5669	5327	4897	3640	3382	3146	2890	2635

Nominal Depth and Flange Width—Weight per Foot

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3 1/2 inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM 24" LOADS

CB SECTIONS

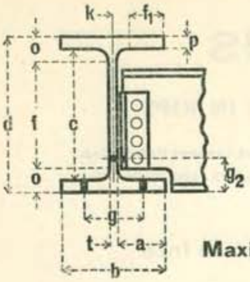
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection. For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot									Coefficient of Deflection
	CB 244 N 24" x 14"				CB 243 N 24" x 12"			CB 242 N 24" x 10"		
	160 Lbs.	150 Lbs.	140 Lbs.	130 Lbs.	120 Lbs.	110 Lbs.	100 Lbs.	93 Lbs.	85 Lbs.	
								280.1	259.2	
10					326.1			269.6	244.4	1.86
11				331.8	325.9	287.5	270.7	245.1	222.2	2.25
12	394.4	373.2	352.0	329.8	298.7	274.0	248.4	224.7	203.7	2.68
13	380.4	355.3	329.8	304.4	275.7	252.9	229.3	207.4	188.0	3.15
14	353.2	329.9	306.2	282.7	256.0	234.9	212.9	192.6	174.6	3.65
15	329.7	307.9	285.8	263.8	239.0	219.2	198.7	179.8	163.0	4.19
16	309.1	288.7	268.0	247.4	224.0	205.5	186.3	168.5	152.8	4.77
17	290.9	271.7	252.2	232.8	210.9	193.4	175.4	158.6	143.8	5.38
18	274.8	256.6	238.2	219.9	199.1	182.7	165.6	149.8	135.8	6.03
19	260.3	243.1	225.7	208.3	188.7	173.1	156.9	141.9	128.7	6.72
20	247.3	230.9	214.4	197.9	179.2	164.4	149.0	134.8	122.2	7.45
21	235.5	219.9	204.2	188.5	170.7	156.6	141.9	128.4	116.4	8.21
22	224.8	210.0	194.9	179.9	162.9	149.5	135.5	122.6	111.1	9.01
23	215.0	200.8	186.4	172.1	155.8	143.0	129.6	117.2	106.3	9.85
24	206.1	192.5	178.7	164.9	149.4	137.0	124.2	112.4	101.9	10.73
25	197.8	184.8	171.5	158.3	143.4	131.5	119.2	107.9	97.8	11.64
26	190.2	177.7	164.9	152.2	137.9	126.5	114.7	103.7	94.0	12.59
27	183.1	171.1	158.8	146.6	132.7	121.8	110.4	99.9	90.5	13.57
28	176.6	165.0	153.1	141.4	128.0	117.4	106.5	96.3	87.3	14.60
29	170.5	159.3	147.9	136.5	123.6	113.4	102.8	93.0	84.3	15.66
30	164.8	154.0	142.9	131.9	119.5	109.6	99.4	89.9	81.5	16.76
31	159.5	149.0	138.3	127.7	115.6	106.1	96.2	87.0	78.9	17.89
32	154.5	144.3	134.0	123.7	112.0	102.8	93.2	84.3	76.4	19.07
33	149.8	140.0	129.9	119.9	108.6	99.6	90.3	81.7	74.1	20.28
34	145.4	135.8	126.1	116.4	105.4	96.7	87.7	79.3	71.9	21.53
35	141.3	132.0	122.5	113.1	102.4	94.0	85.2	77.1	69.9	22.81
36	137.4	128.3	119.1	109.9	99.6	91.3	82.8	74.9	67.9	24.13
37	133.6	124.8	115.9	107.0	96.9	88.9	80.6	72.9	66.1	25.49
38	130.1	121.6	112.8	104.2	94.3	86.5	78.4	71.0	64.3	26.89
39	126.8	118.4	109.9	101.5	91.9	84.3	76.4	69.1	62.7	28.32
40	123.6	115.5	107.2	98.9	89.6	82.2	74.5	67.4	61.1	29.79
42	117.7	110.0	102.1	94.2	85.3	78.3	71.0	64.2	58.2	32.85
44	112.4	105.0	97.5	90.0	81.5	74.8	67.8	61.3	55.6	36.05
46	107.5	100.4	93.2	86.0	77.9	71.5	64.8	58.6	53.2	39.40
48	103.0	96.2	89.3	82.5	74.7	68.5	62.1	56.2	50.9	42.90

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 24″ DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot								
	CB 244 N 24″ x 14″				CB 243 N 24″ x 12″			CB 242 N 24″ x 10″	
	160 Lbs.	150 Lbs.	140 Lbs.	130 Lbs.	120 Lbs.	110 Lbs.	100 Lbs.	93 Lbs.	85 Lbs.
ELEMENTS									
I_{1-1}	5092.2	4727.5	4360.0	3999.3	3630.6	3310.2	2981.4	2725.4	2454.6
S_{1-1}	412.1	384.9	357.3	329.8	298.7	274.0	248.4	224.7	203.7
I_{2-2}	525.2	486.4	447.1	408.4	271.9	246.9	221.2	136.5	121.9
S_{2-2}	74.5	69.2	63.7	58.3	45.0	41.0	36.9	27.2	24.4
DIMENSIONS AND GAGES IN INCHES									
d	24¾	24½	24⅜	24¼	24¼	24⅛	24	24¼	24⅛
b	14⅛	14⅛	14	14	12⅛	12	12	10	10
t	11/16	⅝	⅝	9/16	9/16	½	½	½	7/16
p	1⅛	1 1/16	1	⅞	15/16	⅞	¾	13/16	¾
a	6¾	6¾	6¾	6¾	5¾	5¾	5¾	4¾	4¾
c	22½	22½	22½	22½	22½	22½	22½	22⅝	22⅝
f	20⅞	20⅞	20⅞	20⅞	20⅞	20⅞	20⅞	21½	21½
f_1	5⅞	5⅞	5⅞	5⅞	4 15/16	4 15/16	4 15/16	4 3/16	4 3/16
o	1 15/16	1⅞	1 13/16	1 11/16	1¾	1 11/16	1 9/16	1⅜	1 5/16
k	1 3/16	1⅛	1⅛	1⅛	1⅛	1 1/16	1 1/16	13/16	13/16
g usual	5½	5½	5½	5½	5½	5½	5½	5½	5½
g_2	3	3	2¾	2¾	2¾	2¾	2½	2¾	2½

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.									
M max	618	577	536	495	448	411	373	337	306
V max	197	187	176	166	163	149	135	140	130
L min	12.54	12.38	12.18	11.93	10.99	11.05	11.01	9.63	9.43
fb	12325	11986	11616	11226	11040	10348	9630	9740	9202
fbt	8196	7587	6981	6399	6171	5309	4526	4685	4141
B min	17.88	18.45	19.11	19.86	20.35	21.97	23.91	23.82	25.27
R max	79	73	67	61	59	51	43	45	39
RA	97	97	95	90	88	81	74	76	71
LRA	25.49	23.81	22.57	21.99	20.37	20.30	20.14	17.74	17.21
Wt.CA	36	36	36	36	36	36	36	36	36
RH	162	162	158	150	147	135	123	126	118
LRH	15.26	14.26	13.57	13.19	12.19	12.18	12.12	10.70	10.36
Wt.CH	50	50	50	50	50	50	50	50	50
Q	4945	4619	4288	3958	3584	3288	2981	2696	2444

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA,LRH = Min. Span in Feet to develop RA or RH.
Wt.CA,CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
24″
21″
LOADS

CB SECTIONS

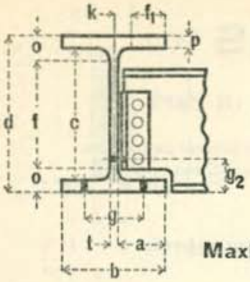
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot										Coefficient of Deflection
	CB 241 N 24″ x 9″			CB 213 N 21″ x 13″			CB 212 N 21″ x 9″				
	81 Lbs.	74 Lbs.	70 Lbs.	116 Lbs.	108 Lbs.	101 Lbs.	96 Lbs.	89 Lbs.	83 Lbs.	77 Lbs.	
	262.2		217.1								
9	253.5	221.9	215.5				263.8	247.2	229.1	211.7	1.51
10	228.1	208.8	193.9				246.6	228.8	213.5	198.0	1.86
11	207.4	189.8	176.3				224.2	208.0	194.1	180.0	2.25
12	190.1	174.0	161.6	258.7	240.0	227.0	205.5	190.7	177.9	165.0	2.68
13	175.5	160.6	149.2	244.8	227.8	212.0	189.7	176.0	164.2	152.3	3.15
14	162.9	149.1	138.5	227.3	211.5	196.9	176.1	163.5	152.5	141.4	3.65
15	152.1	139.2	129.3	212.2	197.4	183.8	164.4	152.6	142.3	132.0	4.19
16	142.6	130.5	121.2	198.9	185.1	172.3	154.2	143.0	133.4	123.8	4.77
17	134.2	122.8	114.1	187.2	174.2	162.2	145.1	134.6	125.6	116.5	5.38
18	126.7	116.0	107.7	176.8	164.5	153.1	137.0	127.1	118.6	110.0	6.03
19	120.1	109.9	102.1	167.5	155.9	145.1	129.8	120.5	112.4	104.2	6.72
20	114.1	104.4	97.0	159.1	148.1	137.8	123.3	114.4	106.7	99.0	7.45
21	108.6	99.4	92.3	151.5	141.0	131.3	117.4	109.0	101.7	94.3	8.21
22	103.7	94.9	88.2	144.7	134.6	125.3	112.1	104.0	97.0	90.0	9.01
23	99.2	90.8	84.3	138.4	128.8	119.8	107.2	99.5	92.8	86.1	9.85
24	95.1	87.0	80.8	132.6	123.4	114.9	102.8	95.4	89.0	82.5	10.73
25	91.3	83.5	77.6	127.3	118.5	110.3	98.6	91.5	85.4	79.2	11.64
26	87.8	80.3	74.6	122.4	113.9	106.0	94.9	88.0	82.1	76.2	12.59
27	84.5	77.3	71.8	117.9	109.7	102.1	91.3	84.8	79.1	73.3	13.57
28	81.5	74.6	69.3	113.7	105.8	98.5	88.1	81.7	76.3	70.7	14.60
29	78.7	72.0	66.9	109.7	102.1	95.1	85.0	78.9	73.6	68.3	15.66
30	76.0	69.6	64.6	106.1	98.7	91.9	82.2	76.3	71.2	66.0	16.76
31	73.6	67.4	62.6	102.7	95.5	88.9	79.6	73.8	68.9	63.9	17.89
32	71.3	65.3	60.6	99.5	92.6	86.1	77.1	71.5	66.7	61.9	19.07
33	69.1	63.3	58.8	96.4	89.7	83.5	74.7	69.3	64.7	60.0	20.28
34	67.1	61.4	57.0	93.6	87.1	81.1	72.5	67.3	62.8	58.2	21.53
35	65.2	59.7	55.4	90.9	84.6	78.8	70.5	65.4	61.0	56.6	22.81
36	63.4	58.0	53.9	88.4	82.3	76.6	68.5	63.6	59.3	55.0	24.13
37	61.7	56.4	52.4	86.0	80.0	74.5	66.6	61.8	57.7	53.5	25.49
38	60.0	55.0	51.0	83.8	77.9	72.5	64.9	60.2	56.2	52.1	26.89
39	58.5	53.5	49.7	81.6	75.9	70.7	63.2	58.7	54.7	50.8	28.32
40	57.0	52.2	48.5	79.6	74.0	68.9	61.7	57.2	53.4	49.5	29.79
42	54.3	49.7	46.2	75.8			58.7	54.5			32.85
44	51.9	47.5	44.1								36.05
46	49.6	45.4	42.2								39.40
48	47.5	43.5	40.4								42.90

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

ESSENTIAL DATA

Maximum Shear, 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM 24″ 21″ DATA

Notation	Nominal Depth and Flange Width—Weight per Foot									
	CB 241 N 24″ x 9″			CB 213 N 21″ x 13″			CB 212 N 21″ x 9″			
	81 Lbs.	74 Lbs.	70 Lbs.	116 Lbs.	108 Lbs.	101 Lbs.	96 Lbs.	89 Lbs.	83 Lbs.	77 Lbs.
ELEMENTS										
I_{1-1}	2292.6	2088.3	1929.1	2819.7	2608.0	2413.8	2196.5	2024.9	1879.0	1732.0
S_{1-1}	**190.1**	**174.0**	**161.6**	**265.2**	**246.8**	**229.7**	**205.5**	**190.7**	**177.9**	**165.0**
I_{2-2}	91.3	82.8	75.4	339.7	313.9	289.8	122.4	112.4	103.9	95.3
S_{2-2}	20.2	18.4	16.8	52.0	48.2	44.6	26.9	24.8	23.0	21.2
DIMENSIONS AND GAGES IN INCHES										
d	24⅛	24	23⅞	21¼	21⅛	21	21⅜	21¼	21⅛	21
b	9	9	9	13	13	13	9⅛	9⅛	9	9
t	7/16	7/16	7/16	½	½	7/16	9/16	½	7/16	7/16
p	¾	11/16	⅝	15/16	⅞	13/16	1	⅞	⅞	13/16
a	4¼	4¼	4¼	6¼	6¼	6¼	4¼	4¼	4¼	4¼
c	22⅝	22⅝	22⅝	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜	19⅜
f	21½	21½	21½	17⅞	17⅞	17⅞	17⅞	17⅞	17⅞	17⅞
f_1	3 11/16	3 11/16	3 11/16	5½	5½	5½	3½	3½	3½	3½
o	1 5/16	1¼	1 3/16	1 11/16	1⅝	1 9/16	1¾	1⅝	1⅝	1 9/16
k	13/16	13/16	13/16	1	1	1	1	1	1	1
g usual	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½
g_2	2½	2½	2½	2¾	2¾	2¾	2¾	2¾	2¾	2¾

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.										
M max	285	261	242	398	370	345	308	286	267	248
V max	131	111	109	129	120	113	134	124	115	106
L min	8.70	9.41	8.93	12.30	12.34	12.14	9.17	9.26	9.32	9.35
fb	9254	8446	8404	11346	10806	10423	11577	10981	10417	9818
fbt	4192	3480	3429	5752	5111	4690	6066	5326	4709	4124
B min	25.25	25.89	25.68	17.18	18.19	18.94	16.81	17.90	19.05	20.41
R max	40	33	32	51	45	41	54	47	41	36
RA	71	65	64	67	62	59	69	64	59	55
LRA	16.06	16.06	15.15	23.75	23.88	23.36	17.87	17.88	18.09	18.00
Wt.CA	36	36	36	30	30	30	30	30	30	30
RH	119	108	107	106	99	94	110	102	95	88
LRH	9.58	9.67	9.06	15.01	14.96	14.66	11.21	11.22	11.24	11.25
Wt.CH	50	50	50	41	41	41	41	41	41	41
Q	2281	2088	1939	3182	2962	2756	2466	2288	2135	1980

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
21″
20″
LOADS

CB SECTIONS

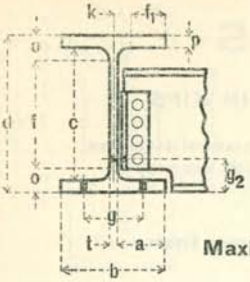
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot: CB 211 N 21″ x 8¼″				CB 203 N 20″ x 12″				Coefficient of Deflection
	73 Lbs.	67 Lbs.	62 Lbs.	58 Lbs.	146 Lbs.	135 Lbs.	125 Lbs.	115 Lbs.	
	218.6	199.1	176.2						
9	206.3	189.3	174.7	161.3					1.51
10	185.6	170.4	157.2	146.2	347.3	324.0	302.4	281.1	1.86
11	168.8	154.9	142.9	132.9	332.8	306.2	282.3	258.5	2.25
12	154.7	142.0	131.0	121.8	305.1	280.7	258.8	237.0	2.68
13	142.8	131.1	120.9	112.4	281.6	259.1	238.9	218.8	3.15
14	132.6	121.7	112.3	104.4	261.5	240.6	221.8	203.1	3.65
15	123.8	113.6	104.8	97.4	244.1	224.6	207.0	189.6	4.19
16	116.0	106.5	98.3	91.4	228.8	210.5	194.1	177.8	4.77
17	109.2	100.2	92.5	86.0	215.4	198.2	182.7	167.3	5.38
18	103.1	94.7	87.3	81.2	203.4	187.1	172.5	158.0	6.03
19	97.7	89.7	82.7	76.9	192.7	177.3	163.5	149.7	6.72
20	92.8	85.2	78.6	73.1	183.1	168.4	155.3	142.2	7.45
21	88.4	81.1	74.9	69.6	174.3	160.4	147.9	135.4	8.21
22	84.4	77.5	71.5	66.4	166.4	153.1	141.2	129.3	9.01
23	80.7	74.1	68.3	63.5	159.2	146.4	135.0	123.6	9.85
24	77.4	71.0	65.5	60.9	152.6	140.4	129.4	118.5	10.73
25	74.3	68.2	62.9	58.5	146.5	134.7	124.2	113.8	11.64
26	71.4	65.6	60.5	56.2	140.8	129.6	119.5	109.4	12.59
27	68.8	63.1	58.2	54.1	135.6	124.7	115.0	105.3	13.57
28	66.3	60.9	56.2	52.2	130.8	120.3	110.9	101.6	14.60
29	64.0	58.8	54.2	50.4	126.3	116.2	107.1	98.1	15.66
30	61.9	56.8	52.4	48.7	122.0	112.3	103.5	94.8	16.76
31	59.9	55.0	50.7	47.2	118.1	108.7	100.2	91.7	17.89
32	58.0	53.3	49.1	45.7	114.4	105.3	97.1	88.9	19.07
33	56.3	51.6	47.6	44.3	110.9	102.1	94.1	86.2	20.28
34	54.6	50.1	46.2	43.0	107.7	99.1	91.3	83.6	21.53
35	53.1	48.7	44.9	41.8	104.6	96.3	88.7	81.3	22.81
36	51.6	47.3	43.7	40.6	101.7	93.6	86.3	79.0	24.13
37	50.2	46.1	42.5	39.5	98.9	91.0	83.9	76.9	25.49
38	48.9	44.8	41.4	38.5	96.4	88.7	81.7	74.8	26.89
39	47.6	43.7	40.3	37.5	93.9	86.4			28.32
40	46.4	42.6	39.3	36.5					29.79
42	44.2								32.85

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 21" 20" DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	CB 211 N 21" x 8 1/4"				CB 203 N 20" x 12"			
	73 Lbs.	67 Lbs.	62 Lbs.	58 Lbs.	146 Lbs.	135 Lbs.	125 Lbs.	115 Lbs.
ELEMENTS								
I_{1-1}	1650.1	1506.2	1382.0	1279.1	3108.8	2832.3	2587.7	2348.3
S_{1-1}	**154.7**	**142.0**	**131.0**	**121.8**	**305.1**	**280.7**	**258.8**	**237.0**
I_{2-2}	74.2	67.3	61.4	56.4	364.9	332.0	302.8	274.2
S_{2-2}	17.8	16.2	14.9	13.7	60.4	55.2	50.5	45.8
DIMENSIONS AND GAGES IN INCHES								
d	21 3/8	21 1/4	21 1/8	21	20 3/8	20 1/8	20	19 7/8
b	8 3/8	8 1/4	8 1/4	8 1/4	12 1/8	12	12	12
t	7/16	7/16	3/8	3/8	3/4	11/16	5/8	5/8
p	3/4	11/16	5/8	5/8	1 1/4	1 1/8	1 1/16	15/16
a	4	4	4	4	5 5/8	5 5/8	5 5/8	5 5/8
c	19 3/4	19 3/4	19 3/4	19 3/4	17 7/8	17 7/8	17 7/8	17 7/8
f	18 3/4	18 3/4	18 3/4	18 3/4	16 5/8	16 5/8	16 5/8	16 5/8
f_1	3 3/8	3 3/8	3 3/8	3 3/8	5 1/16	5 1/16	5 1/16	5 1/16
o	1 5/16	1 1/4	1 3/16	1 3/16	1 7/8	1 3/4	1 11/16	1 9/16
k	13/16	3/4	3/4	3/4	1	1	15/16	15/16
g usual	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
g_2	2 3/4	2 1/2	2 1/2	2 1/2	3	3	3	3

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.								
M max	232	213	197	183	458	421	388	356
V max	109	100	88	81	174	162	151	141
L min	8.49	8.56	8.92	9.06	10.54	10.40	10.27	10.12
fb	9825	9132	8565	8182	14122	13812	13473	13093
fbt	4195	3589	3143	2864	10027	9240	8488	7738
B min	20.73	22.43	22.76	22.92	12.22	12.49	12.81	13.21
R max	37	32	28	25	86	79	72	65
RA	56	52	48	46	81	81	81	78
LRA	16.58	16.38	16.38	15.89	22.60	20.79	19.17	18.23
Wt.CA	30	30	30	30	30	30	30	30
RH	90	83	77	74	130	130	130	124
LRH	10.31	10.27	10.21	9.88	14.08	12.96	11.94	11.47
Wt.CH	41	41	41	41	41	41	41	41
Q	1856	1704	1572	1462	3661	3368	3106	2844

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3 1/2 inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
20″
18″
LOADS

CB SECTIONS

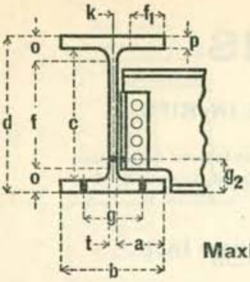
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot											Coefficient of Deflection
	CB 202N 20″ x 9″				CB 201N 20″ x 8″			CB 183N 18″ x 11¾″				
	98 Lbs.	88 Lbs.	80 Lbs.	74 Lbs.	65 Lbs.	60 Lbs.	55 Lbs.	99 Lbs.	92 Lbs.	86 Lbs.	80 Lbs.	
					202.2	190.7	175.2					
8	282.2	252.3	232.8	215.2	194.1	177.3	161.4					1.19
9	262.9	235.9	212.8	196.8	172.5	157.6	143.5					1.51
10	236.6	212.3	191.5	177.1	155.3	141.8	129.1	212.7	200.3	190.3	180.4	1.86
11	215.1	193.0	174.1	161.0	141.2	128.9	117.4	212.2	196.3	182.4	168.7	2.25
12	197.2	176.9	159.6	147.6	129.4	118.2	107.6	194.5	179.9	167.2	154.6	2.68
13	182.0	163.3	147.3	136.3	119.5	109.1	99.3	179.5	166.1	154.3	142.7	3.15
14	169.0	151.6	136.8	126.5	110.9	101.3	92.2	166.7	154.2	143.3	132.5	3.65
15	157.8	141.5	127.7	118.1	103.5	94.6	86.1	155.6	143.9	133.8	123.7	4.19
16	147.9	132.7	119.7	110.7	97.1	88.7	80.7	145.9	134.9	125.4	116.0	4.77
17	139.2	124.9	112.7	104.2	91.3	83.4	76.0	137.3	127.0	118.0	109.1	5.38
18	131.5	117.9	106.4	98.4	86.3	78.8	71.7	129.7	119.9	111.5	103.1	6.03
19	124.6	111.7	100.8	93.2	81.7	74.7	68.0	122.9	113.6	105.6	97.7	6.72
20	118.3	106.1	95.8	88.6	77.6	70.9	64.6	116.7	107.9	100.3	92.8	7.45
21	112.7	101.1	91.2	84.3	73.9	67.5	61.5	111.1	102.8	95.5	88.3	8.21
22	107.6	96.5	87.1	80.5	70.6	64.5	58.7	106.1	98.1	91.2	84.3	9.01
23	102.9	92.3	83.3	77.0	67.5	61.7	56.1	101.5	93.9	87.2	80.7	9.85
24	98.6	88.5	79.8	73.8	64.7	59.1	53.8	97.3	90.0	83.6	77.3	10.73
25	94.7	84.9	76.6	70.9	62.1	56.7	51.7	93.4	86.4	80.3	74.2	11.64
26	91.0	81.6	73.7	68.1	59.7	54.6	49.7	89.8	83.0	77.2	71.4	12.59
27	87.6	78.6	70.9	65.6	57.5	52.5	47.8	86.4	80.0	74.3	68.7	13.57
28	84.5	75.8	68.4	63.3	55.5	50.7	46.1	83.4	77.1	71.7	66.3	14.60
29	81.6	73.2	66.0	61.1	53.6	48.9	44.5	80.5	74.4	69.2	64.0	15.66
30	78.9	70.8	63.8	59.0	51.8	47.3	43.0	77.8	72.0	66.9	61.8	16.76
31	76.3	68.5	61.8	57.1	50.1	45.8	41.7	75.3	69.6	64.7	59.9	17.89
32	74.0	66.3	59.9	55.4	48.5	44.3	40.4	72.9	67.5	62.7	58.0	19.07
33	71.7	64.3	58.0	53.7	47.1	43.0	39.1	70.7	65.4	60.8	56.2	20.28
34	69.6	62.4	56.3	52.1	45.7	41.7	38.0	68.6	63.5	59.0	54.6	21.53
35	67.6	60.7	54.7	50.6	44.4	40.5	36.9	66.7	61.7	57.3	53.0	22.81
36	65.7	59.0	53.2	49.2	43.1	39.4	35.9					24.13
37	64.0	57.4	51.8	47.9	42.0	38.3	34.9					25.49
38	62.3	55.9	50.4	46.6	40.9	37.3	34.0					26.89
39	60.7	54.4			39.8	36.4						28.32

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 20" 18" DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot										
	CB 202N 20" x 9"				CB 201N 20" x 8"			CB 183N 18" x 11¾"			
	98 Lbs.	88 Lbs.	80 Lbs.	74 Lbs.	65 Lbs.	60 Lbs.	55 Lbs.	99 Lbs.	92 Lbs.	86 Lbs.	80 Lbs.
ELEMENTS											
I_{1-1}	2009.7	1784.4	1596.3	1466.7	1309.9	1189.1	1075.6	1777.1	1631.8	1506.6	1383.4
S_{1-1}	197.2	176.9	159.6	147.6	129.4	118.2	107.6	194.5	179.9	167.2	154.6
I_{2-2}	124.3	109.7	97.4	89.1	60.0	53.9	48.3	242.2	222.2	204.8	187.6
S_{2-2}	27.4	24.3	21.6	19.9	14.9	13.4	12.1	41.1	37.8	34.9	32.0
DIMENSIONS AND GAGES IN INCHES											
d	20⅜	20⅛	20	19⅞	20¼	20⅛	20	18¼	18⅛	18	17⅞
b	9⅛	9	9	9	8	8	8	11¾	11¾	11¾	11¾
t	9/16	9/16	½	7/16	7/16	7/16	⅜	½	½	7/16	7/16
p	1	⅞	13/16	¾	11/16	⅝	9/16	⅞	13/16	¾	11/16
a	4¼	4¼	4¼	4¼	3⅞	3⅞	3⅞	5⅝	5⅝	5⅝	5⅝
c	18⅜	18⅜	18⅜	18⅜	18⅞	18⅞	18⅞	16½	16½	16½	16½
f	17¼	17¼	17¼	17¼	17⅞	17⅞	17⅞	15¼	15¼	15¼	15¼
f_1	3⅝	3⅝	3⅝	3⅝	3¼	3¼	3¼	5	5	5	5
o	1 9/16	1 7/16	1⅜	1 5/16	1 3/16	1⅛	1 1/16	1½	1 7/16	1⅜	1 5/16
k	⅞	13/16	13/16	13/16	¾	11/16	11/16	⅞	⅞	⅞	⅞
g usual	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½
g_2	2¾	2¾	2¾	2½	2½	2½	2½	2¾	2¾	2¾	2¾

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.											
M max	296	265	239	221	194	177	161	292	270	251	232
V max	141	126	116	108	101	95	88	106	100	95	90
L min	8.39	8.41	8.23	8.23	7.68	7.44	7.37	10.97	10.78	10.55	10.28
fb	12714	12000	11488	10925	10057	9653	9119	12218	11856	11546	11212
fbt	7336	6252	5572	4927	4184	3813	3374	5926	5454	5080	4709
B min	14.14	15.14	15.89	16.87	19.10	19.98	20.97	13.38	13.82	14.22	14.68
R max	63	53	47	42	36	33	29	48	44	41	38
RA	76	68	64	59	55	52	49	51	48	46	44
LRA	15.57	15.61	14.96	15.01	14.12	13.64	13.18	22.88	22.49	21.81	21.08
Wt.CA	30	30	30	30	30	30	30	21	21	21	21
RH	121	109	102	95	87	83	78	102	97	92	88
LRH	9.78	9.74	9.39	9.32	8.92	8.54	8.28	11.44	11.13	10.90	10.54
Wt.CH	41	41	41	41	41	41	41	29	29	29	29
Q	2366	2123	1915	1771	1553	1418	1291	2334	2159	2006	1855

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
18″
16″
LOADS

CB SECTIONS

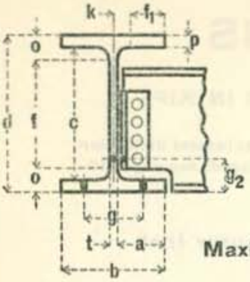
ALLOWABLE UNIFORM LOADS IN KIPS

**Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116**

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot										Coefficient of Deflection
	CB 182N 18″ x 8¾″			CB 181N 18″ x 7½″				CB 164N 16″ x 12″			
	77 Lbs.	70 Lbs.	64 Lbs.	57 Lbs.	52 Lbs.	49 Lbs.	47 Lbs.	90 Lbs.	83 Lbs.	76 Lbs.	
				165.6	152.6	138.6	133.1				
8	209.1	190.1	173.7	156.5	141.9	134.3	128.1				1.19
9	188.7	171.2	156.3	139.1	126.1	119.3	113.9				1.51
10	169.8	154.1	140.6	125.2	113.5	107.4	102.5	187.2	174.1	157.4	1.86
11	154.4	140.1	127.9	113.8	103.2	97.6	93.2	172.6	158.6	145.3	2.25
12	141.5	128.4	117.2	104.3	94.6	89.5	85.4	158.2	145.4	133.2	2.68
13	130.6	118.5	108.2	96.3	87.3	82.6	78.8	146.0	134.2	123.0	3.15
14	121.3	110.1	100.5	89.4	81.1	76.7	73.2	135.6	124.6	114.2	3.65
15	113.2	102.7	93.8	83.4	75.7	71.6	68.3	126.6	116.3	106.6	4.19
16	106.1	96.3	87.9	78.2	71.0	67.1	64.1	118.7	109.1	99.9	4.77
17	99.9	90.6	82.7	73.6	66.8	63.2	60.3	111.7	102.6	94.0	5.38
18	94.3	85.6	78.1	69.5	63.1	59.7	56.9	105.5	96.9	88.8	6.03
19	89.4	81.1	74.0	65.9	59.8	56.5	53.9	99.9	91.8	84.1	6.72
20	84.9	77.0	70.3	62.6	56.8	53.7	51.2	94.9	87.2	79.9	7.45
21	80.9	73.4	67.0	59.6	54.1	51.1	48.8	90.4	83.1	76.1	8.21
22	77.2	70.0	63.9	56.9	51.6	48.8	46.6	86.3	79.3	72.7	9.01
23	73.8	67.0	61.1	54.4	49.4	46.7	44.6	82.5	75.9	69.5	9.85
24	70.8	64.2	58.6	52.2	47.3	44.8	42.7	79.1	72.7	66.6	10.73
25	67.9	61.6	56.3	50.1	45.4	43.0	41.0	75.9	69.8	63.9	11.64
26	65.3	59.3	54.1	48.1	43.7	41.3	39.4	73.0	67.1	61.5	12.59
27	62.9	57.1	52.1	46.4	42.0	39.8	38.0	70.3	64.6	59.2	13.57
28	60.7	55.0	50.2	44.7	41.5	38.4	36.6	67.8	62.3	57.1	14.60
29	58.6	53.1	48.5	43.2	39.2	37.0	35.3	65.5	60.2	55.1	15.66
30	56.6	51.4	46.9	41.7	37.8	35.8	34.2	63.3	58.2	53.3	16.76
31	54.8	49.7	45.4	40.4	36.6	34.7	33.1	61.2	56.3	51.6	17.89
								59.3			
32	53.1	48.2	44.0	39.1	35.5	33.6	32.0				19.07
33	51.5	46.7	42.6	37.9	34.4	32.5	31.1				20.28
34	49.9	45.3	41.4	38.8	33.4	31.6	30.1				21.53
35	48.5	44.0		35.8	32.4	30.7	29.3				22.81

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM
18"
16"
DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot									
	CB 182N 18" x 8 3/4"			CB 181N 18" x 7 1/2"				CB 164N 16" x 12"		
	77 Lbs.	70 Lbs.	64 Lbs.	57 Lbs.	52 Lbs.	49 Lbs.	47 Lbs.	90 Lbs.	83 Lbs.	76 Lbs.
	ELEMENTS									
I_{1-1}	1283.9	1155.3	1047.2	952.0	857.3	808.6	768.6	1285.5	1172.3	1065.5
S_{1-1}	**141.5**	**128.4**	**117.2**	**104.3**	**94.6**	**89.5**	**85.4**	**158.2**	**145.4**	**133.2**
I_{2-2}	93.5	83.7	75.5	48.7	43.5	41.0	38.7	233.2	212.5	193.1
S_{2-2}	21.3	19.1	17.3	12.9	11.6	10.9	10.3	38.6	35.3	32.2
	DIMENSIONS AND GAGES IN INCHES									
d	18 1/8	18	17 7/8	18 1/4	18 1/8	18	18	16 1/4	16 1/8	16
b	8 3/4	8 3/4	8 3/4	7 1/2	7 1/2	7 1/2	7 1/2	12 1/8	12	12
t	1/2	7/16	7/16	3/8	3/8	5/16	5/16	1/2	7/16	7/16
p	13/16	3/4	11/16	11/16	5/8	9/16	9/16	13/16	3/4	11/16
a	4 1/8	4 1/8	4 1/8	3 5/8	3 5/8	3 5/8	3 5/8	5 3/4	5 3/4	5 3/4
c	16 1/2	16 1/2	16 1/2	16 7/8	16 7/8	16 7/8	16 7/8	14 5/8	14 5/8	14 5/8
f	15 1/4	15 1/4	15 1/4	15 7/8	15 7/8	15 7/8	15 7/8	13 1/2	13 1/2	13 1/2
f_1	3 1/2	3 1/2	3 1/2	3 1/16	3 1/16	3 1/16	3 1/16	5 1/8	5 1/8	5 1/8
o	1 7/16	1 3/8	1 5/16	1 3/16	1 1/8	1 1/16	1 1/16	1 7/16	1 3/8	1 5/16
k	7/8	7/8	13/16	11/16	11/16	11/16	11/16	7/8	7/8	7/8
g usual	5 1/2	5 1/2	5 1/2	4	4	4	4	5 1/2	5 1/2	5 1/2
g_2	2 3/4	2 3/4	2 3/4	2 1/2	2 1/2	2 1/2	2 1/2	2 3/4	2 1/2	2 1/2

f, f_1, o and k—Provide usual working clearances.

	MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.									
M max	212	193	176	156	142	134	128	237	218	200
V max	105	95	87	83	76	69	67	94	87	79
L min	8.12	8.11	8.10	7.56	7.44	7.75	7.70	10.14	10.02	10.15
fb	12189	11555	10916	10129	9532	8925	8761	13025	12607	11940
fbt	5851	5084	4421	3829	3346	2918	2804	6252	5673	4895
B min	13.33	14.19	15.18	17.06	18.28	19.23	19.24	10.91	11.31	12.08
R max	47	41	35	31	27	23	22	47	43	37
RA	50	46	43	40	37	34	34	50	47	43
LRA	16.98	16.75	16.35	15.65	15.34	15.79	15.07	18.98	18.56	18.59
Wt.CA	21	21	21	21	21	21	21	21	21	21
RH	101	92	85	79	74	69	67	101	94	86
LRH	8.41	8.37	8.27	7.92	7.67	7.78	7.65	9.40	9.28	9.29
Wt.CH	29	29	29	29	29	29	29	29	29	29
Q	1698	1541	1406	1252	1135	1074	1025	1898	1745	1598

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3 1/2 inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM 16" 15" LOADS

CB SECTIONS

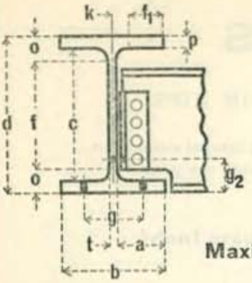
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot											Coefficient of Deflection
	CB 163N 16"x8½"			CB 162N 16" x 7¼"				CB 153N 15" x 11"				
	68 Lbs.	63 Lbs.	58 Lbs.	50 Lbs.	45 Lbs.	40 Lbs.	37 Lbs.	108 Lbs.	99 Lbs.	91 Lbs.	85 Lbs.	
					126.9		108.0					
7				140.4	126.5	110.1	101.5					0.91
8	169.8	155.9	144.0	123.3	110.7	98.6	88.8					1.19
9	151.9	140.9	129.5	109.6	98.4	87.6	78.9	226.9	203.4	187.2	175.0	1.51
10	136.7	126.8	116.5	98.6	88.6	78.8	71.0	206.9	190.1	174.2	162.5	1.86
11	124.3	115.3	105.9	89.7	80.5	71.7	64.6	188.1	172.8	158.4	147.7	2.25
12	113.9	105.7	97.1	82.2	73.8	65.7	59.2	172.4	158.4	145.2	135.4	2.68
13	105.1	97.6	89.6	75.9	68.1	60.7	54.7	159.1	146.2	134.0	125.0	3.15
14	97.6	90.6	83.2	70.5	63.3	56.3	50.7	147.8	135.8	124.5	116.1	3.65
15	91.1	84.6	77.7	65.8	59.0	52.6	47.4	137.9	126.7	116.2	108.3	4.19
16	85.4	79.3	72.8	61.7	55.4	49.3	44.4	129.3	118.8	108.9	101.6	4.77
17	80.4	74.6	68.5	58.0	52.1	46.4	41.8	121.7	111.8	102.5	95.6	5.38
18	75.9	70.5	64.7	54.8	49.2	43.8	39.5	114.9	105.6	96.8	90.3	6.03
19	71.9	66.8	61.3	51.9	46.6	41.5	37.4	108.9	100.1	91.7	85.5	6.72
20	68.3	63.4	58.3	49.3	44.3	39.4	35.5	103.4	95.0	87.1	81.2	7.45
21	65.1	60.4	55.5	47.0	42.2	37.5	33.8	98.5	90.5	83.0	77.4	8.21
22	62.1	57.7	53.0	44.8	40.3	35.8	32.3	94.0	86.4	79.2	73.9	9.01
23	59.4	55.1	50.7	42.9	38.5	34.3	30.9	89.9	82.6	75.8	70.6	9.85
24	57.0	52.9	48.6	41.1	36.9	32.9	29.6	86.2	79.2	72.6	67.7	10.73
25	54.7	50.7	46.6	39.5	35.4	31.5	28.4	82.8	76.0	69.7	65.0	11.64
26	52.6	48.8	44.8	37.9	34.1	30.3	27.3	79.6	73.1	67.0	62.5	12.59
27	50.6	47.0	43.2	36.5	32.8	29.2	26.3	76.6	70.4	64.5	60.2	13.57
28	48.8	45.3	41.6	35.2	31.6	28.2	25.4	73.9	67.9	62.2	58.0	14.60
29	47.1	43.7	40.2	34.0	30.5	27.2	24.5	71.3	65.6	60.1	56.0	15.66
30	45.6	42.3	38.8	32.9	29.5	26.3	23.7	69.0	63.4			16.76
31	44.1	40.9	37.6	31.8	28.6	25.4	22.9					17.89
32	42.7			30.8								19.07

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot										
	CB 163N 16" x 8½"			CB 162N 16" x 7¼"				CB 153N 15" x 11"			
	68 Lbs.	63 Lbs.	58 Lbs.	50 Lbs.	45 Lbs.	40 Lbs.	37 Lbs.	108 Lbs.	99 Lbs.	91 Lbs.	85 Lbs.
	ELEMENTS										
I_{1-1}	924.4	851.7	776.5	668.1	594.6	525.9	470.0	1320.4	1200.4	1089.1	1007.2
S_{1-1}	113.9	105.7	97.1	82.2	73.8	65.7	59.2	172.4	158.4	145.2	135.4
I_{2-2}	80.8	74.2	67.4	41.1	36.3	32.0	28.1	240.6	218.8	198.7	183.9
S_{2-2}	19.0	17.5	16.0	11.2	10.0	8.8	7.8	43.4	39.6	36.1	33.5
	DIMENSIONS AND GAGES IN INCHES										
d	16¼	16⅛	16	16¼	16⅛	16	15⅞	15⅜	15⅛	15	14⅞
b	8½	8½	8½	7⅜	7¼	7¼	7¼	11⅛	11	11	11
t	7/16	7/16	⅜	⅜	5/16	5/16	5/16	⅝	3/16	9/16	½
p	13/16	¾	11/16	⅝	9/16	½	7/16	1 1/16	1	⅞	13/16
a	4	4	4	3½	3½	3½	3½	5¼	5¼	5¼	5¼
c	14⅝	14⅝	14⅝	15	15	15	15	13¼	13¼	13¼	13¼
f	13½	13½	13½	14¼	14¼	14¼	14¼	12⅛	12⅛	12⅛	12⅛
f_1	4⅜	4⅜	4⅜	3	3	3	3	4⅝	4⅝	4⅝	4⅝
o	1 7/16	1⅜	1 5/16	1	15/16	⅞	13/16	1⅝	1 9/16	1 7/16	1⅜
k	⅞	13/16	13/16	9/16	9/16	9/16	9/16	⅞	⅞	13/16	13/16
g usual	5½	5½	5½	4	4	4	4	5½	5½	5½	5½
g_2	2¾	2¾	2½	2½	2½	2½	2¼	3	2¾	2¾	2¾

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	171	159	146	123	111	99	89	259	238	218	203
V max	85	78	72	70	63	55	54	113	102	94	87
L min	8.05	8.14	8.09	7.03	6.98	7.16	6.58	9.12	9.35	9.31	9.29
fb	12314	11739	11202	10719	9971	8996	9002	14930	14456	14091	13763
fbt	5369	4730	4201	3859	3270	2627	2611	9212	8081	7327	6746
B min	11.76	12.45	13.14	14.13	15.37	16.96	16.62	8.48	8.79	9.02	9.25
R max	41	36	32	29	25	20	20	68	59	53	49
RA	46	42	39	38	34	31	30	65	59	55	51
LRA	14.86	15.10	14.94	12.98	13.02	12.72	11.84	15.91	16.11	15.84	15.93
Wt.CA	21	21	21	21	21	21	21	21	21	21	21
RH	92	85	79	76	69	61	61	130	117	109	103
LRH	7.43	7.46	7.37	6.49	6.42	6.46	5.82	7.96	8.12	7.99	7.89
Wt.CH	29	29	29	29	29	29	29	29	29	29	29
Q	1367	1268	1165	986	886	788	710	2069	1901	1742	1625

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
15″
LOADS

CB SECTIONS

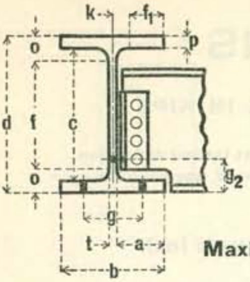
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot								Coefficient of Deflection
	CB 152N 15″ x 7½″				CB 151N 15″ x 6¾″				
	72 Lbs.	66 Lbs.	60 Lbs.	55 Lbs.	49 Lbs.	44 Lbs.	39 Lbs.	35 Lbs.	
	191.8	174.7	159.1	144.6	139.8	124.5	108.0	97.3	
7	187.7	171.9	155.7	143.0	128.1	115.0	102.5	91.4	0.91
8	164.3	150.5	136.2	125.1	112.1	100.7	89.7	80.0	1.19
9	146.0	133.7	121.1	111.2	99.6	89.5	79.7	71.1	1.51
10	131.4	120.4	109.0	100.1	89.6	80.5	71.8	64.0	1.86
11	119.5	109.4	99.1	91.0	81.5	73.2	65.2	58.1	2.25
12	109.5	100.3	90.8	83.4	74.7	67.1	59.8	53.3	2.68
13	101.1	92.6	83.8	77.0	69.0	61.9	55.2	49.2	3.15
14	93.9	86.0	77.8	71.5	64.0	57.5	51.3	45.7	3.65
15	87.6	80.2	72.6	66.7	59.8	53.7	47.8	42.6	4.19
16	82.1	75.2	68.1	62.6	56.0	50.3	44.9	40.0	4.77
17	77.3	70.8	64.1	58.9	52.7	47.4	42.2	37.6	5.38
18	73.0	66.9	60.5	55.6	49.8	44.7	39.9	35.5	6.03
19	69.2	63.4	57.4	52.7	47.2	42.4	37.8	33.7	6.72
20	65.7	60.2	54.5	50.0	44.8	40.3	35.9	32.0	7.45
21	62.6	57.3	51.9	47.7	42.7	38.3	34.2	30.5	8.21
22	59.7	54.7	49.5	45.5	40.8	36.6	32.6	29.1	9.01
23	57.1	52.3	47.4	43.5	39.0	35.0	31.2	27.8	9.85
24	54.8	50.2	45.4	41.7	37.4	33.6	29.9	26.7	10.73
25	52.6	48.1	43.6	40.0	35.9	32.2	28.7	25.6	11.64
26	50.5	46.3	41.9	38.5	34.5	31.0	27.6	24.6	12.59
27	48.7	44.6	40.4	37.1	33.2	29.8	26.6	23.7	13.57
28	46.9	43.0	38.9	35.8	32.0	28.8	25.6	22.8	14.60
29	45.3	41.5	37.6	34.5	30.9	27.8	24.8	22.1	15.66
30	43.8	40.1			29.9	26.8			16.76

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 15" DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot							
	CB 152 N 15" x 7 1/2"				CB 151 N 15" x 6 3/4"			
	72 Lbs.	66 Lbs.	60 Lbs.	55 Lbs.	49 Lbs.	44 Lbs.	39 Lbs.	35 Lbs.
ELEMENTS								
I_{1-1}	838.2	760.0	680.7	620.4	569.6	507.1	448.8	396.7
S_{1-1}	109.5	100.3	90.8	83.4	74.7	67.1	59.8	53.3
I_{2-2}	67.0	60.5	53.9	48.9	34.9	30.9	27.2	23.9
S_{2-2}	17.7	16.0	14.4	13.1	10.2	9.1	8.1	7.1
DIMENSIONS AND GAGES IN INCHES								
d	15 1/4	15 1/8	15	14 7/8	15 1/4	15 1/8	15	14 7/8
b	7 5/8	7 1/2	7 1/2	7 1/2	6 7/8	6 3/4	6 3/4	6 3/4
t	9/16	1/2	7/16	7/16	3/8	3/8	5/16	5/16
p	15/16	7/8	3/4	11/16	5/8	9/16	1/2	1/2
a	3 1/2	3 1/2	3 1/2	3 1/2	3 1/4	3 1/4	3 1/4	3 1/4
c	13 1/2	13 1/2	13 1/2	13 1/2	14	14	14	14
f	12 3/8	12 3/8	12 3/8	12 3/8	13	13	13	13
f_1	2 15/16	2 15/16	2 15/16	2 15/16	2 3/4	2 3/4	2 3/4	2 3/4
o	1 1/2	1 7/16	1 5/16	1 1/4	1 1/16	1	15/16	15/16
k	13/16	13/16	13/16	3/4	5/8	5/8	5/8	9/16
g usual	4	4	4	4	4	4	4	4
g_2	2 3/4	2 3/4	2 3/4	2 1/2	2 1/2	2 1/2	2 1/4	2 1/4

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.								
M max	164	150	136	125	112	101	90	80
V max	96	87	80	72	70	62	54	49
L min	6.85	6.89	6.85	6.92	6.41	6.47	6.64	6.57
fb	13988	13507	13008	12414	11755	10924	9818	9109
fbt	7302	6483	5750	5028	4490	3747	2945	2505
B min	9.31	9.68	10.09	10.66	11.76	12.83	14.59	15.70
R max	54	47	42	36	33	27	21	18
RA	55	50	46	43	40	36	32	29
LRA	11.95	12.04	11.84	11.64	11.21	11.18	11.21	11.03
Wt.CA	21	21	21	21	21	21	21	21
RH	110	101	93	85	80	72	63	58
LRH	5.97	5.96	5.86	5.89	5.60	5.59	5.70	5.51
Wt.CH	29	29	29	29	29	29	29	29
Q	1314	1204	1090	1001	896	805	718	640

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3 1/2 inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM 14″ LOADS

CB SECTIONS

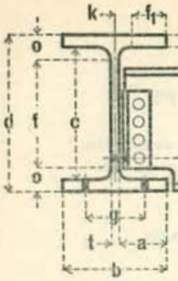
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection. For unbraced sections safe loads must be reduced, see page 116.

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot										Coefficient of Deflection
	CB 145N 14″ x 14½″					CB 144N 14″ x 12″		CB 143N 14″ x 10″			
	119 Lbs.	111 Lbs.	103 Lbs.	95 Lbs.	87 Lbs.	84 Lbs.	78 Lbs.	74 Lbs.	68 Lbs.	61 Lbs.	
								153.6	141.7	126.9	
9								149.6	137.2	122.8	1.51
10						153.5	145.1	134.6	123.5	110.5	1.86
11	198.7	186.2	170.3	157.9	141.8	142.7	132.0	122.4	112.3	100.5	2.25
12	189.3	176.1	163.6	150.5	138.0	130.8	121.0	112.2	102.9	92.1	2.68
13	174.7	162.6	151.0	138.9	127.4	120.7	111.7	103.6	95.0	85.0	3.15
14	162.3	150.9	140.2	129.0	118.3	112.1	103.7	96.2	88.2	78.9	3.65
15	151.4	140.9	130.9	120.4	110.4	104.6	96.8	89.8	82.3	73.7	4.19
16	142.0	132.1	122.7	112.9	103.5	98.1	90.8	84.2	77.2	69.1	4.77
17	133.6	124.3	115.5	106.2	97.4	92.3	85.4	79.2	72.6	65.0	5.33
18	126.2	117.4	109.1	100.3	92.0	87.2	80.7	74.8	68.6	61.4	6.03
19	119.6	111.2	103.3	95.1	87.2	82.6	76.4	70.9	65.0	58.2	6.72
20	113.6	105.7	98.2	90.3	82.8	78.5	72.6	67.3	61.7	55.3	7.45
21	108.2	100.6	93.5	86.0	78.9	74.7	69.1	64.1	58.8	52.6	8.21
22	103.3	96.1	89.2	82.1	75.3	71.4	66.0	61.2	56.1	50.2	9.01
23	98.8	91.9	85.4	78.5	72.0	68.2	63.1	58.5	53.7	48.1	9.85
24	94.7	88.1	81.8	75.3	69.0	65.4	60.5	56.1	51.5	46.1	10.73
25	90.9	84.5	78.5	72.2	66.2	62.8	58.1	53.9	49.4	44.2	11.64
26	87.4	81.3	75.5	69.5	63.7	60.4	55.9	51.8	47.5	42.5	12.59
27	84.1	78.3	72.7	66.9	61.3	58.1	53.8	49.9	45.7	40.9	13.57
28	81.1	75.5	70.1	64.5	59.2	56.1	51.9	48.1	44.1		14.60

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 14" DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot									
	CB 145 N 14" x 14½"					CB144 N 14"x12"		CB 143 N 14" x 10"		
	119 Lbs.	111 Lbs.	103 Lbs.	95 Lbs.	87 Lbs.	84 Lbs.	78 Lbs.	74 Lbs.	68 Lbs.	61 Lbs.
ELEMENTS										
I_{1-1}	1372.2	1265.3	1165.4	1062.5	966.2	927.2	850.5	795.9	723.4	640.8
S_{1-1}	**189.3**	**176.1**	**163.6**	**150.5**	**138.0**	**130.8**	**121.0**	**112.2**	**102.9**	**92.1**
I_{2-2}	491.7	454.7	419.8	383.7	349.7	225.4	206.9	133.4	121.2	107.3
S_{2-2}	67.1	62.2	57.6	52.8	48.2	37.5	34.5	26.5	24.1	21.5
DIMENSIONS AND GAGES IN INCHES										
d	14½	14⅜	14¼	14⅛	14	14⅛	14	14¼	14	13⅞
b	14⅝	14⅝	14⅝	14½	14½	12	12	10⅛	10	10
t	9/16	9/16	½	½	7/16	7/16	7/16	7/16	7/16	⅜
p	15/16	⅞	13/16	¾	11/16	¾	11/16	13/16	11/16	⅝
a	7	7	7	7	7	5¾	5¾	4¾	4¾	4¾
c	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝	12⅝
f	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜
f_1	6⅜	6⅜	6⅜	6⅜	6⅜	5⅛	5⅛	4⅛	4⅛	4⅛
o	1 9/16	1½	1 7/16	1⅜	1 5/16	1⅜	1 5/16	1 7/16	1 5/16	1¼
k	15/16	15/16	⅞	⅞	⅞	⅞	⅞	⅞	⅞	13/16
g usual	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½
g_2	2¾	2¾	2¾	2¾	2½	2½	2½	2¾	2½	2½

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.	119 Lbs.	111 Lbs.	103 Lbs.	95 Lbs.	87 Lbs.	84 Lbs.	78 Lbs.	74 Lbs.	68 Lbs.	61 Lbs.
M max	284	264	245	226	207	196	182	168	154	138
V max	99	93	85	79	71	77	73	77	71	63
L min	11.43	11.35	11.53	11.44	11.68	10.23	10.01	8.77	8.71	8.71
fb	14815	14563	14140	13783	13169	13538	13270	13534	13104	12443
fbt	8459	7864	7042	6423	5557	6106	5706	6104	5504	4728
B min	8.12	8.25	8.53	8.76	9.26	9.02	9.20	9.03	9.36	9.94
R max	60	56	50	45	39	43	40	43	39	33
RA	45	43	39	37	33	36	34	36	33	30
LRA	25.24	24.57	25.17	24.41	25.09	21.80	21.35	18.70	18.71	18.42
Wt.CA	15	15	15	15	15	15	15	15	15	15
RH	90	85	78	73	66	71	68	71	66	60
LRH	12.62	12.43	12.58	12.37	12.55	11.05	10.68	9.48	9.35	9.21
Wt.CH	22	22	22	22	22	22	22	22	22	22
Q	2272	2113	1963	1806	1656	1570	1452	1346	1235	1105

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA,CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM 14″ LOADS

CB SECTIONS

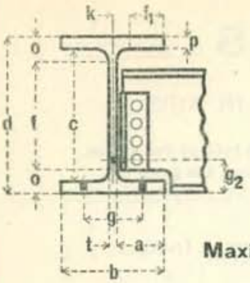
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116.

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot								Coefficient of Deflection
	CB 142 N 14″ x 8″				CB 141 N 14″ x 6¾″				
	58 Lbs.	53 Lbs.	48 Lbs.	43 Lbs.	42 Lbs.	37 Lbs.	33 Lbs.	30 Lbs.	
								86.2	
6					113.9	98.6	89.0	84.8	0.67
7	137.0	123.8	112.7	101.8	104.7	92.4	81.9	72.7	0.91
8	127.4	116.4	105.2	93.9	91.7	80.9	71.7	63.6	1.19
9	113.2	103.5	93.5	83.5	81.5	71.9	63.7	56.5	1.51
10	101.9	93.1	84.1	75.1	73.3	64.7	57.4	50.9	1.86
11	92.6	84.7	76.5	68.3	66.7	58.8	52.2	46.3	2.25
12	84.9	77.6	70.1	62.6	61.1	53.9	47.8	42.4	2.68
13	78.4	71.6	64.7	57.8	56.4	49.8	44.1	39.1	3.15
14	72.8	66.5	60.1	53.7	52.4	46.2	41.0	36.3	3.65
15	67.9	62.1	56.1	50.1	48.9	43.1	38.2	33.9	4.19
16	63.7	58.2	52.6	47.0	45.8	40.4	35.9	31.8	4.77
17	59.9	54.8	49.5	44.2	43.1	38.1	33.7	29.9	5.38
18	56.6	51.7	46.7	41.7	40.7	35.9	31.9	28.3	6.03
19	53.6	49.0	44.3	39.5	38.6	34.0	30.2	26.8	6.72
20	50.9	46.6	42.1	37.6	36.7	32.3	28.7	25.4	7.45
21	48.5	44.3	40.1	35.8	34.9	30.8	27.3	24.2	8.21
22	46.3	42.3	38.2	34.2	33.3	29.4	26.1	23.1	9.01
23	44.3	40.5	36.6	32.7	31.9	28.1	24.9	22.1	9.85
24	42.5	38.8	35.1	31.3	30.6	27.0	23.9	21.2	10.73
25	40.8	37.3	33.7	30.1	29.3	25.9	22.9	20.4	11.64
26	39.2	35.8	32.4	28.9	28.2	24.9	22.1	19.6	12.59
27	37.7	34.5	31.2	27.8	27.2	24.0	21.2	18.8	13.57
28	36.4				26.2	23.1	20.5		14.60

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 14" DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot							
	CB 142 N 14" x 8"				CB 141 N 14" x $6\frac{3}{4}$"			
	58 Lbs.	53 Lbs.	48 Lbs.	43 Lbs.	42 Lbs.	37 Lbs.	33 Lbs.	30 Lbs.
ELEMENTS								
I_{1-1}	596.7	541.0	484.0	428.3	435.3	380.9	334.7	294.3
S_{1-1}	84.9	77.6	70.1	62.6	61.1	53.9	47.8	42.4
I_{2-2}	63.6	57.5	51.2	45.1	30.6	26.6	23.2	20.1
S_{2-2}	15.7	14.3	12.8	11.3	9.0	7.9	6.9	6.0
DIMENSIONS AND GAGES IN INCHES								
d	14	14	$13\frac{3}{4}$	$13\frac{5}{8}$	$14\frac{1}{4}$	$14\frac{1}{8}$	14	$13\frac{7}{8}$
b	$8\frac{1}{8}$	8	8	8	$6\frac{7}{8}$	$6\frac{3}{4}$	$6\frac{3}{4}$	$6\frac{3}{4}$
t	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{1}{4}$	$\frac{1}{4}$
p	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{3}{8}$
a	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{7}{8}$	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{4}$
c	$12\frac{5}{8}$	$12\frac{5}{8}$	$12\frac{5}{8}$	$12\frac{5}{8}$	$13\frac{1}{8}$	$13\frac{1}{8}$	$13\frac{1}{8}$	$13\frac{1}{8}$
f	$11\frac{3}{8}$	$11\frac{3}{8}$	$11\frac{3}{8}$	$11\frac{3}{8}$	$12\frac{1}{4}$	$12\frac{1}{4}$	$12\frac{1}{4}$	$12\frac{1}{4}$
f_1	$3\frac{3}{16}$	$3\frac{3}{16}$	$3\frac{3}{16}$	$3\frac{3}{16}$	$2\frac{13}{16}$	$2\frac{13}{16}$	$2\frac{13}{16}$	$2\frac{13}{16}$
o	$1\frac{5}{16}$	$1\frac{5}{16}$	$1\frac{3}{16}$	$1\frac{1}{8}$	$\frac{15}{16}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{3}{4}$
k	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
g usual	$5\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{1}{2}$	$5\frac{1}{2}$	4	4	4	4
g_2	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{4}$

f, f_1, o and k—Provide usual working clearances.

Notation	58 Lbs.	53 Lbs.	48 Lbs.	43 Lbs.	42 Lbs.	37 Lbs.	33 Lbs.	30 Lbs.
MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.								
M max	127	116	105	94	92	81	72	64
V max	68	62	56	51	57	49	45	43
L min	7.44	7.52	7.47	7.38	6.44	6.56	6.44	5.90
fb	12859	12218	11613	10914	11177	10085	9324	9231
fbt	5221	4521	3948	3383	3722	2935	2471	2400
B min	9.60	10.21	10.82	11.62	11.74	13.27	14.52	14.49
R max	37	32	27	23	26	21	17	17
RA	32	29	27	24	26	23	21	20
LRA	15.92	16.06	15.58	15.65	14.10	14.06	13.66	12.72
Wt.CA	15	15	15	15	15	15	15	15
RH	64	58	54	49	52	46	42	41
LRH	7.96	8.03	7.79	7.67	7.05	7.03	6.83	6.20
Wt.CH	22	22	22	22	22	22	22	22
Q	1019	931	841	751	733	647	574	509

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = $3\frac{1}{2}$ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
12″
LOADS

CB SECTIONS

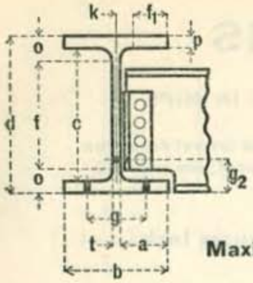
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, **see page 116.**

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot										Coefficient of Deflection
	CB 125 N 12″ x 12″				CB 124 N 12″ x 10″			CB 123 N 12″ x 8″			
	85 Lbs.	79 Lbs.	72 Lbs.	65 Lbs.	64 Lbs.	58 Lbs.	53 Lbs.	50 Lbs.	45 Lbs.	40 Lbs.	
								109.7	98.4	85.4	
8					120.8	106.2	101.0	96.8	86.9	77.6	1.19
9	150.3	141.4	128.2	114.9	114.3	104.0	94.0	86.0	77.2	68.9	1.51
10	138.6	128.3	116.8	105.4	102.8	93.6	84.6	77.4	69.5	62.0	1.86
11	126.0	116.6	106.1	95.8	93.5	85.1	76.9	70.4	63.2	56.4	2.25
12	115.5	106.9	97.3	87.8	85.7	78.0	70.5	64.5	57.9	51.7	2.68
13	106.6	98.7	89.8	81.1	79.1	72.0	65.1	59.5	53.5	47.7	3.15
14	99.0	91.6	83.4	75.3	73.5	66.9	60.4	55.3	49.6	44.3	3.65
15	92.4	85.5	77.8	70.2	68.6	62.4	56.4	51.6	46.3	41.4	4.19
16	86.6	80.2	73.0	65.9	64.3	58.5	52.9	48.4	43.4	38.8	4.77
17	81.5	75.5	68.7	62.0	60.5	55.1	49.8	45.5	40.9	36.5	5.38
18	77.0	71.3	64.9	58.5	57.1	52.0	47.0	43.0	38.6	34.5	6.03
19	73.0	67.5	61.5	55.5	54.1	49.3	44.5	40.7	36.6	32.7	6.72
20	69.3	64.1	58.4	52.7	51.4	46.8	42.3	38.7	34.7	31.0	7.45
21	66.0	61.1	55.6	50.2	49.0	44.6	40.3	36.9	33.1	29.5	8.21
22	63.0	58.3	53.1	47.9	46.8	42.6	38.5	35.2	31.6	28.2	9.01
23	60.3	55.8	50.8	45.8	44.7	40.7	36.8	33.7	30.2	27.0	9.85
24	57.8	53.5	48.7	43.9	42.9	39.0	35.3	32.3	29.0	25.9	10.73
25	55.4	51.3			41.1						11.64

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 12" DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot									
	CB 125N 12" x 12"				CB 124N 12" x 10"			CB 123N 12" x 8"		
	85 Lbs.	79 Lbs.	72 Lbs.	65 Lbs.	64 Lbs.	58 Lbs.	53 Lbs.	50 Lbs.	45 Lbs.	40 Lbs.
ELEMENTS										
I_{1-1}	722.0	661.9	596.2	532.0	527.5	475.3	425.4	393.0	349.3	308.6
S_{1-1}	115.5	106.9	97.3	87.8	85.7	78.0	70.5	64.5	57.9	51.7
I_{2-2}	235.5	216.4	195.3	174.6	119.0	107.4	96.1	56.4	50.0	44.1
S_{2-2}	38.9	35.8	32.4	29.1	23.7	21.4	19.2	14.0	12.4	11.0
DIMENSIONS AND GAGES IN INCHES										
d	12½	12⅜	12¼	12⅛	12¼	12¼	12	12¼	12	12
b	12⅛	12⅛	12	12	10	10	10	8⅛	8	8
t	½	½	7/16	7/16	7/16	⅜	⅜	⅜	⅜	5/16
p	13/16	¾	11/16	⅝	11/16	⅝	9/16	⅝	9/16	½
a	5¾	5¾	5¾	5¾	4⅞	4⅞	4⅞	3⅞	3⅞	3⅞
c	10⅞	10⅞	10⅞	10⅞	10⅞	10⅞	10⅞	10⅞	10⅞	10⅞
f	9¾	9¾	9¾	9¾	9¾	9¾	9¾	9¾	9¾	9¾
f_1	5⅛	5⅛	5⅛	5⅛	5⅛	5⅛	5⅛	3 3/16	3 3/16	3 3/16
o	1 7/16	1⅜	1 5/16	1¼	1 5/16	1¼	1 3/16	1¼	1 3/16	1⅛
k	⅞	⅞	⅞	13/16	⅞	13/16	13/16	13/16	13/16	13/16
g usual	5½	5½	5½	5½	5½	5½	5½	5½	5½	5½
g_2	2¾	2½	2½	2½	2½	2½	2½	2½	2½	2¼

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.										
M max	173	160	146	132	129	117	106	97	87	78
V max	75	71	64	57	60	53	51	55	49	43
L min	9.22	9.07	9.11	9.17	8.51	8.81	8.38	7.06	7.06	7.27
fb	14906	14689	14250	13701	13825	13083	12876	13312	12681	11725
fbt	7468	6992	6213	5412	5654	4749	4494	4992	4312	3494
B min	6.94	7.02	7.25	7.58	7.61	8.13	8.22	7.94	8.40	9.24
R max	49	46	41	35	37	31	29	33	28	23
RA	39	37	34	31	32	29	27	30	27	23
LRA	17.77	17.34	17.17	16.99	16.07	16.14	15.67	12.93	12.87	13.49
Wt.CA	15	15	15	15	15	15	15	15	15	15
RH	79	75	69	62	64	57	55	59	54	47
LRH	8.77	8.55	8.46	8.50	8.03	8.21	7.69	6.56	6.43	6.60
Wt.CH	22	22	22	22	22	22	22	22	22	22
Q	1386	1283	1168	1054	1028	936	846	774	695	620

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM 12" 10" LOADS

CB SECTIONS

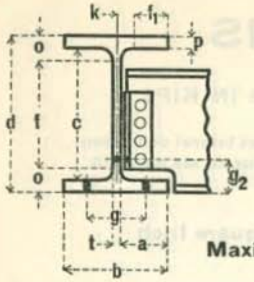
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection. For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot								Coefficient of Deflection
	CB 122N 12" x 6½"				CB 103N 10" x 10"				
	36 Lbs.	32 Lbs.	28 Lbs.	25 Lbs.	66 Lbs.	60 Lbs.	54 Lbs.	49 Lbs.	
				68.4					
6	88.2	80.0	69.1	61.6					0.67
7	79.0	69.9	61.0	52.8	114.6	102.1			0.91
8	69.2	61.2	53.4	46.2	110.6	100.5	89.9	81.6	1.19
9	61.5	54.4	47.5	41.1	98.3	89.3	80.5	72.7	1.51
10	55.3	49.0	42.7	37.0	88.4	80.4	72.5	65.4	1.86
11	50.3	44.5	38.8	33.6	80.4	73.1	65.9	59.5	2.25
12	46.1	40.8	35.6	30.8	73.7	67.0	60.4	54.5	2.68
13	42.6	37.7	32.9	28.4	68.0	61.9	55.8	50.3	3.15
14	39.5	35.0	30.5	26.4	63.2	57.4	51.8	46.7	3.65
15	36.9	32.6	28.5	24.6	59.0	53.6	48.3	43.6	4.19
16	34.6	30.6	26.7	23.1	55.3	50.3	45.3	40.9	4.77
17	32.5	28.8	25.1	21.7	52.0	47.3	42.6	38.5	5.38
18	30.7	27.2	23.7	20.5	49.1	44.7	40.3	36.3	6.03
19	29.1	25.8	22.5	19.5	46.6	42.3	38.2	34.4	6.72
20	27.7	24.5	21.4	18.5	44.2	40.2	36.2	32.7	7.45
21	26.3	23.3	20.3	17.6	42.1	38.3	34.5		8.21
22	25.2	22.3	19.4	16.8					9.01
23	24.1	21.3	18.6	16.1					9.85
24	23.1	20.4	17.8	15.4					10.73

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 12″ 10″ DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot							
	CB 122N 12″ x 6½″				CB 103N 10″ x 10″			
	36 Lbs.	32 Lbs.	28 Lbs.	25 Lbs.	66 Lbs.	60 Lbs.	54 Lbs.	49 Lbs.
ELEMENTS								
I_{1-1}	282.3	247.0	213.4	182.9	382.5	343.5	305.6	272.7
S_{1-1}	46.1	40.8	35.6	30.8	73.7	67.0	60.4	54.5
I_{2-2}	25.7	22.3	19.2	16.2	129.3	116.5	104.0	93.0
S_{2-2}	7.8	6.8	5.9	5.0	25.6	23.1	20.7	18.6
DIMENSIONS AND GAGES IN INCHES								
d	12¼	12⅛	12	11⅞	10⅜	10¼	10⅛	10
b	6½	6½	6½	6½	10⅛	10⅛	10	10
t	5/16	5/16	¼	¼	½	7/16	⅜	⅜
p	9/16	½	7/16	⅜	¾	11/16	⅝	9/16
a	3⅛	3⅛	3⅛	3⅛	4⅞	4⅞	4⅞	4⅞
c	11⅛	11⅛	11⅛	11⅛	8⅞	8⅞	8⅞	8⅞
f	10½	10½	10½	10½	7¾	7¾	7¾	7¾
f_1	2 11/16	2 11/16	2 11/16	2 11/16	5 3/16	5 3/16	5 3/16	5 3/16
o	15/16	⅞	13/16	¾	1 5/16	1¼	1 3/16	1⅛
k	9/16	½	½	½	13/16	13/16	¾	¾
g usual	4	4	4	4	5½	5½	5½	5½
g_2	2½	2¼	2¼	2¼	2½	2½	2½	2½
f, f_1, o and k—Provide usual working clearances.								
MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.								
M max	69	61	53	46	111	101	91	82
V max	44	40	35	34	57	51	45	41
L min	6.27	6.12	6.18	5.41	7.72	7.88	8.07	8.02
fb	11570	10926	9818	9917	15000	14958	14407	13971
fbt	3471	3005	2356	2380	6900	6208	5331	4750
B min	9.64	10.28	11.67	11.39	5.71	5.66	5.90	6.09
R max	23	20	15	15	42	38	32	29
RA	24	22	19	19	36	33	29	27
LRA	11.53	11.13	11.24	9.73	12.28	12.18	12.50	12.11
Wt.CA	15	15	15	15	15	15	15	15
RH	47	43	38	38				
LRH	5.89	5.69	5.62	4.86				
Wt.CH	22	22	22	22				
Q	553	490	427	370	884	804	725	654

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA,LRH = Min. Span in Feet to develop RA or RH.
Wt.CA,CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
10″ 8″
LOADS

CB SECTIONS

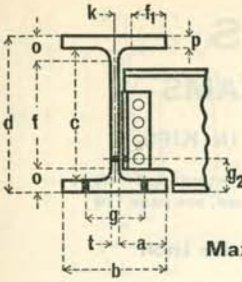
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot											Coefficient of Deflection
	CB 102N 10″ x 8″				CB 101N 10″ x 5¾″				CB 83N 8″ x 8″			
	45 Lbs.	41 Lbs.	37 Lbs.	33 Lbs.	29 Lbs.	26 Lbs.	23 Lbs.	21 Lbs.	35 Lbs.	33 Lbs.	31 Lbs.	
								57.0				
5					68.6	63.1	57.6	51.6			56.1	0.47
6	85.0	79.2	72.4	69.0	62.2	55.2	48.2	43.0	61.9	58.5	55.0	0.67
7	84.2	76.3	68.2	60.0	53.3	47.3	41.3	36.9	53.7	50.6	47.1	0.91
8	73.7	66.8	59.7	52.5	46.7	41.4	36.2	32.3	47.0	44.3	41.3	1.19
9	65.5	59.3	53.1	46.7	41.5	36.8	32.1	28.7	41.7	39.3	36.7	1.51
10	58.9	53.4	47.8	42.0	37.3	33.1	28.9	25.8	37.6	35.4	33.0	1.86
11	53.6	48.6	43.4	38.2	33.9	30.1	26.3	23.5	34.2	32.2	30.0	2.25
12	49.1	44.5	39.8	35.0	31.1	27.6	24.1	21.5	31.3	29.5	27.5	2.68
13	45.3	41.1	36.7	32.3	28.7	25.5	22.3	19.9	28.9	27.2	25.4	3.15
14	42.1	38.1	34.1	30.0	26.7	23.7	20.7	18.4	26.8	25.3	23.6	3.65
15	39.3	35.6	31.8	28.0	24.9	22.1	19.3	17.2	25.0	23.6	22.0	4.19
16	36.8	33.4	29.9	26.3	23.3	20.7	18.1	16.1	23.5	22.1	20.6	4.77
17	34.7	31.4	28.1	24.7	22.0	19.5	17.0	15.2	22.1	20.8	19.4	5.38
18	32.7	29.7	26.5	23.3	20.7	18.4	16.1	14.3				6.03
19	31.0	28.1	25.1	22.1	19.6	17.4	15.2	13.6				6.72
20	29.5	26.7	23.9	21.0	18.7	16.6	14.5	12.9				7.45
21	28.1	25.4	22.7	20.0	17.8	15.8	13.8	12.3				8.21

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CB SECTIONS

BEAM 10″ 8″ DATA

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	CB 102N 10″ x 8″				CB 101N 10″ x 5¾″				CB 83N 8″ x 8″		
	45 Lbs.	41 Lbs.	37 Lbs.	33 Lbs.	29 Lbs.	26 Lbs.	23 Lbs.	21 Lbs.	35 Lbs.	33 Lbs.	31 Lbs.
ELEMENTS											
I_{1-1}	248.3	222.3	196.6	170.8	159.3	139.7	120.5	106.3	128.2	119.8	110.9
S_{1-1}	49.1	44.5	39.8	35.0	31.1	27.6	24.1	21.5	31.3	29.5	27.5
I_{2-2}	53.2	47.7	42.1	36.5	16.5	14.4	12.4	10.8	42.3	39.6	36.7
S_{2-2}	13.3	11.9	10.6	9.2	5.7	5.0	4.3	3.8	10.5	9.9	9.2
DIMENSIONS AND GAGES IN INCHES											
d	10⅛	10	9⅞	9¾	10¼	10⅛	10	9⅞	8⅛	8⅛	8
b	8	8	8	8	5¾	5¾	5¾	5¾	8	8	8
t	⅜	⅜	5/16	5/16	5/16	¼	¼	¼	5/16	5/16	5/16
p	⅝	9/16	½	7/16	½	7/16	⅜	5/16	½	7/16	7/16
a	3⅞	3⅞	3⅞	3⅞	2¾	2¾	2¾	2¾	3⅞	3⅞	3⅞
c	8⅞	8⅞	8⅞	8⅞	9¼	9¼	9¼	9¼	7¼	7¼	7¼
f	7¾	7¾	7¾	7¾	8⅝	8⅝	8⅝	8⅝	6¼	6¼	6¼
f_1	3 3/16	3 3/16	3 3/16	3 3/16	2 7/16	2 7/16	2 7/16	2 7/16	3⅜	3⅜	3⅜
o	1 3/16	1⅛	1 1/16	1	13/16	¾	11/16	⅝	15/16	⅞	⅞
k	¾	¾	¾	¾	7/16	7/16	7/16	7/16	⅝	⅝	⅝
g usual	5½	5½	5½	5½	3	3	3	3	5½	5½	5½
g_2	2½	2½	2¼	2¼	2¼	2¼	2¼	2¼	2¼	2¼	2¼

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	74	67	60	53	47	41	36	32	47	44	41
V max	43	40	36	35	34	32	29	29	31	29	28
L min	6.93	6.74	6.61	6.09	5.44	5.25	5.02	4.52	6.07	6.05	5.88
fb	14078	13783	13335	13195	12422	11960	11402	11485	14696	14465	14315
fbt	4927	4548	4067	3893	3466	3110	2736	2756	4629	4340	4151
B min	6.10	6.21	6.42	6.43	7.33	7.62	8.03	7.87	4.63	4.71	4.74
R max	30	27	24	23	21	19	16	16	26	24	23
RA	37	35	32	31	29	27	25	25	33	32	30
LRA	7.96	7.63	7.46	6.77	6.43	6.13	5.78	5.16	5.69	5.53	5.50
Wt.CA	15	15	15	15	15	15	15	15	15	15	15
Q	589	534	478	420	373	331	289	258	376	354	330

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
9″
8″
LOADS

CB SECTIONS

STANDARD MILL BEAMS

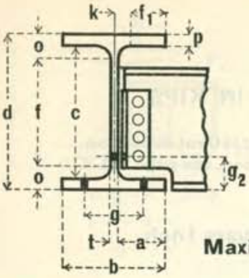
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot								Coefficient of Deflection
	CB 82N 8″ x 6½″			B 40N 9″ x 5¼″ Ⓒ		B 39N 8″ x 5″ Ⓒ			
	30 Lbs.	27 Lbs.	24 Lbs.	23 Lbs.	20 Lbs.	21 Lbs.	19 Lbs.	17 Lbs.	
						69.1			
3				68.3		63.6	55.1		0.17
4				61.2	47.1	47.7	45.3	40.9	0.30
5	58.6	52.1	45.9	49.0	45.6	38.2	36.2	34.3	0.47
6	52.6	47.4	42.2	40.8	38.0	31.8	30.2	28.6	0.67
7	45.1	40.6	36.2	35.0	32.6	27.3	25.9	24.5	0.91
8	39.5	35.6	31.7	30.6	28.5	23.9	22.7	21.5	1.19
9	35.1	31.6	28.1	27.2	25.3	21.2	20.1	19.1	1.51
10	31.6	28.4	25.3	24.5	22.8	19.1	18.1	17.2	1.86
11	28.7	25.9	23.0	22.3	20.7	17.3	16.5	15.6	2.25
12	26.3	23.7	21.1	20.4	19.0	15.9	15.1	14.3	2.68
13	24.3	21.9	19.5	18.8	17.5	14.7	13.9	13.2	3.15
14	22.5	20.3	18.1	17.5	16.3	13.6	12.9	12.3	3.65
15	21.0	19.0	16.9	16.3	15.2	12.7	12.1	11.4	4.19
16	19.7	17.8	15.8	15.3	14.3	11.9	11.3	10.7	4.77
17	18.6	16.7	14.9	14.4	13.4	11.2	10.7	10.1	5.38
18				13.6	12.7				6.03
19				12.9	12.0				6.72

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.
ⒸCarnegie Steel Company only.



CB SECTIONS

STANDARD MILL BEAMS

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM 9″ 8″ DATA

Notation	Nominal Depth and Flange Width—Weight per Foot							
	CB 82N 8″ x 6½″			B 40N 9″ x 5¼″ Ⓒ		B 39N 8″ x 5″ Ⓒ		
	30 Lbs.	27 Lbs.	24 Lbs.	23 Lbs.	20 Lbs.	21 Lbs.	19 Lbs.	17 Lbs.
ELEMENTS								
I_{1-1}	107.8	95.9	84.2	91.6	85.6	63.4	60.3	57.2
S_{1-1}	26.3	23.7	21.1	20.4	19.0	15.9	15.1	14.3
I_{2-2}	23.4	20.8	18.3	8.4	7.9	6.6	6.3	6.0
S_{2-2}	7.1	6.4	5.6	3.2	3.0	2.6	2.5	2.4
DIMENSIONS AND GAGES IN INCHES								
d	8¼	8⅛	8	9	9	8	8	8
b	6½	6½	6½	5 5/16	5 3/16	5⅛	5 1/16	5
t	5/16	5/16	1/4	5/16	3/16	3/8	5/16	3/16
p	1/2	7/16	3/8	3/8	3/8	5/16	5/16	5/16
a	3⅛	3⅛	3⅛	2½	2½	2⅜	2⅜	2⅜
c	7¼	7¼	7¼					
f	6¼	6¼	6¼	7½	7½	6⅝	6⅝	6⅝
f_1	2⅝	2⅝	2⅝					
o	15/16	7/8	13/16	3/4	3/4	11/16	11/16	11/16
k	5/8	9/16	9/16					
g usual	4	4	4	3	3	3	3	3
g_2	2¼	2¼	2¼	2¼	2¼	2¼	2¼	2¼

f, f_1, o and k—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	39	36	32	31	29	24	23	21
V max	29	26	23	34	24	35	28	20
L min	5.39	5.46	5.52	3.59	4.84	2.76	3.29	4.20
fb	14375	13799	13106	14169	11478	15000	14297	12243
fbt	4284	3698	3132	4477	2502	5400	4103	2608
B min	4.79	5.02	5.33	5.37	7.16	4.40	4.72	5.84
R max	24	20	17	26	14	30	23	14
RA	31	28	25	33	23	38	30	22
LRA	5.09	5.08	5.06	3.71	4.96	2.51	3.02	3.90
Wt.CA	15	15	15	15	15	15	15	15
Q	316	284	253	245	228	191	181	172

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

Ⓒ Carnegie Steel Company only.

H-BEAM
8″ to 4″
LOADS

H-BEAMS

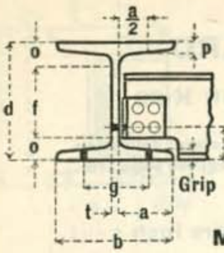
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot									Coefficient of Deflection
	H 4 8″ x 8″			H 3A 6″ x 6″		H 3 6″ x 6″		H 2 5″ x 5″ Ⓒ	H 1 4″ x 4″ Ⓒ	
	37.7 Lbs.	34.3 Lbs.	32.6 Lbs.	27.5 Lbs.	25 Lbs.	22.5 Lbs.	20 Lbs.	18.9 Lbs.	13.8 Lbs.	
									30.0	
3	96.0			63.1		54.0		37.6	21.2	0.17
4	90.6	72.0		49.3	45.1	41.0	36.0	28.5	15.9	0.30
5	72.5	69.4	60.1	39.4	37.6	32.8	31.0	22.8	12.7	0.47
6	60.4	57.8	56.4	32.9	31.4	27.4	25.9	19.0	10.6	0.67
7	51.8	49.5	48.3	28.2	26.9	23.4	22.2	16.3	9.1	0.91
8	45.3	43.4	42.3	24.6	23.5	20.5	19.4	14.3	8.0	1.19
9	40.3	38.5	37.6	21.9	20.9	18.2	17.2	12.7	7.1	1.51
10	36.2	34.7	33.8	19.7	18.8	16.4	15.5	11.4	6.4	1.86
11	32.9	31.5	30.8	17.9	17.1	14.9	14.1	10.4		2.25
12	30.2	28.9	28.2	16.4	15.7	13.7	12.9			2.68
13	27.9	26.7	26.0	15.2	14.5	12.6	11.9			3.15
14	25.9	24.8	24.2							3.65
15	24.2	23.1	22.6							4.19
16	22.7	21.7	21.2							4.77
17	21.3	20.4	19.9							5.38

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.
Ⓒ Carnegie Steel Company only.



H-BEAMS

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

H-BEAM 8″ to 4″ DATA

Notation	H 4 8″ x 8″			H 3A 6″ x 6″		H 3 6″ x 6″		H 2 Ⓒ 5″ x 5″	H 1 Ⓒ 4″ x 4″
	37.7 Lbs.	34.3 Lbs.	32.6 Lbs.	27.5 Lbs.	25 Lbs.	22.5 Lbs.	20 Lbs.	18.9 Lbs.	13.8 Lbs.
ELEMENTS									
I_{1-1}	120.8	115.5	112.8	49.3	47.0	41.0	38.8	23.8	10.7
S_{1-1}	30.2	28.9	28.2	16.4	15.7	13.7	12.9	9.5	5.3
I_{2-2}	36.9	35.1	34.2	16.0	14.9	12.2	11.4	7.8	3.6
S_{2-2}	9.1	8.8	8.6	5.3	5.0	4.0	3.8	3.1	1.8
DIMENSIONS AND GAGES IN INCHES									
d	8	8	8	6	6	6	6	5	4
b	$8\frac{1}{8}$	8	$7\frac{15}{16}$	$6\frac{1}{16}$	$5\frac{15}{16}$	$6\frac{1}{16}$	$5\frac{15}{16}$	5	4
t	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{7}{16}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{5}{16}$
p	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{3}{8}$
a	$3\frac{13}{16}$	$3\frac{13}{16}$	$3\frac{13}{16}$	$2\frac{13}{16}$	$2\frac{13}{16}$	$2\frac{7}{8}$	$2\frac{7}{8}$	$2\frac{3}{8}$	$1\frac{7}{8}$
Grip	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{3}{8}$
f	$6\frac{1}{4}$	$6\frac{1}{4}$	$6\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{1}{4}$	$4\frac{3}{8}$	$4\frac{3}{8}$	$3\frac{3}{8}$	$2\frac{1}{2}$
o	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{7}{8}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{13}{16}$	$\frac{3}{4}$
g usual	5	5	5	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{3}{4}$	$2\frac{1}{4}$

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.									
M max	45	43	42	25	24	21	19	14	8
V max	48	36	30	32	23	27	18	19	15
L min	3.78	4.82	5.63	3.12	4.18	3.04	4.30	3.04	2.12
fb	15000	15000	14781	15000	15000	15000	15000	15000	15000
fbt	7500	5625	4626	6570	4695	5625	3750	4695	4695
B min	4.40	4.40	4.50	3.30	3.30	3.30	3.30	2.75	2.20
R max	41	31	25	33	23	28	19	22	21
RA	53	39	33	23	16	20	13	16	
LRA	3.42	4.45	5.13	4.28	5.89	4.11	5.95	3.56	
Wt.CA	15	15	15	8	8	8	8	8	
Q	362	347	338	197	188	164	155	114	64

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = $3\frac{1}{4}$ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

Ⓒ Carnegie Steel Company only.

BEAM
24″ I
LOADS

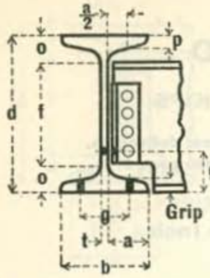
BEAMS
AMERICAN STANDARD
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot									Coefficient of Deflection
	B 18 24″ x 7⅞″				B 1 24″ x 7″					
	120 Lbs.	115 Lbs.	110 Lbs.	105.9 Lbs.	100 Lbs.	95 Lbs.	90 Lbs.	85 Lbs.	79.9 Lbs.	
					430.3	395.1				
6	495.6	424.5			395.3	383.6	359.4	324.3		0.67
7	430.1	420.1	388.8	360.0	338.8	328.8	318.6	308.6	288.0	0.91
8	376.4	367.6	358.6	351.4	296.5	287.7	278.8	270.0	260.9	1.19
9	334.5	326.7	318.8	312.4	263.5	255.7	247.8	240.0	231.9	1.51
10	301.1	294.1	286.9	281.2	237.2	230.2	223.0	216.0	208.7	1.86
11	273.7	267.3	260.8	255.6	215.6	209.2	202.7	196.4	189.7	2.25
12	250.9	245.0	239.1	234.3	197.7	191.8	185.8	180.0	173.9	2.68
13	231.6	226.2	220.7	216.3	182.4	177.0	171.5	166.1	160.6	3.15
14	215.1	210.0	204.9	200.8	169.4	164.4	159.3	154.3	149.1	3.65
15	200.7	196.0	191.3	187.4	158.1	153.4	148.7	144.0	139.1	4.19
16	188.2	183.8	179.3	175.7	148.2	143.8	139.4	135.0	130.5	4.77
17	177.1	173.0	168.8	165.4	139.5	135.4	131.2	127.0	122.8	5.38
18	167.3	163.4	159.4	156.2	131.8	127.9	123.9	120.0	116.0	6.03
19	158.5	154.8	151.0	148.0	124.8	121.1	117.4	113.7	109.9	6.72
20	150.5	147.0	143.5	140.6	118.6	115.1	111.5	108.0	104.4	7.45
21	143.4	140.0	136.6	133.9	112.9	109.6	106.2	102.8	99.4	8.21
22	136.9	133.7	130.4	127.8	107.8	104.6	101.4	98.2	94.9	9.01
23	130.9	127.8	124.7	122.2	103.1	100.1	97.0	93.9	90.7	9.85
24	125.5	122.5	119.5	117.1	98.8	95.9	92.9	90.0	87.0	10.73
25	120.4	117.6	114.8	112.5	94.9	92.1	89.2	86.4	83.5	11.64
26	115.8	113.1	110.4	108.1	91.2	88.5	85.8	83.1	80.3	12.59
27	111.5	108.9	106.3	104.1	87.8	85.2	82.6	80.0	77.3	13.57
28	107.5	105.0	102.5	100.4	84.7	82.2	79.6	77.1	74.5	14.60
29	103.8	101.4	98.9	96.9	81.8	79.4	76.9	74.5	72.0	15.66
30	100.4	98.0	95.6	93.7	79.1	76.7	74.3	72.0	69.6	16.76
31	97.1	94.9	92.6	90.7	76.5	74.2	71.9	69.7	67.3	17.89
32	94.1	91.9	89.7	87.9	74.1	71.9	69.7	67.5	65.2	19.07
33	91.2	89.1	86.9	85.2	71.9	69.7	67.6	65.4	63.3	20.28
34	88.6	86.5	84.4	82.7	69.8	67.7	65.6	63.5	61.4	21.53
35	86.0	84.0	82.0	80.3	67.8	65.8	63.7	61.7	59.6	22.81
36	83.6	81.7	79.7	78.1	65.9	63.9	61.9	60.0	58.0	24.13
37	81.4	79.5	77.5	76.0	64.1	62.2	60.3	58.4	56.4	25.49
38	79.2	77.4	75.5	74.0	62.4	60.6	58.7	56.8	54.9	26.89
39	77.2	75.4	73.6	72.1	60.8	59.0	57.2	55.4	53.5	28.32
40	75.3	73.5	71.7	70.3	59.3	57.5	55.8	54.0	52.2	29.79
42	71.7	70.0	68.3	66.9	56.5	54.8	53.1	51.4	49.7	32.85
44	68.4	66.8	65.2	63.9	53.9	52.3	50.7	49.1	47.4	36.05
46	65.5	63.9	62.4	61.1	51.6	50.0	48.5	47.0	45.4	39.40
48	62.7	61.3	59.8	58.6	49.4	47.9	46.5	45.0	43.5	42.90

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



BEAMS
AMERICAN STANDARD
ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM I 24″ DATA

Notation	Nominal Depth and Flange Width—Weight per Foot								
	B 18 24″ x 7⅞″				B 1 24″ x 7″				
	120 Lbs.	115 Lbs.	110 Lbs.	105.9 Lbs.	100 Lbs.	95 Lbs.	90 Lbs.	85 Lbs.	79.9 Lbs.
ELEMENTS									
I_{1-1}	3010.8	2940.5	2869.1	2811.5	2371.8	2301.5	2230.1	2159.8	2087.2
S_{1-1}	250.9	245.0	239.1	234.3	197.6	191.8	185.8	180.0	173.9
I_{2-2}	84.9	82.8	80.6	78.9	48.4	47.0	45.5	44.2	42.9
S_{2-2}	21.1	20.7	20.3	20.0	13.4	13.0	12.8	12.5	12.2
DIMENSIONS AND GAGES IN INCHES									
d	24	24	24	24	24	24	24	24	24
b	8 1/16	8	7 15/16	7 7/8	7 1/4	7 3/16	7 1/8	7 1/16	7
t	13/16	3/4	11/16	5/8	3/4	11/16	5/8	9/16	1/2
p	1 1/8	1 1/8	1 1/8	1 1/8	7/8	7/8	7/8	7/8	7/8
a	3 5/8	3 5/8	3 5/8	3 5/8	3 1/4	3 1/4	3 1/4	3 1/4	3 1/4
Grip	1 1/8	1 1/8	1 1/8	1 1/8	7/8	7/8	7/8	7/8	7/8
f	20 1/4	20 1/4	20 1/4	20 1/4	20 3/4	20 3/4	20 3/4	20 3/4	20 3/4
o	1 7/8	1 7/8	1 7/8	1 7/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8
g usual	5	5	5	5	4	4	4	4	4
g_2	3 1/4	3 1/4	3 1/4	3 1/4	3	3	3	3	3

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

	120 Lbs.	115 Lbs.	110 Lbs.	105.9 Lbs.	100 Lbs.	95 Lbs.	90 Lbs.	85 Lbs.	79.9 Lbs.
M max	376	368	359	351	296	288	279	270	261
V max	230	212	194	180	215	198	180	162	144
L min	6.55	6.93	7.38	7.81	5.51	5.82	6.20	6.66	7.25
fb	13829	13300	12664	12068	13393	12784	12055	11209	10181
fbt	11036	9802	8548	7543	10005	8770	7522	6311	5091
B min	14.83	15.65	16.74	17.86	15.50	16.53	17.89	19.69	22.29
R max	105	93	81	72	95	83	71	60	48
RA	97	97	97	97	97	97	97	88	79
LRA	15.52	15.15	14.79	14.49	12.22	11.86	11.49	12.27	13.21
Wt.CA	36	36	36	36	36	36	36	36	36
RH	162	162	162	162	162	162	162	148	131
LRH	9.29	9.07	8.86	8.68	7.32	7.10	6.88	7.30	7.96
Wt.CH	50	50	50	50	50	50	50	50	50
Q	3011	2940	2869	2812	2371	2302	2230	2160	2087

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM 20″ LOADS

BEAMS

AMERICAN STANDARD

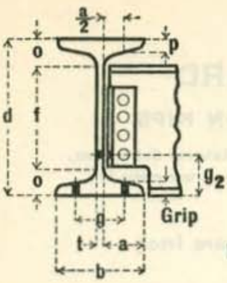
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, **see page 116**

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot								Coefficient of Deflection
	B 2 20″ x 7″					B 3 20″ x 6¼″			
	100 Lbs.	95 Lbs.	90 Lbs.	85 Lbs.	81.4 Lbs.	75 Lbs.	70 Lbs.	65.4 Lbs.	
	419.0					307.7			
5	395.6	384.0	348.5	313.4		303.2	272.2	240.0	0.47
6	329.7	319.9	310.1	300.3	288.0	252.7	242.8	233.9	0.67
7	282.6	274.2	265.8	257.4	251.4	216.6	208.1	200.5	0.91
8	247.2	239.9	232.5	225.2	219.9	189.5	182.1	175.4	1.19
9	219.8	213.3	206.7	200.2	195.5	168.5	161.9	155.9	1.51
10	197.8	192.0	186.0	180.2	176.0	151.6	145.7	140.3	1.86
11	179.8	174.5	169.1	163.8	160.0	137.8	132.5	127.6	2.25
12	164.8	160.0	155.0	150.2	146.6	126.3	121.4	116.9	2.68
13	152.2	147.7	143.1	138.6	135.3	116.6	112.1	108.0	3.15
14	141.3	137.1	132.9	128.7	125.7	108.3	104.1	100.2	3.65
15	131.9	128.0	124.0	120.1	117.3	101.1	97.1	93.6	4.19
16	123.6	120.0	116.3	112.6	110.0	94.8	91.1	87.7	4.77
17	116.4	112.9	109.4	106.0	103.5	89.2	85.7	82.6	5.38
18	109.9	106.6	103.4	100.1	97.8	84.2	80.9	78.0	6.03
19	104.1	101.0	97.9	94.8	92.6	79.8	76.7	73.9	6.72
20	98.9	96.0	93.0	90.1	88.0	75.8	72.8	70.2	7.45
21	94.2	91.4	88.6	85.8	83.8	72.2	69.4	66.8	8.21
22	89.9	87.2	84.6	81.9	80.0	68.9	66.2	63.8	9.01
23	86.0	83.5	80.9	78.3	76.5	65.9	63.3	61.0	9.85
24	82.4	80.0	77.5	75.1	73.3	63.2	60.7	58.5	10.73
25	79.1	76.8	74.4	72.1	70.4	60.6	58.3	56.1	11.64
26	76.1	73.8	71.6	69.3	67.7	58.3	56.0	54.0	12.59
27	73.3	71.1	68.9	66.7	65.2	56.2	54.0	52.0	13.57
28	70.6	68.6	66.4	64.4	62.8	54.2	52.0	50.1	14.60
29	68.2	66.2	64.2	62.1	60.7	52.3	50.2	48.4	15.66
30	65.9	64.0	62.0	60.1	58.7	50.5	48.6	46.8	16.76
31	63.8	61.9	60.0	58.1	56.8	48.9	47.0	45.3	17.89
32	61.8	60.0	58.1	56.3	55.0	47.4	45.5	43.9	19.07
33	59.9	58.2	56.4	54.6	53.3	45.9	44.2	42.5	20.28
34	58.2	56.5	54.7	53.0	51.8	44.6	42.9	41.3	21.53
35	56.5	54.8	53.2	51.5	50.3	43.3	41.6	40.1	22.81
36	54.9	53.3	51.7	50.1	48.9	42.1	40.5	39.0	24.13
37	53.5	51.9	50.3	48.7	47.6	41.0	39.4	37.9	25.49
38	52.1	50.5	49.0	47.4	46.3	39.9	38.3	36.9	26.89

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



BEAMS

AMERICAN STANDARD

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

BEAM 20" DATA

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	B 2 20" x 7"					B 3 20" x 6¼"		
	100 Lbs.	95 Lbs.	90 Lbs.	85 Lbs.	81.4 Lbs.	75 Lbs.	70 Lbs.	65.4 Lbs.
ELEMENTS								
I_{1-1}	1648.3	1599.7	1550.3	1501.7	1466.3	1263.5	1214.2	1169.5
S_{1-1}	164.8	160.0	155.0	150.2	146.6	126.3	121.4	116.9
I_{2-2}	52.4	50.5	48.7	47.0	45.8	30.1	28.9	27.9
S_{2-2}	14.4	14.0	13.7	13.3	13.1	9.4	9.2	8.9
DIMENSIONS AND GAGES IN INCHES								
d	20	20	20	20	20	20	20	20
b	7¼	7 3/16	7⅛	7 1/16	7	6⅜	6 5/16	6¼
t	⅞	13/16	¾	⅝	⅝	⅝	9/16	½
p	15/16	15/16	15/16	15/16	15/16	13/16	13/16	13/16
a	3 3/16	3 3/16	3 3/16	3 3/16	3 3/16	2⅞	2⅞	2⅞
Grip	1	1	1	1	1	¾	¾	¾
f	16½	16½	16½	16½	16½	17	17	17
o	1¾	1¾	1¾	1¾	1¾	1½	1½	1½
g min	2¾	2¾	2¾	2½	2½	2½	2⅜	2⅜
g usual	4	4	4	4	4	4	4	4
g_2	3¼	3¼	3¼	3¼	3¼	3	3	3

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.								
M max	247	240	233	225	220	189	182	175
V max	210	192	174	157	144	154	136	120
L min	4.72	5.00	5.34	5.75	6.11	4.93	5.35	5.85
fb	15000	14896	14366	13713	13135	13589	12723	11739
fbt	13095	11917	10430	8955	7881	8711	7214	5870
B min	11.00	11.11	11.71	12.50	13.27	12.66	13.86	15.44
R max	111	101	89	76	67	74	61	50
RA	81	81	81	81	79	81	74	66
LRA	12.21	11.85	11.48	11.13	11.13	9.36	9.84	10.63
Wt.CA	30	30	30	30	30	30	30	30
RH	130	130	130	130	126	130	119	105
LRH	7.61	7.38	7.15	6.93	6.98	5.83	6.12	6.68
Wt.CH	41	41	41	41	41	41	41	41
Q	1978	1920	1860	1802	1759	1516	1457	1403

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
R max = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
· Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
18″
LOADS

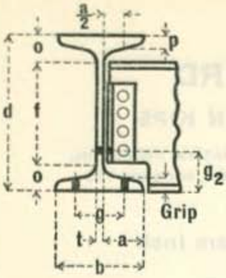
BEAMS
AMERICAN STANDARD
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot								Coefficient of Deflection
	B 19 18″ x 7″		Ⓒ			B 4 18″ x 6″			
	90 Lbs.	85 Lbs.	80 Lbs.	75.6 Lbs.	70 Lbs.	65 Lbs.	60 Lbs.	54.7 Lbs.	
					307.2				
4	343.9				305.8	271.7	236.3		0.30
5	335.1				244.7	234.0	223.4		0.47
		308.4	273.0					198.7	
6	279.2	270.4	261.5	241.9	203.9	195.0	186.2	176.8	0.67
7	239.3	231.7	224.1	217.5	174.8	167.2	159.6	151.5	0.91
8	209.4	202.8	196.1	190.3	152.9	146.3	139.6	132.6	1.19
9	186.1	180.2	174.3	169.2	135.9	130.0	124.1	117.9	1.51
10	167.5	162.2	156.9	152.2	122.3	117.0	111.7	106.1	1.86
11	152.3	147.5	142.6	138.4	111.2	106.4	101.6	96.4	2.25
12	139.6	135.2	130.8	126.9	101.9	97.5	93.1	88.4	2.68
13	128.9	124.8	120.7	117.1	94.1	90.0	85.9	81.6	3.15
14	119.7	115.9	112.1	108.7	87.4	83.6	79.8	75.8	3.65
15	111.7	108.1	104.6	101.5	81.6	78.0	74.5	70.7	4.19
16	104.7	101.4	98.1	95.1	76.5	73.1	69.8	66.3	4.77
17	98.6	95.4	92.3	89.6	72.0	68.8	65.7	62.4	5.38
18	93.1	90.1	87.2	84.6	68.0	65.0	62.1	58.9	6.03
19	88.2	85.4	82.6	80.1	64.4	61.6	58.8	55.8	6.72
20	83.8	81.1	78.5	76.1	61.2	58.5	55.9	53.0	7.45
21	79.8	77.3	74.7	72.5	58.3	55.7	53.2	50.5	8.21
22	76.2	73.7	71.3	69.2	55.6	53.2	50.8	48.2	9.01
23	72.8	70.5	68.2	66.2	53.2	50.9	48.6	46.1	9.85
24	69.8	67.6	65.4	63.4	51.0	48.8	46.5	44.2	10.73
25	67.0	64.9	62.8	60.9	48.9	46.8	44.7	42.4	11.64
26	64.4	62.4	60.4	58.6	47.1	45.0	43.0	40.8	12.59
27	62.1	60.1	58.1	56.4	45.3	43.3	41.4	39.3	13.57
28	59.8	57.9	56.0	54.4	43.7	41.8	39.9	37.9	14.60
29	57.8	55.9	54.1	52.5	42.2	40.4	38.5	36.6	15.66
30	55.8	54.1	52.3	50.7	40.8	39.0	37.2	35.4	16.76
31	54.0	52.3	50.6	49.1	39.5	37.8	36.0	34.2	17.89
32	52.4	50.7	49.0	47.6	38.2	36.6	34.9	33.1	19.07
33	50.8	49.2	47.5	46.1	37.1	35.5	33.8	32.1	20.28
34	49.3	47.7	46.2	44.8	36.0	34.4	32.9	31.2	21.53
35	47.9	46.4	44.8	43.5	35.0	33.4	31.9	30.3	22.81

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.
Ⓒ Carnegie Steel Company only.



BEAMS

AMERICAN STANDARD

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

BEAM 18″ DATA

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot							
	B 19 18″ x 7″ [C]				B 4 18″ x 6″			
	90 Lbs.	85 Lbs.	80 Lbs.	75.6 Lbs.	70 Lbs.	65 Lbs.	60 Lbs.	54.7 Lbs.
ELEMENTS								
I_{1-1}	1256.5	1216.6	1176.8	1141.8	917.5	877.7	837.8	795.5
S_{1-1}	139.6	135.2	130.8	126.9	101.9	97.5	93.1	88.4
I_{2-2}	51.9	49.8	47.9	46.3	24.5	23.4	22.3	21.2
S_{2-2}	14.3	14.0	13.6	13.2	7.8	7.6	7.3	7.1
DIMENSIONS AND GAGES IN INCHES								
d	18	18	18	18	18	18	18	18
b	7¼	7⅛	7$\frac{1}{16}$	7	6¼	6$\frac{3}{16}$	6$\frac{1}{16}$	6
t	$\frac{13}{16}$	$\frac{11}{16}$	⅝	$\frac{9}{16}$	$\frac{11}{16}$	⅝	$\frac{9}{16}$	$\frac{7}{16}$
p	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{11}{16}$
a	3¼	3¼	3¼	3¼	2¾	2¾	2¾	2¾
Grip	1	1	1	1	¾	¾	¾	¾
f	14½	14½	14½	14½	15¼	15¼	15¼	15¼
o	1¾	1¾	1¾	1¾	1⅜	1⅜	1⅜	1⅜
g min	2½	2½	2½	2½	2⅜	2⅜	2¼	2¼
g usual	4	4	4	4	3½	3½	3½	3½
g_2	3¼	3¼	3¼	3¼	2¾	2¾	2¾	2¾
f and o—Provide usual working clearances.								
MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.								
M max	209	203	196	190	153	146	140	133
V max	172	154	137	121	154	136	118	99
L min	4.87	5.26	5.75	6.29	3.98	4.31	4.73	5.34
fb	15000	14854	14169	13389	14832	14140	13226	11917
fbt	11940	10606	8955	7498	10546	8894	7235	5482
B min	9.90	10.04	10.74	11.63	10.06	10.78	11.83	13.63
R max	96	85	72	60	84	71	58	44
RA	65	65	65	59	65	65	58	48
LRA	12.89	12.48	12.06	12.91	9.41	9.00	9.63	11.05
Wt.CA	21	21	21	21	21	21	21	21
RH	130	130	130	118	130	130	115	97
LRH	6.44	6.24	6.04	6.45	4.70	4.50	4.86	5.47
Wt.CH	30	30	30	30	30	30	30	30
Q	1675	1622	1570	1523	1223	1170	1117	1061

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
R max = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA,LRH = Min. Span in Feet to develop RA or RH.
Wt.CA,CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

[C] Carnegie Steel Company only.

BEAM 15″ LOADS

BEAMS

AMERICAN STANDARD

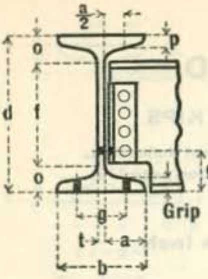
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot									Coefficient of Deflection
	B 5 15″ x 6⅜″					B 6 15″ x 6″				
	100 Lbs.	95 Lbs.	90 Lbs.	85 Lbs.	81.3 Lbs.	75 Lbs.	70 Lbs.	65 Lbs.	60.8 Lbs.	
	420.1	384.5	349.2			312.5	277.2			
4	356.9	345.8	344.8	313.9	288.0	274.9	263.8	241.9	212.4	0.30
5	285.6	276.6	267.8	259.0	252.5	219.9	211.1	202.3	194.9	0.47
6	238.0	230.5	223.2	215.8	210.4	183.3	175.9	168.5	162.4	0.67
7	204.0	197.6	191.3	185.0	180.4	157.1	150.8	144.5	139.2	0.91
8	178.5	172.9	167.4	161.9	157.8	137.4	131.9	126.4	121.8	1.19
9	158.6	153.7	148.8	143.9	140.3	122.2	117.3	112.4	108.3	1.51
10	142.8	138.3	133.9	129.5	126.3	110.0	105.5	101.1	97.4	1.86
11	129.8	125.7	121.7	117.7	114.8	100.0	95.9	91.9	88.6	2.25
12	119.0	115.3	111.6	107.9	105.2	91.6	88.0	84.3	81.2	2.68
13	109.8	106.4	103.0	99.6	97.1	84.6	81.2	77.8	75.0	3.15
14	102.0	98.8	95.7	92.5	90.2	78.5	75.4	72.2	69.6	3.65
15	95.2	92.2	89.3	86.3	84.2	73.3	70.4	67.4	65.0	4.19
16	89.2	86.5	83.7	80.9	78.9	68.7	66.0	63.2	60.9	4.77
17	84.0	81.4	78.8	76.2	74.3	64.7	62.1	59.5	57.3	5.38
18	79.3	76.8	74.4	71.9	70.1	61.1	58.6	56.2	54.1	6.03
19	75.1	72.8	70.5	68.2	66.4	57.9	55.5	53.2	51.3	6.72
20	71.4	69.2	67.0	64.8	63.1	55.0	52.8	50.6	48.7	7.45
21	68.0	65.9	63.8	61.7	60.1	52.4	50.3	48.2	46.4	8.21
22	64.9	62.9	60.9	58.9	57.4	50.0	48.0	46.0	44.3	9.01
23	62.1	60.1	58.2	56.3	54.9	47.8	45.9	44.0	42.4	9.85
24	59.5	57.6	55.8	54.0	52.6	45.8	44.0	42.1	40.6	10.73
25	57.1	55.3	53.6	51.8	50.5	44.0	42.2	40.5	39.0	11.64
26	54.9	53.2	51.5	49.8	48.6	42.3	40.6	38.9	37.5	12.59
27	52.9	51.2	49.6	48.0	46.8	40.7	39.1	37.5	36.1	13.57
28	51.0	49.4	47.8	46.3	45.1	39.3	37.7	36.1	34.8	14.60
29	49.2	47.7	46.2	44.7	43.5	37.9	36.4	34.9	33.6	15.66

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



BEAMS

AMERICAN STANDARD

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM
I 15″
DATA

Notation	Nominal Depth and Flange Width—Weight per Foot								
	B 5 15″ x 6¾″					B 6 15″ x 6″			
	100 Lbs.	95 Lbs.	90 Lbs.	85 Lbs.	81.3 Lbs.	75 Lbs.	70 Lbs.	65 Lbs.	60.8 Lbs.
ELEMENTS									
I_{1-1}	892.4	864.5	837.0	809.4	789.1	687.2	659.6	632.1	609.0
S_{1-1}	**119.0**	**115.3**	**111.6**	**107.9**	**105.2**	**91.6**	**87.9**	**84.3**	**81.2**
I_{2-2}	50.2	47.7	45.2	42.9	41.3	30.6	28.8	27.2	26.0
S_{2-2}	14.8	14.3	13.8	13.3	12.9	9.8	9.3	8.9	8.7
DIMENSIONS AND GAGES IN INCHES									
d	15	15	15	15	15	15	15	15	15
b	6¾	6 11/16	6 9/16	6½	6⅜	6¼	6 3/16	6 1/16	6
t	1 3/16	1 1/16	1	⅞	13/16	⅞	¾	11/16	9/16
p	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	13/16	13/16	13/16	13/16
a	2 13/16	2 13/16	2 13/16	2 13/16	2 13/16	2 11/16	2 11/16	2 11/16	2 11/16
Grip	1	1	1	1	1	⅞	⅞	⅞	⅞
f	11	11	11	11	11	11¾	11¾	11¾	11¾
o	2	2	2	2	2	1⅝	1⅝	1⅝	1⅝
g usual	4	4	4	4	4	3½	3½	3½	3½
g_2	3¼	3¼	3¼	3¼	3¼	3	3	3	3

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	179	173	167	162	158	137	132	126	122
V max	210	192	175	157	144	156	139	121	106
L min	3.40	3.60	3.84	4.12	4.38	3.52	3.81	4.18	4.59
fb	15000	15000	15000	15000	15000	15000	15000	15000	14810
fbt	17505	16020	14550	13080	12000	13020	11550	10080	8738
B min	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.40
R max	127	116	105	95	87	94	84	73	63
RA	65	65	65	65	65	65	65	65	62
LRA	10.98	10.64	10.30	9.96	9.71	8.46	8.11	7.78	7.86
Wt.CA	21	21	21	21	21	21	21	21	21
RH	130	130	130	130	130	130	130	130	124
LRH	5.49	5.32	5.15	4.98	4.86	4.23	4.06	3.89	3.93
Wt.CH	30	30	30	30	30	30	30	30	30
Q	1428	1384	1339	1295	1262	1099	1055	1012	974

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
R max = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = $12\ S_{1-1}$.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
15″
12″
LOADS

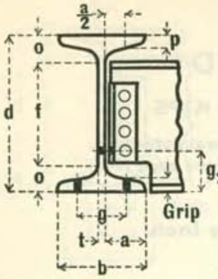
BEAMS
AMERICAN STANDARD
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot								Coefficient of Deflection
	B 7 15″ x 5½″				B 8 12″ x 5¼″				
	55 Lbs.	50 Lbs.	45 Lbs.	42.9 Lbs.	55 Lbs.	50 Lbs.	45 Lbs.	40.8 Lbs.	
					233.3				
3	233.3	198.0			212.9	197.9	162.7		0.17
4	203.5	192.5	162.7	147.6	159.7	150.8	142.0	132.5	0.30
5	162.8	154.0	145.1	141.4	127.7	120.7	113.6	107.6	0.47
6	135.7	128.3	120.9	117.8	106.5	100.5	94.7	89.7	0.67
7	116.3	110.0	103.6	101.0	91.3	86.2	81.2	76.8	0.91
8	101.7	96.2	90.7	88.4	79.8	75.4	71.0	67.2	1.19
9	90.4	85.5	80.6	78.5	71.0	67.0	63.1	59.8	1.51
10	81.4	77.0	72.6	70.7	63.9	60.3	56.8	53.8	1.86
11	74.0	70.0	66.0	64.3	58.1	54.8	51.6	48.9	2.25
12	67.8	64.2	60.5	58.9	53.2	50.3	47.3	44.8	2.68
13	62.6	59.2	55.8	54.4	49.1	46.4	43.7	41.4	3.15
14	58.1	55.0	51.8	50.5	45.6	43.1	40.6	38.4	3.65
15	54.3	51.3	48.4	47.1	42.6	40.2	37.9	35.9	4.19
16	50.9	48.1	45.3	44.2	39.9	37.7	35.5	33.6	4.77
17	47.9	45.3	42.7	41.6	37.6	35.5	33.4	31.6	5.38
18	45.2	42.8	40.3	39.3	35.5	33.5	31.6	29.9	6.03
19	42.8	40.5	38.2	37.2	33.6	31.8	29.9	28.3	6.72
20	40.7	38.5	36.3	35.3	31.9	30.2	28.4	26.9	7.45
21	38.8	36.7	34.5	33.7	30.4	28.7	27.1	25.6	8.21
22	37.0	35.0	33.0	32.1	29.0	27.4	25.8	24.4	9.01
23	35.4	33.5	31.5	30.7	27.8	26.2	24.7	23.4	9.85
24	33.9	32.1	30.2	29.5	26.6	25.1	23.7	22.4	10.73
25	32.6	30.8	29.0	28.3					11.64
26	31.3	29.6	27.9	27.2					12.59
27	30.1	28.5	26.9	26.2					13.57
28	29.1	27.5	25.9	25.2					14.60
29	28.1	26.5	25.0	24.4					15.66

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



BEAMS
AMERICAN STANDARD
ESSENTIAL DATA

BEAM I 15″ 12″ DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	B 7 15″ x 5½″				B 8 12″ x 5¼″			
	Nominal Depth and Flange Width—Weight per Foot							
	55 Lbs.	50 Lbs.	45 Lbs.	42.9 Lbs.	55 Lbs.	50 Lbs.	45 Lbs.	40.8 Lbs.
ELEMENTS								
I_{1-1}	508.7	481.1	453.6	441.8	319.3	301.6	284.1	268.9
S_{1-1}	67.8	64.2	60.5	58.9	53.2	50.3	47.3	44.8
I_{2-2}	17.0	16.0	15.0	14.6	17.3	16.0	14.8	13.8
S_{2-2}	5.9	5.7	5.4	5.3	6.2	5.8	5.5	5.3
DIMENSIONS AND GAGES IN INCHES								
d	15	15	15	15	12	12	12	12
b	5¾	5⅝	5 9/16	5½	5⅝	5½	5⅜	5¼
t	⅝	9/16	7/16	7/16	13/16	11/16	9/16	7/16
p	⅝	⅝	⅝	⅝	11/16	11/16	11/16	11/16
a	2 9/16	2 9/16	2 9/16	2 9/16	2⅜	2⅜	2⅜	2⅜
Grip	⅝	⅝	⅝	⅝	¾	¾	¾	¾
f	12½	12½	12½	12½	9¼	9¼	9¼	9¼
o	1¼	1¼	1¼	1¼	1⅜	1⅜	1⅜	1⅜
g usual	3½	3½	3½	3½	3½	3½	3	3
g_2	2¾	2¾	2¾	2¾	2¾	2¾	2¾	2¾

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	102	96	91	88	80	75	71	67
V max	117	99	81	74	117	99	81	66
L min	3.49	3.89	4.46	4.79	2.74	3.05	3.49	4.06
fb	15000	14423	13166	12446	15000	15000	15000	14672
fbt	9720	7933	5951	5103	12150	10305	8475	6749
B min	8.25	8.73	9.92	10.71	6.60	6.60	6.60	6.82
R max	70	58	43	37	79	67	55	44
RA	65	58	47	43	49	49	45	36
LRA	6.26	6.64	7.72	8.22	6.51	6.16	6.31	7.47
Wt.CA	21	21	21	21	15	15	15	15
RH	130	116	95	86	97	97	89	72
LRH	3.13	3.32	3.82	4.11	3.29	3.11	3.19	3.73
Wt.CH	30	30	30	30	22	22	22	22
Q	814	770	726	707	638	604	568	538

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA,LRH = Min. Span in Feet to develop RA or RH.
Wt.CA,CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
12″
10″
LOADS

BEAMS

AMERICAN STANDARD

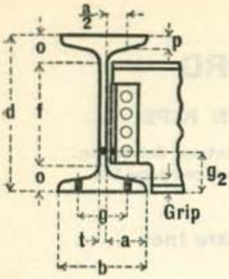
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot						Coefficient of Deflection
	B 9 12″ x 5″		B 10 10″ x 4⅝″				
	35 Lbs.	31.8 Lbs.	40 Lbs.	35 Lbs.	30 Lbs.	25.4 Lbs.	
			177.8	142.6	107.3		
3	123.3		126.4	116.6	106.8	74.4	0.17
4	113.5	100.8	94.8	87.5	80.1	73.3	0.30
5	90.8	86.3	75.8	70.0	64.1	58.6	0.47
6	75.7	71.9	63.2	58.3	53.4	48.8	0.67
7	64.9	61.7	54.2	50.0	45.8	41.9	0.91
8	56.8	54.0	47.4	43.7	40.1	36.6	1.19
9	50.5	48.0	42.1	38.9	35.6	32.6	1.51
10	45.4	43.2	37.9	35.0	32.0	29.3	1.86
11	41.3	39.2	34.5	31.8	29.1	26.6	2.25
12	37.8	36.0	31.6	29.2	26.7	24.4	2.68
13	34.9	33.2	29.2	26.9	24.6	22.5	3.15
14	32.4	30.8	27.1	25.0	22.9	20.9	3.65
15	30.3	28.8	25.3	23.3	21.4	19.5	4.19
16	28.4	27.0	23.7	21.9	20.0	18.3	4.77
17	26.7	25.4	22.3	20.6	18.8	17.2	5.38
18	25.2	24.0	21.1	19.4	17.8	16.3	6.03
19	23.9	22.7	20.0	18.4	16.9	15.4	6.72
20	22.7	21.6	19.0	17.5	16.0	14.7	7.45
21	21.6	20.6					8.21
22	20.6	19.6					9.01
23	19.7	18.8					9.85
24	18.9	18.0					10.73

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



BEAMS

AMERICAN STANDARD

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM
12″
10″
DATA

Notation	B 9 12″ x 5″ 35 Lbs.	31.8 Lbs.	B 10 10″ x 4⅝″ 40 Lbs.	35 Lbs.	30 Lbs.	25.4 Lbs.
ELEMENTS						
I_{1-1}	227.0	215.8	158.0	145.8	133.5	122.1
S_{1-1}	37.8	36.0	31.6	29.2	26.7	24.4
I_{2-2}	10.0	9.5	9.4	8.5	7.6	6.9
S_{2-2}	3.9	3.8	3.7	3.4	3.2	3.0
DIMENSIONS AND GAGES IN INCHES						
d	12	12	10	10	10	10
b	5 1/16	5	5 1/16	4 15/16	4 13/16	4 11/16
t	7/16	3/8	3/4	5/8	7/16	5/16
p	9/16	9/16	1/2	1/2	1/2	1/2
a	2 5/16	2 5/16	2 3/16	2 3/16	2 3/16	2 3/16
Grip	9/16	9/16	1/2	1/2	1/2	1/2
f	9 3/4	9 3/4	8	8	8	8
o	1 1/8	1 1/8	1	1	1	1
g usual	3	3	2 3/4	2 3/4	2 3/4	2 3/4
g_2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.						
M max	57	54	47	44	40	37
V max	62	50	89	71	54	37
L min	3.68	4.28	2.13	2.45	2.99	3.94
fb	14263	12933	15000	15000	15000	13364
fbt	6105	4527	11115	8910	6705	4143
B min	7.10	8.13	5.50	5.50	5.50	6.48
R max	40	29	67	53	40	25
RA	34	28	65	62	47	33
LRA	6.67	7.71	2.92	2.83	3.41	4.44
Wt.CA	15	15	15	15	15	15
RH	67	55				
LRH	3.39	3.93				
Wt.CH	30	30	30	30	30	30
Q	454	432	379	350	320	293

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA,LRH = Min. Span in Feet to develop RA or RH.
Wt.CA,CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM 9" LOADS

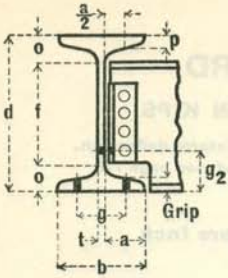
BEAMS
AMERICAN STANDARD
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection. For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	*B 40N 9" x 5¼" Ⓒ		B 11 9" x 4⅜"				Coefficient of Deflection
	23 Lbs.	20 Lbs.	35 Lbs.	30 Lbs.	25 Lbs.	21.8 Lbs.	
			156.4				
2			148.4	121.2	85.8		0.07
3	68.3		98.9	90.1	81.3	62.6	0.17
4	61.2	47.1	74.2	67.6	60.9	56.6	0.30
5	49.0	45.6	59.4	54.1	48.8	45.3	0.47
6	40.8	38.0	49.5	45.1	40.6	37.7	0.67
7	35.0	32.6	42.4	38.6	34.8	32.4	0.91
8	30.6	28.5	37.1	33.8	30.5	28.3	1.19
9	27.2	25.3	33.0	30.0	27.1	25.2	1.51
10	24.5	22.8	29.7	27.0	24.4	22.6	1.86
11	22.3	20.7	27.0	24.6	22.2	20.6	2.25
12	20.4	19.0	24.7	22.5	20.3	18.9	2.68
13	18.8	17.5	22.8	20.8	18.8	17.4	3.15
14	17.5	16.3	21.2	19.3	17.4	16.2	3.65
15	16.3	15.2	19.8	18.0	16.3	15.1	4.19
16	15.3	14.3	18.5	16.9	15.2	14.2	4.77
17	14.4	13.4	17.5	15.9	14.3	13.3	5.38
18	13.6	12.7	16.5	15.0	13.5	12.6	6.03
19	12.9	12.0	15.6	14.2	12.8	11.9	6.72

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.
*B 40N, 9" Beam, is a Standard Mill Section, not American Standard.
ⒸCarnegie Steel Company only.



BEAMS

AMERICAN STANDARD

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM I 9" DATA

Notation	Nominal Depth and Flange Width—Weight per Foot					
	*B 40N Ⓒ 9" x 5¼"		B 11 9" x 4⅜"			
	23 Lbs.	20 Lbs.	35 Lbs.	30 Lbs.	25 Lbs.	21.8 Lbs.
ELEMENTS						
I_{1-1}	91.6	85.6	111.3	101.4	91.4	84.9
S_{1-1}	20.4	19.0	24.7	22.5	20.3	18.9
I_{2-2}	8.4	7.9	7.3	6.4	5.6	5.2
S_{2-2}	3.2	3.0	3.0	2.8	2.5	2.4
DIMENSIONS AND GAGES IN INCHES						
d	9	9	9	9	9	9
b	5 5/16	5 3/16	4¾	4⅝	4 7/16	4 5/16
t	5/16	3/16	¾	9/16	⅜	5/16
p	⅜	⅜	7/16	7/16	7/16	7/16
a	2½	2½	2	2	2	2
Grip	⅜	⅜	½	½	½	½
f	7½	7½	7	7	7	7
o	¾	¾	1	1	1	1
g usual	3	3	2½	2½	2½	2½
g_2	2¼	2¼	2½	2½	2½	2½

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.						
M max	31	29	37	34	30	28
V max	34	24	78	61	43	31
L min	3.59	4.84	1.90	2.23	2.84	3.62
fb	14169	11478	15000	15000	15000	13626
fbt	4477	2502	10860	8415	5955	3952
B min	5.37	7.16	4.95	4.95	4.95	5.68
R max	26	14	62	48	34	23
RA	33	23	65	59	42	30
LRA	3.71	4.96	2.28	2.29	2.90	3.78
Wt.CA	15	15	15	15	15	15
Q	245	228	296	270	244	227

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

*B 40N, 9" Beam, is a Standard Mill Section, not American Standard.

Ⓒ Carnegie Steel Company only.

BEAM
8″
7″
LOADS

BEAMS

AMERICAN STANDARD

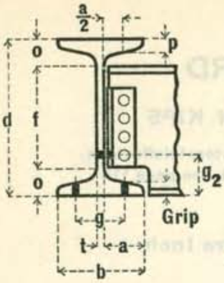
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot										Coefficient of Deflection
	*B 39N 8″ x 5″ ©			B 12 8″ x 4″				B 13 7″ x 3⅝″			
	21 Lbs.	19 Lbs.	17 Lbs.	25.5 Lbs.	23 Lbs.	20.5 Lbs.	18.4 Lbs.	20 Lbs.	17.5 Lbs.	15.3 Lbs.	
								75.6			
2	69.1			102.1	84.7	67.0		71.9	58.0	42.0	0.07
3	63.6	55.1		68.1	64.2	60.2	51.8	47.9	44.5	41.4	0.17
4	47.7	45.3	40.9	51.0	48.1	45.2	42.7	36.0	33.4	31.1	0.30
5	38.2	36.2	34.3	40.8	38.5	36.1	34.1	28.8	26.7	24.8	0.47
6	31.8	30.2	28.6	34.0	32.1	30.1	28.4	24.0	22.3	20.7	0.67
7	27.3	25.9	24.5	29.2	27.5	25.8	24.4	20.5	19.1	17.7	0.91
8	23.9	22.7	21.5	25.5	24.1	22.6	21.3	18.0	16.7	15.5	1.19
9	21.2	20.1	19.6	22.7	21.4	20.1	19.0	16.0	14.8	13.8	1.51
10	19.1	18.1	17.2	20.4	19.3	18.1	17.1	14.4	13.4	12.4	1.86
11	17.3	16.5	15.6	18.6	17.5	16.4	15.5	13.1	12.1	11.3	2.25
12	15.9	15.1	14.3	17.0	16.0	15.1	14.2	12.0	11.1	10.4	2.68
13	14.7	13.9	13.2	15.7	14.8	13.9	13.1	11.1	10.3	9.6	3.15
14	13.6	12.9	12.3	14.6	13.7	12.9	12.2	10.3	9.5	8.9	3.65
15	12.7	12.1	11.4	13.6	12.8	12.0	11.4	9.6	8.9	8.3	4.19
16	11.9	11.3	10.7	12.8	12.0	11.3	10.7				4.77
17	11.2	10.7	10.1	12.0	11.3	10.6	10.0				5.38

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.
*B 39N, 8″ Beam, is a Standard Mill Section, not American Standard.
© Carnegie Steel Company only.



BEAMS

AMERICAN STANDARD

ESSENTIAL DATA

Maximum Shear 12,000 Pounds Per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM
8″
7″
DATA

Notation	Nominal Depth and Flange Width—Weight per Foot									
	*B 39N © 8″ x 5″			B 12 8″ x 4″				B 13 7″ x 3⅝″		
	21 Lbs.	19 Lbs.	17 Lbs.	25.5 Lbs.	23 Lbs.	20.5 Lbs.	18.4 Lbs.	20 Lbs.	17.5 Lbs.	15.3 Lbs.
ELEMENTS										
I_{1-1}	63.4	60.3	57.2	68.1	64.2	60.2	56.9	41.9	38.9	36.2
S_{1-1}	15.9	15.1	14.3	17.0	16.0	15.1	14.2	12.0	11.1	10.4
I_{2-2}	6.6	6.3	6.0	4.7	4.4	4.0	3.8	3.1	2.9	2.7
S_{2-2}	2.6	2.5	2.4	2.2	2.1	2.0	1.9	1.6	1.6	1.5
DIMENSIONS AND GAGES IN INCHES										
d	8	8	8	8	8	8	8	7	7	7
b	5⅛	5 1/16	4 15/16	4¼	4 3/16	4 1/16	4	3⅞	3¾	3 11/16
t	⅜	5/16	3/16	9/16	7/16	⅜	¼	7/16	⅜	¼
p	5/16	5/16	5/16	7/16	7/16	7/16	7/16	⅜	⅜	⅜
a	2⅜	2⅜	2⅜	1⅞	1⅞	1⅞	1⅞	1 11/16	1 11/16	1 11/16
Grip	5/16	5/16	5/16	½	7/16	7/16	7/16	⅜	⅜	⅜
f	6⅝	6⅝	6⅝	6¼	6¼	6¼	6¼	5¼	5¼	5¼
o	11/16	11/16	11/16	⅞	⅞	⅞	⅞	⅞	⅞	⅞
g usual	3	3	3	2¼	2¼	2¼	2¼	2¼	2¼	2¼
g_2	2¼	2¼	2¼	2¼	2¼	2¼	2¼	2	2	2

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	24	23	21	26	24	23	21	18	17	16
V max	35	28	20	51	42	34	26	38	29	21
L min	2.76	3.29	4.20	2.00	2.27	2.70	3.29	1.90	2.30	2.96
fb	15000	14297	12243	15000	15000	15000	13925	15000	15000	14271
fbt	5400	4103	2608	7980	6615	5235	3760	6750	5175	3568
a min	4.40	4.72	5.84	4.40	4.40	4.40	4.89	3.85	3.85	4.14
R max	30	23	14	44	36	29	21	35	27	19
RA	38	30	22	56	46	37	28	24	18	13
LRA	2.51	3.02	3.90	1.82	2.09	2.45	3.04	3.00	3.70	4.80
Wt.CA	15	15	15	15	15	15	15	8	8	8
Q	191	181	172	204	192	181	170	144	133	125

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
a min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when a = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

*B 39N, 8″ Beam, is a Standard Mill Section, not American Standard.

© Carnegie Steel Company only.

BEAM
6″
5″
LOADS

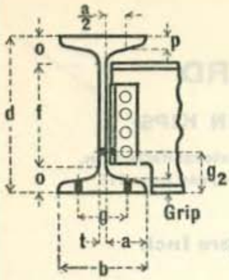
BEAMS
AMERICAN STANDARD
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span In Feet	Nominal Depth and Flange Width—Weight per Foot						Coefficient of Deflection
	B 14 6″ x 3⅜″			B 15 5″ x 3″			
	17.25 Lbs.	14.75 Lbs.	12.5 Lbs.	14.75 Lbs.	12.25 Lbs.	10 Lbs.	
	67.0	49.4		59.3	41.6		
2	52.0	47.6	33.1	36.1	32.4	25.2	0.07
3	34.7	31.8	29.0	24.1	21.6	19.3	0.17
4	26.0	23.8	21.8	18.1	16.2	14.5	0.30
5	20.8	19.1	17.4	14.4	13.0	11.6	0.47
6	17.3	15.9	14.5	12.0	10.8	9.7	0.67
7	14.9	13.6	12.4	10.3	9.3	8.3	0.91
8	13.0	11.9	10.9	9.0	8.1	7.3	1.19
9	11.6	10.6	9.7	8.0	7.2	6.4	1.51
10	10.4	9.5	8.7	7.2	6.5	5.8	1.86
11	9.5	8.7	7.9	6.6	5.9	5.3	2.25
12	8.7	7.9	7.3				2.68
13	8.0	7.3	6.7				3.15

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



BEAMS

AMERICAN STANDARD

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM 6″ 5″ DATA

Notation	Nominal Depth and Flange Width—Weight per Foot					
	B 14 6″ x 3⅜″			B 15 5″ x 3″		
	17.25 Lbs.	14.75 Lbs.	12.5 Lbs.	14.75 Lbs.	12.25 Lbs.	10.0 Lbs.
	ELEMENTS					
I_{1-1}	26.0	23.8	21.8	15.0	13.5	12.1
S_{1-1}	8.7	7.9	7.3	6.0	5.4	4.8
I_{2-2}	2.3	2.1	1.8	1.7	1.4	1.2
S_{2-2}	1.3	1.2	1.1	1.0	0.91	0.82
	DIMENSIONS AND GAGES IN INCHES					
d	6	6	6	5	5	5
b	3 9/16	3 7/16	3 5/16	3 5/16	3 1/8	3
t	7/16	3/8	1/4	1/2	3/8	3/16
p	3/8	3/8	3/8	5/16	5/16	5/16
a	1 9/16	1 9/16	1 9/16	1 3/8	1 3/8	1 3/8
Grip	3/8	3/8	3/8	3/8	3/8	3/8
f	4 1/2	4 1/2	4 1/2	3 1/2	3 1/2	3 1/2
o	3/4	3/4	3/4	3/4	3/4	3/4
g usual	2	2	2	1 3/4	1 3/4	1 3/4
g_2	2	2	2	2	2	2

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	13	12	11	9.0	8.1	7.2
V max	33	25	17	30	21	13
L min	1.55	1.93	2.63	1.22	1.56	2.30
fb	15000	15000	14672	15000	15000	15000
fbt	6975	5145	3375	7410	5205	3150
B min	3.30	3.30	3.43	2.75	2.75	2.75
R max	35	26	17	35	25	15
RA	24	18	12	26	18	11
LRA	2.18	2.63	3.65	1.38	1.80	2.62
Wt.CA	8	8	8	8	8	8
Q	104	95	88	72	65	58

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
4"
3"
LOADS

BEAMS

AMERICAN STANDARD

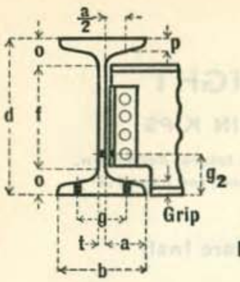
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot							Coefficient of Deflection
	B 16 4" x 2⅝"				B 17 3" x 2⅜"			
	10.5 Lbs.	9.5 Lbs.	8.5 Lbs.	7.7 Lbs.	7.5 Lbs.	6.5 Lbs.	5.7 Lbs.	
					25.1			
1	38.4	31.3	24.3	18.2	23.1	18.1	12.2	0.02
2	21.3	20.1	18.9	17.9	11.5	10.7	9.9	0.07
3	14.2	13.4	12.6	11.9	7.7	7.1	6.6	0.17
4	10.6	10.0	9.5	8.9	5.8	5.3	5.0	0.30
5	8.5	8.0	7.6	7.2	4.6	4.3	4.0	0.47
					3.9	3.6	3.3	
6	7.1	6.7	6.3	6.0	3.3	3.0	2.8	0.67
7	6.1	5.7	5.4	5.1	2.9	2.7	2.5	0.91
8	5.3	5.0	4.7	4.5				1.19
9	4.7	4.5	4.2	4.0				1.51
10	4.3	4.0	3.8	3.6				1.86

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



BEAMS
AMERICAN STANDARD
ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM 4" 3" DATA

Notation	Nominal Depth and Flange Width—Weight per Foot						
	B 16 4" x 2 5/8"				B 17 3" x 2 3/8"		
	10.5 Lbs.	9.5 Lbs.	8.5 Lbs.	7.7 Lbs.	7.5 Lbs.	6.5 Lbs.	5.7 Lbs.
ELEMENTS							
I_{1-1}	7.1	6.7	6.3	6.0	2.9	2.7	2.5
S_{1-1}	3.5	3.3	3.2	3.0	1.9	1.8	1.7
I_{2-2}	1.0	0.91	0.83	0.77	0.59	0.51	0.46
S_{2-2}	0.70	0.65	0.61	0.58	0.47	0.43	0.40
DIMENSIONS AND GAGES IN INCHES							
d	4	4	4	4	3	3	3
b	2 7/8	2 13/16	2 3/4	2 11/16	2 1/2	2 7/16	2 5/16
t	3/8	5/16	1/4	3/16	3/8	1/4	3/16
p	5/16	5/16	5/16	5/16	1/4	1/4	1/4
a	1 1/4	1 1/4	1 1/4	1 1/4	1 1/16	1 1/16	1 1/16
Grip	5/16	5/16	5/16	5/16	5/16	5/16	5/16
f	2 3/4	2 3/4	2 3/4	2 3/4	1 3/4	1 3/4	1 3/4
o	5/8	5/8	5/8	5/8	5/8	5/8	5/8
g usual	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
g_2	1 3/4	1 3/4	1 3/4	1 3/4			

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	5.3	5.0	4.8	4.5	2.9	2.7	2.6
V max	19	16	12	9.1	13	9.0	6.1
L min	1.11	1.28	1.56	1.96	0.92	1.18	1.62
fb	15000	15000	15000	15000	15000	15000	15000
fbt	6000	4890	3795	2850	5235	3765	2550
B min	2.20	2.20	2.20	2.20	1.65	1.65	1.65
R max	27	22	17	13	22	16	11
Q	42	40	38	36	23	22	20

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3 1/2 inches.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM
24″
to
10″
LOADS

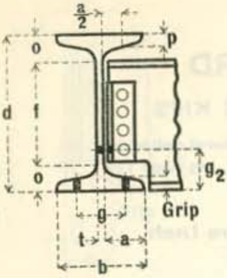
BEAMS
ILLINOIS-SPECIAL LIGHT
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot							Coefficient of Deflection
	B 20 24″ x 7″ Φ 71 Lbs.	B 21 21″ x 7″ Φ 75 Lbs.	B 22 21″ x 6½″ Φ 58 Lbs.	B 23 18″ x 6″ Φ 46 Lbs.	B 24 15″ x 5½″ Φ 35 Lbs.	B 25 12″ x 5″ Φ 25 Lbs.	B 26 10″ x 5″ Φ 22 Lbs.	
					118.8	77.8	60.0	
5				164.2	117.6	70.1	53.0	0.47
6	276.5	262.1	216.7	150.2	98.0	58.4	44.2	0.67
7	259.2	248.7	186.5	128.7	84.0	50.1	37.9	0.91
8	226.8	217.7	163.2	112.7	73.5	43.8	33.2	1.19
9	201.6	193.5	145.1	100.1	65.3	38.9	29.5	1.51
10	181.4	174.1	130.6	90.1	58.8	35.0	26.5	1.86
11	164.9	158.3	118.7	81.9	53.5	31.9	24.1	2.25
12	151.2	145.1	108.8	75.1	49.0	29.2	22.1	2.68
13	139.6	133.9	100.4	69.3	45.2	27.0	20.4	3.15
14	129.6	124.4	93.3	64.4	42.0	25.0	18.9	3.65
15	121.0	116.1	87.0	60.1	39.2	23.4	17.7	4.19
16	113.4	108.8	81.6	56.3	36.8	21.9	16.6	4.77
17	106.7	102.4	76.8	53.0	34.6	20.6	15.6	5.38
18	100.8	96.7	72.5	50.1	32.7	19.5	14.7	6.03
19	95.5	91.6	68.7	47.4	30.9	18.4	14.0	6.72
20	90.7	87.1	65.3	45.1	29.4	17.5		7.45
21	86.4	82.9	62.2	42.9	28.0	16.7		8.21
22	82.5	79.2	59.4	41.0	26.7	15.9		9.01
23	78.9	75.7	56.8	39.2	25.6	15.2		9.85
24	75.6	72.6	54.4	37.6	24.5			10.73
25	72.6	69.6	52.2	36.0	23.5			11.64
26	69.8	67.0	50.2	34.7	22.6			12.59
27	67.2	64.5	48.4	33.4	21.8			13.57
28	64.8	62.2	46.6	32.2	21.0			14.60
29	62.6	60.0	45.0	31.1				15.66
30	60.5	58.0	43.5	30.0				16.76
31	58.5	56.2	42.1	29.1				17.89
32	56.7	54.4	40.8	28.2				19.07
33	55.0	52.8	39.6	27.3				20.28
34	53.4	51.2	38.4	26.5				21.53
35	51.8	49.8	37.3					22.81
36	50.4	48.4	36.3					24.13
37	49.0	47.1	35.3					25.49
38	47.7	45.8	34.4					26.89
39	46.5	44.6	33.5					28.32
40	45.4							29.79
42	43.2							32.85
44	41.2							36.05
46	39.4							39.40

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.
Φ Illinois Steel Company only.



BEAMS

ILLINOIS-SPECIAL LIGHT

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

BEAM 24″ to 10″ DATA

Notation	B 20 24″ x 7″ Φ 71 Lbs.	B 21 21″ x 7″ Φ 75 Lbs.	B 22 21″ x $6\frac{1}{2}$″ Φ 58 Lbs.	B 23 18″ x 6″ Φ 46 Lbs.	B 24 15″ x $5\frac{1}{2}$″ Φ 35 Lbs.	B 25 12″ x 5″ Φ 25 Lbs.	B 26 10″ x 5″ Φ 22 Lbs.
	Nominal Depth and Flange Width—Weight per Foot						
ELEMENTS							
I_{1-1}	1815.0	1524.0	1143.0	675.7	367.9	175.5	110.3
S_{1-1}	151.2	145.1	108.8	75.1	49.0	29.2	22.1
I_{2-2}	34.0	41.9	24.5	17.1	11.6	7.3	6.9
S_{2-2}	9.7	12.0	7.5	5.7	4.2	2.9	2.8
DIMENSIONS AND GAGES IN INCHES							
d	24	21	21	18	15	12	10
b	7	7	$6\frac{1}{2}$	6	$5\frac{1}{2}$	5	5
t	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{1}{4}$	$\frac{1}{4}$
p	$\frac{11}{16}$	$\frac{13}{16}$	$\frac{5}{8}$	$\frac{9}{16}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{3}{8}$
a	$3\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{16}$	$2\frac{13}{16}$	$2\frac{9}{16}$	$2\frac{3}{8}$	$2\frac{3}{8}$
c	$22\frac{5}{8}$	$19\frac{3}{8}$	$19\frac{3}{4}$	$16\frac{7}{8}$	14	$11\frac{3}{16}$	$9\frac{3}{16}$
f	$19\frac{1}{4}$	$15\frac{3}{4}$	$16\frac{3}{4}$	$14\frac{1}{4}$	$11\frac{5}{8}$	$9\frac{1}{8}$	$7\frac{3}{8}$
o	$2\frac{3}{8}$	$2\frac{5}{8}$	$2\frac{1}{8}$	$1\frac{7}{8}$	$1\frac{11}{16}$	$1\frac{7}{16}$	$1\frac{5}{16}$
g usual	4	4	4	$3\frac{1}{2}$	$3\frac{1}{2}$	3	3
g_2	$3\frac{5}{8}$	$3\frac{7}{8}$	$3\frac{3}{8}$	$3\frac{1}{8}$	$2\frac{15}{16}$	$2\frac{11}{16}$	$2\frac{9}{16}$
f and o—Provide usual working clearances.							
MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.							
M max	227	218	163	113	74	44	33
V max	138	131	108	82	59	39	30
L min	6.56	6.64	6.02	5.49	4.95	4.51	4.42
fb	9820	11660	10030	10300	10660	10855	11740
fbt	4715	6065	4310	3915	3515	2930	2935
B min	23.3	16.4	19.9	16.5	13.1	10.3	7.7
R max	45	53	38	31	26	19	18
RA	76	68	56	40	35	21	20
LRA	11.94	12.80	11.66	11.27	8.40	8.34	6.63
Wt.CA	36	30	30	21	21	15	15
RH	126	109	90	80	69	43	
LRH	7.20	7.99	7.25	5.63	4.26	4.07	
Wt.CH	50	41	41	29	29	22	
Q	1815	1740	1305	900	590	350	265

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = $3\frac{1}{2}$ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
RH = Max. Value of Shop Rivets in Kips in one Connection Series H. See page of Connections.
Rivet Values in Outstanding Legs must be investigated.
LRA, LRH = Min. Span in Feet to develop RA or RH.
Wt.CA, CH = Weight in pounds of one Connection Series A or H, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

Φ Illinois Steel Company only.

CHANNEL
18" [
15"
LOADS

CHANNELS

AMERICAN STANDARD

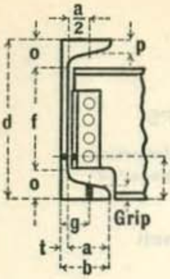
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot										Coefficient of Deflection
	©*C 60 18" x 4"				C 1 15" x 3⅜"						
	58.0 Lbs.	51.9 Lbs.	45.8 Lbs.	42.7 Lbs.	55 Lbs.	50 Lbs.	45 Lbs.	40 Lbs.	35 Lbs.	33.9 Lbs.	
	302.4				293.0	257.8	222.5	187.2			
3	298.1	259.2	216.0	194.4	228.8	214.2	199.4	184.7	151.9	144.0	0.17
4	223.6	207.4	191.2	183.1	171.6	160.7	149.5	138.5	127.5	125.0	0.30
5	178.9	165.9	152.9	146.5	137.3	128.5	119.6	110.8	102.0	100.0	0.47
6	149.1	138.3	127.5	122.1	114.4	107.1	99.7	92.4	85.0	83.4	0.67
7	127.8	118.5	109.2	104.6	98.1	91.8	85.5	79.2	72.9	71.4	0.91
8	111.8	103.7	95.6	91.5	85.8	80.3	74.8	69.3	63.7	62.5	1.19
9	99.4	92.2	85.0	81.4	76.3	71.4	66.5	61.6	56.7	55.6	1.51
10	89.4	83.0	76.5	73.2	68.6	64.3	59.8	55.4	51.0	50.0	1.86
11	81.3	75.4	69.5	66.6	62.4	58.4	54.4	50.4	46.4	45.5	2.25
12	74.5	69.1	63.7	61.0	57.2	53.6	49.8	46.2	42.5	41.7	2.68
13	68.8	63.8	58.8	56.3	52.8	49.4	46.0	42.6	39.2	38.5	3.15
14	63.9	59.3	54.6	52.3	49.0	45.9	42.7	39.6	36.4	35.7	3.65
15	59.6	55.3	51.0	48.8	45.8	42.8	39.9	36.9	34.0	33.3	4.19
16	55.9	51.8	47.8	45.8	42.9	40.2	37.4	34.6	31.9	31.3	4.77
17	52.6	48.8	45.0	43.1	40.4	37.8	35.2	32.6	30.0	29.4	5.38
18	49.7	46.1	42.5	40.7	38.1	35.7	33.2	30.8	28.3	27.8	6.03
19	47.1	43.7	40.2	38.5	36.1	33.8	31.5	29.2	26.8	26.3	6.72
20	44.7	41.5	38.2	36.6	34.3	32.1	29.9	27.7	25.5	25.0	7.45
21	42.6	39.5	36.4	34.9	32.7	30.6	28.5	26.4	24.3	23.8	8.21
22	40.7	37.7	34.8	33.3	31.2	29.2	27.2	25.2	23.2	22.7	9.01
23	38.9	36.1	33.2	31.8	29.8	27.9	26.0	24.1	22.2	21.7	9.85
24	37.3	34.6	31.9	30.5	28.6	26.8	24.9	23.1	21.2	20.8	10.73
25	35.8	33.2	30.6	29.3	27.5	25.7	23.9	22.2	20.4	20.0	11.64
26	34.4	31.9	29.4	28.2	26.4	24.7	23.0	21.3	19.6	19.2	12.59
27	33.1	30.7	28.3	27.1	25.4	23.8	22.2	20.5	18.9	18.5	13.57
28	31.9	29.6	27.3	26.2	24.5	23.0	21.4	19.8	18.2	17.9	14.60
29	30.8	28.6	26.4	25.3	23.7	22.2	20.6	19.1	17.6	17.2	15.66
30	29.8	27.7	25.5	24.4							16.76
31	28.8	26.8	24.7	23.6							17.89
32	28.0	25.9	23.9	22.9							19.07
33	27.1	25.1	23.2	22.2							20.28
34	26.3	24.4	22.5	21.5							21.53
35	25.5	23.7	21.8	20.9							22.81

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.
*C 60-18" Channel, is a Ship Building Channel, not American Standard.
©Carnegie Steel Company only.



CHANNELS
AMERICAN STANDARD
ESSENTIAL DATA
Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

CHANNEL 18″ 15″ DATA

Notation	Nominal Depth and Flange Width—Weight per Foot									
	Ⓒ*C 60 18″ x 4″				C 1 15″ x 3 3/8″					
	58 Lbs.	51.9 Lbs.	45.8 Lbs.	42.7 Lbs.	55 Lbs.	50 Lbs.	45 Lbs.	40 Lbs.	35 Lbs.	33.9 Lbs.
ELEMENTS										
I_{1-1}	670.7	622.1	573.5	549.2	429.0	401.4	373.9	346.3	318.7	312.6
S_{1-1}	74.5	69.1	63.7	61.0	57.2	53.6	49.8	46.2	42.5	41.7
I_{2-2}	18.5	17.1	15.8	15.0	12.1	11.2	10.3	9.3	8.4	8.2
S_{2-2}	5.6	5.3	5.1	4.9	4.1	3.8	3.6	3.4	3.2	3.2
DIMENSIONS AND GAGES IN INCHES										
d	18	18	18	18	15	15	15	15	15	15
b	4 3/16	4 1/8	4	3 15/16	3 13/16	3 11/16	3 5/8	3 1/2	3 7/16	3 3/8
t	11/16	5/8	1/2	7/16	13/16	11/16	5/8	1/2	7/16	3/8
p	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8
a	3 1/2	3 1/2	3 1/2	3 1/2	3	3	3	3	3	3
Grip	5/8	5/8	5/8	5/8	11/16	11/16	5/8	5/8	5/8	5/8
f	15 1/2	15 1/2	15 1/2	15 1/2	12 1/4	12 1/4	12 1/4	12 1/4	12 1/4	12 1/4
o	1 1/4	1 1/4	1 1/4	1 1/4	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
g usual	2 1/2	2 1/2	2 1/2	2 1/2	2 1/4	2 1/4	2	2	2	2
g_2	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
f and o—Provide usual working clearances.										
MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.										
M max	112	104	96	92	86	80	75	69	64	63
V max	151	130	108	97	147	129	111	94	76	72
L min	2.96	3.20	3.54	3.77	2.34	2.50	2.69	2.96	3.56	3.48
fb	14749	13846	12570	11739	15000	15000	15000	14091	12666	12255
fbt	10324	8308	6285	5283	12210	10740	9270	7327	5345	4902
B min	10.15	11.10	12.69	13.90	8.25	8.25	8.25	9.03	10.46	10.94
R max	83	66	50	42	89	78	67	53	39	36
RA	65	63	53	47	65	65	65	55	44	42
LRA	6.88	6.58	7.21	7.79	5.28	4.95	4.60	5.04	5.80	5.96
Wt.CA	21	21	21	21	21	21	21	21	21	21
Q	894	829	764	732	686	643	598	554	510	500

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3 1/2 inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

*C 60—18″, is a Ship Building Channel, not American Standard.

ⒸCarnegie Steel Company only.

CHANNEL
13" 12"
LOADS

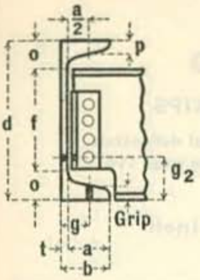
CHANNELS
AMERICAN STANDARD
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot											Coefficient of Deflection
	C 20 13" x 4"						C 2 12" x 3"					
	50 Lbs.	45 Lbs.	40 Lbs.	37 Lbs.	35 Lbs.	31.8 Lbs.	40 Lbs.	35 Lbs.	30 Lbs.	25 Lbs.	20.7 Lbs.	
							217.4	182.0				
2	245.5	210.0	174.7				196.5	178.8	146.9	111.5		0.07
3	192.6	179.7	167.0	153.5	139.5	117.0	131.0	119.2	107.5	95.7	80.6	0.17
4	144.4	134.8	125.2	119.5	115.7	109.6	98.3	89.4	80.6	71.8	64.1	0.30
5	115.5	107.8	100.2	95.6	92.6	87.7	78.6	71.5	64.5	57.4	51.2	0.47
6	96.3	89.9	83.5	79.7	77.1	73.1	65.5	59.6	53.7	47.8	42.7	0.67
7	82.5	77.0	71.6	68.3	66.1	62.6	56.2	51.1	46.1	41.0	36.6	0.91
8	72.2	67.4	62.6	59.7	57.8	54.8	49.1	44.7	40.3	35.9	32.0	1.19
9	64.2	59.9	55.7	53.1	51.4	48.7	43.7	39.7	35.8	31.9	28.5	1.51
10	57.8	53.9	50.1	47.8	46.3	43.8	39.3	35.8	32.2	28.7	25.6	1.86
11	52.5	49.0	45.5	43.5	42.1	39.9	35.7	32.5	29.3	26.1	23.3	2.25
12	48.1	44.9	41.7	39.8	38.6	36.5	32.8	29.8	26.9	23.9	21.4	2.68
13	44.4	41.5	38.5	36.8	35.6	33.7	30.2	27.5	24.8	22.1	19.7	3.15
14	41.3	38.5	35.8	34.1	33.1	31.3	28.1	25.5	23.0	20.5	18.3	3.65
15	38.5	35.9	33.4	31.9	30.9	29.2	26.2	23.8	21.5	19.1	17.1	4.19
16	36.1	33.7	31.3	29.9	28.9	27.4	24.6	22.3	20.2	17.9	16.0	4.77
17	34.0	31.7	29.5	28.1	27.2	25.8	23.1	21.0	19.0	16.9	15.1	5.38
18	32.1	30.0	27.8	26.6	25.7	24.4	21.8	19.9	17.9	15.9	14.2	6.03
19	30.4	28.4	26.4	25.2	24.4	23.1	20.7	18.8	17.0	15.1	13.5	6.72
20	28.9	27.0	25.0	23.9	23.1	21.9	19.7	17.9	16.1	14.4	12.8	7.45
21	27.5	25.7	23.9	22.8	22.0	20.9	18.7	17.0	15.4	13.7	12.2	8.21
22	26.3	24.5	22.8	21.7	21.0	19.9	17.9	16.3	14.7	13.0	11.6	9.01
23	25.1	23.4	21.8	20.8	20.1	19.1	17.1	15.5	14.0	12.5	11.1	9.85
24	24.1	22.5	20.9	19.9	19.3	18.3	16.4	14.9	13.4	12.0	10.7	10.73
25	23.1	21.6	20.0	19.1	18.5	17.5						11.64
26	22.2	20.7	19.3	18.4	17.8	16.9						12.59

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CHANNELS

AMERICAN STANDARD

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

CHANNEL 13″ 12″ DATA

Notation	Nominal Depth and Flange Width—Weight per Foot										
	C 20 13″ x 4″						C 2 12″ x 3″				
	50 Lbs.	45 Lbs.	40 Lbs.	37 Lbs.	35 Lbs.	31.8 Lbs.	40 Lbs.	35 Lbs.	30 Lbs.	25 Lbs.	20.7 Lbs.
ELEMENTS											
I_{1-1}	312.9	292.0	271.4	258.9	250.7	237.5	196.5	178.8	161.2	143.5	128.1
S_{1-1}	48.1	44.9	41.7	39.8	38.6	36.5	32.8	29.8	26.9	23.9	21.4
I_{2-2}	16.7	15.3	13.9	13.0	12.5	11.6	6.6	5.9	5.2	4.5	3.9
S_{2-2}	4.9	4.6	4.3	4.2	4.0	3.9	2.5	2.3	2.1	1.9	1.7
DIMENSIONS AND GAGES IN INCHES											
d	13	13	13	13	13	13	12	12	12	12	12
b	4 7/16	4 5/16	4 3/16	4 1/8	4 1/16	4	3 7/16	3 5/16	3 3/16	3 1/16	2 15/16
t	13/16	11/16	9/16	1/2	7/16	3/8	3/4	5/8	1/2	3/8	1/4
p	5/8	5/8	5/8	5/8	5/8	5/8	1/2	1/2	1/2	1/2	1/2
a	3 5/8	3 5/8	3 5/8	3 5/8	3 5/8	3 5/8	2 11/16	2 11/16	2 11/16	2 11/16	2 11/16
Grip	5/8	5/8	5/8	9/16	9/16	9/16	5/8	5/8	1/2	1/2	1/2
f	10 1/2	10 1/2	10 1/2	10 1/2	10 1/2	10 1/2	10	10	10	10	10
o	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1	1	1	1	1
g usual	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2	2	1 3/4	1 3/4	1 3/4
g_2	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	72	67	63	60	58	55	49	45	40	36	32
V max	123	105	87	77	70	59	109	91	73	56	40
L min	2.35	2.57	2.86	3.11	3.32	3.74	1.81	1.97	2.20	2.57	3.19
fb	15000	15000	15000	14602	14042	12852	15000	15000	15000	13631	11165
fbt	11805	10095	8400	7184	6276	4820	11325	9480	7650	5276	3126
B min	7.15	7.15	7.15	7.43	7.86	8.89	6.60	6.60	6.60	7.56	9.90
R max	80	68	57	48	42	33	74	62	50	34	20
RA	49	49	44	39	35	30	49	49	40	30	22
LRA	5.89	5.50	5.69	6.12	6.62	7.30	4.02	3.65	4.04	4.78	5.84
Wt.CA	15	15	15	15	15	15	15	15	15	15	15
Q	577	539	500	478	463	438	394	358	323	287	257

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3 1/2 inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

CHANNEL
10″ 9″
LOADS

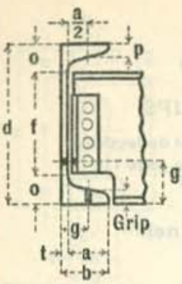
CHANNELS
AMERICAN STANDARD
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot									Coefficient of Deflection
	C 3 10″ x 2⅝″					C 4 9″ x 2½″				
	35 Lbs.	30 Lbs.	25 Lbs.	20 Lbs.	15.3 Lbs.	25 Lbs.	20 Lbs.	15 Lbs.	13.4 Lbs.	
	196.8	161.5	126.2			132.2	96.8			
2	138.3	123.6	108.9	91.0	57.6	94.0	80.8	61.6	49.7	0.07
3	92.2	82.4	72.6	62.8	53.5	62.7	53.8	45.0	42.1	0.17
4	69.1	61.8	54.4	47.1	40.1	47.0	40.4	33.8	31.5	0.30
5	55.3	49.4	43.5	37.7	32.1	37.6	32.3	27.0	25.2	0.47
6	46.1	41.2	36.3	31.4	26.8	31.4	26.9	22.5	21.0	0.67
7	39.5	35.3	31.1	26.9	22.9	26.9	23.1	19.3	18.0	0.91
8	34.6	30.9	27.2	23.5	20.1	23.5	20.2	16.9	15.8	1.19
9	30.7	27.5	24.2	20.9	17.8	20.9	17.9	15.0	14.0	1.51
10	27.7	24.7	21.8	18.8	16.1	18.8	16.2	13.5	12.6	1.86
11	25.1	22.5	19.8	17.1	14.6	17.1	14.7	12.3	11.5	2.25
12	23.0	20.6	18.1	15.7	13.4	15.7	13.5	11.3	10.5	2.68
13	21.3	19.0	16.7	14.5	12.3	14.5	12.4	10.4	9.7	3.15
14	19.8	17.7	15.6	13.5	11.5	13.4	11.5	9.7	9.0	3.65
15	18.4	16.5	14.5	12.6	10.7	12.5	10.8	9.0	8.4	4.19
16	17.3	15.4	13.6	11.8	10.0	11.8	10.1	8.4	7.9	4.77
17	16.3	14.5	12.8	11.1	9.4	11.1	9.5	8.0	7.4	5.38
18	15.4	13.7	12.1	10.5	8.9	10.4	9.0	7.5	7.0	6.03
19	14.6	13.0	11.5	9.9	8.4	9.9	8.5	7.1	6.6	6.72
20	13.8	12.4	10.9	9.4	8.0					7.45

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CHANNELS

AMERICAN STANDARD

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

CHANNEL
10″
9″
DATA

Notation	Nominal Depth and Flange Width—Weight per Foot								
	C 3 10″ x 2⅝″					C 4 9″ x 2½″			
	35 Lbs.	30 Lbs.	25 Lbs.	20 Lbs.	15.3 Lbs.	25 Lbs.	20 Lbs.	15 Lbs.	13.4 Lbs.
ELEMENTS									
I_{1-1}	115.2	103.0	90.7	78.5	66.9	70.5	60.6	50.7	47.3
S_{1-1}	23.0	20.6	18.1	15.7	13.4	15.7	13.5	11.3	10.5
I_{2-2}	4.6	4.0	3.4	2.8	2.3	3.0	2.4	1.9	1.8
S_{2-2}	1.9	1.7	1.5	1.3	1.2	1.4	1.2	1.0	0.97
DIMENSIONS AND GAGES IN INCHES									
d	10	10	10	10	10	9	9	9	9
b	3 3/16	3 1/16	2 7/8	2 3/4	2 5/8	2 13/16	2 5/8	2 1/2	2 7/16
t	13/16	11/16	1/2	3/8	1/4	5/8	7/16	5/16	1/4
p	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16
a	2 3/8	2 3/8	2 3/8	2 3/8	2 3/8	2 3/16	2 3/16	2 3/16	2 3/16
Grip	1/2	1/2	1/2	7/16	7/16	1/2	1/2	7/16	7/16
f	8 1/4	8 1/4	8 1/4	8 1/4	8 1/4	7 1/4	7 1/4	7 1/4	7 1/4
o	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8
g usual	1 3/4	1 3/4	1 3/4	1 1/2	1 1/2	1 1/2	1 1/2	1 3/8	1 3/8
g_2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	35	31	27	24	20	24	20	17	16
V max	98	81	63	45	29	66	48	31	25
L min	1.40	1.53	1.72	2.07	2.79	1.43	1.67	2.20	2.54
fb	15000	15000	15000	14609	11401	15000	15000	13509	11917
fbt	12300	10095	7890	5537	2736	9180	6720	3850	2741
B min	5.50	5.50	5.50	5.71	8.03	4.95	4.95	5.75	6.81
R max	74	61	47	33	16	53	39	22	16
RA	65	65	55	40	25	64	47	30	24
LRA	2.12	1.90	1.97	2.36	3.22	1.47	1.72	2.26	2.63
Wt.CA	15	15	15	15	15	15	15	15	15
Q	276	247	217	188	161	188	162	136	126

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

CHANNEL
8″ 7″
LOADS

CHANNELS

AMERICAN STANDARD

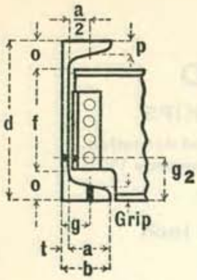
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot										Coefficient of Deflection
	C 5 8″ x 2¼″					C 6 7″ x 2⅛″					
	21.25 Lbs.	18.75 Lbs.	16.25 Lbs.	13.75 Lbs.	11.5 Lbs.	19.75 Lbs.	17.25 Lbs.	14.75 Lbs.	12.25 Lbs.	9.8 Lbs.	
	111.2	93.5	75.8	58.2		105.7	88.0	70.4	52.8		
2	71.4	65.5	59.7	53.8	42.2	56.7	51.5	46.4	41.2	35.3	0.07
3	47.6	43.7	39.8	35.8	32.3	37.8	34.3	30.9	27.5	24.1	0.17
4	35.7	32.8	29.8	26.9	24.2	28.3	25.8	23.2	20.6	18.1	0.30
5	28.6	26.2	23.9	21.5	19.4	22.7	20.6	18.6	16.5	14.5	0.47
6	23.8	21.9	19.9	17.9	16.2	18.9	17.2	15.5	13.7	12.0	0.67
7	20.4	18.7	17.0	15.4	13.8	16.2	14.7	13.3	11.8	10.3	0.91
8	17.9	16.4	14.9	13.4	12.1	14.2	12.9	11.6	10.3	9.0	1.19
9	15.9	14.6	13.3	11.9	10.8	12.6	11.4	10.3	9.2	8.0	1.51
10	14.3	13.1	11.9	10.8	9.7	11.3	10.3	9.3	8.2	7.2	1.86
11	13.0	11.9	10.8	9.8	8.8	10.3	9.4	8.4	7.5	6.6	2.25
12	11.9	10.9	9.9	9.0	8.1	9.4	8.6	7.7	6.9	6.0	2.68
13	11.0	10.1	9.2	8.3	7.5	8.7	7.9	7.1	6.3	5.6	3.15
14	10.2	9.4	8.5	7.7	6.9	8.1	7.4	6.6	5.9	5.2	3.65
15	9.5	8.7	8.0	7.2	6.5	7.6	6.9	6.2	5.5	4.8	4.19
16	8.9	8.2	7.5	6.7	6.1						4.77
17	8.4	7.7	7.0	6.3	5.7						5.38

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CHANNELS
AMERICAN STANDARD
ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

CHANNEL 8" 7" DATA

Nominal Depth and Flange Width—Weight per Foot

Notation	C 5 8" x 2¼"					C 6 7" x 2⅛"				
	21.25 Lbs.	18.75 Lbs.	16.25 Lbs.	13.75 Lbs.	11.5 Lbs.	19.75 Lbs.	17.25 Lbs.	14.75 Lbs.	12.25 Lbs.	9.8 Lbs.
ELEMENTS										
I_{1-1}	47.6	43.7	39.8	35.8	32.3	33.1	30.1	27.1	24.1	21.1
S_{1-1}	11.9	10.9	9.9	9.0	8.1	9.4	8.6	7.7	6.9	6.0
I_{2-2}	2.2	2.0	1.8	1.5	1.3	1.8	1.6	1.4	1.2	0.98
S_{2-2}	1.1	1.0	0.94	0.86	0.79	0.96	0.86	0.79	0.71	0.63
DIMENSIONS AND GAGES IN INCHES										
d	8	8	8	8	8	7	7	7	7	7
b	2 5/8	2 1/2	2 7/16	2 5/16	2 1/4	2 1/2	2 3/8	2 5/16	2 3/16	2 1/16
t	9/16	1/2	3/8	5/16	1/4	5/8	1/2	7/16	5/16	3/16
p	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
a_1	2 1/16	2 1/16	2 1/16	2 1/16	2 1/16	1 7/8	1 7/8	1 7/8	1 7/8	1 7/8
Grip	7/16	7/16	7/16	3/8	3/8	7/16	7/16	7/16	3/8	3/8
f	6 1/4	6 1/4	6 1/4	6 1/4	6 1/4	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2
o	7/8	7/8	7/8	7/8	7/8	3/4	3/4	3/4	3/4	3/4
g usual	1 1/2	1 1/2	1 1/2	1 3/8	1 3/8	1 1/2	1 1/2	1 1/4	1 1/4	1 1/4
g_2	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2	2	2	2	2

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	18	16	15	14	12	14	13	12	10	9.0
V max	56	47	38	29	21	53	44	35	26	18
L min	1.29	1.40	1.57	1.86	2.30	1.07	1.17	1.31	1.57	2.04
fb	15000	15000	15000	14606	12493	15000	15000	15000	15000	13135
fbt	8685	7305	5925	4425	2748	9435	7860	6285	4710	2758
B min	4.40	4.40	4.40	4.57	5.69	3.85	3.85	3.85	3.85	4.65
R max	48	40	33	24	15	50	41	33	25	14
RA	61	51	41	32	23	32	28	22	16	11
LRA	1.17	1.28	1.45	1.69	2.11	1.76	1.84	2.10	2.59	3.27
Wt.CA	15	15	15	15	15	8	8	8	8	8
Q	143	131	119	108	97	113	103	92	83	72

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

CHANNEL
6″ [
5″ [
LOADS

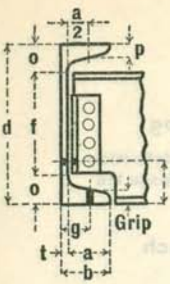
CHANNELS
AMERICAN STANDARD
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, see page 116

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot							Coefficient of Deflection
	C 7 6″ x 1⅞″				C 8 5″ x 1¾″			
	15.5 Lbs.	13 Lbs.	10.5 Lbs.	8.2 Lbs.	11.5 Lbs.	9 Lbs.	6.7 Lbs.	
	80.5				56.6			
1	77.8	62.9	45.2	28.8	49.7	39.0	22.8	0.02
2	38.9	34.5	30.1	26.0	24.8	21.2	17.8	0.07
3	25.9	23.0	20.1	17.3	16.6	14.1	11.9	0.17
4	19.5	17.3	15.1	13.0	12.4	10.6	8.9	0.30
5	15.6	13.8	12.0	10.4	9.9	8.5	7.1	0.47
6	13.0	11.5	10.0	8.7	8.3	7.1	5.9	0.67
7	11.1	9.9	8.6	7.4	7.1	6.0	5.1	0.91
8	9.7	8.6	7.5	6.5	6.2	5.3	4.4	1.19
9	8.6	7.7	6.7	5.8	5.5	4.7	4.0	1.51
10	7.8	6.9	6.0	5.2	5.0	4.2	3.6	1.86
11	7.1	6.3	5.5	4.7	4.5	3.8	3.2	2.25
12	6.5	5.8	5.0	4.3				2.68
13	6.0	5.3	4.6	4.0				3.15

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CHANNELS

AMERICAN STANDARD

ESSENTIAL DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

CHANNEL 6″ 5″ DATA

Notation	Nominal Depth and Flange Width—Weight per Foot						
	C 7 6″ x 1 7/8″				C 8 5″ x 1 3/4″		
	15.5 Lbs.	13 Lbs.	10.5 Lbs.	8.2 Lbs.	11.5 Lbs.	9 Lbs.	6.7 Lbs.
ELEMENTS							
I_{1-1}	19.5	17.3	15.1	13.0	10.4	8.8	7.4
S_{1-1}	6.5	5.8	5.0	4.3	4.1	3.5	3.0
I_{2-2}	1.3	1.1	0.87	0.70	0.82	0.64	0.48
S_{2-2}	0.73	0.65	0.57	0.50	0.54	0.45	0.38
DIMENSIONS AND GAGES IN INCHES							
d	6	6	6	6	5	5	5
b	2 1/4	2 3/16	2 1/16	1 15/16	2 1/16	1 7/8	1 3/4
t	9/16	7/16	5/16	3/16	1/2	5/16	3/16
p	5/16	5/16	5/16	5/16	5/16	5/16	5/16
a_1	1 3/4	1 3/4	1 3/4	1 3/4	1 9/16	1 9/16	1 9/16
Grip	3/8	3/8	3/8	5/16	5/16	5/16	5/16
f	4 1/2	4 1/2	4 1/2	4 1/2	3 3/4	3 3/4	3 3/4
o	3/4	3/4	3/4	3/4	5/8	5/8	5/8
g usual	1 3/8	1 3/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
g_2	2	2	2	2	2	2	2

f and o—Provide usual working clearances.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.

M max	9.8	8.7	7.5	6.5	6.2	5.3	4.5
V max	40	31	23	14	28	20	11
L min	0.97	1.11	1.33	1.79	0.87	1.08	1.58
fb	15000	15000	15000	13846	15000	15000	14625
fbt	8385	6555	4710	2769	7080	4875	2779
B min	3.30	3.30	3.30	3.70	2.75	2.75	2.85
R max	42	33	24	14	34	23	13
RA	29	23	16	11	25	17	10
LRA	1.34	1.51	1.88	2.35	0.98	1.24	1.80
Wt.CA	8	8	8	8	8	8	8
Q	78	70	60	52	49	42	36

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B min = Min. End Bearing in inches to develop Vmax.
R max = Max. End Reaction in Kips when B = 3½ inches.
RA = Max. Value of Shop Rivets in Kips in one Connection Series A. See page of Connections.
LRA = Min. Span in feet to develop RA.
Wt.CA = Weight in pounds of one Connection Series A, including Web Rivets.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

CHANNEL
4"
3"
LOADS

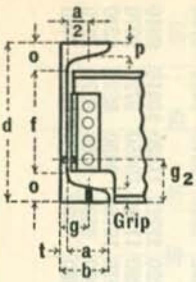
CHANNELS
AMERICAN STANDARD
ALLOWABLE UNIFORM LOADS IN KIPS

Applicable only when sections are braced against lateral deflection.
For unbraced sections safe loads must be reduced, **see page 116**

Maximum Bending Stress 18,000 Pounds per Square Inch

Span in Feet	Nominal Depth and Flange Width—Weight per Foot: C 9 4" x 1⅝" 7.25 Lbs.	C 9 4" x 1⅝" 6.25 Lbs.	C 9 4" x 1⅝" 5.4 Lbs.	C 10 3" x 1⅜" 6 Lbs.	C 10 3" x 1⅜" 5 Lbs.	C 10 3" x 1⅜" 4.1 Lbs.	Coefficient of Deflection
	30.7			25.6	18.6		
1	27.3	23.7	17.3	16.4	14.7	12.2	0.02
2	13.6	12.5	11.4	8.2	7.3	6.5	0.07
3	9.1	8.3	7.6	5.5	4.9	4.4	0.17
4	6.8	6.2	5.7	4.1	3.7	3.3	0.30
5	5.5	5.0	4.6	3.3	2.9	2.6	0.47
6	4.5	4.2	3.8	2.7	2.4	2.2	0.67
7	3.9	3.6	3.3	2.3	2.1	1.9	0.91
8	3.4	3.1	2.8	2.1	1.8	1.6	1.19
9	3.0	2.8	2.5				1.51
10	2.7	2.5	2.3				1.86

Loads above upper horizontal lines will produce maximum allowable shear in webs.
Loads below lower horizontal lines will produce excessive deflections.



CHANNELS
AMERICAN STANDARD
ESSENTIAL DATA

CHANNEL 4″ 3″ DATA

Maximum Shear 12,000 Pounds per Square Inch

Maximum Bending Stress 18,000 Pounds per Square Inch

Notation	Nominal Depth and Flange Width—Weight per Foot					
	C 9 4″ x 1 5/8″			C 10 3″ x 1 3/8″		
	7.25 Lbs.	6.25 Lbs.	5.4 Lbs.	6 Lbs.	5 Lbs.	4.1 Lbs.
ELEMENTS						
I_{1-1}	4.5	4.1	3.8	2.1	1.8	1.6
S_{1-1}	**2.3**	**2.1**	**1.9**	**1.4**	**1.2**	**1.1**
I_{2-2}	0.44	0.38	0.32	0.31	0.25	0.20
S_{2-2}	0.35	0.32	0.29	0.27	0.24	0.21
DIMENSIONS AND GAGES IN INCHES						
d	4	4	4	3	3	3
b	1 3/4	1 5/8	1 9/16	1 9/16	1 1/2	1 7/16
t	5/16	1/4	3/16	3/8	1/4	3/16
p	5/16	5/16	5/16	1/4	1/4	1/4
a_1	1 3/8	1 3/8	1 3/8	1 1/4	1 1/4	1 1/4
Grip	5/16	5/16	5/16	1/4	1/4	1/4
f	2 3/4	2 3/4	2 3/4	1 3/4	1 3/4	1 3/4
o	5/8	5/8	5/8	5/8	5/8	5/8
g usual	1	1	1	7/8	7/8	7/8
g_2	1 3/4	1 3/4	1 3/4			

f and o—Provides usual working clearance.

MAXIMUM BENDING MOMENTS, WEB RESISTANCES, ETC.						
M max	3.5	3.2	2.9	2.1	1.8	1.7
V max	15	12	8.6	13	9.3	6.1
L min	0.90	1.06	1.32	0.66	0.78	1.08
fb	15000	15000	15000	15000	15000	15000
fbt	4800	3705	2700	5340	3870	2550
B min	2.20	2.20	2.20	1.65	1.65	1.65
R max	22	17	12	23	16	11
Q	28	25	23	17	14	13

Mmax = Max. Bending Moment in Kips. Vmax = Max. Web Shear in Kips.
Lmin = Min. Span in feet to develop Vmax.
fb = Allowable Unit Stress for Web Buckling in pounds per square inch.
fbt = Value of Web in Buckling per inch of length, in pounds.
B = Min. End Bearing in inches to develop Vmax.
Rmax = Max. End Reaction in Kips when B = 3½ inches.
Q = Coefficient of Strength = 12 S_{1-1}.
To obtain safe uniformly distributed load in Kips, divide Q by the required span in feet.

BEAM LOADS

CB SECTIONS—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
CB 362 N 36 x 16½	300	83460	75860	69520	64180	59590	55670	51880	45910	41000	36760	33170	30120	27470	25080	23090	21230	19640	18180	16990	15790	14740
	280	77610	70550	64650	59680	55420	51770	48410	42840	38260	34290	30950	28100	25630	23400	21540	19810	18320	16960	15850	14730	13750
	260	73320	66650	61080	56380	52350	48900	44620	39480	35260	31610	28530	25900	23620	21570	19850	18260	16890	15630	14610	13580	12680
	250	70820	64380	59000	54460	50570	47240	42810	37880	33830	30330	27370	24850	22660	20690	19050	17520	16200	15000	14010	13030	12160
	240	68260	62040	56860	52490	48730	45530	41000	36280	32400	29050	26210	23800	21710	19820	18240	16780	15520	14370	13420	12480	11650
	230	65700	59720	54730	50530	46910	43820	39190	34680	30970	27770	25060	22750	20750	18940	17440	16040	14830	13730	12830	11930	11130
CB 361 N 36 x 12	192	65170	59240	54290	47090	40560	35310	31100	27520	24580	22030	19880	18050	16460	15030	13840	12730	11770	10900	10180	9470	8840
	176	60730	55200	50140	42770	36850	32080	28250	25000	22330	20010	18060	16400	14960	13660	12570	11560	10690	9900	9250	8600	8030
	167	57260	52060	47410	40440	34840	30330	26710	23640	21110	18920	17080	15510	14140	12910	11890	10930	10110	9360	8740	8130	7590
	158	52350	47590	43630	38220	32930	28660	25240	22340	19950	17880	16140	14660	13360	12200	11230	10330	9560	8850	8260	7680	7170
	150	48500	44090	40420	36110	31110	27080	23850	21110	18850	16900	15250	13850	12630	11530	10610	9760	9030	8360	7810	7260	6780
CB 332 N 33 x 15¾	260	72330	65750	60250	55620	51650	46990	41380	36620	32700	29310	26460	24020	21910	20000	18410	16930	15660	14500	13550	12590	11760
	240	67210	61100	55990	51690	47990	43190	28030	33660	30060	26940	24320	22080	20140	18380	16930	15560	14400	13330	12450	11580	10810
	220	62090	56440	51720	47740	44330	39410	34700	30710	27420	24580	22190	20150	18370	16770	15440	14200	13140	12160	11360	10560	9860
	210	59770	54340	49790	45970	42680	37490	33010	29210	26090	23390	21110	19170	17480	15960	14690	13510	12500	11570	10810	10050	9380
	200	57020	51830	47500	43850	40720	35640	31390	27780	24810	22240	20070	18220	16620	15170	13970	12840	11880	11000	10280	9550	8920
CB 331 N 33 x 11½	152	51130	46480	40490	34540	29750	25910	22810	20190	18030	16160	14590	13240	12080	11030	10150	9340	8640	7990	7470	6940	6480
	141	47160	42870	37180	31710	27320	23780	20950	18540	16550	14840	13390	12160	11090	10120	9320	8570	7930	7340	6860	6380	5950
	132	43780	39800	34430	29370	25300	22030	19400	17160	15330	13740	12400	11260	10270	9380	8630	7940	7340	6800	6350	5900	5510
	125	42150	38130	32040	27330	23540	20500	18050	15970	14270	12790	11540	10480	9560	8730	8030	7390	6830	6320	5910	5490	5130
CB 302 N 36 x 15	240	65090	59170	54220	50060	45490	39600	34880	30860	27560	24710	22300	20250	18460	16860	15520	14270	13200	12220	11420	10610	9910
	220	59580	54160	49630	45820	41640	36250	31920	28250	25230	22620	20410	18530	16900	15430	14210	13060	12080	11190	10450	9720	9070
	200	54090	49160	45050	41590	37800	32910	28980	25650	22900	20530	18530	16830	15340	14010	12900	11860	10970	10150	9490	8820	8230
	190	51470	46780	42870	39580	35850	31210	27490	24320	21720	19470	17570	15960	14550	13290	12230	11250	10400	9630	9000	8370	7810
	180	48600	44180	40480	37370	33990	29590	26060	23060	20590	18460	16660	15130	13800	12600	11600	10660	9860	9130	8530	7930	7400

Loads within the heavy lines are maximum loads for web shear.

CB SECTIONS—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
CB 301 N 30 x 10½	131	43790	37580	31570	26930	23200	20200	17790	15740	14060	12600	11370	10330	9420	8600	7920	7280	6730	6230	5820	5410	5050
	122	41740	34470	28970	24710	21290	18530	16320	14440	12900	11560	10430	9470	8640	7890	7260	6680	6180	5720	5340	4970	4640
	115	39170	32350	27180	23190	19980	17390	15320	13550	12100	10850	9790	8890	8110	7400	6820	6270	5800	5370	5010	4660	4350
	108	36070	30210	25380	21650	18650	16240	14300	12660	11300	10130	9140	8300	7570	6910	6360	5850	5410	5010	4680	4350	4060
CB 272 N 27 x 14	175	44210	40190	36830	34000	30490	26540	23380	20690	18470	16560	14950	13570	12380	11300	10400	9570	8850	8190	7650	7110	6640
	166	41840	38040	34860	32180	28910	25170	22170	19610	17520	15700	14170	12870	11730	10710	9860	9070	8390	7770	7260	6750	6300
	156	39560	35590	32620	30110	27170	23650	20830	18430	16460	14760	13320	12090	11030	10070	9270	8520	7880	7300	6820	6340	5920
	145	37580	34160	31310	28900	24980	21740	19150	16940	15130	13570	12240	11120	10140	9260	8520	7840	7250	6710	6270	5830	5440
CB 271 N 27 x 10	112	34890	30060	25260	21550	18560	16160	14230	12590	11250	10080	9100	8260	7530	6880	6330	5820	5390	4990	4660	4330	4040
	104	31250	27930	23470	20020	17250	15010	13220	11700	10450	9370	8450	7680	7000	6390	5880	5410	5010	4630	4330	4020	3760
	97	27870	25340	21840	18630	16050	13970	12300	10890	9720	8720	7870	7140	6510	5950	5480	5030	4660	4310	4030	3740	3500
	91	27170	23870	20050	17110	14740	12830	11300	10000	8930	8000	7220	6560	5980	5460	5030	4620	4280	3960	3700	3440	3210
	85	26350	21770	18290	15600	13440	11700	10300	9120	8140	7300	6590	5980	5460	4980	4590	4220	3900	3610	3370	3140	2930
CB 244 N 24 x 14	160	39440	35850	32860	29280	25220	21960	19340	17110	15280	13700	12360	11230	10240	9350	8600	7910	7320	6770	6330	5880	5490
	150	37320	33920	31080	27340	23560	20510	18060	15980	14270	12790	11550	10490	9560	8730	8040	7390	6840	6330	5910	5500	5130
	140	35200	32000	29320	25380	21870	19040	16760	14840	13250	11880	10720	9730	8880	8100	7460	6860	6350	5870	5490	5100	4760
	130	33180	30160	27470	23430	20180	17570	15470	13690	12230	10960	9890	8980	8190	7480	6890	6330	5860	5420	5070	4710	4400
CB 243 N 24 x 12	120	32610	29610	24880	21220	18280	15920	14020	12400	11080	9930	8960	8140	7420	6770	6240	5740	5300	4910	4590	4270	3980
	110	29750	27040	22820	19470	16770	14600	12860	11380	10160	9110	8220	7460	6810	6210	5720	5260	4870	4500	4210	3910	3650
	100	27070	24610	20690	17650	15200	13230	11650	10310	9210	8260	7450	6770	6170	5630	5190	4770	4410	4080	3820	3550	3310
CB 242 N 24 x 10	93	26960	22270	18710	15960	13750	11970	10540	9330	8330	7470	6740	6120	5580	5100	4690	4310	3990	3690	3450		
	85	24440	20190	16960	14470	12470	10850	9560	8460	7550	6770	6110	5550	5060	4620	4250	3910	3620	3350	3130		

Loads within the heavy lines are maximum loads for web shear.

BEAM LOADS

CB SECTIONS—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
CB 241 N 24 x 9	81	22810	18840	15830	13500	11630	10130	8920	7890	7050	6320	5700	5180	4720	4310	3970	3650	3380	3130	2920	2720	2530
	74	20880	17250	14490	12360	10650	9270	8160	7220	6450	5780	5220	4740	4320	3950	3630	3340	3090	2860	2670	2490	2320
	70	19390	16020	13460	11480	9890	8610	7580	6710	5990	5370	4850	4400	4010	3670	3370	3100	2870	2660	2480	2310	2150
CB 213 N 21 x 13	116	25870	23520	21550	18840	16230	14130	12440	11010	9830	8820	7960	7220	6590	6010	5540	5090	4710	4360	4070	3790	3540
	108	24000	21810	20000	17530	15100	13150	11580	10250	9150	8200	7400	6720	6130	5600	5150	4740	4380	4060	3790	3520	3290
	101	22700	20630	18910	16320	14060	12240	10780	9540	8520	7640	6890	6260	5710	5210	4800	4410	4080	3780	3530	3280	3060
CB 212 N 21 x 9	96	24660	20370	17110	14600	12580	10950	9640	8530	7620	6830	6170	5600	5100	4660	4290	3950	3650	3380	3160	2930	2740
	89	22880	18900	15880	13550	11670	10160	8950	7920	7070	6340	5720	5190	4740	4330	3980	3660	3390	3140	2930	2720	2540
	83	21350	17630	14820	12640	10890	9480	8350	7390	6600	5910	5340	4850	4420	4030	3710	3420	3160	2920	2730	2540	2370
	77	19800	16350	13740	11720	10100	8790	7740	6850	6120	5480	4950	4490	4100	3740	3450	3170	2930	2710	2530	2360	2200
CB 211 N 21 x 8¼	73	18560	15330	12880	10990	9470	8240	7260	6420	5740	5140	4640	4210	3840	3510	3230	2970	2750	2540	2380	2210	2060
	67	17040	14080	11830	10090	8690	7570	6660	5900	5270	4720	4260	3870	3530	3220	2960	2730	2520	2330	2180	2030	1890
	62	15720	12980	10910	9310	8020	6980	6150	5440	4860	4350	3930	3570	3250	2970	2740	2520	2330	2150	2010	1870	1750
	58	14620	12070	10140	8650	7450	6490	5710	5060	4520	4050	3650	3320	3030	2760	2540	2340	2160	2000	1870	1740	1620
CB 203 N 20 x 12	146	34730	30240	25410	21670	18670	16260	14320	12670	11310	10140	9150	8310	7580	6920	6370	5860	5420	5020	4690	4360	4070
	135	32400	27820	23380	19940	17180	14960	13170	11650	10410	9330	8420	7650	6970	6370	5860	5390	4990	4610	4310	4010	3740
	125	30240	25650	21550	18390	15840	13790	12140	10750	9600	8600	7760	7050	6430	5870	5400	4970	4600	4250	3980	3700	3450
	115	28110	23490	19740	16840	14500	12630	11120	9840	8790	7880	7110	6460	5890	5380	4950	4550	4210	3900	3640	3380	3160
CB 202 N 20 x 9	98	23660	19550	16420	14010	12070	10510	9250	8190	7310	6550	5920	5370	4900	4470	4120	3790	3500	3240	3030	2820	2630
	88	21230	17530	14730	12570	10830	9430	8300	7340	6560	5880	5310	4820	4390	4010	3690	3400	3140	2910	2720	2530	2360
	80	19150	15820	13290	11340	9770	8500	7490	6630	5920	5310	4790	4350	3960	3620	3330	3060	2830	2620	2450	2280	2130
	74	17710	14630	12290	10490	9030	7860	6930	6130	5470	4910	4430	4020	3670	3350	3080	2830	2620	2430	2270	2110	1970

Loads within the heavy lines are maximum loads for web shear.

CB SECTIONS—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
CB 201 N 20 x 8	65	15530	12830	10780	9190	7920	6890	6070	5370	4800	4300	3880	3520	3210	2930	2700	2480	2300	2130	1990	1850	1720
	60	14180	11720	9840	8400	7230	6300	5550	4910	4380	3930	3550	3220	2940	2680	2470	2270	2100	1940	1820	1690	1580
	55	12910	10660	8960	7640	6590	5730	5050	4470	3990	3580	3230	2930	2670	2440	2250	2070	1910	1770	1650	1540	1440
CB 183 N 18 x 11¾	99	21270	19280	16200	13820	11900	10360	9130	8080	7210	6470	5840	5300	4830	4410	4060	3730	3450	3200	2990	2780	2590
	92	20020	17830	14980	12780	11010	9590	8440	7470	6670	5980	5400	4900	4470	4080	3760	3450	3190	2960	2760	2570	2400
	86	19030	16570	13920	11880	10230	8910	7850	6940	6200	5560	5020	4550	4150	3790	3490	3210	2970	2750	2570	2390	2230
	80	18040	15320	12880	10980	9460	8240	7250	6420	5730	5140	4640	4210	3840	3510	3230	2970	2750	2540	2380	2210	2060
CB 182 N 18 x 8¾	77	16980	14030	11280	10050	8660	7540	6640	5880	5250	4700	4250	3850	3510	3210	2950	2720	2510	2330	2170	2020	1890
	70	15410	12730	10690	9120	7860	6840	6020	5330	4760	4270	3850	3500	3190	2910	2680	2470	2280	2110	1970	1830	1710
	64	14060	11620	9760	8330	7170	6240	5500	4870	4350	3900	3520	3190	2910	2660	2450	2250	2080	1930	1800	1670	1560
CB 181 N 18 x 7½	57	12520	10340	8690	7410	6380	5560	4890	4330	3870	3470	3130	2840	2590	2370	2180	2000	1850	1710	1600	1490	1390
	52	11350	9380	7880	6720	5790	5040	4440	3930	3510	3140	2840	2580	2350	2150	1980	1820	1680	1560	1450	1350	1260
	49	10740	8870	7450	6360	5480	4770	4200	3720	3320	2970	2690	2440	2220	2030	1870	1720	1590	1470	1370	1280	1190
	47	10250	8460	7110	6070	5230	4550	4010	3550	3170	2840	2560	2330	2120	1940	1780	1640	1520	1400	1310	1220	1140
CB 164 N 16 x 12	90	18720	15680	13170	11240	9680	8430	7420	6570	5870	5260	4750	4310	3930	3590	3300	3040	2810	2600	2430	2260	2110
	83	17410	14410	12110	10330	8900	7750	6820	6040	5390	4830	4360	3960	3610	3300	3040	2790	2580	2390	2230	2080	1940
	76	15740	13200	11090	9460	8150	7100	6250	5530	4940	4430	4000	3630	3310	3020	2780	2560	2370	2190	2050	1900	1780
CB 163 N 16 x 8½	68	13670	11290	9490	8090	6970	6070	5340	4730	4220	3790	3420	3100	2830	2580	2380	2190	2020	1870	1750	1630	1520
	63	12680	10480	8800	7510	6470	5630	4960	4390	3920	3510	3170	2880	2630	2400	2210	2030	1880	1740	1620	1510	1410
	58	11650	9620	8090	6900	5940	5170	4560	4030	3600	3230	2910	2650	2410	2200	2030	1860	1720	1600	1490	1390	1290
CB 162 N 16 x 7¼	50	9860	8150	6850	5840	5030	4380	3860	3410	3050	2730	2470	2240	2040	1860	1720	1580	1460	1350	1260		
	45	8860	7320	6150	5240	4520	3930	3460	3060	2740	2450	2210	2010	1830	1670	1540	1420	1310	1210	1130		
	40	7880	6510	5470	4670	4020	3500	3080	2730	2440	2180	1970	1790	1630	1490	1370	1260	1170	1080	1010		
	37	7100	5870	4930	4210	3620	3150	2780	2460	2200	1970	1780	1610	1470	1340	1240	1140	1050	970	910		

Loads within the heavy lines are maximum loads for web shear.
Loads below the dotted lines will produce excessive deflection.

BEAM LOADS

BEAM LOADS

CB SECTIONS—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
CB 153 N 15 x 11	108	25200	20690	17090	14360	12250	10550	9190	8090	7160	6390	5730	5170	4700	4280	3910	3600	3310	3060	2830	2650	2460
	99	22600	19010	15700	13190	11250	9690	8440	7430	6580	5870	5270	4750	4310	3930	3590	3310	3040	2810	2600	2430	2260
	91	20800	17420	14390	12090	10320	8890	7740	6810	6030	5380	4830	4360	3960	3610	3290	3030	2790	2580	2390	2230	
	85	19440	16250	13420	11280	9620	8290	7210	6350	5620	5020	4500	4060	3690	3360	3070	2830	2600	2400	2230	2080	
CB 152 N 15 x 7½	72	16230	13140	10850	9120	7780	6700	5830	5140	4550	4060	3640	3290	2980	2720	2480	2290	2100	1940	1800	1680	1560
	66	14860	12040	9940	8350	7130	6140	5340	4710	4160	3720	3330	3010	2730	2490	2270	2090	1930	1780	1650	1540	1430
	60	13460	10900	9000	7560	6450	5560	4840	4260	3770	3370	3020	2720	2470	2260	2060	1900	1740	1610	1490	1390	
	55	12360	10010	8270	6950	5920	5100	4440	3910	3460	3090	2770	2500	2270	2070	1890	1740	1600	1480	1370	1280	
CB 151 N 15 x 6¾	49	11070	8960	7400	6220	5310	4570	3980	3500	3100	2770	2480	2240	2030	1860	1690	1560	1430	1330	1230	1150	1070
	44	9940	8050	6650	5590	4770	4110	3580	3150	2790	2490	2230	2010	1830	1670	1520	1400	1290	1190	1100	1030	960
	39	8860	7180	5930	4980	4250	3660	3190	2810	2480	2220	1990	1790	1630	1490	1360	1250	1150	1060	980	920	
	35	7900	6400	5280	4440	3790	3260	2840	2500	2210	1980	1770	1600	1450	1320	1210	1110	1020	950	880	820	
CB 145 N 14	119	22080	19870	18060	15760	13450	11590	10090	8880	7860	7020	6290	5680	5160	4700	4290	3950	3640	3360	3110		
	111	20690	18620	16930	14670	12510	10780	9380	8260	7310	6530	5850	5280	4800	4370	3990	3680	3380	3130	2900		
	103	18920	17030	15480	13620	11620	10010	8720	7680	6790	6070	5440	4910	4460	4060	3710	3420	3140	2910	2690		
	95	17540	15790	14350	12530	10690	9210	8020	7060	6250	5580	5000	4520	4100	3740	3410	3140	2890	2670	2470		
	87	15750	14180	12890	11490	9800	8450	7350	6470	5730	5120	4590	4140	3760	3430	3130	2880	2650	2450	2270		
CB 144 N 14	84	17050	15350	12960	10890	9290	8000	6970	6140	5430	4850	4350	3920	3560	3250	2970	2730	2510	2320	2150		
	78	16120	14510	11990	10080	8600	7410	6450	5680	5020	4490	4020	3630	3300	3010	2740	2530	2320	2150	1990		
CB 143 N 14	74	16630	13460	11120	9340	7970	6870	5980	5260	4660	4160	3730	3370	3060	2790	2540	2340	2150	1990	1840		
	68	15250	12350	10200	8570	7310	6300	5480	4830	4270	3820	3420	3090	2800	2560	2330	2150	1980	1830	1690		
	61	13650	11050	9130	7670	6540	5640	4910	4320	3820	3420	3060	2760	2510	2290	2090	1920	1770	1640			

Loads within the heavy lines are maximum loads for web shear.
Loads below the dotted lines will produce excessive deflection.

CB SECTIONS—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
CB 142 N 14 x 8	58	19580	15920	12580	10190	8420	7070	6030	5200	4520	3980	3530	3150	2820	2550	2310	2110	1930	1770	1630	1510	1400
	53	17690	14550	11500	9310	7690	6460	5510	4750	4130	3640	3220	2880	2580	2330	2110	1930	1760	1620	1490	1380	
	48	16100	13150	10390	8410	6950	5840	4980	4290	3730	3290	2910	2600	2330	2100	1910	1740	1590	1460	1350	1240	
	43	14540	11740	9280	7510	6200	5210	4450	3830	3340	2940	2600	2320	2080	1880	1710	1550	1420	1310	1200	1110	
CB 141 N 14 x 6¾	42	14960	11460	9060	7330	6060	5090	4340	3740	3260	2870	2540	2270	2030	1830	1660	1520	1390	1280	1170	1090	1000
	37	13200	10110	7990	6470	5340	4490	3830	3300	2870	2530	2240	2000	1790	1620	1470	1340	1220	1130	1030	960	890
	33	11710	8970	7080	5740	4740	3980	3400	2930	2550	2240	1980	1770	1590	1430	1300	1190	1080	1000	920	850	790
	30	10390	7950	6280	5090	4200	3530	3010	2600	2260	1990	1760	1570	1410	1270	1150	1050	960	890	810	750	
CB 125 N 12 x 12	85	21480	18790	16700	13860	11450	9620	8210	7070	6150	5420	4800	4280	3840	3470	3150	2870	2620	2410			
	79	20210	17680	15710	12830	10600	8900	7590	6540	5700	5020	4440	3960	3550	3210	2910	2660	2420	2230			
	72	18320	16020	14240	11680	9640	8100	6910	5950	5180	4570	4040	3610	3230	2920	2650	2420	2210				
	65	16420	14360	12760	10540	8700	7310	6240	5370	4680	4120	3650	3260	2920	2630	2390	2180	1990				
CB 124 N 12 x 10	64	17270	15110	12700	10280	8490	7140	6090	5240	4570	4020	3560	3180	2850	2570	2330	2130	1940	1790			
	58	15180	13280	11560	9360	7730	6500	5540	4770	4160	3660	3240	2890	2590	2340	2120	1940	1770				
	53	14440	12630	10450	8460	6990	5870	5010	4310	3760	3310	2930	2610	2340	2120	1920	1750	1600				
CB 123 N 12 x 8	50	15680	12100	9560	7740	6390	5370	4580	3950	3440	3030	2680	2390	2140	1940	1760	1600	1460				
	45	14060	10860	8580	6950	5740	4820	4110	3540	3080	2720	2400	2150	1920	1740	1580	1440	1310				
	40	12200	9700	7660	6200	5120	4310	3670	3160	2750	2430	2150	1920	1720	1550	1410	1280	1170				
CB 122 N 12 x 6½	36	11290	8650	6830	5530	4570	3840	3280	2820	2460	2160	1910	1710	1530	1380	1260	1150	1050				
	32	9990	7650	6050	4900	4040	3400	2900	2500	2170	1910	1690	1510	1360	1220	1110	1010	930				
	28	8720	6680	5280	4270	3530	2970	2530	2180	1900	1670	1480	1320	1180	1070	970	880	810				
	25	7540	5780	4570	3700	3050	2570	2190	1890	1640	1450	1280	1140	1020	920	840	770	700				

Loads within the heavy lines are maximum loads for web shear.
Loads below the dotted lines will produce excessive deflection.

BEAM LOADS

CB SECTIONS—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	Span in Feet: 3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
CB 103 N 10 x 10	66	38200	28650	22920	19100	16380	13820	10920	8840	7310	6140	5240	4510	3930	3460	3060	2730	2450	2210
	60	34030	25520	20420	17020	14590	12570	9930	8040	6640	5580	4760	4100	3570	3140	2780	2480	2230	2010
	54	29950	22460	17970	14980	12840	11230	8950	7250	5990	5030	4290	3700	3220	2830	2510	2240	2010	1810
	49	27200	20400	16320	13600	11660	10200	8080	6540	5400	4540	3870	3340	2900	2560	2260	2020	1810	
CB 102 N 10 x 8	45	28330	21250	17000	14170	12030	9210	7280	5890	4870	4090	3490	3010	2620	2300	2040	1820	1630	1470
	41	26400	19800	15840	13200	10900	8350	6590	5340	4410	3710	3160	2720	2370	2090	1850	1650	1480	
	37	24100	18080	14460	12050	9750	7460	5900	4780	3940	3310	2830	2440	2120	1870	1650	1480	1320	
	33	23010	17260	13800	11510	8570	6570	5190	4200	3470	2910	2490	2140	1860	1640	1450	1300	1160	
CB 101 N 10 x 5¾	29	22850	17140	13710	10370	7620	5830	4610	3730	3080	2590	2210	1900	1660	1460	1290	1150	1030	930
	26	21050	15790	12630	9200	6760	5180	4090	3310	2740	2300	1960	1690	1470	1290	1150	1020	920	830
	23	19200	14400	11520	8030	5900	4520	3570	2890	2390	2010	1710	1470	1280	1130	1000	890	800	
	21	19010	14260	10320	7170	5270	4030	3190	2580	2130	1790	1530	1320	1150	1010	890	800	710	
CB 83 N 8 x 8	35	20610	15460	12370	10310	7670	5870	4640	3760	3100	2610	2220	1920	1670	1470				
	33	19490	14620	11700	9750	7230	5530	4370	3540	2920	2460	2100	1810	1570	1380				
	31	18690	14020	11220	9170	6740	5160	4080	3300	2730	2290	1950	1680	1470	1290				
CB 82 N 8 x 6½	30	19530	14650	11720	8770	6440	4930	3900	3160	2610	2190	1870	1610	1400	1230				
	27	17360	13020	10420	7900	5800	4450	3510	2840	2350	1970	1680	1450	1260	1110				
	24	15290	11470	9180	7030	5170	3960	3130	2530	2090	1760	1500	1290	1120	990				

Loads within the heavy lines are maximum loads for web shear.
Loads below the dotted lines will produce excessive deflection.

BEAMS—STANDARD MILL—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
B 40 N 9 x 5½ Ⓒ	23	22750	15300	9790	6800	5000	3830	3020	2450	2020	1700	1450	1250	1090	960	850	760
	20	15690	11770	9120	6330	4650	3560	2820	2280	1880	1580	1350	1160	1010	830	790	700
B 39 N 8 x 5 Ⓒ	21	21200	11930	7630	5300	3890	2980	2360	1910	1580	1320	1130	970	850	750		
	19	18370	11330	7250	5030	3700	2830	2240	1810	1500	1260	1070	920	800	710		
	17	13630	10220	6860	4770	3500	2680	2120	1720	1420	1190	1020	880	760	670		
H-BEAMS																	
H 4 8 x 8	37.7	32000	22650	14500	10070	7400	5660	4480	3620	2990	2520	2150	1850	1610	1420		
	34.3	24000	18000	13870	9630	7080	5420	4280	3470	2860	2410	2050	1770	1540	1360		
	32.6	20030	15020	12020	9400	6910	5290	4180	3380	2800	2350	2000	1730	1500	1320		
H 3A 6 x 6	27.5	21020	12300	7870	5470	4020	3080	2430	1970	1630	1370						
	25.0	15020	11270	7540	5230	3850	2940	2330	1880	1560	1310						
H 3 6 x 6	22.5	18000	10280	6580	4570	3360	2570	2030	1640	1360	1140						
	22.0	12000	9000	6190	4300	3160	2420	1910	1550	1280	1070						
H 2 5 x 5 Ⓒ	18.9	12520	7130	4560	3170	2330	1780	1410	1140								
H 1 4 x 4 Ⓒ	13.8	7070	3980	2540	1770	1300	990	790									

Loads within the heavy lines are maximum loads for web shear.
Loads below the dotted lines will produce excessive deflection.
Ⓒ Carnegie Steel Company only.

BEAM LOADS

BEAMS—AMERICAN STANDARD—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET																			
		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B 18 24 x 7⅛	120	30110	24880	20910	17820	15360	13380	11760	10420	9290	8340	7530	6830	6220	5690	5230	4820	4450	4130	3840	3350
	115	29410	24300	20430	17400	15000	13070	11490	10170	9080	8150	7350	6670	6070	5560	5110	4710	4350	4030	3750	3270
	110	28690	23710	19930	16980	14640	12750	11210	9930	8860	7950	7170	6510	5930	5420	4980	4590	4240	3910	3660	3190
	105.9	28120	23230	19520	16640	14340	12500	10980	9730	8680	7790	7030	6380	5810	5310	4880	4500	4160	3860	3590	3120
B 1 24 x 7	100	23720	19600	16470	14030	12100	10540	9260	8210	7320	6570	5930	5380	4900	4480	4120	3800	3510	3250	3030	2640
	95	23020	19020	15980	13620	11740	10230	8990	7960	7100	6380	5790	5220	4760	4350	4000	3680	3400	3160	2940	2560
	90	22300	18430	15490	13200	11380	9910	8710	7720	6880	6180	5580	5060	4610	4220	3870	3570	3300	3060	2850	2480
	85	21600	17850	15000	12780	11020	9600	8440	7470	6670	5980	5400	4900	4460	4080	3750	3460	3200	2960	2760	2400
	79.9	20870	17250	14490	12350	10650	9280	8150	7220	6440	5780	5220	4730	4310	3950	3620	3340	3090	2860	2660	2320
B 2 20 x 7	100	19780	16350	13740	11700	10090	8790	7730	6840	6100	5480	4950	4490	4090	3920	3430	3170	2930	2710	2520	2200
	95	19200	15860	13330	11360	9790	8530	7500	6640	5920	5320	4800	4350	3970	3630	3330	3070	2840	2630	2450	2130
	90	18600	15380	12920	11010	9490	8270	7270	6440	5740	5150	4650	4220	3840	3520	3230	2980	2750	2550	2370	2070
	85	18020	14890	12510	10660	9190	8010	7040	6240	5560	4990	4510	4090	3720	3410	3130	2880	2670	2470	2300	2000
	81.4	17600	14540	12220	10410	8980	7820	6870	6090	5430	4870	4400	3990	3640	3330	3050	2820	2600	2410	2240	1960
B 3 20 x 6¼	75	15160	12530	10530	8970	7740	6740	5920	5250	4680	4200	3790	3440	3130	2870	2630	2430	2240	2080	1930	1680
	70	14570	12040	10120	8620	7430	6480	5690	5040	4500	4040	3640	3300	3010	2750	2530	2330	2160	2000	1860	1620
	65.4	14030	11600	9750	8300	7160	6240	5480	4860	4330	3890	3510	3180	2900	2650	2440	2250	2080	1930	1790	1560
B 19 18 x 7 ©	90	16750	13850	11630	9910	8550	7450	6540	5800	5170	4640	4190	3800	3460	3170	2910	2680	2480	2300	2110	1860
	85	16220	13410	11270	9600	8270	7210	6340	5610	5010	4490	4060	3680	3350	3070	2820	2600	2400	2230	2070	1800
	80	15690	12970	10900	9280	8010	6970	6130	5430	4840	4350	3920	3560	3240	2970	2720	2510	2320	2150	2000	1740
	75.6	15220	12580	10570	9010	7770	6770	5950	5270	4700	4220	3810	3450	3150	2880	2640	2440	2250	2090	1940	1690
B 4 18 x 6	70	12230	10110	8500	7240	6420	5440	4780	4230	3780	3390	3060	2770	2530	2310	2120	1960	1810	1680	1560	1360
	65	11700	9670	8130	6920	5970	5200	4570	4050	3610	3240	2930	2650	2420	2210	2030	1870	1730	1610	1490	1300
	60	11170	9230	7760	6610	5700	4960	4360	3870	3450	3090	2750	2530	2310	2110	1940	1790	1650	1530	1430	1240
	54.7	10610	8770	7370	6280	5410	4710	4140	3670	3270	2940	2650	2410	2190	2010	1840	1700	1570	1460	1350	1180

© Carnegie Steel Company only.

BEAMS—AMERICAN STANDARD—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET																				
		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
	100	39670	29150	22320	17640	14280	11800	9910	8450	7280	6340	5580	4940	4410	3960	3570	3240	2960	2700	2480	2280	2110
	95	38430	28240	21630	17090	13840	11430	9600	8190	7060	6140	5410	4790	4280	3830	3460	3140	2860	2620	2410	2210	2050
B 5	90	37200	27300	20930	16540	13390	11060	9290	7930	6830	5950	5240	4630	4140	3710	3350	3040	2770	2530	2330	2140	1980
15 x 6⅜	85	35970	26430	20240	15990	12950	10700	8990	7670	6600	5750	5060	4480	4000	3590	3240	2940	2680	2450	2250	2070	1920
	81.3	35070	25770	19730	15590	12620	10430	8760	7470	6440	5610	4940	4370	3900	3500	3160	2870	2610	2390	2200	2020	1870
	75	30540	22440	17180	13570	11000	9090	7640	6510	5510	4890	4290	3800	3390	3050	2750	2490	2270	2080	1910	1760	1630
B 6	70	29320	21540	16490	13030	10550	8720	7330	6250	5390	4690	4120	3650	3260	2920	2640	2390	2180	2000	1830	1690	1560
15 x 6	65	28090	20640	15800	12490	10110	8360	7020	5980	5160	4490	3950	3500	3120	2800	2530	2290	2090	1910	1760	1620	1500
	60.8	27070	19890	15230	12030	9740	8050	6770	5770	4970	4330	3810	3370	3010	2700	2440	2210	2010	1840	1690	1560	1440
	55	22600	16610	12720	10050	8140	6730	5650	4820	4150	3590	3180	2820	2510	2250	2030	1850	1680	1540	1410	1300	1200
B 7	50	21380	15710	12030	9500	7700	6360	5350	4560	3930	3420	3010	2660	2380	2130	1920	1750	1590	1460	1340	1230	1140
15 x 5½	45	20150	14810	11340	8960	7260	6000	5040	4290	3700	3220	2833	2510	2240	2010	1810	1650	1500	1370	1260	1160	1070
	42.9	19630	14420	11040	8730	7070	5840	4910	4180	3610	3140	2760	2450	2180	1960	1770	1600	1460	1340	1230	1130	1050
	55	17740	13030	9980	7890	6390	5280	4440	3780	3260	2840	2490	2210	1970	1770	1600	1450	1320	1210	1110		
B 8	50	16760	12310	9430	7450	6030	4990	4190	3570	3080	2680	2360	2090	1860	1670	1510	1370	1250	1140	1050		
12 x 5¼	45	15780	11590	8880	7010	5680	4700	3950	3360	2900	2520	2220	1970	1750	1570	1420	1290	1170	1070	990		
	40.8	14940	10980	8410	6640	5380	4450	3740	3180	2740	2390	2100	1860	1660	1490	1340	1220	1110	1020	930		
B 9	35	12610	9270	7100	5610	4540	3750	3150	2690	2320	2020	1770	1570	1400	1260	1140	1030	940	860	790		
12 x 5	31.8	11990	8810	6740	5330	4320	3570	3000	2550	2200	1920	1690	1490	1330	1200	1080	980	890	820	750		
	40	10530	7740	5930	5100	3790	3130	2630	2240	1930	1690	1480	1310	1170	1050	950	860					
B 10	35	9720	7140	5470	4320	3500	2890	2430	2070	1780	1550	1370	1210	1080	970	870	790					
10 x 4⅝	30	8900	6540	5010	3960	3200	2650	2230	1900	1630	1420	1250	1110	990	890	800	730					
	25.4	8140	5980	4580	3620	2930	2420	2050	1730	1500	1300	1140	1010	900	810	730	670					

Loads below the dotted lines will produce excessive deflection.

BEAM LOADS

BEAM LOADS

BEAMS—AMERICAN STANDARD—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 2	2½	3	3½	4	4½	5	5½	6	6½	7	8	9	10	11	12	13	14	15	16	17
B 11 9 x 4⅜	35	74100	47420	32930	24200	18530	14640	11860	9800	8230	7020	6060	4640	4260	2970	2450	2060	1760	1510	1320	1160	1030
	30	60590	43200	30000	22040	16880	13330	10800	8930	7500	6390	5520	4220	3340	2700	2230	1880	1600	1380	1200	1060	940
	25	42880	34300	27070	19890	15230	12030	9740	8050	6770	5770	4980	3810	3010	2440	2010	1690	1440	1240	1080	950	840
	21.8	31320	25060	20880	17900	14180	11200	9070	7500	6300	5370	4620	3540	2800	2260	1870	1570	1340	1160	1010	880	780
B 12 8 x 4	25.5	51040	32660	22680	16670	12760	10080	8170	6750	5670	4830	4170	3190	2520	2040	1690	1420	1210	1040	910	800	710
	23	42340	30800	21390	15710	12030	9510	7700	6360	5350	4560	3930	3010	2380	1930	1590	1340	1140	980	860	750	670
	20.5	33500	26800	20080	14750	11300	8920	7230	5970	5020	4280	3690	2820	2230	1810	1490	1250	1070	920	800	710	630
	18.4	25920	20740	17280	13930	10660	8430	6830	5640	4740	4040	3480	2670	2110	1710	1420	1180	1010	870	760	670	590
B 13 7 x 3⅝	20	35950	23010	15980	11740	8990	7100	5750	4750	3990	3400	2940	2250	1780	1440	1190	1000	850	730	640	560	500
	17.5	28980	23180	14840	10900	8350	6590	5340	4410	3710	3160	2730	2090	1650	1340	1100	930	790	680	590	520	460
	15.3	21000	16800	14000	10140	7760	6130	4970	4110	3450	2940	2540	1940	1530	1240	1030	860	740	630	550	490	430
B 14 6 x 3⅜	17.25	26020	16650	11560	8520	6500	5140	4160	3440	2890	2460	2120	1630	1280	1040	860	720	620	530	460	410	360
	14.75	23820	15240	10590	7780	5950	4700	3810	3150	2650	2260	1940	1490	1180	950	790	660	560	490	420	370	330
	12.5	16560	13250	9680	7110	5450	4300	3490	2880	2420	2060	1780	1360	1080	870	720	610	520	450	390	340	300
B 15 5 x 3	14.75	18060	11560	8030	5900	4510	3570	2890	2390	2010	1710	1470	1130	890	720	600	500	430	370	320	280	250
	12.25	16220	10380	7210	5300	4060	3200	2600	2140	1800	1540	1320	1010	800	650	540	450	380	330	290	250	220
	10	12600	9290	6450	4740	3630	2870	2320	1920	1610	1370	1180	910	720	580	480	400	340	300	260	230	200
B 16 4 x 2⅝	10.5	10630	6800	4720	3470	2660	2100	1700	1410	1180	1010	870	660	520	430	350						
	9.5	10040	6420	4460	3280	2510	1980	1610	1330	1110	950	820	630	500	400	330						
	8.5	9450	6050	4200	3090	2360	1870	1510	1250	1050	890	770	590	470	380	310						
	7.7	8950	5730	3980	2920	2240	1770	1430	1180	990	850	730	560	440	360	300						
B 17 3 x 2⅜	7.5	5770	3690	2560	1880	1440	1140	920	760	640	550	470	360	280	230	190						
	6.5	5330	3410	2370	1740	1330	1050	850	700	590	500	430	330	260	210	180						
	5.7	4960	3180	2210	1620	1240	980	790	660	550	470	410	310	250	200	160						

Loads within the heavy lines are maximum loads for web shear.
Loads below the dotted lines will produce excessive deflection.

BEAMS—ILLINOIS-SPECIAL LIGHT

ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
B 20 24 x 7 Φ	71	18140	14990	12590	10740	9250	8060	7090	6280	5610	5030	4540	4120	3760	3430	3160	2900	2690	2490	2320	2160	2020
B 21 21 x 7 Φ	75	17410	14380	12080	10310	8880	7730	6810	6020	5380	4820	4350	3950	3600	3290	3030	2790	2580	2390	2230	2070	1930
B 22 21 x 6½ Φ	58	13060	10780	9060	7730	6660	5800	5100	4520	4030	3620	3260	2960	2700	2470	2270	2090	1930	1790	1670	1550	1450
B 23 18 x 6 Φ	46	9010	7440	6250	5340	4600	4000	3520	3120	2780	2500	2250	2050	1870	1700	1570	1440	1330	1230	1150	1070	1000
B 24 15 x 5½ Φ	35	5880	4860	4080	3480	3000	2610	2300	2030	1820	1630	1470	1330	1220	1110	1020	940	870	810	750		
B 25 12 x 5 Φ	25	3500	2890	2430	2070	1790	1560	1370	1210	1080	970	880	800	730	660							
B 26 10 x 5 Φ	22	2650	2190	1840	1570	1350	1180	1040	920	820	730											

Loads below the dotted lines will produce excessive deflection.
Φ Illinois Steel Company only.

BEAM
LOADS

CHANNEL LOADS

CHANNELS—AMERICAN STANDARD—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
*C 60 18 x 4 [C]	58.0	24830	18250	13970	11040	8940	7380	6200	5290	4560	3970	3500	3090	2760	2480	2240	2030	1850	1690	1560	1430	1320
	51.9	23030	16920	12960	10240	8290	6850	5750	4910	4230	3680	3240	2870	2560	2300	2070	1880	1720	1570	1440	1330	1230
	45.8	21230	15600	11950	9440	7640	6310	5300	4530	3900	3390	2990	2640	2360	2120	1910	1740	1580	1440	1330	1220	1130
	42.7	20330	14940	11440	9040	7320	6050	5080	4330	3730	3250	2860	2530	2260	2030	1830	1660	1520	1380	1270	1170	1080
C 1 15 x 3⅜	55	19070	14010	10720	8470	6860	5670	4800	4060	3440	3050	2680	2370	2120	1900	1720	1560	1420	1300	1190	1100	1020
	50	17850	13120	10040	7940	6430	5310	4460	3800	3280	2860	2510	2220	1980	1780	1610	1460	1330	1210	1120	1030	950
	45	16620	12210	9350	7380	5980	4940	4150	3540	3050	2660	2340	2070	1850	1660	1500	1360	1240	1130	1040	960	880
	40	15390	11310	8660	6840	5540	4580	3850	3280	2830	2460	2160	1920	1710	1530	1390	1260	1140	1050	960	890	820
	35	14170	10410	7970	6300	5100	4220	3540	3020	2600	2270	1990	1760	1570	1410	1280	1160	1050	960	890	820	750
	33.9	13890	10210	7810	6170	5000	4130	3470	2960	2550	2220	1950	1730	1540	1390	1250	1130	1030	950	870	800	740
†C 20 13 x 4	50	16050	11790	9030	7130	5780	4770	4010	3420	2950	2570	2260	2000	1780	1600	1440	1310	1190	1090	1000	920	850
	45	14980	11000	8420	6660	5390	4460	3740	3190	2750	2400	2110	1870	1660	1490	1350	1200	1110	1020	940	860	800
	40	13920	10220	7830	6190	5010	4140	3480	2960	2560	2230	1960	1730	1550	1390	1250	1140	1040	950	870	800	740
	37	13280	9750	7470	6860	4780	3950	3320	2830	2440	2120	1870	1650	1480	1320	1200	1080	990	900	830	760	710
	35	12860	9440	7230	5710	4630	3820	3210	2740	2360	2060	1810	1600	1430	1280	1160	1050	960	870	800	740	680
	31.8	12180	8950	6850	5410	4380	3620	3040	2590	2240	1950	1710	1520	1350	1210	1100	990	910	830	760	700	650
C 2 12 x 3	40	10920	8020	6140	4850	3930	3250	2730	2330	2010	1750	1530	1360	1210	1090	980	890	810	740	680	630	580
	35	9930	7300	5590	4410	3580	2960	2480	2120	1820	1590	1400	1240	1100	990	890	810	740	680	620	570	530
	30	8960	6580	5040	3980	3220	2670	2240	1910	1650	1430	1260	1120	990	890	810	730	670	610	560	520	480
	25	7970	5860	4490	3540	2870	2370	1990	1700	1460	1280	1120	990	890	800	720	650	590	540	500	460	420
	20.7	7120	5230	4000	3170	2560	2120	1780	1520	1310	1140	1000	890	790	710	640	580	530	480	440	410	380
C 3 10 x 2⅝	35	7680	5640	4320	3410	2770	2290	1920	1640	1410	1230	1080	960	850	770	690	630					
	30	6860	5040	3860	3050	2470	2040	1720	1460	1260	1100	970	850	760	680	620	560					
	25	6050	4440	3400	2690	2180	1800	1520	1290	1110	970	850	660	670	600	540	490					
	20	5230	3840	2940	2320	1880	1560	1310	1110	960	840	740	650	580	520	470	430					
	15.3	4460	3280	2510	1980	1610	1330	1110	950	820	710	630	560	500	440	400	360					

Loads below the dotted lines will produce excessive deflection.
[C] Carnegie Steel Company only.

*C 60—18″ is a Ship Building Channel, not American Standard.
†C 20—13″ is a Car Building Channel.

CHANNELS—AMERICAN STANDARD—ALLOWABLE UNIFORM LOAD IN POUNDS PER FOOT

Section Index and Nominal Size	Pounds per Foot	SPAN IN FEET 2	2½	3	3½	4	4½	5	5½	6	6½	7	8	9	10	11	12	13	14	15	16	17
C 4 9 x 2½	25.0	47100	30140	20930	15380	11780	9300	7540	6230	5220	4460	3840	2940	2320	1880	1550	1310	1110	960	840	730	650
	20.0	40500	25920	18000	13220	10130	8000	6480	5360	4490	3830	3300	2520	2010	1620	1330	1130	960	820	720	630	560
	15.0	30780	21700	15070	11070	8480	6700	5420	4480	3750	3210	2760	2110	1670	1350	1120	940	800	690	600	530	470
	13.4	24840	19870	14000	10290	7880	6220	5040	4170	3510	2980	2580	1970	1560	1260	1040	880	750	640	560	490	440
C 5 8 x 2¼	21.25	35720	22860	15870	11660	8930	7050	5710	4720	3970	3380	2920	2230	1760	1430	1180	990	850	730	640	560	490
	18.75	32770	20970	14570	10700	8190	6470	5240	4330	3640	3100	2680	2050	1620	1310	1080	910	780	670	580	510	450
	16.25	29830	19090	13260	9740	7440	5890	4770	3940	3310	2820	2430	1860	1470	1190	990	830	710	610	530	470	410
	13.75	26880	17210	11950	8780	6720	5310	4300	3560	2990	2550	2190	1680	1330	1080	890	750	640	550	480	420	370
	11.50	21120	15510	10770	7910	6060	4790	3880	3200	2690	2290	1980	1510	1200	970	800	670	570	490	430	380	340
C 6 7 x 2⅛	19.75	28340	18140	12590	9250	7080	5600	4530	3750	3150	2680	2310	1770	1400	1130	940	790	670	580	500	440	390
	17.25	25760	16490	11450	8410	6440	5090	4120	3410	2870	2440	2100	1610	1270	1030	850	720	610	530	460	400	360
	14.75	23190	14840	10310	7570	5800	4580	3710	3070	2580	2200	1890	1450	1150	930	770	640	550	470	410	360	320
	12.25	20620	13200	9170	6730	5160	4070	3300	2730	2300	1950	1680	1290	1020	820	680	570	490	420	370	320	290
	9.8	17640	11570	8030	5900	4520	3570	2890	2390	2010	1710	1480	1130	890	720	600	500	430	370	320	280	250
C 7 6 x 1⅞	15.5	19460	12460	8650	6350	4870	3840	3110	2570	2160	1840	1590	1220	960	780	640	540	460	400	350	300	270
	13.0	17260	11050	7670	5640	4320	3410	2760	2280	1920	1640	1420	1080	850	690	570	480	410	350	310	270	240
	10.5	15050	9630	6690	4910	3760	2970	2410	1990	1670	1430	1230	940	740	600	500	420	360	310	270	240	210
	8.2	13000	8320	5780	4240	3250	2570	2080	1720	1440	1230	1060	810	640	520	430	360	310	270	230	200	180
C 8 5 x 1¾	11.5	12420	7950	5520	4060	3110	2450	1990	1640	1380	1180	1010	780	610	500	410	350	290	250	220	190	170
	9.0	10590	6780	4710	3460	2650	2090	1690	1400	1180	1000	860	660	520	420	350	290	250	220	190	170	150
	6.7	8900	5700	3950	2910	2220	1760	1420	1180	990	840	730	560	440	360	290	250	210	180	160	140	120
C 9 4 x 1⅝	7.25	6820	4370	3030	2230	1710	1350	1090	900	760	650	560	430	340	270							
	6.25	6230	3980	2770	2030	1560	1230	1000	820	690	590	510	390	310	250							
	5.40	5690	3640	2530	1860	1420	1120	910	750	630	540	460	360	280	230							
C 10 3 x 1⅜	6.0	4110	2630	1830	1340	1030	810	660	540	460	390	340	260	200	160							
	5.0	3670	2350	1630	1200	920	720	590	490	410	350	300	230	180	150							
	4.1	3270	2090	1450	1070	820	650	520	430	370	310	270	210	160	130							

Loads within the heavy lines are maximum loads for web shear.
Loads below the dotted horizontal lines will produce excessive deflection.

CHANNEL LOADS

ANGLE
LOADS

UNEQUAL ANGLES

Allowable Uniform Load in Kips

Neutral Axis Parallel to Shorter Leg

Applicable only when sections are rigidly secured against lateral deflection

Maximum Bending Stress 18,000 Pounds per Square Inch

Size, Inches	Thickness, Inches	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
8 x 6	1	181.32	9.47	19.2
	15/16	171.24	8.91	19.2
	7/8	160.92	8.34	19.3
	13/16	150.60	7.77	19.4
	3/4	140.04	7.19	19.5
	11/16	129.24	6.61	19.5
	5/8	118.44	6.03	19.6
	9/16	107.40	5.45	19.7
	1/2	96.24	4.86	19.8
	7/16	84.84	4.27	19.9
8 x 3½	1	164.28	9.50	17.3
	15/16	155.28	8.93	17.4
	7/8	146.16	8.37	17.5
	13/16	136.80	7.80	17.5
	3/4	127.32	7.22	17.7
	11/16	117.60	6.64	17.7
	5/8	107.76	6.06	17.8
	9/16	97.80	5.47	17.9
	1/2	87.72	4.88	18.0
	7/16	77.40	4.28	18.1
7 x 3½	1	126.96	8.25	15.4
	15/16	120.00	7.78	15.4
	7/8	113.04	7.28	15.5
	13/16	105.84	6.78	15.6
	3/4	98.64	6.29	15.7
	11/16	91.20	5.79	15.8
	5/8	83.64	5.28	15.9
	9/16	75.96	4.77	15.9
	1/2	68.16	4.26	16.0
	7/16	60.12	3.73	16.1
	3/8	51.96	3.21	16.2
6 x 4	1	96.24	7.02	13.7
	15/16	91.08	6.59	13.8
	7/8	85.80	6.18	13.9
	13/16	80.40	5.76	14.0
	3/4	75.00	5.35	14.0
	11/16	69.36	4.92	14.1
	5/8	63.72	4.49	14.2
	9/16	57.96	4.06	14.3
	1/2	52.08	3.63	14.4
	7/16	45.96	3.18	14.5
	3/8	39.84	2.74	14.5

Size, Inches	Thickness, Inches	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
6 x 3½	1	93.96	7.02	13.4
	15/16	88.92	6.61	13.5
	7/8	83.76	6.19	13.5
	13/16	78.60	5.78	13.6
	3/4	73.20	5.35	13.7
	11/16	67.80	4.92	13.8
	5/8	62.28	4.49	13.9
	9/16	56.64	4.07	13.9
	1/2	50.88	3.63	14.0
	7/16	45.00	3.19	14.1
	3/8	39.00	2.75	14.2
	5/16	32.88	2.30	14.3
5 x 4	7/8	59.88	5.08	11.8
	13/16	56.28	4.74	11.9
	3/4	52.44	4.39	12.0
	11/16	48.60	4.04	12.0
	5/8	44.76	3.70	12.1
	9/16	40.68	3.34	12.2
	1/2	36.60	2.98	12.3
	7/16	32.40	2.62	12.4
	3/8	28.08	2.26	12.4
5 x 3½	7/8	58.56	5.10	11.5
	13/16	54.96	4.75	11.6
	3/4	51.36	4.41	11.6
	11/16	47.64	4.06	11.7
	5/8	43.80	3.71	11.8
	9/16	39.84	3.35	11.9
	1/2	35.88	3.00	12.0
	7/16	31.68	2.63	12.1
	3/8	27.48	2.26	12.1
	5/16	23.28	1.91	12.2
5 x 3	13/16	53.40	4.75	11.2
	3/4	49.92	4.41	11.3
	11/16	46.32	4.07	11.4
	5/8	42.60	3.72	11.5
	9/16	38.76	3.35	11.6
	1/2	34.92	3.00	11.6
	7/16	30.96	2.64	11.7
	3/8	26.88	2.28	11.8
	5/16	22.68	1.91	11.9

UNEQUAL ANGLES

Allowable Uniform Load in Kips

Neutral Axis Parallel to Shorter Leg

Applicable only when sections are rigidly secured against lateral deflection

Maximum Bending Stress 18,000 Pounds per Square Inch

Size, Inches	Thickness, Inches	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
4½ x 3	13/16	43.44	4.26	10.2
	3/4	40.56	3.95	10.3
	11/16	37.68	3.63	10.4
	5/8	34.68	3.32	10.5
	9/16	31.68	3.01	10.5
	1/2	28.44	2.68	10.6
	7/16	25.20	2.36	10.7
	3/8	21.96	2.04	10.8
	5/16	18.48	1.70	10.9
4 x 3½	13/16	35.04	3.71	9.5
	3/4	33.00	3.47	9.5
	11/16	30.72	3.20	9.6
	5/8	28.20	2.91	9.7
	9/16	25.80	2.64	9.8
	1/2	23.16	2.35	9.9
	7/16	20.64	2.08	9.9
	3/8	18.00	1.80	10.0
	5/16	15.12	1.50	10.1
4 x 3	13/16	34.44	3.76	9.2
	3/4	32.16	3.48	9.2
	11/16	29.88	3.20	9.3
	5/8	27.60	2.93	9.4
	9/16	25.20	2.66	9.5
	1/2	22.68	2.37	9.6
	7/16	20.16	2.08	9.7
	3/8	17.52	1.80	9.7
	5/16	14.76	1.51	9.8
	1/4	12.00	1.22	9.9
3½ x 3	13/16	26.40	3.25	8.1
	3/4	24.60	3.00	8.2
	11/16	22.92	2.77	8.3
	5/8	21.12	2.53	8.3
	9/16	19.32	2.30	8.4
	1/2	17.40	2.05	8.5
	7/16	15.48	1.80	8.6
	3/8	13.56	1.57	8.7
	5/16	11.52	1.32	8.7
	1/4	9.36	1.06	8.8
3½ x 2½	11/16	22.20	2.78	8.0
	5/8	20.52	2.55	8.1
	9/16	18.72	2.30	8.1
	1/2	16.92	2.06	8.2
	7/16	15.12	1.82	8.3
	3/8	13.20	1.57	8.4
	5/16	11.16	1.32	8.4
	1/4	9.00	1.05	8.6
3 x 2½	9/16	13.80	1.95	7.1
	1/2	12.48	1.74	7.2
	7/16	11.16	1.54	7.2
	3/8	9.72	1.33	7.3
	5/16	8.28	1.12	7.4
	1/4	6.72	0.90	7.5
3 x 2	1/2	12.00	1.75	6.9
	7/16	10.68	1.54	6.9
	3/8	9.36	1.33	7.0
	5/16	7.92	1.12	7.1
	1/4	6.48	0.90	7.2
2½ x 2	1/2	8.40	1.45	5.8
	7/16	7.56	1.28	5.9
	3/8	6.60	1.10	6.0
	5/16	5.64	0.93	6.1
	1/4	4.56	0.75	6.1
	3/16	3.48	0.56	6.2
	© 1/8	2.40	0.38	6.3
2½ x 1½	5/16	5.28	0.92	5.7
	1/4	4.32	0.75	5.8
	3/16	3.36	0.57	5.9
2¼ x 1½ ©	1/2	6.48	1.30	5.0
	7/16	5.76	1.13	5.1
	3/8	5.04	0.98	5.2
	5/16	4.32	0.83	5.2
	1/4	3.60	0.68	5.3
	3/16	2.76	0.51	5.4
2 x 1½	3/8	4.08	0.88	4.6
	5/16	3.48	0.74	4.7
	1/4	2.88	0.60	4.8
	3/16	2.16	0.44	4.9
	1/8	1.50	0.30	4.9
2 x 1¼ ©	1/4	2.75	0.60	4.6
	3/16	2.12	0.45	4.7
1¾ x 1¼	1/4	2.11	0.51	4.1
	3/16	1.64	0.39	4.2
	1/8	1.13	0.27	4.3
1½ x 1¼ ©	5/16	1.92	0.55	3.5
	1/4	1.56	0.44	3.6
	3/16	1.21	0.33	3.7

© Carnegie Steel Company only.

ANGLE

LOADS

UNEQUAL ANGLES

Allowable Uniform Load in Kips

Neutral Axis Parallel to Longer Leg

Applicable only when sections are rigidly secured against lateral deflection

Maximum Bending Stress 18,000 Pounds per Square Inch

Size, Inches	Thickness, Inches	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
8 x 6	1	107.04	6.87	15.6
	15/16	101.16	6.47	15.6
	7/8	95.28	6.06	15.7
	13/16	89.28	5.65	15.8
	3/4	83.16	5.23	15.9
	11/16	76.92	4.82	16.0
	5/8	70.56	4.40	16.0
	9/16	64.08	3.98	16.1
	1/2	57.48	3.55	16.2
	7/16	50.76	3.12	16.3
8 x 3½	1	36.24	3.92	9.2
	15/16	34.20	3.67	9.3
	7/8	32.28	3.43	9.4
	13/16	30.24	3.19	9.5
	3/4	28.20	2.94	9.6
	11/16	26.04	2.69	9.7
	5/8	24.00	2.46	9.7
	9/16	21.84	2.22	9.9
	1/2	19.68	1.98	9.9
	7/16	17.52	1.75	10.0
7 x 3½	1	35.52	3.91	9.1
	15/16	33.60	3.67	9.2
	7/8	31.68	3.42	9.3
	13/16	29.76	3.19	9.3
	3/4	27.72	2.94	9.4
	11/16	25.68	2.71	9.5
	5/8	23.64	2.47	9.6
	9/16	21.60	2.23	9.7
	1/2	19.44	2.00	9.7
	7/16	17.28	1.75	9.9
	3/8	15.12	1.52	9.9
6 x 4	1	45.48	4.49	10.1
	15/16	43.08	4.21	10.2
	7/8	40.68	3.95	10.3
	13/16	38.16	3.68	10.4
	3/4	35.64	3.41	10.5
	11/16	33.12	3.14	10.5
	5/8	30.48	2.87	10.6
	9/16	27.72	2.59	10.7
	1/2	24.96	2.32	10.8
	7/16	22.20	2.04	10.9
	3/8	19.20	1.75	11.0

Size, Inches	Thickness, Inches	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
6 x 3½	1	34.80	3.91	8.9
	15/16	32.88	3.66	9.0
	7/8	31.08	3.43	9.1
	13/16	29.16	3.19	9.1
	3/4	27.24	2.96	9.2
	11/16	25.32	2.72	9.3
	5/8	23.28	2.48	9.4
	9/16	21.24	2.25	9.5
	1/2	19.08	2.00	9.6
	7/16	16.92	1.76	9.6
	3/8	14.76	1.51	9.7
	5/16	12.48	1.27	9.8
5 x 4	7/8	39.72	3.98	10.0
	13/16	37.32	3.70	10.1
	3/4	34.80	3.42	10.2
	11/16	32.28	3.15	10.2
	5/8	29.76	2.89	10.3
	9/16	27.12	2.61	10.4
	1/2	24.48	2.33	10.5
	7/16	21.72	2.06	10.6
	3/8	18.84	1.77	10.6
5 x 3½	7/8	30.24	3.43	8.8
	13/16	28.44	3.20	8.9
	3/4	26.64	2.98	9.0
	11/16	24.72	2.73	9.1
	5/8	22.80	2.50	9.1
	9/16	20.76	2.26	9.2
	1/2	18.72	2.02	9.3
	7/16	16.68	1.78	9.4
	3/8	14.52	1.54	9.5
	5/16	12.24	1.29	9.5
5 x 3	13/16	20.88	2.73	7.7
	3/4	19.56	2.53	7.7
	11/16	18.12	2.32	7.8
	5/8	16.68	2.12	7.9
	9/16	15.24	1.91	8.0
	1/2	13.80	1.71	8.1
	7/16	12.24	1.51	8.1
	3/8	10.68	1.30	8.2
	5/16	9.00	1.08	8.3

UNEQUAL ANGLES

Allowable Uniform Load in Kips

Neutral Axis Parallel to Longer Leg

Applicable only when sections are rigidly secured against lateral deflection

Maximum Bending Stress 18,000 Pounds per Square Inch

Size, Inches	Thickness, Inches	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
4½ x 3	13/16	20.52	2.73	7.5
	3/4	19.20	2.53	7.6
	11/16	17.88	2.32	7.7
	5/8	16.44	2.11	7.8
	9/16	15.00	1.90	7.8
	1/2	13.56	1.71	7.9
	7/16	12.12	1.51	8.0
	3/8	10.56	1.31	8.1
	5/16	9.00	1.10	8.2
4 x 3½	13/16	27.60	3.22	8.6
	3/4	25.80	2.99	8.6
	11/16	24.00	2.76	8.7
	5/8	22.08	2.51	8.8
	9/16	20.16	2.27	8.9
	1/2	18.24	2.04	9.0
	7/16	16.20	1.80	9.0
	3/8	14.16	1.56	9.1
	5/16	12.00	1.31	9.2
4 x 3	13/16	20.16	2.74	7.4
	3/4	18.84	2.53	7.4
	11/16	17.52	2.32	7.6
	5/8	16.20	2.12	7.6
	9/16	14.76	1.92	7.7
	1/2	13.32	1.71	7.8
	7/16	11.88	1.51	7.9
	3/8	10.44	1.31	7.9
	5/16	8.88	1.11	8.0
	1/4	7.20	0.89	8.1
3½ x 3	13/16	19.80	2.74	7.2
	3/4	18.48	2.53	7.3
	11/16	17.28	2.34	7.4
	5/8	15.96	2.14	7.4
	9/16	14.52	1.93	7.5
	1/2	13.20	1.74	7.6
	7/16	11.76	1.53	7.7
	3/8	10.20	1.31	7.8
	5/16	8.64	1.10	7.8
	1/4	6.96	0.88	7.9
3½ x 2½	11/16	11.88	1.92	6.2
	5/8	11.04	1.76	6.3
	9/16	10.08	1.59	6.3
	1/2	9.12	1.42	6.4
	7/16	8.16	1.25	6.5
	3/8	7.08	1.07	6.6
	5/16	6.00	0.90	6.7
	1/4	4.92	0.73	6.8

Size, Inches	Thickness, Inches	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
3 x 2½	9/16	9.84	1.59	6.2
	1/2	8.88	1.42	6.3
	7/16	7.92	1.25	6.3
	3/8	6.96	1.08	6.4
	5/16	5.88	0.90	6.5
	1/4	4.80	0.73	6.6
3 x 2	1/2	5.64	1.11	5.1
	7/16	5.04	0.98	5.2
	3/8	4.44	0.85	5.2
	5/16	3.84	0.72	5.3
	1/4	3.00	0.58	5.4
2½ x 2	1/2	5.52	1.12	4.9
	7/16	4.92	0.98	5.0
	3/8	4.32	0.85	5.1
	5/16	3.72	0.72	5.2
	1/4	3.00	0.58	5.2
	3/16	2.40	0.45	5.3
	Ⓒ 1/8	1.62	0.30	5.4
2½ x 1½	5/16	2.04	0.52	3.9
	1/4	1.68	0.41	4.1
	3/16	1.32	0.32	4.1
2¼ x 1½ Ⓒ	1/2	3.12	0.85	3.7
	7/16	2.76	0.74	3.7
	3/8	2.40	0.63	3.8
	5/16	2.04	0.53	3.9
	1/4	1.68	0.42	4.0
	3/16	1.32	0.33	4.0
2 x 1½	3/8	2.40	0.65	3.7
	5/16	2.04	0.54	3.8
	1/4	1.68	0.43	3.9
	3/16	1.32	0.33	4.0
	1/8	0.90	0.22	4.0
2 x 1¼ Ⓒ	1/4	1.16	0.35	3.3
	3/16	0.90	0.27	3.4
1¾ x 1¼	1/4	1.14	0.35	3.2
	3/16	0.90	0.27	3.3
	1/8	0.62	0.19	3.4
1½ x 1¼ Ⓒ	5/16	1.36	0.45	3.0
	1/4	1.12	0.36	3.1
	3/16	0.88	0.27	3.2

ⒸCarnegie Steel Company only.

ANGLE

LOADS

EQUAL ANGLES

Allowable Uniform Load in Kips

Neutral Axis Parallel to Either Leg

Applicable only when sections are rigidly secured against lateral deflection

Maximum Bending Stress 18,000 Pounds per Square Inch

Size, Inches	Thickness, Inches	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
8 x 8	1 1/8	210.36	10.51	20.0
	1 1/16	200.04	9.96	20.1
	1	189.60	9.40	20.2
	15/16	179.04	8.84	20.2
	7/8	168.24	8.28	20.3
	13/16	157.32	7.71	20.4
	3/4	146.28	7.14	20.5
	11/16	135.00	6.56	20.6
	5/8	123.60	5.98	20.7
	9/16	112.08	5.41	20.7
	1/2	100.44	4.83	20.8
6 x 6	©1 1/16	108.36	7.37	14.7
	1	102.84	6.94	14.8
	15/16	97.32	6.54	14.9
	7/8	91.56	6.12	15.0
	13/16	85.80	5.70	15.0
	3/4	79.92	5.29	15.1
	11/16	74.04	4.87	15.2
	5/8	67.92	4.44	15.3
	9/16	61.68	4.02	15.4
	1/2	55.32	3.58	15.5
	7/16	48.84	3.14	15.5
	3/8	42.36	2.71	15.6
5 x 5	1	69.60	5.73	12.1
	15/16	65.88	5.39	12.2
	7/8	62.04	5.05	12.3
	13/16	58.20	4.71	12.4
	3/4	54.36	4.36	12.5
	11/16	50.40	4.02	12.5
	5/8	46.32	3.68	12.6
	9/16	42.12	3.32	12.7
	1/2	37.80	2.96	12.8
	7/16	33.48	2.61	12.9
	3/8	29.04	2.25	12.9
4 x 4	13/16	36.12	3.72	9.7
	3/4	33.72	3.45	9.8
	11/16	31.32	3.18	9.8
	5/8	28.80	2.91	9.9
	9/16	26.28	2.63	10.0
	1/2	23.64	2.34	10.1
	7/16	21.00	2.06	10.2
	3/8	18.24	1.78	10.2
	5/16	15.48	1.50	10.3
	1/4	12.60	1.21	10.4

Size, Inches	Thickness, Inches	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
3 1/2 x 3 1/2	13/16	27.00	3.24	8.3
	3/4	25.32	3.01	8.4
	11/16	23.52	2.76	8.5
	5/8	21.72	2.53	8.6
	9/16	19.80	2.29	8.7
	1/2	17.88	2.05	8.7
	7/16	15.84	1.80	8.8
	3/8	13.80	1.55	8.9
	5/16	11.76	1.31	9.0
	1/4	9.48	1.05	9.1
3 x 3	5/8	15.60	2.16	7.2
	9/16	14.28	1.95	7.3
	1/2	12.84	1.73	7.4
	7/16	11.40	1.52	7.5
	3/8	9.96	1.32	7.6
	5/16	8.52	1.12	7.6
	1/4	6.96	0.90	7.7
2 1/2 x 2 1/2	1/2	8.76	1.45	6.1
	7/16	7.80	1.27	6.2
	3/8	6.84	1.10	6.2
	5/16	5.76	0.92	6.3
	1/4	4.68	0.74	6.4
	3/16	3.60	0.55	6.5
	1/8	2.40	0.37	6.6
2 x 2	7/16	4.80	1.00	4.8
	3/8	4.20	.86	4.9
	5/16	3.60	.72	5.0
	1/4	3.00	.59	5.1
	3/16	2.28	.45	5.1
	1/8	1.56	.30	5.2
1 3/4 x 1 3/4	5/16	2.76	.64	4.3
	1/4	2.28	.52	4.4
	3/16	1.68	.38	4.4
	1/8	1.20	.26	4.6
1 1/2 x 1 1/2	3/8	2.28	.64	3.5
	5/16	1.94	.54	3.6
	1/4	1.61	.44	3.7
	3/16	1.25	.33	3.8
	1/8	0.86	.22	3.9
1 1/4 x 1 1/4	5/16	1.31	.44	3.0
	1/4	1.09	.36	3.0
	3/16	0.85	.27	3.1
	1/8	0.59	.18	3.2
1 x 1	1/4	0.67	.28	2.4
	3/16	0.53	.22	2.4
	1/8	0.37	.15	2.5

©Carnegie Steel Company only.

TEES AND ZEES

LOADS

Allowable Uniform Load in Kips

Neutral Axis Parallel to Flanges

Applicable only when sections are rigidly secured against lateral deflection

Maximum Bending Stress 18,000 Pounds per Square Inch

TEES

Size Flange x Stem, Inches	Weight per Foot, Pounds	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
Ⓒ6 1/2 x 6 1/2	19.8	59.40	3.50	17.0
4 x 4	13.5	24.24	2.40	10.1
4 x 4	10.5	18.96	1.85	10.3
3 x 3	7.8	10.32	1.36	7.6
3 x 3	6.7	8.88	1.16	7.7
2 1/2 x 2 1/2	6.4	7.08	1.14	6.2
2 1/2 x 2 1/2	5.5	6.00	0.95	6.3
2 1/4 x 2 1/4	4.9	4.92	0.88	5.6
2 1/4 x 2 1/4	4.1	3.84	0.67	5.7
2 x 2	4.3	3.72	0.75	5.0
2 x 2	3.56	3.12	0.62	5.0
Ⓒ5 x 3 1/8	13.6	13.55	1.60	8.5
Ⓒ5 x 3	11.5	12.75	1.59	8.0
4 x 5	15.3	37.56	3.05	12.3
4 x 5	11.9	29.16	2.33	12.5
Ⓒ4 x 4 1/2	14.4	30.48	2.72	11.2
Ⓒ4 x 4 1/2	11.2	23.76	2.08	11.4
4 x 3	9.2	10.80	1.36	7.9
Ⓒ4 x 3	7.8	9.24	1.15	8.1
4 x 2 1/2	8.5	7.44	1.11	6.7
Ⓒ4 x 2 1/2	7.2	6.36	0.94	6.8
Ⓒ3 x 2 1/2	6.1	6.24	0.96	6.5
2 1/2 x 3	6.1	8.64	1.16	7.4
Ⓒ1 1/2 x 2	2.45	2.34	0.48	4.9
Ⓒ1 1/2 x 1 1/4	1.25	0.64	0.19	3.3

ZEES

Size Depth x Flange, Inches	Thickness, Inches	1 Foot Span	Maximum Span 360 x Deflection	
		Safe Load	Safe Load	Length, Feet
6 1/8 x 3 5/8	7/8	196.80	17.95	11.0
6 1/16 x 3 9/16	13/16	182.64	16.83	10.9
6 x 3 1/2	3/4	168.48	15.68	10.7
6 1/8 x 3 5/8	11/16	169.20	15.43	11.0
6 1/16 x 3 9/16	5/8	153.84	14.18	10.9
6 x 3 1/2	9/16	138.60	12.91	10.7
6 1/8 x 3 5/8	1/2	134.64	12.28	11.0
6 1/16 x 3 9/16	7/16	117.96	10.87	10.9
6 x 3 1/2	3/8	101.28	9.43	10.7
5 1/8 x 3 3/8	13/16	134.40	14.65	9.2
5 1/16 x 3 5/16	3/4	124.08	13.69	9.1
5 x 3 1/4	11/16	113.64	12.70	9.0
5 1/8 x 3 3/8	5/8	114.84	12.52	9.2
5 1/16 x 3 5/16	9/16	103.44	11.42	9.1
5 x 3 1/4	1/2	92.16	10.30	9.0
5 1/8 x 3 3/8	7/16	89.28	9.73	9.2
5 1/16 x 3 5/16	3/8	76.68	8.46	9.1
5 x 3 1/4	5/16	64.08	7.16	9.0
4 1/8 x 3 3/16	3/4	87.12	11.80	7.4
4 1/16 x 3 1/8	11/16	79.80	10.97	7.3
4 x 3 1/16	5/8	72.60	10.14	7.2
4 1/8 x 3 3/16	9/16	74.16	10.04	7.4
4 1/16 x 3 1/8	1/2	66.00	9.08	7.3
4 x 3 1/16	7/16	57.96	8.10	7.2
4 1/8 x 3 3/16	3/8	56.04	7.59	7.4
4 1/16 x 3 1/8	5/16	46.92	6.45	7.3
4 x 3 1/16	1/4	37.68	5.26	7.2
3 1/16 x 2 3/4	9/16	41.16	7.51	5.5
3 x 2 11/16	1/2	36.72	6.84	5.4
3 1/16 x 2 3/4	7/16	35.76	6.52	5.5
3 x 2 11/16	3/8	30.84	5.74	5.4
3 1/16 x 2 3/4	5/16	28.56	5.21	5.5
3 x 2 11/16	1/4	23.04	4.29	5.4

ⒸCarnegie Steel Company only.

PLATE AND ANGLE GIRDERS

Girders, built up of plates and angles are used for heavy loads and long spans, where rolled sections are insufficient.

Loads upon a plate and angle girder develop compressive and tensile stresses resisted by the upper and lower flanges, and shearing stresses resisted by the web plate.

The most economical section is the single web girder; box girders with double or triple webs are used where great length of span combined with lateral stiffness require them.

WEB. The web plate governs the depth of the girder which, to avoid excessive deflection, should not be less than 1/15 of the span, the thickness depends upon the shear which is greatest at the point of support and should not be less than 1/160 of the unsupported distance between the flanges; the web is reinforced by stiffeners at intervals to prevent buckling.

Web Shear and Stiffeners. Web plates subjected to direct vertical shear must resist buckling; the allowable vertical shear may be obtained from the table on page 228, based on a maximum shearing stress of 12000 pounds, giving allowable unit web shear, V/A, total vertical shear ÷ gross area of web, for various ratios of h/t, distance between flanges ÷ thickness of web.

Stiffeners are required at the ends and at points of concentrated loads and at other points where the clear distance between flange angles, h, exceeds allowable safe stresses obtained from table, and also where h is greater than 60 times the thickness of the web; stiffeners are generally in pairs, one on each side of the web, bearing closely against the projecting leg of the flange angles; the pitch of rivets in stiffeners should not exceed 6 inches.

FLANGES. The flange area is so proportioned that the maximum compressive or tensile stress, $f = \frac{n\ M}{I}$, does not exceed the maximum allowable unit stress when applied only to the net section of the girder.

When the flanges are alike, as they usually are, the preliminary investigation is simplified by assuming that the stresses in the flanges are uniformly distributed, and their resultants act at the center of gravity of the flanges.

A=Area of one flange d=Effective depth t=Web thickness

Total Moment of Resistance, $M = f\left(A\,d + \frac{d^2\,t}{6}\right) = f\,d\left(A + \frac{d\,t}{6}\right)$.

The net moment of resistance of the web plate, with allowance for reduction of area due to web splices is generally taken as $\frac{d\,t}{8}$, or:

Net Moment of Resistance, $M = f\left(A\,d + \frac{d^2\,t}{8}\right) = f\,d\left(A + \frac{d\,t}{8}\right)$.

d is the approximate distance between centers of gravity of flange angles, or distance out to out of angles when flange plates are used.

The final design of the girder is obtained in accordance with the method given for the computation of compound sections.

Flange Plates. When the girder carries a uniformly distributed load, the flange areas vary as the ordinates of a parabola, and the theoretical length of the flange plate is

$$L_1 = L\sqrt{\frac{a_1}{A}} \qquad L_2 = L\sqrt{\frac{a_2}{A}} \qquad L_3 = L\sqrt{\frac{a_3}{A}}$$

L = Length of girder. A = Total Area of Flange.
L_1, L_2, L_3 = Length of flange plates, beginning with outside plate.
a_1, a_2, a_3 = Total area of flange plates, from outer to inner plates.

Sufficient length, usually from 12 to 18 inches, is added to each end of plate to take up the shear; the plate next to the flange angle is extended to full length of the girder, to resist lateral deflection.

EXAMPLE. Required the length of flange plates of a 60-inch girder, 60 feet long, the flange including flange angles, two flange plates and one-eighth of web plate; rivets ⅞″ dia.

2—Angles	6″ x 3½″ x ½″	Net Area	9.00—2.00 = 7.00 sq. in.
1—Inner Flange Plate	14″ x 7/16″	" "	6.13—0.87 = 5.26 "
1—Outer Flange Plate	14″ x ⅜″	" "	5.25—0.75 = 4.50 "
⅛—Web Plate	60″ x ⅜″	" "	2.81 = 2.81 "
			19.57 sq. in.

Outer plate, $L_1 = 60\sqrt{\frac{4.50}{19.57}} = 28.8$ ft. say 32 ft. Inner plate, $L_2 = 60\sqrt{\frac{4.50+5.26}{19.57}} = 42.4$ ft. full length.

Maximum End and Flange Stress. In addition to a girder having sufficient flange area to resist the maximum bending moment, it must also be capable of withstanding stresses at the ends.

The end resistance of a riveted girder depends on: First, the resistance of the web plate to shearing; second, the resistance of the flange rivets to bearing, it being assumed that the bearing value of rivets does not exceed twice their value in single shear.

The difference in flange stress between any two points is the horizontal shear to be transmitted into the web by the flange rivets between those points, and can not be greater than that of the end reaction considered to be distributed along the flange within a length equal to the distance, a, between the center of the rivets in upper and lower flange with one line of rivets, or between the center lines of two lines of rivets, according to design.

Web Stress: $d \times t \times f$ = Maximum End Resistance if less than flange stress.
d = Depth. t = Thickness of web. f = Allowable unit shearing stress.

Flange Stress: $\frac{a\,R}{p}$ = Maximum End Resistance if less than Web stress.
a = Effective distance (d + ½″) – 2 x distance from back of angles, for one or two rivet lines.
R = Bearing value of one rivet. p = Minimum pitch between two rivets.
Required the maximum end resistance of a girder, properly stiffened at ends.

EXAMPLE 1. Girder composed of 1—Web Plate, 36″ x 5/16″ 4—Flange Angles, 5″ x 3½″.
Web Stress: 36 x 5/16 x 12,000 = 135,000 pounds.
Flange Rivets: a = (36″ + ½″) – 4½″ = 32″; 32 ÷ 2½ = 13 Rivets.
Bearing value of ⅞″ Dia. Rivet: ⅞ x 5/16 x 30,000 = 8,200 pounds.
Flange Stress: 8,200 x 13 = 106,600 pounds—Maximum End Resistance.

EXAMPLE 2. Girder composed of 1—Web Plate, 48″ x ⅜″ 4—Flange Angles, 6″ x 6″.
Web Stress: 48 x ⅜ x 12,000 = 216,000 pounds = Maximum End Resistance.
Flange Rivets. a = (48″ + ½″) – 7″ = 41½″; 41½ ÷ 1¾ = 24 Rivets.
Bearing value of ⅞″ Dia. Rivet: ⅞ x ⅜ x 30,000 = 9,840 pounds.
Flange Stress: 9,840 x 24 = 236,160 pounds.

Rivet Spacing in Flanges. It follows that the rivets connecting the web plate with the flange angles are required to transmit the horizontal shearing stress from the web to the flange, which horizontal shear in any panel is equal to the vertical shear at center of panel multiplied by its length and divided by the vertical distance, a.

As the shear increases from the point of greatest bending moment towards the supports, the number of rivets in vertical legs of the flange angles must also increase as the supports are approached.

Pitch of rivets in flange angles, $p = \frac{a\,R}{V}$

V = Total vertical shear at the panel under consideration.
R = Resistance of one rivet, i. e., the bearing or shearing value, whichever is smaller.
a = Effective distance between upper and lower lines of rivets.

The formula gives the theoretical rivet spacing for any point in the flanges due to the total shear, but in practice the pitch is computed from the maximum stress in each panel, in nearest ¼ inch.

EXAMPLE. A girder composed of 5″ x 3½″ angles and 36″ x 5/16″ web, 30 ft. long, divided into 3-foot panels, supports a uniformly distributed load of 72 tons, or 4,800 pounds per foot.

Required rivet pitch in panels, when distance between rivet lines = 32 inches.

	Shearing Stress, Pounds	Horizontal Stress, Pounds per Inch
Panel 1.	144,000 ÷ 2 = 72,000	72,000 ÷ 32 = 2,250
" 2.	72,000 – (4,800 x 3) = 57,600	57,600 ÷ 32 = 1,800
" 3.	72,000 – (4,800 x 6) = 43,200	43,200 ÷ 32 = 1,350
" 4.	72,000 – (4,800 x 9) = 28,800	28,800 ÷ 32 = 900

Bearing value of ⅞″ Dia. Rivet: ⅞ x 5/16 x 30,000 = 8,200 pounds.

Panel 1.	Rivet Pitch	8,200 ÷ 2,250 = 3.6	say 3½″ spacing
" 2.	" "	8,200 ÷ 1,800 = 4.5	" 4½″ "
" 3.	" "	8,200 ÷ 1,350 = 6.1	" 6″ maximum spacing
" 4.	" "	8,200 ÷ 900 = 9.1	" 6″ " "

When the load rests directly on the top or bottom flanges, the rivets connecting this flange with the web plate are also required to distribute the load; then the resultant stress on rivets on the loaded flange is represented by the resultant of horizontal shear and vertical load.

Example. Loads bearing directly on one flange only, then first panel, foregoing example:

Horizontal Shear	2,250 pounds per inch.	Vertical Load 400 pounds per inch.
Resultant Stress	$\sqrt{2{,}250^2 + 400^2} = 2{,}285$ pounds.	Rivet Pitch $8{,}200 \div 2{,}285 = 3.58''$.

Flange Plates. At the end of each flange plate, sufficient rivets must be provided to transmit the allowable stress on the net section of the plate to the adjacent members.

Example. Required number of rivets, $\frac{7}{8}''$ Dia., for $14'' \times \frac{7}{16}''$ Inner Flange Plate.
$14'' \times \frac{7}{16}''$ Inner Flange Plate, net area: $(6.13 - .875) = 5.26$ sq. in.
Resistance: $5.26 \times 18{,}000 = 94{,}680$ pounds.
Shearing value of $\frac{7}{8}''$ Dia. Rivet: $.6013 \times 13{,}500 = 8{,}120$ pounds.
$94{,}680 \div 8{,}120 = 12$ rivets, or:
Two lines of 6 rivets each end of plate, spaced 3 inches to $3\frac{1}{2}$ inches.

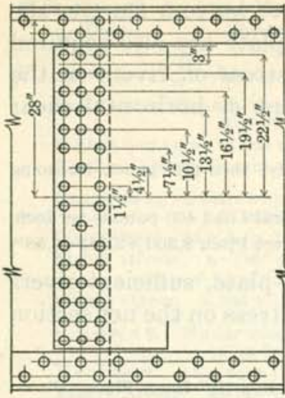
SPLICES. In long and deep girders or in girders to be made from stock lengths, it is often necessary to splice the web plate or also flange angles and plates.

The resistance of all splice plates must be such as to develop the full resisting strength of the rivets in the splice, in particular when rivet stresses are to be transmitted through narrow plates.

Web Splices. As there is no vertical shearing stress in the middle of the girder under a uniformly distributed load, web splices are sometimes made at that point, but, generally, the web is spliced in two places equidistant from the center.

The rivets in the web splice must transmit the web stresses so that no additional stresses are imparted to the flange rivets.

The rivets are not equally stressed, the stress is zero at the neutral axis and increases uniformly to a maximum at extreme distance; the moment stress of each rivet is as its distance from neutral axis, and the moment of resistance as the square of its distance from neutral axis.



EXAMPLE:

Required the web splice in a 60 inch girder with ⅜ inch web plate capable of resisting the bending moment at 18,000 pounds fiber stress, one-eighth of the web area being considered as flange acting at the extreme edge of the plate. Concentrated load 125,000 pounds, 2 feet from center. Splice at center.

Each side of joint must be provided with enough rivets to resist;

a. The full shear at the splice acting vertically and the stress on each rivet will be, total shear at splice ÷ number of rivets each side of joint.

b. That portion of the bending moment which is taken by ⅛ of the web acting horizontally and the maximum stress will be this value ÷ the Section Modulus of the rivet group.

$6 \times 22.5^2 = 3{,}038$
$6 \times 19.5^2 = 2{,}281$
$6 \times 16.5^2 = 1{,}633$
$6 \times 13.5^2 = 1{,}093$
$6 \times 10.5^2 = 661$
$4 \times 7.5^2 = 225$
$2 \times 4.5^2 = 41$
$4 \times 1.5^2 = 9$
$I = 8{,}981$

$S = \frac{8{,}981}{22.5} = 399$

The resultant of these two forces will be the maximum stress on each rivet in outside line of splice plate.

Under the condition of loading here assumed the shear at center $=$ smaller end reaction $= \frac{125{,}000 \times 23}{50} = 57{,}500$ and $\frac{57{,}500}{40} = 1{,}438 =$ shear per rivet.

The Section Modulus of the rivet group for rivets of unit value $= 399$ in.^{3}.

Moment resisted by ⅛ of web $60 \times \frac{3}{8} \times \frac{1}{8} \times 60 \times 18{,}000 =$ 3,036,000 inch pounds, $3{,}036{,}000 \div 399 = 7{,}600$ lbs.

Maximum in outside line $\sqrt{7{,}600^2 + 1{,}438^2} = 7{,}734$ lbs.

Maximum allowable stress per rivet is governed by bearing on ⅜" plate at 30,000 lbs. = 9,840 lbs. for ⅞" rivet at outside line in girder 28" from center. Maximum value would be $\frac{9{,}840 \times 22.5}{28} = 7{,}910$ lbs. at outside line of rivets in splice.

To determine thickness of splice plates

Stress in center of plate 22.5" from center of girder $= \frac{18{,}000 \times 22.5}{30} = 13{,}500$ pounds per square inch. Consider the moment carried by the extreme rivets to be resisted by the portion of the splice adjacent to these rivets. In this case the upper 3" of splice plates should develop the extreme row of rivets.

Horizontal stress in three extreme rivets is $7{,}600 \times 3 = 22{,}800$ lbs. and $\frac{22{,}800}{13{,}500} = 1.68$ square inches net.

$3'' - 1'' = 2''$, $\frac{1.68}{2 \times 2} = .42'' = \frac{7}{16}''$ = required thickness of splice plates.

GENERAL REQUIREMENTS FOR RIVETING

1. In proportioning rivets the nominal diameter of the rivet shall be used, and in deducting rivet holes they shall be taken ⅛ inch greater than the nominal diameter of the rivets.

2. The minimum distance between centers of rivet holes shall be three diameters of the rivet, but the distance shall preferably be not less than:

4½″—1¼″ rivets	3½″—1″ rivets	2½″—¾″ rivets	1¾″—½″ rivets
4″ —1⅛″ "	3″ — ⅞″ "	2″ —⅝″ "	

3. The maximum pitch in the line of stress of compression members composed of plates and shapes shall not exceed 16 times the thinnest outside plate or shape, nor 20 times the thinnest enclosed plate with a maximum of 12 inches, and at right angles to the direction of stress the distance between lines of rivets shall not exceed 30 times the thinnest plate or shape.

4. For angles in built-up sections with two gage lines, with rivets staggered, the maximum pitch in the line of stress in each gage line shall not exceed 24 times the thinnest plate, with a maximum of 18 inches.

5. The minimum distance from the center of any rivet hole to a sheared edge shall be:

2¼″—1¼″ rivets	1¾″—1″ rivets	1¼″—¾″ rivets	1″—½″ rivets
2″ —1⅛″ "	1½″— ⅞″ "	1⅛″—⅝″ "	

The maximum distance from any edge shall be 8 times the thickness of the plate.

6. The pitch of the rivets at the end of built compression members shall not exceed 4 times the diameters of the rivets for a length equal to 1½ times the maximum width of the member.

Allowable Web Shear V/A for Various Ratios of c/t

c/t	V/A	c/t	V/A	c/t	V/A	c/t	V/A
50	12000	67	9485	84	7465	101	5921
51	11841	68	9352	85	7362	102	5843
52	11682	69	9220	86	7260	103	5766
53	11525	70	9091	87	7160	104	5690
54	11369	71	8963	88	7062	105	5589
55	11215	72	8837	89	6955	106	5543
56	11062	73	8713	90	6870	107	5471
57	10910	74	8591	91	6777	108	5401
58	10760	75	8471	92	6684	109	5331
59	10612	76	8352	93	6594	110	5263
60	10465	77	8235	94	6505	115	4938
61	10320	78	8120	95	6417	120	4639
62	10176	79	8006	96	6331	125	4364
63	10035	80	7895	97	6246	130	4110
64	9894	81	7785	98	6163	135	3875
65	9756	82	7677	99	6081	140	3659
66	9619	83	7570	100	6000	145	3458

Ratio c/t=Distance between Flanges ÷ Thickness of Web Plates, inches.
Ratio V/A=Vertical Shear, pounds ÷ Gross Area of Web, sq. inches.

PLATE AND ANGLE GIRDERS—APPROXIMATE DESIGN

In preliminary design of a symmetrical girder or in cases where extreme accuracy is not essential it is sufficient to base the transverse resistance of the section on the moment of inertia of the two flanges, obtained from the general formula:

$$M = f\frac{I}{n} = f\,A\,d, \qquad A = \frac{M}{f\,d}, \qquad 2\,A = \frac{2\,M}{f\,d}$$

where A is the area of either top or bottom flanges, and 2 A the combined area of top and bottom flange angles and plates and d is the total depth of the girder.

The tables which follow give the moment of inertia of four flange angles and two flange plates of various sizes for depths of girders from 36 to 84 inches, sizes not given can be obtained by interpolation of nearest values.

In proportioning the flange angles and plates it is desirable to allow at least one-third of the flange area required for flange angles.

The results correspond nearly to the net moment of inertia of the section, the omission of the section modulus of the web plate offsetting a reduction for rivet holes.

Example. Plate and Angle Girder, limited to a depth of 38½ inches, to resist a maximum bending moment of 1,000,000 foot pounds, fiber stress 18,000 pounds:

$$2\,A = \frac{2\,M}{f\,d} = \frac{2 \times 12 \times 1{,}000{,}000}{18{,}000 \times 38} = 35.1 \text{ sq. in.;} \qquad \text{then from table:}$$

4—Flange Angles, 6″ x 4″ x 7/16″	A=16.7 sq. in.
2—Flange Plates, 14″ x ¾″	A=21.0 "
	37.7 sq. in.

Including for a more exact computation a web plate, 36″ x ⅝″, with proper reduction of 1″ dia. holes; when

$$I = \frac{M\,d}{2\,f} = \frac{12 \times 1{,}000{,}000 \times 38}{2 \times 18{,}000} = 12{,}667 \text{ in.}^4\text{, from table.}$$

4—Flange Angles,	6″ x 4″ x 7/16″ d_1=36½″	I=5,040 in.^{4}
2—Flange Plates,	14″ x ¾″ d_1=36½″	I=7,280 in.^{4}
1—Web Plate,	36″ x ⅝″ d =36″	I=2,430 in.^{4}
		14,750 in.^{4}
4—Flange Holes,	1″ x 1 3/16″ l =18″	I=1,540 in.^{4}
2—Web Holes,	1″ x 1½″ l_1 =16″	I= 768 in.^{4}
		12,442 in.^{4}

CRANE-RUNWAY GIRDERS

Design. In the design of crane-runway girders the following conditions of loading must be provided for:

1. Bending moment due to maximum reaction of crane load, being the sum of moving load at extreme end of crane and half the weight of the crane girder, in center of span of the crane-runway girder.

2. Provision must be made against lateral deflection in case of an excessive ratio of span length to flange width; generally by a channel with flanges turned downward and riveted to the top flange of girder.

3. In addition to the lateral deflection due to total transverse load provision must also be made against a lateral impact due to the reaction of crane load, when suddenly started or stopped; this reaction is transmitted directly to the top flange of girder, and is generally assumed to be equal to 1/20 of the bending moment due to the transverse load.

4. The web of girder must be of sufficient strength to resist the total reaction from crane occurring at extreme end or point of bearing of runway girder.

5. The unit stress should not exceed the maximum stress allowable for moving loads.

The computations of the bending moment and the lateral deflection due to transverse loading are made in accordance with usual practice in the design of girders; the lateral impact against top flange of girder may be computed from formulas given in the following. Let:

M_1 = Bending Moment due to transverse load.
$\frac{1}{20} M_1$ = Bending Moment due to lateral impact.
S = Section Modulus of girder section, Axis 1-1.
s = Section Modulus of top flange, Axis 2-2.
f_1 = Unit Stress for transverse load.
f_2 = Unit Stress for lateral impact load.

$$M_1 : \tfrac{1}{20} M_1 = f_1 S : f_2 s, \qquad f_1 : f_2 = 1 : \frac{S}{20s}$$

$M\ max$ = Maximum Bending Moment $= M_1 + \frac{1}{20} M_1$.
$f\ max$ = Combined Unit Stress $= f_1 + f_2$

$= f_1\left(1 + \frac{S}{20s}\right)$, and must not exceed the maximum allowable unit fiber stress.

$$M\ max = \frac{f\,S}{1 + \frac{S}{20\,s}}$$

For symmetrical sections, where top and bottom flanges are of equal section modulus, $s = \frac{1}{2} S_{2\text{-}2}$, and formulas are

$$f\ max = f_1\left(1 + \frac{S_{1\text{-}1}}{10\,S_{2\text{-}2}}\right) \qquad M\ max = \frac{f\,S_{1\text{-}1}}{1 + \frac{S_{1\text{-}1}}{10\,S_{2\text{-}2}}}$$

EXAMPLE. Crane-runway girder is to support a moving load of 36,000 pounds, the sum of total crane load and half the weight of the crane, in the center of span of 25 feet. Crane-runway girder to be a 30″-Beam provided with a 15″-Channel riveted to top flange, assuming sections:

CB 301N, 30″ x 115 lb. and C 1, 15″ x 33.9 lb.

$$M_1 \text{ for transverse load } = \frac{36{,}000 \times 25}{4} = 225{,}000 \text{ ft. lbs.}$$

$$M_2 \text{ for dead load of girder } = \frac{148.9 \times 25^2}{8} = 11{,}633 \text{ ft. lbs.}$$

M for transverse and dead load 236,633 ft. lbs.

$$\text{Load reduction for lateral deflection for ratio } \frac{25 \times 12}{15} = 20 : 92.6\%.$$

$$\text{Maximum Bending Moment, } \frac{236{,}633}{92.6} = 255{,}600 \text{ ft. lbs.}$$

Bending Stresses. The Moment of Inertia and Section Modulus are for the net sections, with allowance for 1″ dia. holes. Unit stress for transverse load and lateral impact 12,000 pounds.

Total Section, Axis 1-1

$$I = 6{,}560.9 - 370.3 = 6{,}190.6 \text{ in.}^4$$

$$S = \frac{6{,}190.6}{17.6} = 351.7 \text{ in.}^3$$

Top Flange Axis 2-2

$$I = 394.6 - 19.1 = 375.5 \text{ in.}^4$$

$$S = \frac{375.5}{7.5} = 50.0 \text{ in.}^3$$

$$M \max = f \frac{S}{1 + \frac{S}{20s}}$$

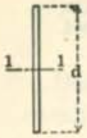
$$M = 12{,}000 \frac{351.7}{1 + \frac{351.7}{20 \times 50.0}} = 3{,}122{,}290 \text{ in. lb.}$$

$$\text{The section will therefore resist } \frac{3{,}122{,}290}{12} = 260{,}190 \text{ ft. lb.}$$

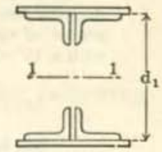
Web Resistance. Total load at point of bearing = 36,000 pounds.

From table page 122 the web resistance of CB 301N, 115 lb. is 55,670 pounds for web buckling at minimum end bearing of 3½ inches.

PLATE GIRDERS



Moments of Inertia and Areas of Component Parts



$I_{1\text{-}1}$ OF ONE WEB PLATE, Thickness in Inches

Depth d	1/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8
36	243	1458	1701	1944	2430	2916	3402	3888	4374
42	385	2315	2701	3087	3859	4631	5402	6174	6946
48	576	3456	4032	4608	5760	6912	8064	9216	10368
54	820	4921	5741	6561	8201	9842	11482	13122	14762
60	1125	6750	7875	9000	11250	13500	15750	18000	20250
72	1944	11664	13608	15552	19440	23328	27216	31104	34992
84	3087	18522	21609	24696	30869	37042	43220	49392	55564

$I_{1\text{-}1}$ OF TWO FLANGE PLATES, Thickness in Inches (For One Inch of Width)

Depth d_1	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2
36 1/2	255	297	342	431	520	611	703	891	1084	1281	1484
42 1/2	345	402	462	581	702	823	946	1197	1453	1714	1982
48 1/2	448	523	600	754	910	1067	1225	1547	1876	2210	2552
54 1/2	565	659	756	950	1145	1342	1540	1943	2353	2769	3194
60 1/2	695	811	926	1158	1407	1648	1891	2383	2884	3392	3908
72 1/2	996	1162	1328	1660	2012	2356	2701	3400	4108	4825	5552
84 1/2	1351	1576	1800	2251	2725	3189	3655	4596	4801	6510	7484

$I_{1\text{-}1}$ OF 4 FLANGE ANGLES, Thickness in Inches

Size	Depth d_1	3/8	7/16	1/2	5/8	3/4	7/8	Size	Depth d_1	3/8	7/16	1/2	5/8	3/4	7/8
	36 1/2	4350	5040	5690	6980	8220	9410		36 1/2	4870	5640	6400	7860	9270	10630
	42 1/2	5980	6920	7820	9610	11330	12970		42 1/2	6770	7840	8890	10930	12910	14820
	48 1/2	7870	9110	10310	12670	14940	17120		48 1/2	8980	10400	11800	14520	17160	19710
6 x 4	54 1/2	10020	11560	13130	16150	19050	21830	6 x 6	54 1/2	11500	13320	15120	18620	22010	25300
	60 1/2	12430	14380	16290	20040	23660	27130		60 1/2	14340	16610	18850	23230	27480	31590
	72 1/2	18020	20860	23650	29110	34370	39430		72 1/2	20950	24280	27570	33990	40230	46260
	84 1/2	24660	28540	32370	39860	47090	54040		84 1/2	28820	33420	37940	46790	55410	63750

$I_{1\text{-}1}$ OF 4 FLANGE ANGLES, Thickness in Inches

Size	Depth d_1	7/16	1/2	5/8	3/4	7/8	1	Size	Depth d_1	1/2	5/8	3/4	7/8	1	1 1/8
	36 1/2	6770	7690	9470	11200	12850	14480		36 1/2	8190	10100	11950	13750	15490	17180
	42 1/2	9380	10650	13120	15540	17850	20130		42 1/2	11460	14140	16750	19280	21740	24150
	48 1/2	12410	14100	17380	20590	23680	26720		48 1/2	15280	18880	22370	25770	29080	32310
8 x 6	54 1/2	15870	18030	22240	26360	30330	34230	8 x 8	54 1/2	19660	24300	28810	33210	37500	41680
	60 1/2	19750	22450	27710	32850	37810	42690		60 1/2	24600	30420	36080	41600	46990	52260
	72 1/2	28800	32750	40440	47970	55240	62410		72 1/2	36160	44730	53080	61240	69230	77030
	84 1/2	39560	44990	55580	65950	75980	85870		84 1/2	49940	61800	73390	84690	95780	106610

AREA OF FOUR ANGLES

Size	Thickness in Inches							
	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8
6 x 4	14.4	16.7	19.0	23.4	27.8	31.9		
6 x 6	17.4	20.2	23.0	28.4	33.8	38.9		
8 x 6		23.7	27.0	33.4	39.8	45.9	52.0	
8 x 8			31.0	38.4	45.8	52.9	60.0	66.9

AREA OF TWO FLANGE PLATES

Width	Thickness in Inches								
	1/16	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2
12	1.50	9.0	12.0	15.0	18.0	21.0	24.0	30.0	36.0
14	1.75	10.5	14.0	17.5	21.0	24.5	28.0	35.0	42.0
16	2.00	12.0	16.0	20.0	24.0	28.0	32.0	40.0	48.0
18	2.25	13.5	18.0	22.5	27.0	31.5	36.0	45.0	54.0
20	2.50	15.0	20.0	25.0	30.0	35.0	40.0	50.0	60.0
24	3.00	18.0	24.0	30.0	36.0	42.0	48.0	60.0	72.0

AREA OF ONE WEB PLATE

Depth	Thickness in Inches			
	1/16	1/4	3/8	1/2
36	2.25	9.0	13.5	18.0
42	2.63	10.5	15.8	21.0
48	3.00	12.0	18.0	24.0
54	3.38	13.5	20.3	27.0
60	3.75	15.0	22.5	30.0
72	4.50	18.0	27.0	36.0
84	5.25	21.0	31.5	42.0

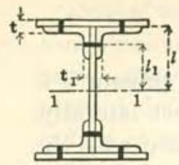
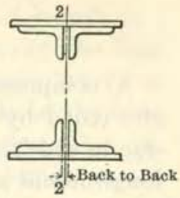


PLATE GIRDERS

Moments of Inertia of Holes and Component Parts



Distance l or l_1	I_{1-1} OF ONE HOLE, Thickness of Metal t or t_1 and Area of Hole for ⅞″ Rivet														
	¾	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2¼	2½	2¾	3
	0.75	0.88	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.25	2.50	2.75	3.00
16	192	224	256	288	320	352	384	416	448	480	512	576	640	704	768
18	243	284	324	365	405	446	486	527	567	608	648	729	810	891	972
18½	257	299	342	385	428	471	513	556	599	642	685	770	856	941	1027
19	271	316	361	406	451	496	542	587	632	677	722	812	903	993	1083
21	331	386	441	496	551	606	662	717	772	827	882	992	1103	1213	1323
21½	347	404	462	520	578	636	693	751	809	867	925	1040	1156	1271	1387
22	363	424	484	545	605	666	726	787	847	908	968	1089	1210	1331	1452
24	432	504	576	648	720	792	864	936	1008	1080	1152	1296	1440	1584	1728
24½	450	525	600	675	750	825	900	975	1050	1125	1201	1351	1501	1651	1801
25	469	547	625	703	781	859	938	1016	1094	1172	1250	1406	1563	1719	1875
27	547	638	729	820	911	1002	1094	1185	1276	1367	1458	1640	1823	2005	2187
27½	567	662	756	851	945	1040	1134	1229	1323	1418	1513	1702	1891	2080	2269
28	588	686	784	882	980	1078	1176	1274	1372	1470	1568	1764	1960	2156	2352
30	675	788	900	1013	1125	1238	1350	1463	1575	1688	1800	2025	2250	2475	2700
30½	698	814	930	1047	1163	1279	1395	1512	1628	1744	1861	2093	2326	2558	2791
31	721	841	961	1081	1201	1321	1442	1562	1682	1802	1922	2162	2403	2643	2883
34	867	1012	1156	1301	1445	1590	1734	1879	2023	2168	2312	2601	2890	3179	3468
36	972	1134	1296	1458	1620	1782	1944	2106	2268	2430	2592	2916	3240	3564	3888
36½	999	1166	1332	1499	1665	1832	1998	2165	2331	2498	2665	2998	3331	3664	3997
37	1027	1198	1369	1540	1711	1882	2054	2225	2396	2567	2738	3080	3423	3765	4107
40	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3600	4000	4400	4800
42	1323	1544	1764	1985	2205	2426	2646	2867	3087	3308	3528	3969	4410	4851	5292
42½	1355	1580	1806	2032	2258	2484	2709	2935	3161	3387	3613	4064	4516	4967	5419
43	1387	1618	1849	2080	2311	2542	2774	3005	3236	3467	3698	4160	4623	5085	5547

I_{2-2} OF TWO FLANGE PLATES, Thickness in Inches

Width	⅜	7/16	½	⅝	¾	⅞	1	1¼	1½	1¾	2
12	108	126	144	180	216	252	288	360	432	504	576
14	172	200	229	286	343	401	458	572	686	802	916
16	256	299	341	426	512	597	682	852	1024	1194	1364
18	365	425	486	608	729	851	972	1216	1458	1702	1944
20	500	583	667	834	1000	1167	1334	1668	2000	2234	2668
24	864	1008	1152	1440	1728	2016	2304	2880	3456	4032	4608

I_{2-2} OF FOUR ANGLES 6 x 4

Dist. b to b	Thickness in Inches					
	⅜	7/16	½	⅝	¾	⅞
⅜	120	140	160	200	240	280
7/16	121	141	162	203	245	290
½	123	144	165	206	250	295
⅝	127	148	170	213	257	300
¾	130	153	176	220	265	310
⅞	136	158	180	227	274	320

I_{2-2} OF FOUR ANGLES 6 x 6

Dist. b to b	Thickness in Inches					
	⅜	7/16	½	⅝	¾	⅞
⅜	120	140	160	200	243	285
7/16	122	142	162	204	247	289
½	124	144	165	208	252	294
⅝	128	149	170	215	260	305
¾	132	154	177	223	270	315
⅞	137	160	183	230	280	326

I_{2-2} OF FOUR ANGLES 8 x 6

Dist. b to b	Thickness in Inches					
	7/16	½	⅝	¾	⅞	1
⅜	322	368	462	554	650	742
7/16	326	372	467	561	657	751
½	330	377	473	568	665	760
⅝	338	386	485	582	680	780
¾	346	396	497	596	698	800
⅞	355	405	510	610	716	820

I_{2-2} OF FOUR ANGLES 8 x 8

Dist. b to b	Thickness in Inches					
	½	⅝	¾	⅞	1	1⅛
⅜	370	462	558	650	748	843
7/16	375	468	565	659	758	854
½	380	474	572	668	768	865
⅝	390	486	586	685	788	888
¾	398	498	602	703	808	910
⅞	408	510	617	720	830	934

COLUMNS AND STRUTS

A compression member, subjected to longitudinal pressure, is shortened by the compression and also tends to deflect laterally, due to the fact that the load cannot be applied coincident with the longitudinal axis and that the material is not perfectly homogeneous. This flexure occurs generally in the direction of the least resisting moment of the section; the load which will cause a column to fail decreases in the ratio of length to least lateral resistance of the section, the ultimate failure being the result of combined stresses due to compression, transverse shear and flexure.

Column Formulas. Under ideal conditions, when it can be assumed that the load is applied axially and that the material is perfectly homogeneous, the resistance of the column would equal its resistance to compressive forces up to the elastic limit, and there would not be any flexure; if, however, a deflection be imparted to the column by a lateral force, the column would ultimately fail by bending.

Euler's Formula, $P = k\frac{\pi^2 EI}{l^2}$ or $\frac{P}{A} = k\frac{\pi^2 E}{(l/r)^2}$, is based upon the foregoing theory, and gives results close to the ultimate strength found for long and slender struts, when k is a constant varying with the condition of end bearing, (k = 4 for columns fixed both ends). For shorter and heavier columns, or for lower ratios of l/r the results do not correspond with actual tests.

Rankine's Formula, $P = \frac{Af}{1 + c\,(l/r)^2}$ or $\frac{P}{A} = \frac{f}{1 + c\,(l/r)^2}$, represents the type of formula now in general use and the various formulas for proportioning columns which are based upon this general formula agree with actual tests within certain limits. In this formula a certain compressive unit stress for direct crushing is assumed and reduced in ratio of length of column and least radius of gyration, l/r; value of c is an empirical factor, varying with the resistance of the material and with conditions of end bearing.

Straight Line Formulas. In practice, compression members of a greater ratio of slenderness, l/r, than 120 are rarely used, and within this limit the curve can be represented by a straight line, the general formula assuming the simpler form: $\frac{P}{A} = f - c\,(\frac{l}{r})$.

Compression formulas determining the resistance of webs in rolled beams or riveted girders against buckling, or the necessary reduction of safe loads due to lateral deflection of unbraced beams, are likewise based on one or the other type of column formulas.

Ratio of Slenderness. l/r is ratio of the unsupported length of a compression member to its radius of gyration, generally the least radius, excepting when the unsupported length is rigidly braced to prevent deflection in the direction which corresponds to the least radius of gyration. It is, therefore, necessary to determine the radii of gyration and to use the proper ratio of slenderness in any particular case.

Usual practice limits the maximum ratio of l/r for main members under permanent stress, permitting a higher ratio for secondary members under temporary stress, as in wind bracing.

Compressive Unit Stresses. The tables of allowable loads of column sections have been computed in accordance with the formula for steel columns of American Institute of Steel Construction, 1923—Revised 1928.

$$f = \frac{18{,}000}{1 + \frac{1}{18{,}000}\,(l/r)^2},$$

Maximum unit stress at $l/r = 60$: 15,000 lb. per sq. inch.
Maximum l/r: Primary members = 120; Secondary members = 200.

Explanation of Tables. The tables give the concentric safe loads in thousands of pounds for CB Sections of the Variable-Depth and Constant-Depth Type, also of a selected line of 14-inch column sections with cover plates, the values having been computed based upon for the least radius of gyration.

In addition to the safe loads, tables give the moments of inertia and the radii of gyration about both axes of symmetry, for use with other compression formulas or for use in computation of the safe strength of a column braced against flexure in such a manner that the greater radius of gyration may be used.

Combined Compression and Bending Stresses. Generally the loads are concentric and equally distributed over the cross section of the column or balanced on opposite sides thereof. In the case of beams carried on brackets or other forms of eccentric loading, bending stresses are produced which should be taken into consideration and the column sections so proportioned that the combined stresses do not exceed the allowable compressive and bending stresses in accordance with the formulas given in the following:

P = Concentric load. P_1 = Eccentric load.
l = Length of column = $l_1 + l_2$, end distances of eccentric load.
λ = Greater distance of eccentric load from either end of column.
f_c = Unit compressive stress for length l of column.
f_{c_1} = Unit compressive stress for length $\lambda = l_1 > l_2$ or $= l_2 > l_1$.
f_s = Unit bending stress.
M = Bending moment due to eccentric load.
y = Distance of eccentric load from center of column.
n = Distance of extreme fiber from center of column.
r = Radius of gyration of section in plane of bending.
A = Cross sectional area of section.

Compression due to concentric and eccentric load:

$$P = Af_c \;,\quad P_1 = Af_{c1}.$$

Bending stress due to bending at point of eccentric load:

$$M = P_1 y \frac{l_1}{l} \text{ from top and } P_1 y \frac{l_2}{l} \text{ from bottom.}$$

$$M_{max} = P_1 y \frac{\lambda}{l} = f_s \frac{I}{n} = f_s \frac{Ar^2}{n} \text{ and } A = \frac{P_1\, y\, \lambda\, n}{l\, f_s\, r^2}$$

Total area required for combined compressive and bending stresses:

$$A = \frac{P}{f_c} + \frac{P_1}{f_{c1}} + \frac{P_1\, y\, \lambda\, n}{l\, f_s\, r^2}$$

When the eccentric load is in center, $l_1 = l_2 = \frac{1}{2} l$. $M_{max} = \frac{1}{2} P_1 y$ and

$$A = \frac{P}{f_c} + \frac{P_1}{f_{c1}} + \frac{P_1\, y\, n}{2 f_s\, r^2}$$

When the eccentric load is at the top or bottom, formula reduces to

$$A = \frac{P + P_1}{f_c} + \frac{P_1\, y\, n}{f_s\, r^2}$$

Example: Required a CB column, 25 feet in length, to support a concentric load of 418,000 pounds and an eccentric load of 50,000 pounds acting at a distance of 19 inches from center of section, in plane of greatest resistance, axis 1-1, and at a distance of 5 feet from top of column.

Unit compression and bending stresses in accordance with A. I. S. C. requirements.

Assuming CB 145 N, 145 pounds, with the following properties:

A = 42.62 sq. in. n = 7.44 in. $r_{1\text{-}1}$ = 6.34 in. $r_{2\text{-}2}$ = 3.78 in.
f_c for $L/r = 25 \times 12 \div 3.78 = 79.4$ 13,330 lbs. per sq. in.
f_{c1} for $\lambda/r = 20 \times 12 \div 3.78 = 63.5$ 14,710 lbs. per sq. in.

$$A = \frac{418{,}000}{13{,}330} + \frac{50{,}000}{14{,}710} + \frac{50{,}000 \times 19 \times 20 \times 7.44}{25 \times 18{,}000 \times 6.34^2} = 42.57 \text{ sq. in.}$$

Note: The bending factor, A/S, given with the properties of column sections may be used to advantage in computation of columns with eccentric load, substituting the value of A/S for n/r^2 in formula.

In the example the value of A/S, axis 1-1 = $42.62 \div 230.0 = 0.185$.

$$A = \frac{418{,}000}{13{,}330} + \frac{50{,}000}{14{,}710} + \frac{50{,}000 \times 19 \times 20 \times 0.185}{25 \times 18{,}000} = 42.57 \text{ sq. in.}$$

COMPARISON OF COMPRESSION FORMULAS

Allowable Unit Stresses in Pounds per Square Inch

Ratio	Rankine	*A. I. S. C., 1928	Chicago, 1924
	Flat Bearing	Building Code Formulas:	
$\frac{l}{r}$	$\frac{12500}{1+\frac{l^2}{36000r^2}}$	$\frac{18000}{1+\frac{l^2}{18000r^2}}$	$16000-70\frac{l}{r}$
0	12500		
5	12491		
10	12465		
15	12422		
20	12363		Maximum
25	12287		14000
30	12195		13900
35	12089		13550
40	11968		13200
45	11834		12850
50	11688		12500
55	11531	Maximum	12150
60	11364	15000	11800
65	11187	14578	11450
70	11002	14148	11100
75	10811	13714	10750
80	10613	13279	10400
85	10410	12844	10050
90	10204	12414	9700
95	9995	11989	9350
100	9784	11571	9000
105	9571	11163	8650
110	9356	10764	8300
115	9142	10376	7950
120	8929	10000	7600
125	8717	9636	7250
130	8507	9284	6900
135	8299	8944	6550
140	8094	8617	6200
145	7892	8302	5850
150	7692	8000	5500
155	7496	7710	
160	7305	7431	
165	7118	7164	
170	6934	6908	
175	6754	6663	
180	6579	6429	
185	6408	6204	
190	6242	5989	
195	6080	5783	
200	5921	5586	

*A. I. S. C. formula adopted by principal cities in the United States, excepting the above.

Maximum Ratio l/r	Main Members	Secondary Members
A. I. S. C. Formula.......	120	200
Chicago Bldg. Law, 1924..	120	150

COMPRESSION UNIT STRESSES

Allowable Unit Stresses in Pounds per Square Inch

by Compression Formula of

American Institute of Steel Construction: $f = \dfrac{18{,}000}{1+\dfrac{1}{18{,}000}(l/\mathrm{r})^2}$

The following tables give the unit stresses for ratios of l/r in intervals of $\frac{5}{10}$. Intermediate values may be found by interpolation from the figures given for the tenth units of l/r by adding or deducting from the nearest tabulated figure the corresponding multiple.

EXAMPLE: Unit stress for $l/\mathrm{r}=94.7$ and $l/\mathrm{r}=150.8$

$l/\mathrm{r}=94.7$ 11989 +3x8.4 or 12031—2x8.4=12014

$l/\mathrm{r}=150.8$ 7941 +2x5.9 or 7971—3x5.9= 7953

Main Members—Ratios of l/r up to 120

Ratio, l/r	Unit Stress, Pounds	Diff. 0.10	Ratio, l/r	Unit Stress, Pounds	Diff. 0.10	Ratio, l/r	Unit Stress, Pounds	Diff. 0.10	Ratio, l/r	Unit Stress, Pounds	Diff. 0.10
60	15000		75	13714		90	12414		105	11163	
.5	14958	8.4	.5	13671	8.7	.5	12371	8.6	.5	11122	8.1
61	14916		76	13627		91	12328		106	11082	
.5	14874	8.4	.5	13584	8.7	.5	12286	8.5	.5	11042	8.0
62	14832		77	13540		92	12243		107	11002	
.5	14790	8.4	.5	13496	8.7	.5	12201	8.5	.5	10962	8.0
63	14748		78	13453		93	12158		108	10922	
.5	14705	8.5	.5	13409	8.7	.5	12116	8.5	.5	10883	7.9
64	14663		79	13366		94	12073		109	10843	
.5	14621	8.5	.5	13322	8.7	.5	12031	8.4	.5	10804	7.9
65	14578		80	13279		95	11989		110	10764	
.5	14535	8.5	.5	13235	8.7	.5	11947	8.4	.5	10725	7.9
66	14493		81	13192		96	11905		111	10686	
.5	14450	8.6	.5	13148	8.7	.5	11863	8.4	.5	10647	7.8
67	14407		82	13105		97	11821		112	10608	
.5	14364	8.6	.5	13061	8.7	.5	11779	8.4	.5	10569	7.8
68	14321		83	13018		98	11737		113	10530	
.5	14278	8.6	.5	12974	8.7	.5	11696	8.3	.5	10491	7.7
69	14235		84	12931		99	11654		114	10453	
.5	14192	8.7	.5	12888	8.7	.5	11613	8.3	.5	10415	7.7
70	14148		85	12844		100	11571		115	10376	
.5	14105	8.7	.5	12801	8.6	.5	11530	8.2	.5	10338	7.6
71	14062		86	12758		101	11489		116	10300	
.5	14019	8.7	.5	12715	8.6	.5	11448	8.2	.5	10262	7.6
72	13975		87	12672		102	11407		117	10224	
.5	13932	8.7	.5	12629	8.6	.5	11366	8.2	.5	10187	7.5
73	13888		88	12585		103	11325		118	10149	
.5	13845	8.7	.5	12542	8.6	.5	11284	8.2	.5	10112	7.5
74	13801		89	12500		104	11244		119	10074	
.5	13758	8.7	.5	12457	8.6	.5	11203	8.1	.5	10037	7.4
75	13714		90	12414		105	11163		120	10000	

COMPRESSION UNIT STRESSES

Allowable Unit Stresses in Pounds per Square Inch

by Compression Formula of

American Institute of Steel Construction: $f = \dfrac{18{,}000}{1 + \dfrac{1}{18{,}000}(l/r)^2}$

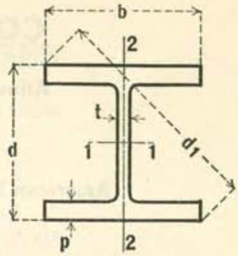
Secondary Members—Ratios of l/r up to 200

Ratio, l/r	Unit Stress, Pounds	Diff. 0.10	Ratio, l/r	Unit Stress, Pounds	Diff. 0.10	Ratio, l/r	Unit Stress, Pounds	Diff. 0.10	Ratio, l/r	Unit Stress, Pounds	Diff. 0.10
120	10000		140	8617		160	7431		180	6429	
.5	9963	7.4	.5	8585	6.4	.5	7404	5.4	.5	6406	4.6
121	9926		141	8553		161	7377		181	6383	
.5	9890	7.3	.5	8521	6.3	.5	7350	5.4	.5	6360	4.5
122	9853		142	8490		162	7323		182	6338	
.5	9816	7.3	.5	8458	6.3	.5	7296	5.4	.5	6315	4.5
123	9780		143	8427		163	7269		183	6293	
.5	9744	7.2	.5	8396	6.3	.5	7243	5.3	.5	6270	4.5
124	9708		144	8364		164	7217		184	6248	
.5	9672	7.2	.5	8333	6.2	.5	7190	5.3	.5	6226	4.4
125	9636		145	8302		165	7164		185	6204	
.5	9600	7.1	.5	8272	6.1	.5	7138	5.2	.5	6182	4.4
126	9564		146	8241		166	7112		186	6160	
.5	9529	7.1	.5	8210	6.1	.5	7086	5.2	.5	6139	4.3
127	9493		147	8180		167	7061		187	6117	
.5	9458	7.0	.5	8150	6.1	.5	7035	5.1	.5	6095	4.3
128	9423		148	8119		168	7009		188	6074	
.5	9388	7.0	.5	8089	6.0	.5	6984	5.1	.5	6053	4.3
129	9353		149	8060		169	6959		189	6031	
.5	9318	6.9	.5	8030	6.0	.5	6934	5.0	.5	6010	4.2
130	9284		150	8000		170	6908		190	5989	
.5	9249	6.9	.5	7971	5.9	.5	6883	5.0	.5	5968	4.2
131	9215		151	7941		171	6858		191	5947	
.5	9181	6.8	.5	7912	5.9	.5	6834	4.9	.5	5926	4.2
132	9146		152	7882		172	6809		192	5906	
.5	9112	6.8	.5	7853	5.8	.5	6785	4.9	.5	5885	4.1
133	9078		153	7824		173	6760		193	5864	
.5	9045	6.7	.5	7796	5.8	.5	6736	4.9	.5	5844	4.1
134	9011		154	7767		174	6711		194	5824	
.5	8978	6.7	.5	7738	5.7	.5	6687	4.8	.5	5803	4.0
135	8944		155	7710		175	6663		195	5783	
.5	8911	6.6	.5	7681	5.7	.5	6639	4.8	.5	5763	4.0
136	8878		156	7653		176	6615		196	5743	
.5	8845	6.6	.5	7625	5.6	.5	6592	4.7	.5	5723	3.9
137	8812		157	7597		177	6568		197	5703	
.5	8779	6.5	.5	7569	5.6	.5	6545	4.7	.5	5684	3.9
138	8746		158	7541		178	6521		198	5664	
.5	8714	6.5	.5	7514	5.5	.5	6498	4.7	.5	5643	3.9
139	8681		159	7486		179	6475		199	5624	
.5	8649	6.4	.5	7459	5.5	.5	6452	4.6	.5	5606	3.9
140	8617		160	7431		180	6429		200	5586	

COLUMN
18″ H
LOADS

CB SECTIONS

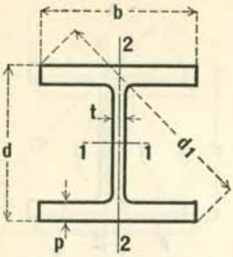
ALLOWABLE CONCENTRIC LOADS IN KIPS



Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	CB 183 N 18″ x 11¾″				CB 182 N 18″ x 8¾″			CB 181 N 18″ x 7½″			
	99 Lbs.	92 Lbs.	86 Lbs.	80 Lbs.	77 Lbs.	70 Lbs.	64 Lbs.	57 Lbs.	52 Lbs.	49 Lbs.	47 Lbs.
8	437	406	379	353	340	309	282	251	229	216	207
9	437	406	379	353	340	309	282	247	224	211	202
10	437	406	379	353	340	309	282	236	215	202	193
11	437	406	379	353	330	299	273	226	206	194	185
12	437	406	379	353	319	289	263	216	196	185	176
13	437	406	379	353	307	278	253	205	187	176	168
14	437	406	379	353	295	268	243	196	178	167	159
15	431	400	373	345	284	257	234	186	169	159	151
16	420	390	363	337	272	247	224	177	160	151	143
17	410	380	354	328	261	237	215	168	152	143	136
18	399	370	345	319	250	227	206	159	144	136	129
19	389	361	336	311	240	217	197	151	137	129	122
20	378	351	327	302	230	208	188	143	130	122	116
21	368	341	317	293	220	199	180	136	123	116	110
22	357	331	308	285	210	190	172	129	117	110	104
23	347	322	299	276	201	182	165	122	111	104	99
24	337	312	290	268	192	174	157	116	105	99	94
25	327	303	282	260	184	167	151	110	100	94	89
26	317	294	273	252	176	159	144	105	95	90	85
27	308	285	265	244	169	153	138	100	90	85	80
28	298	276	257	237	162	146	132	95	86	81	
29	289	268	249	229	155	140	126				
30	281	260	241	222	148	134	121				
Area, in.²	29.12	27.06	25.29	23.52	22.65	20.59	18.83	16.76	15.29	14.40	13.82
I_{1-1}, in.⁴	1777.1	1631.8	1506.6	1383.4	1283.9	1155.3	1047.2	952.0	857.3	808.6	768.6
S_{1-1}, in.³	194.5	179.9	167.2	154.6	141.5	128.4	117.2	104.3	94.6	89.5	85.4
r_{1-1}, in.	7.81	7.76	7.72	7.67	7.53	7.49	7.46	7.54	7.49	7.49	7.46
A/S_{1-1}	.150	.150	.151	.152	.160	.160	.161	.161	.162	.161	.162
I_{2-2}, in.⁴	242.2	222.2	204.8	187.6	93.5	83.7	75.5	48.7	43.5	41.0	38.7
S_{2-2}, in.³	41.1	37.8	34.9	32.0	21.3	19.1	17.3	12.9	11.6	10.9	10.3
r_{2-2}, in.	2.88	2.87	2.85	2.82	2.03	2.02	2.00	1.70	1.69	1.69	1.67
A/S_{2-2}	.709	.716	.725	.735	1.063	1.078	1.088	1.299	1.318	1.321	1.342
d, in.	18¼	18⅛	18	17⅞	18⅛	18	17⅞	18¼	18⅛	18	18
d_1, in.	21¾	21⅝	21½	21 7/16	20 3/16	20 1/16	19 11/16	19 11/16	19⅝	19 9/16	19½
b, in.	11¾	11¾	11¾	11¾	8¾	8¾	8¾	7½	7½	7½	7½
t, in.	½	½	7/16	7/16	½	7/16	7/16	⅜	⅜	5/16	5/16
p, in.	⅞	13/16	¾	11/16	13/16	¾	11/16	11/16	⅝	9/16	9/16

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.



CB SECTIONS

COLUMN
H 16″
LOADS

ALLOWABLE CONCENTRIC LOADS IN KIPS

Unit Stress—American Institute of Steel Construction—1928

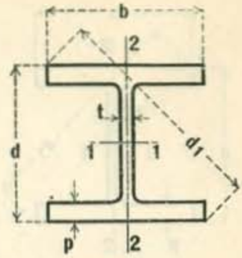
Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot									
	CB 164N 16″ x 12″			CB 163N 16″ x 8½″			CB 162N 16″ x 7¼″			
	90 Lbs.	83 Lbs.	76 Lbs.	68 Lbs.	63 Lbs.	58 Lbs.	50 Lbs.	45 Lbs.	40 Lbs.	37 Lbs.
8	397	366	335	300	278	256	221	198	177	163
9	397	366	335	300	278	256	215	193	171	157
10	397	366	335	300	278	255	206	185	164	150
11	397	366	335	290	268	247	196	176	156	143
12	397	366	335	280	259	238	187	168	149	136
13	397	366	335	270	249	229	178	160	142	129
14	397	366	335	259	239	220	169	152	135	122
15	396	364	333	249	230	211	161	144	128	116
16	387	356	325	239	220	202	153	137	121	109
17	377	347	317	228	211	194	145	129	115	104
18	368	339	309	219	202	186	137	123	109	98
19	359	330	301	210	194	178	130	116	103	93
20	350	321	293	201	185	170	123	110	97	88
21	340	313	285	192	177	162	117	104	92	83
22	331	304	278	184	169	155	111	99	88	79
23	322	296	270	176	162	148	105	94	83	74
24	313	287	262	168	155	142	100	89	79	70
25	304	279	255	161	148	136	95	85	75	67
26	295	271	247	154	142	130	90	80	71	63
27	287	263	240	147	136	124	86	76	67	
28	279	255	233	141	130	119				
29	270	248	226	135	124	114				
30	262	241	219	129	119	109				
Area, in.^{2}	26.47	24.42	22.33	19.99	18.52	17.06	14.70	13.23	11.78	10.88
I_{1-1}, in.^{4}	1285.5	1172.3	1065.5	924.4	851.7	776.5	668.1	594.6	525.9	470.0
S_{1-1}, in.^{3}	158.2	145.4	133.2	113.9	105.7	97.1	82.2	73.8	65.7	59.2
r_{1-1}, in.	6.97	6.93	6.91	6.80	6.78	6.75	6.74	6.70	6.68	6.57
A/S_{1-1}	.167	.168	.168	.176	.175	.176	.179	.179	.179	.184
I_{2-2}, in.^{4}	233.2	212.5	193.1	80.8	74.2	67.4	41.1	36.3	32.0	28.1
S_{2-2}, in.^{3}	38.6	35.3	32.2	19.0	17.5	16.0	11.2	10.0	8.8	7.8
r_{2-2}, in.	2.97	2.95	2.94	2.01	2.00	1.99	1.67	1.66	1.65	1.61
A/S_{2-2}	.686	.692	.693	1.052	1.058	1.066	1.313	1.323	1.339	1.395
d, in.	16¼	16⅛	16	16¼	16⅛	16	16¼	16⅛	16	15⅞
d_1, in.	20¼	20⅛	20	18⅜	18¼	18⅛	17⅞	17¾	17⅝	17½
b, in.	12⅛	12	12	8½	8½	8½	7⅜	7¼	7¼	7¼
t, in.	½	7/16	7/16	7/16	7/16	⅜	⅜	5/16	5/16	5/16
p, in.	13/16	¾	11/16	13/16	¾	11/16	⅝	9/16	½	7/16

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

COLUMN 15" H LOADS

CB SECTIONS

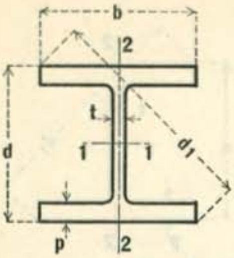
ALLOWABLE CONCENTRIC LOADS IN KIPS



Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot											
	CB 153 N 15" x 11"				CB 152 N 15" x 7½"				CB 151 N 15" x 6¾"			
	108 Lbs.	99 Lbs.	91 Lbs.	85 Lbs.	72 Lbs.	66 Lbs.	60 Lbs.	55 Lbs.	49 Lbs.	44 Lbs.	39 Lbs.	35 Lbs.
7	477	437	401	375	318	291	264	243	216	194	172	154
8	477	437	401	375	318	291	264	243	214	192	170	152
9	477	437	401	375	316	290	262	240	205	183	162	145
10	477	437	401	375	304	278	252	230	195	175	154	138
11	477	437	401	375	292	267	241	221	186	166	147	131
12	477	437	401	375	280	255	231	211	176	157	139	124
13	477	437	401	375	267	244	220	201	167	149	131	117
14	474	433	398	371	255	233	210	192	158	141	124	110
15	462	423	388	361	243	222	200	183	149	133	117	104
16	450	412	378	352	231	211	190	174	141	126	111	98
17	438	400	368	342	220	201	181	165	133	119	105	93
18	426	390	357	332	210	191	172	157	126	112	99	87
19	414	378	347	323	199	182	163	149	119	106	93	82
20	402	367	337	313	190	173	155	142	112	100	88	78
21	390	356	327	304	180	164	147	135	106	94	83	73
22	378	346	317	295	172	156	140	128	100	89	78	69
23	367	335	307	285	163	149	133	121	95	84	74	65
24	355	325	298	276	155	141	127	115	90	80	70	62
25	344	315	288	268	148	135	121	110	85	75	66	59
26	333	305	279	259	141	128	115	105	80			
27	323	295	270	251	134	122	109	100				
28	313	286	262	243	128	116	104	95				
29	303	276	253	235	122	111	99	90				
30	293	267	245	227								
31	284	259	237	220								
32	275	250	229	213								
33	266	243	222	206								
34	257	235	215	199								
35	245	227	208	193								
Area, in.^{2}	31.77	29.11	26.76	24.99	21.18	19.41	17.63	16.18	14.41	12.93	11.47	10.29
I_{1-1}, in.^{4}	1320.4	1200.4	1089.1	1007.2	838.2	760.0	680.7	620.4	569.6	507.1	448.8	396.7
S_{1-1}, in.^{3}	172.4	158.4	145.2	135.4	109.5	100.3	90.8	83.4	74.7	67.1	59.8	53.3
r_{1-1}, in.	6.45	6.42	6.38	6.35	6.29	6.26	6.21	6.19	6.29	6.26	6.25	6.21
A/S_{1-1}	.184	.184	.184	.185	.193	.194	.194	.194	.193	.193	.192	.193
I_{2-2}, in.^{4}	240.6	218.8	198.7	183.9	67.0	60.5	53.9	48.9	34.9	30.9	27.2	23.9
S_{2-2}, in.^{3}	43.4	39.6	36.1	33.5	17.7	16.0	14.4	13.1	10.2	9.1	8.1	7.1
r_{2-2}, in.	2.75	2.74	2.73	2.71	1.78	1.77	1.75	1.74	1.56	1.55	1.54	1.52
A/S_{2-2}	.732	.735	.741	.746	1.197	1.213	1.224	1.235	1.413	1.421	1.416	1.449
d, in.	15⅜	15⅛	15	14⅞	15¼	15⅛	15	14⅞	15¼	15⅛	15	14⅞
d_1, in.	18 13/16	18 11/16	18⅝	18½	17⅛	16 15/16	16 13/16	16 11/16	16¾	16⅝	16½	16⅜
b, in.	11⅛	11	11	11	7⅝	7½	7½	7½	6⅞	6¾	6¾	6¾
t, in.	⅝	9/16	9/16	½	9/16	½	7/16	7/16	⅜	⅜	5/16	5/16
p, in.	1 1/16	1	⅞	13/16	13/16	⅞	¾	11/16	⅝	9/16	½	½

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.



CB SECTIONS

COLUMN 14" H LOADS

ALLOWABLE CONCENTRIC LOADS IN KIPS

Unit Stress—American Institute of Steel Construction—1928

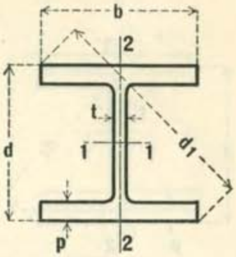
Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot									
	CB 146 N 14" x 16"									
	426 Lbs.	412 Lbs.	398 Lbs.	384 Lbs.	370 Lbs.	356 Lbs.	342 Lbs.	328 Lbs.	314 Lbs.	300 Lbs.
18	1880	1817	1756	1694	1632	1570	1508	1447	1385	1324
19	1880	1817	1756	1694	1632	1570	1508	1447	1385	1324
20	1880	1817	1756	1694	1632	1570	1508	1447	1385	1324
21	1880	1817	1756	1694	1632	1570	1508	1447	1385	1323
22	1871	1806	1743	1680	1616	1553	1489	1426	1363	1301
23	1842	1778	1716	1653	1590	1528	1465	1403	1341	1280
24	1812	1749	1688	1626	1564	1503	1441	1379	1318	1258
25	1783	1720	1660	1599	1537	1477	1416	1356	1296	1236
26	1752	1691	1632	1571	1510	1452	1391	1332	1272	1214
27	1722	1662	1603	1544	1484	1426	1367	1308	1250	1192
28	1692	1632	1575	1516	1457	1400	1342	1284	1226	1170
29	1662	1603	1547	1489	1431	1375	1317	1260	1203	1148
30	1631	1574	1519	1461	1404	1349	1292	1237	1181	1127
31	1602	1545	1490	1434	1378	1324	1268	1212	1158	1104
32	1572	1515	1462	1407	1352	1299	1243	1189	1135	1083
33	1542	1487	1434	1380	1326	1273	1219	1166	1113	1062
34	1513	1458	1406	1353	1300	1248	1195	1143	1091	1040
35	1483	1430	1380	1326	1274	1223	1171	1120	1069	1020
36	1455	1402	1353	1300	1249	1199	1148	1097	1047	999
37	1426	1374	1326	1274	1224	1175	1125	1075	1026	978
38	1398	1347	1299	1249	1199	1151	1102	1053	1004	958
39	1371	1320	1273	1223	1175	1128	1079	1032	984	938
40	1343	1294	1247	1199	1151	1105	1057	1010	963	918
Area, in.^{2}	125.30	121.16	117.05	112.92	108.83	104.68	100.56	96.47	92.36	88.24
I_{1-1}, in.^{4}	6611.4	6309.7	6015.2	5726.9	5455.1	5179.3	4910.4	4656.8	4400.5	4150.1
S_{1-1}, in.^{3}	707.5	682.1	657.0	632.1	608.2	583.6	559.3	535.9	512.0	488.2
r_{1-1}, in.	7.26	7.22	7.17	7.12	7.08	7.03	6.99	6.95	6.90	6.86
A/S_{1-1}	.177	.178	.178	.179	.179	.179	.180	.180	.180	.181
I_{2-2}, in.^{4}	2361.2	2265.7	2171.7	2078.4	1987.5	1896.4	1806.9	1719.7	1632.9	1547.2
S_{2-2}, in.^{3}	282.8	272.2	261.7	251.3	241.2	231.0	220.8	211.0	201.1	191.3
r_{2-2}, in.	4.34	4.32	4.31	4.29	4.27	4.26	4.24	4.22	4.20	4.19
A/S_{2-2}	.443	.445	.447	.449	.452	.453	.455	.457	.459	.461
d, in.	18¾	18½	18¼	18⅛	18	17¾	17½	17⅜	17¼	17
d_1, in.	25⅛	24 15/16	24¾	24 9/16	24⅜	24 5/16	24⅛	23⅞	23 11/16	23½
b, in.	16¾	16⅝	16⅝	16½	16½	16⅜	16⅜	16¼	16¼	16⅛
t, in.	1⅞	1 13/16	1 13/16	1¾	1 11/16	1⅝	1 9/16	1½	1 7/16	1⅜
p, in.	3 1/16	2 15/16	2 13/16	2¾	2 11/16	2⅝	2 7/16	2⅜	2 5/16	2 5/16

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

COLUMN 14" H LOADS

CB SECTIONS

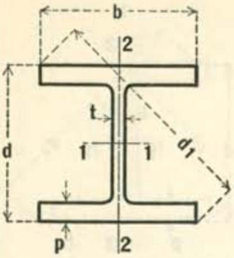
ALLOWABLE CONCENTRIC LOADS IN KIPS



Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot: CB 146N 14" x 16"								
	287 Lbs.	273 Lbs.	264 Lbs.	255 Lbs.	246 Lbs.	237 Lbs.	228 Lbs.	219 Lbs.	211 Lbs.
18	1266	1204	1164	1125	1085	1045	1005	966	931
19	1266	1204	1164	1125	1085	1045	1005	966	931
20	1266	1204	1164	1125	1085	1045	1005	966	931
21	1263	1199	1158	1118	1078	1038	997	957	921
22	1242	1180	1139	1100	1060	1021	981	941	905
23	1222	1160	1120	1082	1042	1003	964	925	890
24	1201	1140	1101	1063	1024	985	947	908	873
25	1179	1120	1081	1043	1006	968	930	892	858
26	1159	1100	1062	1024	988	950	913	875	842
27	1137	1079	1042	1005	969	933	896	859	826
28	1116	1059	1023	987	950	914	878	843	810
29	1095	1039	1003	968	932	897	862	826	794
30	1074	1019	984	949	914	879	845	810	779
31	1053	999	964	930	896	862	828	793	763
32	1033	979	945	912	878	845	811	777	747
33	1012	960	926	893	861	827	795	761	732
34	991	940	907	875	843	810	778	745	717
35	972	921	889	857	825	794	762	730	702
36	952	902	870	839	808	777	746	714	687
37	932	883	852	822	791	761	730	700	672
38	912	865	834	805	775	745	715	684	658
39	894	847	817	788	758	729	700	670	644
40	875	829	799	771	742	713	685	656	630
Area, $in.^2$	84.39	80.28	77.62	74.98	72.33	69.68	67.03	64.42	62.04
I_{1-1}, $in.^4$	3912.3	3674.1	3525.4	3372.3	3228.6	3080.2	2941.4	2798.8	2670.4
S_{1-1}, $in.^3$	465.5	442.1	427.3	412.0	397.4	382.2	367.7	352.7	339.1
r_{1-1}, in.	6.81	6.77	6.74	6.71	6.68	6.65	6.62	6.59	6.56
A/S_{1-1}	.181	.182	.182	.182	.182	.182	.182	.183	.183
I_{2-2}, $in.^4$	1467.3	1384.2	1331.5	1278.6	1227.1	1175.0	1124.7	1074.2	1028.6
S_{2-2}, $in.^3$	181.9	172.3	166.2	159.9	153.9	147.7	141.8	135.7	130.2
r_{2-2}, in.	4.17	4.15	4.14	4.13	4.12	4.11	4.10	4.08	4.07
A/S_{2-2}	.464	.466	.467	.469	.470	.472	.472	.475	.476
d, in.	16 3/4	16 5/8	16 1/2	16 3/8	16 1/4	16 1/8	16	15 7/8	15 3/4
d_1, in.	23 5/16	23 1/8	23	22 15/16	22 13/16	22 11/16	22 9/16	22 7/16	22 5/16
b, in.	16 1/8	16 1/8	16	16	16	15 7/8	15 7/8	15 7/8	15 3/4
t, in.	1 5/16	1 1/4	1 1/4	1 3/16	1 1/8	1 1/8	1 1/16	1	1
p, in.	2 1/16	2	1 15/16	1 7/8	1 13/16	1 3/4	1 11/16	1 5/8	1 9/16

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.



CB SECTIONS

COLUMN H 14" LOADS

ALLOWABLE CONCENTRIC LOADS IN KIPS

Unit Stress—American Institute of Steel Construction—1928

Effective Length In Feet	Nominal Depth and Flange Width—Weight per Foot								
	CB 146N 14" x 16"								
	202 Lbs.	193 Lbs.	184 Lbs.	176 Lbs.	167 Lbs.	158 Lbs.	150 Lbs.	142 Lbs.	*320 Lbs.
18	891	851	812	776	737	697	662	626	1411
19	891	851	812	776	737	697	662	626	1411
20	891	851	812	776	737	697	661	625	1411
21	880	841	801	765	725	685	650	614	1407
22	866	826	788	752	712	674	639	603	1385
23	850	812	774	739	700	662	627	593	1362
24	835	798	760	725	687	650	616	581	1339
25	820	783	746	712	674	638	604	571	1315
26	805	768	732	699	661	626	593	560	1291
27	790	754	718	685	649	613	581	549	1268
28	774	739	704	672	636	601	570	538	1245
29	759	725	690	658	623	589	558	527	1221
30	744	710	676	645	610	577	547	516	1197
31	729	695	662	632	598	565	536	505	1175
32	714	681	649	619	585	554	524	495	1151
33	699	667	635	606	573	542	513	484	1128
34	685	653	622	593	561	530	502	474	1105
35	670	639	609	581	549	519	492	463	1083
36	656	626	596	568	537	508	481	453	1061
37	642	613	583	556	526	497	471	443	1039
38	629	599	570	544	514	487	460	434	1017
39	615	586	558	532	503	476	450	424	996
40	602	574	546	521	492	465	440	415	975
Area, in.^{2}	59.38	56.75	54.12	51.73	49.10	46.44	44.13	41.76	94.09
I_{1-1}, in.^{4}	2538.1	2402.3	2275.3	2149.1	2020.4	1899.6	1787.2	1667.8	4140.7
S_{1-1}, in.^{3}	324.8	310.0	295.9	281.9	267.2	253.3	240.2	226.2	492.6
r_{1-1}, in.	6.54	6.51	6.48	6.45	6.41	6.40	6.36	6.32	6.63
A/S_{1-1}	.183	.183	.183	.184	.184	.183	.184	.185	.191
I_{2-2}, in.^{4}	979.8	930.6	883.6	838.2	790.5	745.0	703.2	658.9	1635.0
S_{2-2}, in.^{3}	124.4	118.5	112.8	107.2	101.3	95.8	90.6	85.0	195.7
r_{2-2}, in.	4.06	4.05	4.04	4.03	4.01	4.01	3.99	3.97	4.17
A/S_{2-2}	.477	.479	.480	.483	.485	.485	.487	.491	.481
d, in.	15 5/8	15 1/2	15 3/8	15 1/4	15 1/8	15	14 7/8	14 3/4	16 3/4
d_1, in.	22 1/4	22 1/8	22	21 7/8	21 3/4	21 5/8	21 1/2	21 7/16	23 3/4
b, in.	15 3/4	15 3/4	15 5/8	15 5/8	15 5/8	15 1/2	15 1/2	15 1/2	16 3/4
t, in.	15/16	15/16	7/8	13/16	13/16	3/4	11/16	11/16	1 7/8
p, in.	1 1/2	1 7/16	1 3/8	1 5/16	1 1/4	1 3/16	1 1/8	1 1/16	2 1/16

*Core Section.

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

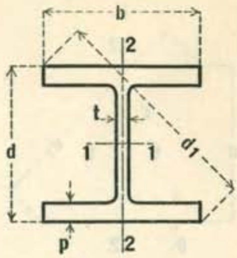
COLUMN

14″ H

LOADS

CB SECTIONS

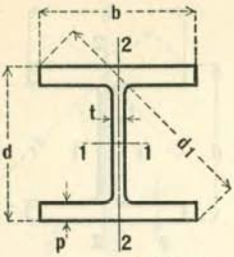
ALLOWABLE CONCENTRIC LOADS IN KIPS



Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot										
	CB 145N 14″ x 14½″									CB 144N 14″ x 12″	
	153 Lbs.	145 Lbs.	136 Lbs.	127 Lbs.	119 Lbs.	111 Lbs.	103 Lbs.	95 Lbs.	87 Lbs.	84 Lbs.	78 Lbs.
15	675	639	600	560	525	489	454	419	383	370	344
16	675	639	600	560	525	489	454	419	383	363	336
17	675	639	600	560	525	489	454	419	383	354	329
18	675	639	600	560	525	489	454	419	383	346	321
19	674	638	598	558	522	486	451	415	380	337	313
20	662	627	587	548	513	477	443	408	373	329	305
21	650	615	577	538	503	468	434	400	366	320	297
22	638	603	566	528	494	459	426	392	359	312	289
23	625	592	555	517	484	450	417	384	351	303	281
24	613	580	543	507	474	441	409	377	344	295	273
25	600	568	532	496	464	432	400	369	337	287	265
26	588	556	521	486	455	423	392	361	330	279	258
27	576	545	510	476	445	414	383	353	323	271	251
28	564	533	499	466	435	405	375	345	316	263	243
29	551	521	488	455	426	396	366	338	309	256	236
30	539	510	478	445	416	387	358	330	302	248	229
31	528	499	467	435	407	378	350	322	295	241	223
32	516	488	456	426	398	370	342	315	288	234	216
33	504	476	446	416	389	361	334	308	281	227	210
34	493	465	436	406	380	353	327	301	275	221	204
35	481	455	426	397	371	344	319	294	268	214	198
36	470	445	416	388	362	336	312	287	262	208	192
37	460	434	406	379	354	329	304	280	256	202	186
38	449	424	397	370	346	321	297	273	250	196	181
39	438	414	388	361	337	313	290	267	244	190	176
40	428	405	379	353	330	306	283	260	238	185	170
Area, in.^{2}	44.98	42.62	39.98	37.33	34.97	32.62	30.27	27.92	25.56	24.68	22.94
I_{1-1}, in.^{4}	1820.9	1710.9	1592.3	1476.0	1372.2	1265.3	1165.4	1062.5	966.2	927.2	850.5
S_{1-1}, in.^{3}	242.8	230.0	215.9	201.9	189.3	176.1	163.6	150.5	138.0	130.8	121.0
r_{1-1}, in.	6.36	6.34	6.31	6.29	6.26	6.23	6.20	6.17	6.15	6.13	6.09
A/S_{1-1}	.185	.185	.185	.185	.185	.185	.185	.186	.185	.189	.190
I_{2-2}, in.^{4}	646.0	608.5	567.7	527.6	491.7	454.7	419.8	383.7	349.7	225.4	206.9
S_{2-2}, in.^{3}	87.1	82.3	77.0	71.8	67.1	62.2	57.6	52.8	48.2	37.5	34.5
r_{2-2}, in.	3.79	3.78	3.77	3.76	3.75	3.73	3.72	3.71	3.70	3.02	3.00
A/S_{2-2}	.516	.518	.519	.520	.521	.524	.526	.529	.530	.658	.665
d, in.	15	14 7/8	14 3/4	14 5/8	14 1/2	14 3/8	14 1/4	14 1/8	14	14 1/8	14
d_1, in.	21 1/8	21	20 7/8	20 3/4	20 11/16	20 1/2	20 7/16	20 5/16	20 3/16	18 5/8	18 1/2
b, in.	14 7/8	14 3/4	14 3/4	14 3/4	14 5/8	14 5/8	14 5/8	14 1/2	14 1/2	12	12
t, in.	3/4	3/4	11/16	5/8	9/16	9/16	1/2	1/2	7/16	7/16	7/16
p, in.	1 5/16	1 1/8	1 1/16	1	15/16	7/8	13/16	3/4	11/16	3/4	11/16

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.



CB SECTIONS

COLUMN H 14″ LOADS

ALLOWABLE CONCENTRIC LOADS IN KIPS

Unit Stress—American Institute of Steel Construction—1928

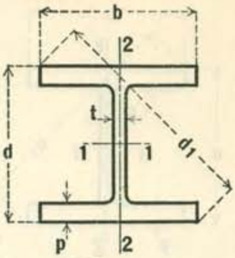
Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot										
	CB 143 N 14″ x 10″			CB 142 N 14″ x 8″				CB 141 N 14″ x 6¾″			
	74 Lbs.	68 Lbs.	61 Lbs.	58 Lbs.	53 Lbs.	48 Lbs.	43 Lbs.	42 Lbs.	37 Lbs.	33 Lbs.	30 Lbs.
7	326	300	269	255	233	212	190	185	163	145	132
8	326	300	269	255	233	212	190	184	162	144	129
9	326	300	269	255	233	212	190	176	155	137	124
10	326	300	269	252	230	208	186	168	148	131	117
11	326	300	269	243	222	201	179	160	140	124	111
12	326	300	269	234	213	193	172	152	133	118	105
13	321	294	264	225	205	185	165	144	126	112	100
14	312	286	256	216	197	177	158	136	120	106	94
15	303	277	248	207	188	170	151	129	113	100	89
16	294	269	241	198	180	163	145	121	107	94	84
17	284	261	233	189	172	155	138	115	101	89	79
18	275	252	225	181	164	148	132	108	95	84	74
19	266	244	218	173	157	142	126	102	90	79	70
20	257	235	211	165	150	135	120	97	85	75	66
21	249	227	203	157	143	129	114	91	80	71	62
22	240	220	196	150	137	123	109	86	76	67	59
23	232	212	189	144	130	117	104	82	72	63	56
24	224	204	183	137	124	112	99	77	68	60	53
25	216	197	176	131	119	107	95	73	65	57	50
26	208	190	170	125	114	102	90	70	61		
27	201	183	164	119	108	98	86				
28	194	177	158	114	104	93	83				
29	187	170	152	109	99	89	79				
30	180	164	147	105	95	85	75				
Area, in.^{2}	21.75	20.00	17.94	17.03	15.56	14.10	12.64	12.35	10.87	9.69	8.81
I_{1-1}, in.^{4}	795.9	723.4	640.8	596.7	541.0	484.0	428.3	435.3	380.9	334.7	294.3
S_{1-1}, in.^{3}	112.2	102.9	92.1	84.9	77.6	70.1	62.6	61.1	53.9	47.8	42.4
r_{1-1}, in.	6.05	6.01	5.98	5.92	5.90	5.86	5.82	5.94	5.92	5.88	5.78
A/S_{1-1}	.194	.194	.195	.201	.201	.201	.202	.202	.202	.203	.208
I_{2-2}, in.^{4}	133.4	121.2	107.3	63.6	57.5	51.2	45.1	30.6	26.6	23.2	20.1
S_{2-2}, in.^{3}	26.5	24.1	21.5	15.7	14.3	12.8	11.3	9.0	7.9	6.9	6.0
r_{2-2}, in.	2.48	2.46	2.45	1.93	1.92	1.91	1.89	1.57	1.57	1.55	1.51
A/S_{2-2}	.821	.830	.834	1.085	1.088	1.102	1.119	1.372	1.376	1.404	1.468
d, in.	14¼	14	13⅞	14	14	13¾	13⅝	14¼	14⅛	14	13⅞
d_1, in.	17 7/16	17 5/16	17 3/16	16¼	16⅛	16	15⅞	15 13/16	15 11/16	15 9/16	15 7/16
b, in.	10⅛	10	10	8⅛	8	8	8	6⅞	6¾	6¾	6¾
t, in.	7/16	7/16	⅜	7/16	⅜	⅜	5/16	⅜	5/16	¼	¼
p, in.	13/16	11/16	⅝	11/16	11/16	9/16	½	9/16	½	7/16	⅜

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

COLUMN 12" H LOADS

CB SECTIONS

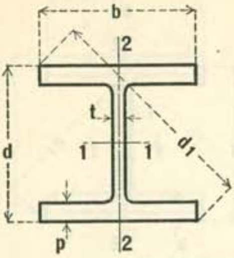
ALLOWABLE CONCENTRIC LOADS IN KIPS



Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot								
	CB 125N 12" x 12"								
	190 Lbs.	176 Lbs.	169 Lbs.	161 Lbs.	154 Lbs.	147 Lbs.	140 Lbs.	133 Lbs.	126 Lbs.
11	838	776	745	710	679	648	617	587	556
12	838	776	745	710	679	648	617	587	556
13	838	776	745	710	679	648	617	587	556
14	838	776	745	710	679	648	617	587	556
15	838	776	745	710	679	648	617	587	556
16	838	776	745	710	678	647	615	584	552
17	825	761	731	695	664	633	602	572	540
18	807	745	715	680	649	619	589	559	528
19	790	729	699	664	635	605	575	546	516
20	772	712	682	649	620	591	562	533	503
21	754	695	666	633	605	576	548	520	491
22	736	678	650	618	590	563	535	507	479
23	718	662	634	603	576	548	521	494	467
24	700	645	618	588	561	534	508	482	454
25	682	628	602	572	546	520	495	469	442
26	665	612	587	558	532	507	482	457	430
27	648	596	571	543	518	493	469	444	419
28	631	580	556	528	504	480	456	432	408
29	614	565	541	514	491	467	444	421	396
30	598	550	527	500	477	454	431	409	385
31	582	535	512	486	464	442	420	398	375
32	567	520	498	473	451	430	408	387	364
33	551	506	485	460	439	418	397	376	354
34	536	492	471	448	427	406	386	365	344
35	522	479	459	435	415	395	375	355	334
Area, in.²	55.86	51.75	49.69	47.33	45.27	43.21	41.15	39.10	37.04
I_{1-1}, in.⁴	1891.5	1710.6	1626.9	1540.0	1455.5	1372.8	1295.5	1219.9	1142.0
S_{1-1}, in.³	263.1	242.3	232.4	221.9	211.7	201.6	191.9	182.3	172.4
r_{1-1}, in.	5.82	5.75	5.72	5.70	5.67	5.64	5.61	5.59	5.55
A/S_{1-1}	.212	.214	.214	.213	.214	.214	.214	.214	.215
I_{2-2}, in.⁴	589.8	538.1	513.2	486.0	461.1	436.6	413.1	389.9	366.3
S_{2-2}, in.³	93.1	85.3	81.6	77.7	73.9	70.1	66.6	63.1	59.4
r_{2-2}, in.	3.25	3.22	3.21	3.20	3.19	3.18	3.17	3.16	3.14
A/S_{2-2}	.600	.607	.609	.609	.613	.616	.618	.620	.624
d, in.	14⅜	14⅛	14	13⅞	13¾	13⅝	13½	13⅜	13¼
d_1, in.	19 5/16	18 15/16	18⅞	18¾	18⅝	18½	18⅜	18¼	18⅛
b, in.	12⅝	12⅝	12⅝	12½	12½	12½	12⅜	12⅜	12⅜
t, in.	1 1/16	1	1	15/16	⅞	⅞	13/16	¾	¾
p, in.	1¾	1⅝	1 9/16	1½	1 7/16	1⅜	1 5/16	1¼	1 3/16

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.



CB SECTIONS

COLUMN H 12″ LOADS

ALLOWABLE CONCENTRIC LOADS IN KIPS

Unit Stress—American Institute of Steel Construction—1928

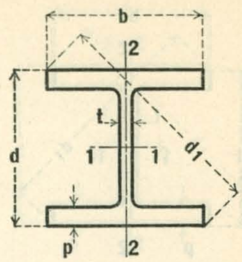
Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot								
	CB 125N 12″ x 12″								
	120 Lbs.	113 Lbs.	106 Lbs.	99 Lbs.	92 Lbs.	85 Lbs.	79 Lbs.	72 Lbs.	65 Lbs.
15	529	498	467	436	406	375	348	317	286
16	525	494	463	431	400	369	343	312	281
17	513	483	453	422	391	361	335	304	274
18	502	472	442	412	382	353	327	297	268
19	490	461	432	402	373	344	319	290	261
20	478	450	421	392	364	336	311	283	254
21	467	439	411	382	355	327	303	275	248
22	455	428	400	373	346	319	295	268	241
23	443	417	390	363	337	310	287	261	235
24	432	406	380	353	328	302	280	254	228
25	420	395	370	344	319	294	272	247	222
26	409	384	360	334	310	286	264	240	216
27	398	374	350	325	301	278	257	233	210
28	387	364	340	316	293	270	250	227	204
29	376	354	331	307	285	262	243	220	198
30	366	344	321	299	277	255	236	214	192
31	355	334	312	290	269	248	229	208	186
32	346	325	304	282	261	241	222	202	181
33	336	315	295	274	254	234	216	196	176
34	326	306	287	266	246	227	210	190	171
35	317	298	278	258	239	220	204	185	166
Area, in.²	35.26	33.21	31.15	29.09	27.04	24.98	23.22	21.15	19.09
I_{1-1}, in.⁴	1069.9	998.8	929.0	857.3	787.4	722.0	661.9	596.2	532.0
S_{1-1}, in.³	163.1	153.7	144.3	134.5	124.8	115.5	106.9	97.3	87.8
r_{1-1}, in.	5.51	5.48	5.46	5.43	5.40	5.38	5.34	5.31	5.28
A/S_{1-1}	.216	.216	.216	.216	.217	.216	.217	.217	.217
I_{2-2}, in.⁴	344.9	322.7	300.7	278.3	256.3	235.5	216.4	195.3	174.6
S_{2-2}, in.³	56.0	52.6	49.2	45.7	42.2	38.9	35.8	32.4	29.1
r_{2-2}, in.	3.13	3.12	3.11	3.09	3.08	3.07	3.05	3.04	3.02
A/S_{2-2}	.630	.631	.633	.637	.641	.642	.649	.653	.656
d, in.	13 1/8	13	12 7/8	12 3/4	12 5/8	12 1/2	12 3/8	12 1/4	12 1/8
d_1, in.	18	17 15/16	17 13/16	17 11/16	17 9/16	17 7/16	17 5/16	17 3/16	17 1/16
b, in.	12 3/8	12 1/4	12 1/4	12 1/4	12 1/8	12 1/8	12 1/8	12	12
t, in.	3/4	11/16	5/8	5/8	9/16	1/2	1/2	7/16	7/16
p, in.	1 1/8	1 1/16	1	15/16	7/8	13/16	3/4	11/16	5/8

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

COLUMN
12" H
LOADS

CB SECTIONS

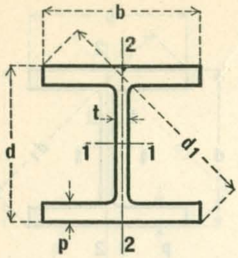
ALLOWABLE CONCENTRIC LOADS IN KIPS



Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot									
	CB 124N 12" x 10"			CB 123N 12" x 8"			CB 122N 12" x 6½"			
	64 Lbs.	58 Lbs.	53 Lbs.	50 Lbs.	45 Lbs.	40 Lbs.	36 Lbs.	32 Lbs.	28 Lbs.	25 Lbs.
6	282	256	234	220	198	176	159	141	123	110
7	282	256	234	220	198	176	159	141	123	110
8	282	256	234	220	198	176	157	139	121	107
9	282	256	234	220	198	176	150	133	116	102
10	282	256	234	219	196	174	143	127	110	97
11	282	256	234	211	190	168	136	120	105	92
12	282	256	234	203	183	162	129	114	99	87
13	279	252	230	196	175	156	122	108	94	82
14	271	246	223	188	168	149	116	102	89	77
15	264	239	217	180	161	143	109	96	84	73
16	256	231	210	172	155	137	103	91	79	68
17	248	224	204	165	148	131	98	86	74	64
18	240	217	197	158	141	125	92	81	70	61
19	233	210	191	151	135	120	87	76	66	57
20	225	203	184	144	129		82	72	62	54
21	218	197	178	138	123	114	78	68	59	51
22	210	190	172	132	118	109	74	64	56	48
23	203	183	166	126	113	104	70	61	53	45
24	196	177	160	120	107	100	66	58	50	43
25	189	171	155	115	103	95	62	55	47	
26	183	165	149	110	98	91	59			
27	176	159	144	105	94	87				
28	170	154	139	100	90	83				
29	164	148	134	96	86	79				
30	159	143	129	92	82	76				
Area, in.²	18.81	17.04	15.57	14.69	13.21	11.75	10.58	9.42	8.22	7.36
I_{1-1}, in.⁴	527.5	475.3	425.4	393.0	349.3	308.6	282.3	247.0	213.4	182.9
S_{1-1}, in.³	85.7	78.0	70.5	64.5	57.9	51.7	46.1	40.8	35.6	30.8
r_{1-1}, in.	5.30	5.28	5.23	5.17	5.14	5.13	5.17	5.12	5.10	4.98
A/S_{1-1}	.219	.218	.221	.228	.228	.227	.230	.231	.231	.239
I_{2-2}, in.⁴	119.0	107.4	96.1	56.4	50.0	44.1	25.7	22.3	19.2	16.2
S_{2-2}, in.³	23.7	21.4	19.2	14.0	12.4	11.0	7.8	6.8	5.9	5.0
r_{2-2}, in.	2.52	2.51	2.48	1.96	1.95	1.94	1.56	1.54	1.53	1.48
A/S_{2-2}	.794	.796	.811	1.049	1.065	1.068	1.356	1.385	1.393	1.472
d, in.	12¼	12¼	12	12¼	12	12	12¼	12⅛	12	11⅞
d_1, in.	15 15/16	15 13/16	15 11/16	14⅝	14 9/16	14⅜	13 15/16	13 13/16	13 11/16	13 9/16
b, in.	10	10	10	8⅛	8	8	6½	6½	6½	6½
t, in.	7/16	⅜	⅜	⅜	⅜	5/16	5/16	5/16	¼	¼
p, in.	11/16	⅝	9/16	⅝	9/16	½	9/16	½	7/16	⅜

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.



CB SECTIONS

COLUMN H 10″ LOADS

ALLOWABLE CONCENTRIC LOADS IN KIPS

Unit Stress—American Institute of Steel Construction—1928

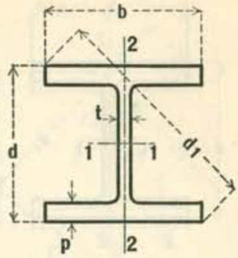
Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot: CB 103N 10″ x 10″							
	136 Lbs.	130 Lbs.	124 Lbs.	118 Lbs.	112 Lbs.	106 Lbs.	100 Lbs.	95 Lbs.
13	600	573	547	520	494	467	441	419
14	594	567	540	512	486	459	433	410
15	579	553	526	499	473	447	422	399
16	564	538	512	486	460	435	410	388
17	549	523	498	472	447	423	398	377
18	533	509	484	459	435	411	387	366
19	518	494	470	445	422	398	375	355
20	503	479	456	432	409	386	364	344
21	487	465	442	419	396	374	352	334
22	473	451	428	406	384	363	341	323
23	458	437	415	393	372	351	331	313
24	444	423	402	380	360	340	320	303
25	430	409	389	368	348	329	309	293
26	416	396	377	356	337	318	299	283
27	403	383	365	344	326	307	289	274
28	390	371	353	333	315	297	280	264
29	377	359	341	322	305	288	271	256
30	365	348	330	312	295	278	262	247
31	353	336	319	302	285	269	253	239
32	342	325	309	292	276	260	244	231
33	331	315	299	282	267	251	236	223
34	320	305	289	273	258	243	229	216
35	310	295	280	264	250	235	221	209
Area, in.²	40.01	38.23	36.45	34.68	32.92	31.16	29.42	27.92
I_{1-1}, in.⁴	916.9	864.2	812.9	765.2	718.6	671.0	624.7	584.2
S_{1-1}, in.³	154.4	147.1	139.9	133.1	126.3	119.3	112.4	106.2
r_{1-1}, in.	4.79	4.75	4.72	4.70	4.67	4.64	4.61	4.58
A/S_{1-1}	.259	.260	.261	.261	.261	.261	.262	.263
I_{2-2}, in.⁴	295.9	280.2	264.8	250.0	235.4	220.8	206.6	194.2
S_{2-2}, in.³	56.0	53.2	50.4	47.8	45.2	42.5	39.9	37.6
r_{2-2}, in.	2.72	2.71	2.70	2.68	2.67	2.66	2.65	2.64
A/S_{2-2}	.714	.719	.723	.726	.728	.733	.737	.743
d, in.	11⅞	11¾	11⅝	11½	11⅜	11¼	11⅛	11
d_1, in.	15 15/16	15 13/16	15 11/16	15 9/16	15 7/16	15 5/16	15¼	15⅛
b, in.	10⅝	10½	10½	10½	10⅜	10⅜	10⅜	10⅜
t, in.	15/16	⅞	⅞	13/16	¾	¾	11/16	11/16
p, in.	1½	1 7/16	1⅜	1 5/16	1¼	1 3/16	1⅛	1 1/16

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

COLUMN
10" H
LOADS

CB SECTIONS

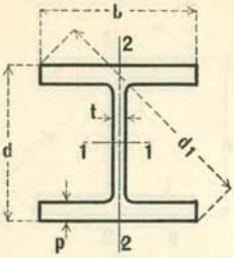
ALLOWABLE CONCENTRIC LOADS IN KIPS



Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot							
	CB 103N 10" x 10"							
	89 Lbs.	83 Lbs.	77 Lbs.	72 Lbs.	66 Lbs.	60 Lbs.	54 Lbs.	49 Lbs.
12	393	366	340	318	291	265	238	216
13	393	366	340	317	291	264	237	214
14	384	357	331	309	283	257	231	208
15	374	347	322	300	275	250	224	202
16	363	338	313	292	267	243	218	196
17	353	328	304	283	260	235	211	191
18	343	318	295	275	252	228	205	185
19	332	308	286	266	244	221	198	179
20	322	299	277	258	236	214	192	173
21	312	289	268	250	229	207	186	167
22	302	280	259	242	221	200	180	162
23	292	271	251	234	214	194	174	156
24	283	262	242	226	207	187	168	151
25	273	253	234	218	200	181	162	146
26	264	245	227	211	193	175	157	141
27	256	237	219	204	186	169	151	136
28	247	229	212	197	180	163	146	131
29	239	221	204	190	174	157	141	127
30	231	214	197	184	168	152	136	122
31	223	206	191	178	162	147	132	118
32	216	200	184	171	157	142	127	114
33	208	193	178	166	151	137	123	110
34	202	186	172	160	146	132	119	106
35	195	180	166	155	141	128	115	103
Area, in.^{2}	26.17	24.41	22.65	21.17	19.43	17.65	15.89	14.38
I_{1-1}, in.^{4}	542.1	498.9	456.9	420.4	382.5	343.5	305.6	272.7
S_{1-1}, in.^{3}	99.7	92.8	86.1	80.1	73.7	67.0	60.4	54.5
r_{1-1}, in.	4.55	4.52	4.49	4.46	4.44	4.41	4.39	4.35
A/S_{1-1}	.262	.263	.263	.264	.264	.263	.263	.264
I_{2-2}, in.^{4}	180.6	166.9	153.4	141.8	129.3	116.5	104.0	93.0
S_{2-2}, in.^{3}	35.2	32.6	30.1	27.9	25.6	23.1	20.7	18.6
r_{2-2}, in.	2.63	2.61	2.60	2.59	2.58	2.57	2.56	2.54
A/S_{2-2}	.743	.749	.752	.759	.759	.764	.768	.773
d, in.	10⅞	10¾	10⅝	10½	10⅜	10¼	10⅛	10
d_1, in.	15	14⅞	14¾	14⅝	14½	14⅜	14¼	14 5/16
b, in.	10¼	10¼	10¼	10⅛	10⅛	10⅛	10	10
t, in.	⅝	9/16	9/16	½	½	7/16	⅜	⅜
p, in.	1	15/16	⅞	13/16	¾	11/16	⅝	9/16

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.



COLUMN
H 10″
LOADS

CB SECTIONS

ALLOWABLE CONCENTRIC LOADS IN KIPS

Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	CB 102 N 10″ x 8″ 45 Lbs.	41 Lbs.	37 Lbs.	33 Lbs.	CB 101 N 10″ x 5¾″ 29 Lbs.	26 Lbs.	23 Lbs.	21 Lbs.
6	198	181	163	146	128	115	101	93
7	198	181	163	146	128	114	100	91
8	198	181	163	146	121	108	95	86
9	198	181	163	146	115	102	90	81
10	198	181	162	144	109	97	85	76
11	192	174	156	139	102	91	79	72
12	185	168	151	134	96	85	75	67
13	178	162	145	129	90	80	70	63
14	171	156	139	124	85	75	65	59
15	165	149	133	118	80	70	61	55
16	158	143	128	113	75	66	57	51
17	151	137	122	108	70	62	54	48
18	145	131	117	104	66	58	50	45
19	139	126	112	99	62	54	47	42
20	133	120	107	95	58	51	44	39
21	127	115	102	90	54	48	41	37
22	122	110	98	86	51	45	39	35
23	116	105	93	82	48			
24	111	100	89	79				
25	106	96	85	75				
26	102	92	82	72				
27	97	88	78	69				
28	93	84	75	66				
29	89	80	71	63				
30	86	77	68	60				
Area, in.²	13.22	12.06	10.85	9.72	8.54	7.65	6.76	6.18
I_{1-1}, in.⁴	248.3	222.3	196.6	170.8	159.3	139.7	120.5	106.3
S_{1-1}, in.³	49.1	44.5	39.8	35.0	31.1	27.6	24.1	21.5
r_{1-1}, in.	4.33	4.29	4.26	4.19	4.32	4.27	4.22	4.15
A/S_{1-1}	.269	.271	.273	.278	.275	.277	.280	.287
I_{2-2}, in.⁴	53.2	47.7	42.1	36.5	16.5	14.4	12.4	10.8
S_{2-2}, in.³	13.3	11.9	10.6	9.2	5.7	5.0	4.3	3.8
r_{2-2}, in.	2.01	1.99	1.97	1.94	1.39	1.37	1.35	1.32
A/S_{2-2}	.994	1.013	1.024	1.057	1.498	1.530	1.572	1.626
d, in.	10 1/8	10	9 7/8	9 3/4	10 1/4	10 1/8	10	9 7/8
d_1, in.	12 15/16	12 13/16	12 3/4	12 5/8	11 15/16	11 11/16	11 9/16	11 1/2
b, in.	8	8	8	8	5 3/4	5 3/4	5 3/4	5 3/4
t, in.	3/8	3/8	5/16	5/16	5/16	1/4	1/4	1/4
p, in.	5/8	9/16	1/2	7/16	1/2	7/16	3/8	5/16

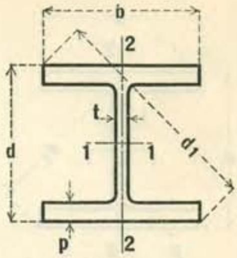
Nominal Depth and Flange Width—Weight per Foot

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

COLUMN 8" H LOADS

CB SECTIONS

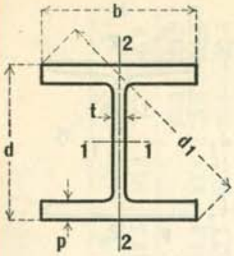
ALLOWABLE CONCENTRIC LOADS IN KIPS



Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot												
	CB 83N 8" x 8"										CB 82N 8" x 6½"		
	67 Lbs.	62 Lbs.	58 Lbs.	53 Lbs.	48 Lbs.	44 Lbs.	40 Lbs.	35 Lbs.	33 Lbs.	31 Lbs.	30 Lbs.	27 Lbs.	24 Lbs.
7	296	273	256	234	212	194	176	154	146	137	132	119	106
8	296	273	256	234	212	194	176	154	146	137	132	119	106
9	296	273	256	234	212	194	176	154	146	137	127	114	102
10	296	273	256	234	212	194	176	154	146	137	122	109	97
11	292	269	251	229	207	189	171	150	141	132	116	104	93
12	282	261	243	221	200	183	165	145	136	127	111	99	88
13	273	252	234	214	193	176	159	139	131	123	105	94	84
14	263	243	226	206	186	170	154	134	126	118	100	89	79
15	253	234	217	198	179	163	148	129	121	113	95	85	75
16	244	225	209	190	172	157	142	124	116	109	90	80	71
17	234	216	201	183	165	151	136	119	111	104	85	76	67
18	225	207	192	175	158	144	130	114	107	100	80	72	64
19	216	199	185	168	152	138	125	109	102	96	76	68	60
20	207	191	177	161	145	133	120	104	98	91	72	64	57
21	199	183	170	154	139	127	114	100	94	87	68	61	54
22	191	175	163	148	133	122	109	95	90	84	65	58	51
23	183	168	156	142	128	116	105	91	86	80	61	55	48
24	175	161	149	136	122	111	100	87	82	77	58	52	46
25	168	154	143	130	117	107	96	84	78	73	55	49	43
26	161	148	137	125	112	102	92	80	75	70	52	47	41
27	154	142	131	119	108	98	88	77	72	67	50	44	
28	148	136	126	114	103	94	84	73	69	64			
29	142	131	121	110	99	90	81	70	66	61			
30	136	125	116	105	95	86	77	67	63	59			
31	131	120	111	101	91	83	74	65	61	56			
32	126	115	107	97	87	79	71	62	58	54			
33	121	111	102	93	84	76	68	59	56	52			
34	116	107	98	89	80	73	66						
35	112	102											
Area, in.²	19.70	18.22	17.04	15.57	14.10	12.92	11.74	10.28	9.70	9.10	8.81	7.93	7.06
I_{1-1}, in.⁴	275.6	252.2	230.3	207.1	186.3	167.5	148.3	128.2	119.8	110.9	107.8	95.9	84.2
S_{1-1}, in.³	60.8	56.4	52.3	47.7	43.5	39.7	35.7	31.3	29.5	27.5	26.3	23.7	21.1
r_{1-1}, in.	3.74	3.72	3.68	3.65	3.63	3.60	3.55	3.53	3.51	3.49	3.50	3.48	3.46
A/S_{1-1}	.324	.323	.326	.326	.324	.325	.329	.328	.329	.331	.335	.335	.335
I_{2-2}, in.⁴	88.4	81.0	74.6	67.4	60.7	54.8	48.8	42.3	39.6	36.7	23.4	20.8	18.3
S_{2-2}, in.³	21.3	19.7	18.2	16.5	15.0	13.6	12.1	10.5	9.9	9.2	7.1	6.4	5.6
r_{2-2}, in.	2.12	2.11	2.09	2.08	2.07	2.06	2.04	2.03	2.02	2.01	1.63	1.62	1.61
A/S_{2-2}	.925	.925	.936	.944	.940	.950	.970	.979	.980	.989	1.241	1.239	1.261
d, in.	9	9	8 3/4	8 5/8	8 1/2	8 1/2	8 1/4	8 1/8	8 1/8	8	8 1/4	8 1/8	8
d_1, in.	12 5/16	12 3/16	12 1/16	11 15/16	11 13/16	11 3/4	11 5/8	11 1/2	11 7/16	11 3/8	10 1/2	10 7/16	10 5/16
b, in.	8 1/4	8 1/4	8 1/4	8 1/8	8 1/8	8 1/8	8 1/8	8	8	8	6 1/2	6 1/2	6 1/2
t, in.	9/16	9/16	1/2	1/2	7/16	3/8	3/8	5/16	5/16	5/16	5/16	5/16	1/4
p, in.	15/16	7/8	13/16	3/4	11/16	5/8	9/16	1/2	7/16	7/16	1/2	7/16	3/8

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.



CB SECTIONS

COLUMN
6″ H
LOADS

ALLOWABLE CONCENTRIC LOADS IN KIPS

Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	Nominal Depth and Flange Width—Weight per Foot: CB 61 N 5¾″ x 9½″ Ⓒ					
	88 Lbs.	80 Lbs.	70 Lbs.	60 Lbs.	50 Lbs.	40 Lbs.
11	388	353	309	264	221	176
12	388	353	309	264	221	176
13	388	352	306	261	217	173
14	378	343	298	254	211	168
15	368	333	290	247	205	162
16	357	324	281	239	199	157
17	347	314	273	232	192	152
18	337	305	264	225	186	147
19	326	295	256	218	180	143
20	316	286	248	210	174	138
21	306	277	239	203	168	133
22	296	268	232	197	162	128
23	286	259	224	190	157	124
24	277	250	216	183	151	119
25	268	242	209	177	146	115
26	259	234	202	171	141	111
27	250	226	195	165	136	107
28	242	218	188	159	131	103
29	233	211	181	154	126	99
30	225	203	175	148	122	96
31	218	196	169	143	118	92
32	211	190	163	138	113	89
33	203	183	158	133	109	86
34	197	177	152	129	106	83
35	190	171	147	124	102	80
Area, in.²	25.87	23.52	20.58	17.63	14.70	11.76
I 1-1, in.⁴	187.3	164.9	138.7	113.9	91.0	69.6
S 1-1, in.³	54.7	49.5	43.0	36.7	30.4	24.2
r 1-1, in.	2.69	2.65	2.60	2.54	2.49	2.43
A/S 1-1	.473	.475	.479	.480	.484	.486
I 2-2, in.⁴	175.4	156.3	133.3	111.1	90.1	69.9
S 2-2, in.³	34.9	31.4	27.1	22.8	18.7	14.7
r 2-2, in.	2.60	2.58	2.54	2.51	2.48	2.44
A/S 2-2	.741	.749	.759	.773	.786	.800
d, in.	6⅞	6⅝	6½	6¼	6	5¾
d_1, in.	12 5/16	12	11 13/16	11 9/16	11⅜	11⅛
b, in.	10	10	9⅞	9¾	9⅝	9½
t, in.	1 1/16	15/16	⅞	¾	⅝	½
p, in.	1 1/16	15/16	13/16	¾	⅝	½

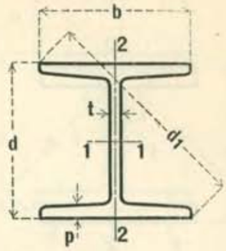
Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

ⒸCarnegie Steel Company only.

COLUMN
9″ to 4″
H
LOADS

H-BEAMS
STANDARD MILL BEAMS

ALLOWABLE CONCENTRIC LOADS IN KIPS



Unit Stress—American Institute of Steel Construction—1928

Effective Length In Feet	B 40 N 9″ x 5¼″ Ⓒ		B 39 N 8″ x 5″ Ⓒ			H 4 8″ x 8″			H 3A 6″ x 6″		H 3 6″ x 6″		H 2 5″ x 5″ Ⓒ	H 1 4″ x 4″ Ⓒ
	23 Lbs.	20 Lbs.	21 Lbs.	19 Lbs.	17 Lbs.	37.7 Lbs.	34.3 Lbs.	32.6 Lbs.	27.5 Lbs.	25 Lbs.	22.5 Lbs.	20 Lbs.	18.9 Lbs.	13.8 Lbs.
1	101	88	93	84	75	165	150	143	121	110	99	88	82	60
2	101	88	93	84	75	165	150	143	121	110	99	88	82	60
3	101	88	93	84	75	165	150	143	121	110	99	88	82	60
4	101	88	93	84	75	165	150	143	121	110	99	88	82	60
5	101	88	93	84	75	165	150	143	121	110	99	88	82	59
6	99	87	87	80	72	165	150	143	121	110	99	88	82	54
7	93	82	81	75	68	165	150	143	121	110	98	88	77	50
8	86	77	75	69	63	165	150	143	116	106	93	83	73	46
9	80	71	69	64	58	165	150	143	110	100	88	79	68	42
10	74	66	63	59	54	160	146	140	104	95	83	75	63	38
11	69	62	58	54	50	154	141	135	98	90	78	70	59	35
12	63	57	53	50	46	147	135	130	92	84	73	66	55	32
13	59	53	49	46	42	141	130	124	87	79	69	62	51	29
14	54	49	45	42	39	135	124	119	81	75	64	58	47	26
15	50	45	41	39	36	129	119	114	76	70	60	55	44	24
16	46	42	38	36	33	123	114	109	72	66	56	51	41	
17	43	39	35	33	31	117	108	104	67	62	53	48	38	
18	40	36			28	112	103	100	63	58	50	45	35	
19		34				106	99	95	59	55	46	42	33	
20						101	94	91	56	51	44	40	31	
21						96	90	86	52	48	41	37		
22						92	85	83	49	46	38	35		
23						87	81	79	46	43		33		
24						83	78	75						
25						79	74	72						
Area, in.²	6.76	5.88	6.17	5.59	5.00	11.00	10.00	9.50	8.08	7.33	6.61	5.86	5.47	3.99
I 1-1, in.⁴	91.6	85.6	63.4	60.3	57.2	120.8	115.5	112.8	49.3	47.0	41.0	38.8	23.8	10.7
S 1-1, in.³	20.4	19.0	15.9	15.1	14.3	30.2	28.9	28.2	16.4	15.7	13.7	12.9	9.5	5.3
r 1-1, in.	3.68	3.82	3.21	3.29	3.38	3.31	3.40	3.45	2.47	2.53	2.49	2.57	2.08	1.64
A/S 1-1	.331	.309	.388	.370	.350	.364	.346	.337	.493	.467	.482	.454	.576	.753
I 2-2, in.⁴	8.4	7.9	6.6	6.3	6.0	36.9	35.1	34.2	16.0	14.9	12.2	11.4	7.8	3.6
S 2-2, in.³	3.2	3.0	2.6	2.5	2.4	9.1	8.8	8.6	5.3	5.0	4.0	3.8	3.1	1.8
r 2-2, in.	1.12	1.16	1.03	1.06	1.09	1.83	1.87	1.90	1.41	1.43	1.36	1.39	1.20	0.95
A/S 2-2	2.113	1.960	2.373	2.236	2.083	1.209	1.136	1.105	1.535	1.466	1.653	1.542	1.765	2.217
d, in.	9	9	8	8	8	8	8	8	6	6	6	6	5	4
d_1, in.	10½	10 7/16	9½	9½	9 7/16	11 7/16	11 5/16	11¼	8 9/16	8½	8 9/16	8½	7 1/16	5 11/16
b, in.	5 5/16	5 5/16	5⅛	5 1/16	5	8⅛	8	7 15/16	6 1/16	5 15/16	6 1/16	5 15/16	5	4
t, in.	5/16	5/16	⅜	5/16	5/16	½	⅜	5/16	7/16	5/16	⅜	¼	5/16	5/16
p, in.	⅜	⅜	5/16	5/16	5/16	7/16	7/16	7/16	½	½	⅜	⅜	7/16	⅜

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

Ⓒ Carnegie Steel Company only.

BEAM COLUMNS—AMERICAN STANDARD SECTIONS

Allowable Concentric Loads in Kips

Depth In.	24	24	20	20	18	18	15	15	12	12	10	9	8	7	6	5	4	3
Weight, lb./ft.	105.9	79.9	81.4	65.4	75.6	54.7	60.8	42.9	40.8	31.8	25.4	21.8	18.4	15.3	12.5	10.0	7.7	5.7
Effective Length in feet																		
																	33.3	24.6
3	464.7	350.0	356.1	286.2	330.6	239.1	265.2	187.4	177.6	138.9	110.7	94.8	80.1	66.5	54.2	43.1	33.0	23.5
4	464.7	350.0	356.1	286.2	330.6	239.1	265.2	187.4	177.6	138.9	110.7	94.8	80.1	65.9	52.1	39.7	29.1	20.3
5	464.7	350.0	356.1	286.2	330.6	239.1	265.2	187.4	177.6	138.9	109.5	91.2	74.9	60.0	46.9	35.1	25.3	17.2
6	464.7	350.0	356.1	286.2	330.6	235.6	265.2	180.3	170.9	130.0	101.7	83.9	68.3	54.1	41.8	30.7	21.8	14.6
7	464.7	346.4	355.3	271.0	330.6	221.2	251.1	168.2	159.5	120.4	93.8	76.7	61.8	48.5	37.0	26.8	18.7	12.3
8	464.7	328.9	337.7	254.5	319.1	206.8	235.8	156.2	148.1	110.9	86.0	69.7	55.7	43.3	32.7	23.4	16.1	10.5
9	445.0	311.0	320.0	238.0	303.4	192.6	220.5	144.5	137.0	102.0	78.7	63.2	50.1	38.6	28.9	20.4	13.9	
10	424.9	293.2	302.3	222.0	287.3	178.7	205.7	133.4	126.4	93.4	71.8	57.2	45.0	34.5	25.5	17.9		
11	404.6	275.6	284.5	206.7	271 7	165.6	191.6	122.9	116.5	85.5	65.5	51.8	40.5	30.8	22.6			
12	384.6	258.7	267.7	192.2	256.3	153.3	178.1	113.1	107.2	78.3	59.7	47.0	36.5	27.6	20.2			
13	364.9	242.6	251.4	178.6	241.4	141.8	165.5	104.1	98.7	71.7	54.5	42.6	33.0	24.7				
14	345.8	227.3	235.8	165.9	227.2	131.2	153.7	95.8	90.9	65.7	49.8	38.7	29.8					
15	327.4	212.9	221.2	154.0	213.8	121.5	142.7	88.4	83.8	60.3	45.6	35.3						
16	309.8	199.2	207.5	143.2	201.0	112.6	132.6	81.6	77.3	55.4	41.8							
17	293.0	186.6	194.6	133.2	188.9	104.4	123.4	75.4	71.4									
18	277.1	174.9	182.5	124.0	177.6	96.9	114.9	69.8	66.1									
19	262.0	163.9	171.3	115.5	167.1	90.1	107.1											
20	247.7	153.8	160.8	107.8	157.3		99.9											
21	234.5	144.4	151.2		148.1													
22	222.0	135.8	142.3		139.5													
23	210.2		133.9		131.6													
24	199.2				124.4													
25	188.8																	
26	179.1																	
Area, in.²	30.98	23.33	23.74	19.08	22.04	15.94	17.68	12.49	11.84	9.26	7.38	6.32	5.34	4.43	3.61	2.87	2.21	1.64
I_{1-1}, in.⁴	2811.5	2087.2	1466.3	1169.5	1141.8	795.5	609.0	441.8	268.9	215.8	122.1	84.9	56.9	36.2	21.8	12.1	6.0	2.5
r_{1-1}, in.	9.53	9.46	7.86	7.83	7.20	7.07	5.87	5.95	4.77	4.83	4.07	3.67	3.26	2.86	2.46	2.05	1.64	1.23
I_{2-2}, in.⁴	78.9	42.9	45.8	27.9	46.3	21.2	26.0	14.6	13.8	9.5	6.9	5.2	3.8	2.7	1.8	1.2	0.77	0.46
r_{2-2}, in.	1.60	1.36	1.39	1.21	1.45	1.15	1.21	1.08	1.08	1.01	0.97	0.90	0.84	0.78	0.72	0.65	0.59	0.53
Weight, lb./ft.	105.9	79.9	81.4	65.4	75.6	54.7	60.8	42.9	40.8	31.8	25.4	21.8	18.4	15.3	12.5	10.0	7.7	5.7

Safe loads in accordance with A. I. S. C. Column Formula, maximum 15,000 pounds for lengths of 60 radii and under.

Safe loads above upper zig-zag line are for ratios of l/r not over 60. between zig-zag lines up to 120 l/r, and below lower zig-zag line not over 200 l/r.

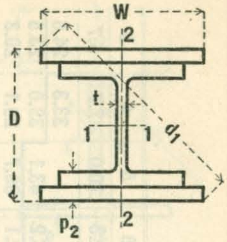
COLUMN

LOADS

CB SECTIONS

COLUMNS WITH COVER PLATES

ALLOWABLE CONCENTRIC LOADS IN KIPS

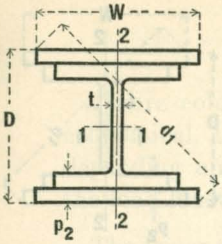


Unit Stress—American Institute of Steel Construction—1928

CORE—CB 146N 426 Lbs., 14″ x 16″

Effective Length in Feet	Cover Plates—Width by Thickness—Inches											
	22 x 3¼	22 x 3⅛	22 x 3	22 x 2⅞	22 x 2¾	22 x 2⅝	22 x 2½	21 x 2½	21 x 2⅜	21 x 2¼	21 x 2⅛	21 x 2
20	4025	3942	3860	3777	3695	3612	3530	3455	3376	3297	3218	3140
21	4025	3942	3860	3777	3695	3612	3530	3455	3376	3297	3218	3140
22	4025	3942	3860	3777	3695	3612	3530	3455	3376	3297	3218	3140
23	4025	3942	3860	3777	3695	3612	3530	3455	3376	3297	3218	3140
24	4025	3942	3860	3777	3695	3612	3530	3455	3376	3297	3218	3140
25	4025	3942	3860	3777	3695	3612	3530	3455	3376	3297	3218	3140
26	4025	3942	3860	3777	3695	3612	3530	3455	3372	3286	3204	3118
27	4025	3942	3860	3777	3695	3612	3524	3410	3327	3243	3161	3078
28	4000	3915	3829	3739	3653	3567	3478	3365	3283	3201	3118	3035
29	3950	3867	3782	3692	3607	3523	3434	3320	3238	3155	3076	2994
30	3900	3818	3733	3645	3561	3475	3388	3274	3194	3112	3032	2950
31	3851	3768	3685	3597	3514	3430	3343	3229	3149	3068	2989	2909
32	3800	3718	3636	3549	3467	3384	3299	3180	3104	3022	2946	2865
33	3749	3670	3587	3501	3418	3338	3251	3134	3057	2978	2901	2823
34	3698	3620	3538	3453	3371	3292	3206	3088	3012	2934	2858	2779
35	3647	3570	3488	3405	3320	3244	3161	3042	2967	2888	2814	2736
36	3595	3524	3439	3357	3277	3198	3114	2996	2922	2844	2771	2694
37	3546	3469	3390	3309	3230	3152	3069	2950	2877	2800	2728	2650
38	3495	3419	3341	3260	3183	3105	3024	2905	2832	2757	2684	2609
39	3444	3369	3291	3212	3136	3058	2978	2859	2786	2712	2641	2566
40	3393	3321	3243	3165	3087	3012	2933	2814	2742	2669	2598	2525
42	3294	3222	3148	3068	2995	2922	2843	2724	2655	2582	2515	2443
44	3194	3124	3052	2975	2903	2830	2756	2635	2569	2498	2431	2362
46	3096	3028	2958	2883	2813	2743	2669	2548	2483	2415	2350	2283
48	3001	2936	2866	2792	2724	2655	2583	2464	2401	2335	2271	2206
50	2907	2843	2776	2704	2638	2571	2500	2383	2320	2256	2194	2129
Area, in.²	268.3	262.8	257.3	251.8	246.3	240.8	235.3	230.3	225.0	219.8	214.5	209.3
I_{1-1}, in.⁴	23946	23084	22235	21407	20593	19798	19017	18453	17725	17010	16313	15629
S_{1-1}, in.³	1901	1851	1801	1752	1703	1654	1605	1558	1512	1467	1422	1378
r_{1-1}, in.	9.45	9.37	9.30	9.22	9.14	9.07	8.99	8.95	8.87	8.80	8.72	8.64
A/S_{1-1}	.141	.142	.143	.144	.145	.146	.147	.148	.149	.150	.151	.152
I_{2-2}, in.⁴	8129	7907	7685	7463	7242	7020	6798	6220	6027	5834	5641	5448
S_{2-2}, in.³	739	719	699	678	658	638	618	592	574	556	537	519
r_{2-2}, in.	5.50	5.49	5.47	5.44	5.42	5.40	5.37	5.20	5.18	5.15	5.13	5.10
A/S_{2-2}	.363	.366	.368	.371	.374	.377	.381	.389	.392	.396	.399	.403
D, in.	25 3/16	24 15/16	24 11/16	24 7/16	24 3/16	23 15/16	23 11/16	23 11/16	23 7/16	23 3/16	22 15/16	22 11/16
d_1, in.	33 7/16	33¼	33 1/16	32⅞	32 11/16	32½	32 5/16	31 11/16	31½	31 5/16	31⅛	30 15/16
W, in.	22	22	22	22	22	22	22	21	21	21	21	21
t, in.	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞
P_2, in.	6 5/16	6 3/16	6 1/16	5 15/16	5 13/16	5 11/16	5 9/16	5 9/16	5 7/16	5 5/16	5 3/16	5 1/16

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.



CB SECTIONS

COLUMN LOADS

COLUMNS WITH COVER PLATES

ALLOWABLE CONCENTRIC LOADS IN KIPS

Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	CORE—CB146N 426 Lbs. 14″ x 16″ — Cover Plates—Width by Thickness—Inches									
	20 x 2	20 x 1⅞	20 x 1¾	20 x 1⅝	20 x 1½	18 x 1½	18 x 1⅜	18 x 1¼	18 x 1⅛	18 x 1
20	3008	3005	2930	2855	2780	2690	2622	2555	2487	2420
21	3008	3005	2930	2855	2780	2690	2622	2555	2487	2420
22	3008	3005	2930	2855	2780	2690	2622	2555	2487	2420
23	3008	3005	2930	2855	2780	2690	2622	2550	2480	2410
24	3008	3005	2930	2855	2780	2655	2584	2513	2442	2375
25	3069	2989	2910	2831	2750	2615	2545	2475	2406	2339
26	3028	2949	2869	2792	2712	2575	2506	2437	2369	2302
27	2986	2908	2829	2752	2673	2535	2467	2399	2330	2265
28	2942	2865	2787	2711	2633	2495	2426	2359	2293	2229
29	2899	2823	2746	2671	2594	2454	2387	2321	2255	2191
30	2857	2782	2704	2630	2554	2414	2347	2282	2216	2154
31	2814	2738	2663	2590	2514	2373	2308	2244	2179	2118
32	2769	2696	2621	2548	2474	2333	2268	2205	2141	2080
33	2726	2655	2580	2509	2435	2292	2229	2165	2103	2044
34	2683	2611	2537	2467	2394	2252	2189	2127	2065	2007
35	2640	2569	2497	2426	2354	2212	2151	2089	2029	1971
36	2596	2528	2455	2387	2315	2172	2112	2052	1991	1935
37	2554	2485	2414	2346	2277	2133	2074	2014	1954	1899
38	2512	2444	2373	2307	2237	2094	2036	1976	1918	1864
39	2470	2403	2333	2267	2198	2070	1997	1940	1883	1829
40	2427	2361	2292	2227	2159	2017	1960	1904	1847	1794
42	2345	2282	2213	2150	2085	1943	1887	1833	1778	1726
44	2264	2202	2136	2075	2011	1870	1816	1763	1710	1661
46	2186	2125	2061	2002	1940	1800	1748	1697	1645	1598
48	2108	2051	1988	1931	1869	1732	1682	1631	1582	1536
50	2035	1978	1917	1861	1803	1666	1617	1569	1521	1477
Area, in.²	205.3	200.3	195.3	190.3	185.3	179.3	174.8	170.3	165.8	161.3
I_{1-1}, in.⁴	15200	14564	13941	13333	12737	12125	11602	11090	10592	10104
S_{1-1}, in.³	1340	1298	1256	1215	1174	1118	1082	1047	1012	977
r_{1-1}, in.	8.60	8.53	8.45	8.37	8.29	8.22	8.15	8.07	7.99	7.91
A/S_{1-1}	.153	.154	.155	.157	.158	.160	.162	.163	.164	.165
I_{2-2}, in.⁴	5028	4861	4695	4528	4361	3819	3698	3576	3455	3333
S_{2-2}, in.³	503	486	469	453	436	424	411	397	384	370
r_{2-2}, in.	4.95	4.93	4.90	4.88	4.85	4.62	4.60	4.58	4.56	4.55
A/S_{2-2}	.408	.412	.416	.420	.425	.423	.425	.429	.432	.436
D, in.	22 11/16	22 7/16	22 3/16	21 15/16	21 11/16	21 11/16	21 7/16	21 3/16	20 15/16	20 11/16
d_1, in.	30¼	30 1/16	29⅞	29 11/16	29½	28 3/16	28	27 13/16	27⅝	27 7/16
W, in.	20	20	20	20	20	18	18	18	18	18
t, in.	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞
P_2, in.	5 1/16	4 15/16	4 13/16	4 11/16	4 9/16	4 9/16	4 7/16	4 5/16	4 3/16	4 1/16

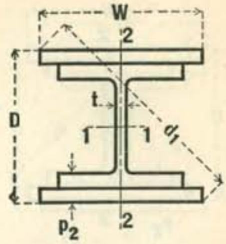
Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

COLUMN LOADS

CB SECTIONS

COLUMNS WITH COVER PLATES

ALLOWABLE CONCENTRIC LOADS IN KIPS



Unit Stress—American Institute of Steel Construction—1928

Effective Length in Feet	CORE—CB 146N 320 Lbs. 14″ x 16″						
	Cover Plates—Width by Thickness—Inches						
	18 x 1¾	18 x 1⅝	18 x 1½	18 x 1⅜	18 x 1¼	18 x 1⅛	18 x 1
20	2356	2289	2221	2154	2086	2019	1951
21	2356	2289	2221	2154	2086	2019	1951
22	2356	2289	2221	2154	2086	2019	1951
23	2356	2288	2216	2145	2076	2004	1934
24	2323	2254	2184	2114	2044	1973	1904
25	2289	2219	2150	2082	2013	1943	1874
26	2254	2185	2117	2049	1981	1912	1844
27	2218	2151	2084	2017	1950	1881	1815
28	2183	2117	2050	1984	1917	1849	1784
29	2148	2082	2016	1951	1886	1819	1753
30	2112	2047	1982	1918	1853	1787	1723
31	2076	2013	1948	1885	1822	1756	1694
32	2041	1978	1915	1852	1789	1725	1663
33	2006	1943	1880	1820	1758	1694	1633
34	1970	1909	1847	1786	1725	1663	1603
35	1935	1875	1814	1754	1695	1633	1573
36	1901	1841	1782	1723	1663	1602	1544
37	1866	1808	1748	1690	1632	1572	1515
38	1832	1774	1716	1659	1601	1543	1486
39	1798	1742	1684	1628	1572	1513	1457
40	1765	1708	1653	1597	1541	1484	1429
42	1700	1645	1590	1537	1483	1428	1375
44	1636	1583	1531	1479	1426	1373	1321
46	1574	1524	1472	1422	1371	1319	1270
48	1515	1465	1416	1367	1318	1268	1220
50	1456	1409	1362	1314	1267	1218	1172
Area, in.²	157.1	152.6	148.1	143.6	139.1	134.6	130.1
I_{1-1}, in.⁴	9582	9124	8677	8241	7816	7402	6998
S_{1-1}, in.³	944	910	876	843	810	777	744
r_{1-1}, in.	7.81	7.73	7.65	7.58	7.50	7.42	7.33
A/S_{1-1}	.166	.168	.169	.170	.172	.173	.175
I_{2-2}, in.⁴	3336	3214	3093	2972	2850	2729	2607
S_{2-2}, in.³	371	357	344	330	317	303	290
r_{2-2}, in.³	4.61	4.59	4.57	4.55	4.53	4.50	4.48
A/S_{2-2}	.424	.427	.431	.435	.439	.444	.449
D, in.	20 5/16	20 1/16	19 13/16	19 9/16	19 5/16	19 1/16	18 13/16
d_1, in.	27⅛	26 15/16	26¾	26 9/16	26⅜	26 5/16	26 1/16
W, in.	18	18	18	18	18	18	18
t, in.	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞	1⅞
P_2, in.	3 15/16	3 11/16	3 9/16	3 7/16	3 5/16	3 5/16	3 1/16

Safe load values above upper zig-zag line are for ratios of l/r not over 60, those between zig-zag lines are for ratios up to 120 l/r and those below lower zig-zag line are for ratios not over 200 l/r.

GRILLAGE FOUNDATIONS

Where column base plates are found to be undesirable or uneconomical, a one or two tier grillage may be used if so desired, depending upon the bearing value of the soil or rock over which the load must be spread.

The lower tier must rest upon a solid bed of concrete of sufficient thickness to distribute the load to the soil.

The spaces between the beams should be filled with, and the beams enclosed in concrete not less than four inches thick.

The minimum clear distance between flanges of top tier beams = 1″, for the bottom tier = 2″.

Maximum clear distance for bottom tier beams = ¾ of the flange width. Beams should have pipe separators and should not be painted.

To determine the area in square feet required for the foundation, divide the total load on the column by the bearing value of the soil per square foot which will give the area of the footing in square feet, the shape of which must be determined by local conditions. On the assumption that the loads on the soil are uniformly distributed, the number, size, and weight of the beams are determined from the maximum bending moment, maximum shear or the maximum web resistance to buckling as follows:

- W = total load on the foundation in pounds.
- L = length of beam in feet.
- a = loaded portion in feet.
- d = depth of beam in inches.
- t = thickness of beam web in inches.
- n = number of beams.
- f_b = allowable unit web buckling resistance.
- f_s = allowable unit web shearing resistance.

The maximum bending moment occurs at the center of the beam and is equal in foot pounds to $\frac{W(L\text{-}a)}{8}$, and the section modulus required for each beam is $\frac{12\,W(L\text{-}a)}{8\,f\,n}$.

The proper size of beam in any tier with regard to flexure at a unit stress of 18000 pounds per square inch may be found in the safe load table for the length corresponding to (L–a) by dividing the total load by the number of beams.

Or may be found from the table of maximum bending moments by dividing the total bending moment by the number of beams.

Or from the table of properties by dividing the total section modulus required by the number of beams in the tier, which is equal to $\frac{3W(L-a)}{36000}$.

Note, however, that the load on the beam for any span must not exceed the maximum tabular safe load for shear.

The maximum vertical shear occurs at the edge of the column base or at a distance in feet of $\frac{L-a}{2}$ from each end of the beam and is equal to $\frac{W}{L} \times \frac{L-a}{2}$.

Web thickness, t, to resist average shear $= \frac{W}{L} \times \frac{L-a}{2} \times \frac{1}{12000\,n\,d}$

or average vertical shear $= \frac{W}{L} \times \frac{L-a}{2} \times \frac{1}{n\,d\,t}$ which must not exceed 12000 pounds per square inch.

The maximum buckling stress occurs on a length in inches of $12a + d/2$ and is equal, in total, per lineal inch of web to $\frac{W}{12a + d/2}$.

The required thickness of web, t, to resist buckling $= \frac{W}{n(12a + d/2)\,f_b}$ or the average web resistance per square inch to buckling, $f_b = \frac{W}{n(12a + d/2)\,t}$ which must not exceed the tabular values for the allowable buckling resistance on beam webs.

Rolled Steel Column Base Plates: To distribute the loads from columns over girders, grillage beams, etc., solid slabs of rolled steel may be advantageously used in place of cast iron or riveted steel bases, etc.

The method of determining the thickness, t, of the slab with respect to the direction of the upper tier is the same as that used in paragraph under Column Base Plates, $t = \sqrt{\frac{W j^2}{6000K\,B}}$

Required thickness of slab, t, with respect to the direction parallel to the bottom tier is obtained by assuming that the maximum bending moment occurs at the point of column load concentration (.95d or .8b, depending on the direction in which the column is turned) and that the reaction from the outside beam in the upper tier is the load, the cantilever span, *l* being the distance from the point of maximum moment to this beam and $t = \sqrt{\frac{6\,W\,l}{n\,B\,f}}$

EXAMPLE: Required to design a grillage foundation to distribute the load of 1,880,000 pounds, from CB 146 N 426 lbs. to a concrete pier, having an allowable bearing capacity of 500 pounds per square inch.

$\frac{1,880,000}{500}$ = 3,760 square inches required in base.

60″ x 63″ = 3,780. Make length of bottom tier 60″.

Assume a column base plate 26″ x 28″.

$\frac{28-13.36}{2} = 7.32 \qquad t = \sqrt{\frac{1,880,000 \times 7.32^2}{6,000 \times 26 \times 28}} = 4.80$ Use 5″

$\frac{24-17.75}{2} = 3.12 \qquad t = \sqrt{\frac{6 \times 1,880,000 \times 3.12}{4 \times 28 \times 18,000}} = 4.18$ Use 5″

Top tier: 4 Beams, 63″ long, 8″ centers.

Section modulus required per beam = $\frac{1,880,000 \times (63-28)}{8 \times 18,000 \times 4}$ = 114.2 in.³

Use 4 – 15″ x 95 lb. Beams

Buckling Stress: $f_b = \frac{1,880,000}{35.5 \times 4 \times 1.068}$ = 12,400 lbs. per sq. in.

Maximum allowable f_b = 15,000 lbs. per sq. in.

Shear occurs at edge of slab and is $f_s = \frac{1,880,000 \times 17.5}{63 \times 4 \times 15 \times 1.068}$ = 8,150 lbs. per sq. in.

Maximum f_s = 12,000 lbs. per sq. in.

Bottom Tier:

60″–30″=30″

Section Modulus required per beam = $\frac{1,880,000 \times 30}{8 \times 18,000 \times 9}$ = 43.5 in.³

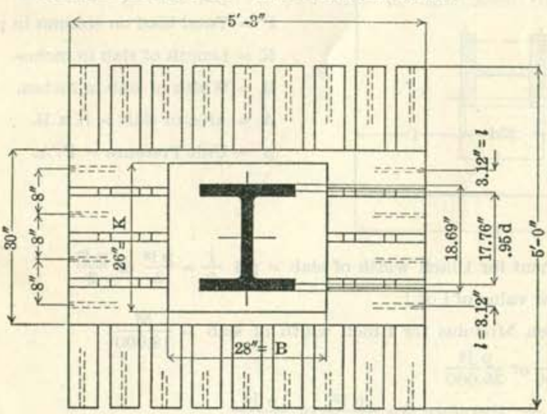
Use 9–12″ x 40.8 lb. Beams.

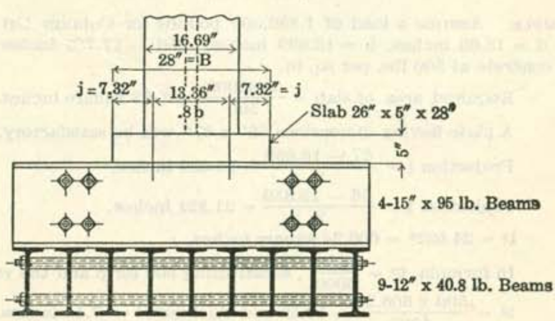
Buckling Stress $f_b = \frac{1,880,000}{36 \times .460 \times 9}$ = 12,615 lbs. per sq. in.

Maximum allowable f_b = 15,000 lbs. per sq. in.

Shear occurs at outside edges of upper tier and is $f_s = \frac{1,880,000}{60 \times 12 \times .46}$ = 8,515 lbs. per sq. in.

Maximum allowable f_s = 12,000 lbs. per sq. in.





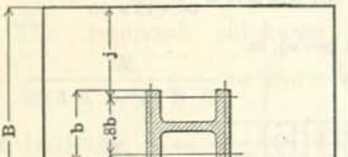
DIMENSIONS OF BASE PLATES FOR CB SECTIONS

The only condition considered in these tables is that of base plates resting on concrete having safe bearing values of 500, 625 and 750 pounds per square inch.

For many of the heavier column loads given, single or double tier grillages may very often be found to be lighter and more economical than base plates on concrete, but grillages should be the subject of study for each specific case and principles governing design may be found on preceding pages.

The column loads given in the following tables for CB Sections are the maximum for each section and weight, or 15,000 pounds multiplied by the area.

For purposes of calculation, the column load P is assumed to be distributed within a rectangle whose dimensions are 0.95d and 0.8b, and the base slab is considered as a cantilever with uniformly distributed load where the span is $i = \frac{K - .95d}{2}$ parallel to web of column, and $j = \frac{B - .8b}{2}$ parallel to flange.



P = Total load on column in pounds.

K = Length of slab in inches.

B = Width of slab in inches.

A = Area of slab = K x B.

p = Unit Pressure = P/A.

M = Moment for 1 inch width of slab $= p\,i\,\frac{i}{2} = \frac{p\,i^2}{2}$ or $\frac{p\,j^2}{2}$

Use greater value of i or j:

S = Section Modulus for 1 inch width of slab $= \frac{M}{18{,}000}$

$= \frac{p\,i^2}{36{,}000}$ or $\frac{p\,j^2}{36{,}000}$

Since $S = \frac{t}{6}$, therefore $t^2 = \frac{p\,i^2}{6{,}000}$ or $\frac{p\,j^2}{6{,}000}$

EXAMPLE. Assume a load of 1,880,000 pounds for Column CB 146 N 426 lbs. per ft., d = 18.69 inches, b = 16.699 inches, .95d = 17.756 inches, .8b = 13.359 inches, concrete at 500 lbs. per sq. in.

Required area of slab $= \frac{1880000}{500} = 3723$ square inches.

A plate having dimensions 56″ x 67″ will be satisfactory.

Projection $i = \frac{67 - 16.699}{2} = 24.622$ inches.

Projection $j = \frac{56 - 13.359}{2} = 21.321$ inches.

$i^2 = 24.622^2 = 606.24$ square inches.

In formula, $t^2 = \frac{p\,i^2}{6000}$, substituting 500 for p and the value of i^2, then

$t^2 = \frac{500 \times 606.24}{6000} = 50.52$ and thickness $t = 7.11$ inches.

RECOMMENDED SIZES

The following widths and thicknesses are suggested as being sufficient to meet all ordinary requirements. The adoption and use of these sizes as standards will result in better service in the way of shipments from the mill and will also tend to make this class of business more desirable to the rolling mills.

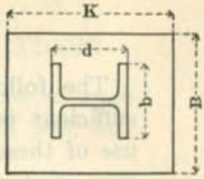
14 x 1¼	28 x 3	44 x 5
14 x 1½	28 x 3½	44 x 5½
	28 x 4	
16 x 1½	32 x 3½	48 x 5½
16 x 2	32 x 4	48 x 6
		48 x 6½
20 x 2	36 x 4	52 x 6
20 x 2½	36 x 4½	52 x 6½
20 x 3		
24 x 2	40 x 4½	56 x 6½
24 x 2½	40 x 5	56 x 7
24 x 3		56 x 8

The thicknesses given above are the thicknesses of the rolled plate.

COLUMN
BASES

COLUMN BASES STANDARD

14 INCH COLUMNS

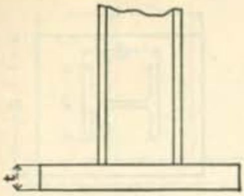


MAXIMUM BENDING STRESS, 18,000 POUNDS PER SQUARE INCH

Column Section No.	Weight per Foot, Lbs.	Load in Kips	Column Dimensions d, In.	b, In.	Pressure per Sq. In. on Concrete 500 Pounds — Thickness, t, In. Calculated	Finished	Rolled	B, In.	K, In.	Weight Rolled, Lbs.
CB 146 N	426	1880	18.690	16.699	7.11	7⅝	8	56	67	8504
	412	1817	18.500	16.647	6.85	7⅝	8	56	65	8250
	398	1756	18.310	16.595	6.58	6⅝	7	56	63	6996
	384	1694	18.120	16.541	6.18	6⅛	6½	56	60	6187
	370	1632	17.940	16.479	6.18	6⅛	6½	56	58	5981
	356	1570	17.750	16.422	6.19	6⅛	6½	56	56	5775
	342	1508	17.560	16.365	5.91	6⅛	6½	54	56	5569
	328	1447	17.380	16.299	5.70	5¾	6	52	56	4950
	314	1385	17.190	16.240	5.64	5¾	6	52	53	4685
	300	1324	17.000	16.179	5.49	5¾	6	51	52	4508
	287	1266	16.810	16.133	5.25	5¼	5½	48	53	3964
	273	1204	16.620	16.070	5.07	5¼	5½	48	50	3740
	264	1164	16.500	16.026	5.08	5¼	5½	48	49	3665
	255	1125	16.370	15.992	4.94	5¼	5½	47	48	3515
	246	1085	16.250	15.947	4.84	4¾	5	44	49	3054
	237	1045	16.120	15.911	4.72	4¾	5	44	48	2992
	228	1005	16.000	15.865	4.52	4¾	5	44	46	2867
	219	966	15.870	15.830	4.52	4¾	5	44	44	2742
	211	931	15.750	15.800	4.62	4¾	5	40	47	2663
	202	891	15.630	15.751	4.35	4¼	4½	40	45	2295
	193	851	15.500	15.713	4.08	4¼	4½	40	43	2193
	184	812	15.380	15.665	3.97	4¼	4½	40	41	2091
	176	776	15.250	15.642	4.12	4¼	4½	36	43	1973
	167	737	15.120	15.602	3.85	3¾	4	36	41	1673
	158	697	15.000	15.550	3.57	3¾	4	36	39	1591
	150	662	14.880	15.520	3.40	3¾	4	36	37	1509
	142	626	14.746	15.500	3.61	3¾	4	32	39	1414
	*320	1411	16.810	16.710	5.58	5¾	6	52	54	4773

*Column Core Section.

NOTE: Rolled Thickness includes allowance for planing on one side and is rounded up to nearest recommended standard thickness. Mill orders should specify the rolled thickness.



COLUMN BASES STANDARD

14 INCH COLUMNS

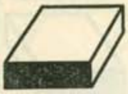
MAXIMUM BENDING STRESS, 18,000 POUNDS PER SQUARE INCH

Column Section No.	Weight per Foot, Lbs.	Pressure per Sq. In. on Concrete: 625 Pounds — Thickness, t, In. Calculated	Finished	Rolled	B, In.	K, In.	Weight Rolled, Lbs.	750 Pounds — Thickness, t, In. Calculated	Finished	Rolled	B, In.	K, In.	Weight Rolled, Lbs.
	426	6.43	6½	7	54	56	5997	6.12	6⅛	6½	48	52	4596
	412	6.12	6⅛	6½	52	56	5362	6.13	6⅛	6½	48	50	4419
	398	6.12	6⅛	6½	52	54	5171	6.14	6⅛	6½	48	49	4331
	384	6.13	6⅛	6½	52	52	4979	5.97	6⅛	6½	47	48	4154
	370	5.82	5¾	6	50	52	4419	5.63	5¾	6	45	48	3672
	356	5.56	5¾	6	48	52	4243	5.50	5¾	6	44	48	3590
	342	5.52	5¾	6	48	50	4080	5.54	5¾	6	42	48	3427
	328	5.53	5¾	6	48	48	3916	5.57	5¾	6	40	48	3264
	314	5.22	5¼	5½	46	48	3440	5.13	5¼	5½	42	44	2879
	300	5.04	5¼	5½	44	48	3291	4.92	5¼	5½	40	44	2742
	287	4.92	5¼	5½	44	46	3154	4.79	4¾	5	40	42	2380
	273	4.92	5¼	5½	44	44	3017	4.80	4¾	5	40	40	2266
	264	4.61	4¾	5	42	44	2618	4.63	4¾	5	39	40	2210
CB 146 N	255	4.62	4¾	5	41	44	2555	4.46	4¾	5	38	40	2153
	246	4.36	4¼	4½	40	43	2193	4.34	4¼	4½	36	40	1836
	237	4.31	4¼	4½	40	42	2142	4.19	4¼	4½	36	39	1790
	228	4.32	4¼	4½	40	40	2040	4.12	4¼	4½	36	37	1698
	219	4.16	4¼	4½	39	40	1989	4.13	4¼	4½	36	36	1652
	211	3.96	4¼	4½	37	40	1887	3.95	4¼	4½	35	36	1606
	202	3.98	4¼	4½	36	40	1836	3.74	3¾	4	33	36	1346
	193	3.70	3¾	4	36	38	1550	3.76	3¾	4	32	36	1305
	184	3.71	3¾	4	36	36	1469	3.44	3¾	4	32	34	1233
	176	3.56	3¾	4	35	36	1428	3.44	3¾	4	32	32	1160
	167	3.42	3¾	4	33	36	1346	3.27	3¼	3½	31	32	984
	158	3.28	3¼	3½	32	35	1111	3.14	3¼	3½	29	32	920
	150	3.10	3¼	3½	32	33	1047	3.16	3¼	3½	28	32	888
	142	2.94	3¼	3½	31	32	984	2.83	3¼	3½	28	30	833
	*320	5.32	5¼	5½	47	48	3515	5.24	5¼	5½	43	44	2948

*Column Core Section.

NOTE: Rolled Thickness includes allowance for planing on one side and is rounded up to nearest recommended standard thickness. Mill orders should specify the rolled thickness.

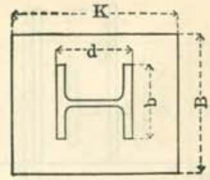
COLUMN



BASES

COLUMN BASES STANDARD

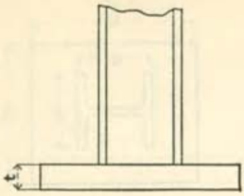
14 and 12 INCH COLUMNS



MAXIMUM BENDING STRESS, 18,000 POUNDS PER SQUARE INCH

Column Section No.	Weight per Foot, Lbs.	Load in Kips	Column Dimensions d, In.	Column Dimensions b, In.	Pressure per Sq. In. on Concrete 500 Pounds: Thickness, t, In. Calculated	Finished	Rolled	B, In.	K, In.	Weight Rolled, Lbs.
	153	675	15.00	14.828	3.48	3¾	4	36	38	1550
	145	639	14.88	14.789	3.49	3¾	4	36	36	1469
	136	600	14.75	14.740	3.46	3¾	4	32	38	1378
	127	560	14.62	14.690	3.05	3¼	3½	32	35	1111
CB 145 N	119	525	14.50	14.649	2.93	3¼	3½	32	33	1047
	111	489	14.37	14.618	3.08	3¼	3½	28	35	972
	103	454	14.25	14.576	2.81	2¾	3	28	33	785
	95	419	14.12	14.544	2.39	2¾	3	28	30	714
	87	383	14.00	14.500	2.37	2¾	3	28	28	666
CB 144 N	84	370	14.18	12.021	2.51	2¾	3	27	28	643
	78	344	14.06	12.000	2.26	2¼	2½	24	29	493
	190	838	14.38	12.671	4.31	4¼	4½	40	42	2142
	176	776	14.12	12.613	4.17	4¼	4½	39	40	1989
	169	745	14.00	12.574	3.89	4¼	4½	37	40	1887
	161	710	13.88	12.513	3.87	4¼	4½	36	40	1836
	154	679	13.75	12.481	3.76	3¾	4	36	38	1550
	147	648	13.62	12.449	3.76	3¾	4	36	36	1469
	140	617	13.50	12.407	3.47	3¾	4	34	36	1387
	133	587	13.38	12.365	3.36	3¾	4	33	36	1346
CB 125 N	126	556	13.25	12.331	3.24	3¼	3½	32	35	1111
	120	529	13.12	12.318	3.20	3¼	3½	32	33	1047
	113	498	13.00	12.274	3.06	3¼	3½	31	32	984
	106	467	12.88	12.228	2.85	3¼	3½	29	32	920
	99	436	12.75	12.191	2.73	2¾	3	28	31	738
	92	406	12.62	12.154	2.64	2¾	3	28	29	690
	85	375	12.50	12.106	2.50	2¾	3	27	28	643
	79	348	12.38	12.081	2.34	2¾	3	25	28	595
	72	317	12.25	12.041	2.22	2¼	2½	24	27	459
	65	286	12.12	12.000	2.08	2¼	2½	24	24	408

NOTE: Rolled Thickness includes allowance for planing on one side and is rounded up to nearest recommended standard thickness. Mill orders should specify the rolled thickness.



COLUMN BASES STANDARD

14 and 12 INCH COLUMNS

COLUMN BASES

MAXIMUM BENDING STRESS, 18,000 POUNDS PER SQUARE INCH

Column Section No.	Weight per Foot, Lbs.	Pressure per Sq. In. on Concrete: 625 Pounds — Thickness, t, In. Calculated	Finished	Rolled	B, In.	K, In.	Weight Rolled, Lbs.	750 Pounds — Thickness, t, In. Calculated	Finished	Rolled	B, In.	K, In.	Weight Rolled, Lbs.
	153	3.18	3¼	3½	32	34	1079	3.14	3¼	3½	29	32	920
	145	3.19	3¼	3½	32	32	1015	2.98	3¼	3½	28	31	861
	136	2.88	3¼	3½	30	32	952	2.87	3¼	3½	28	29	805
	127	2.86	3¼	3½	28	32	888	2.70	2¾	3	27	28	643
CB 145 N	119	2.57	2¾	3	28	30	714	2.51	2¾	3	25	28	595
	111	2.58	2¾	3	28	28	666	2.36	2¾	3	24	27	551
	103	2.60	2¾	3	24	30	612	2.18	2¼	2½	24	25	425
	95	2.31	2¼	2½	24	28	476	2.19	2¼	2½	24	24	408
	87	2.01	2	2	24	26	354	1.89	2	2	22	24	299
CB 144 N	84	2.27	2¼	2½	24	25	425	2.01	2	2	21	24	286
	78	2.12	2¼	2½	23	24	391	1.84	2	2	20	23	261
	190	4.09	4¼	4½	36	37	1698	3.95	4¼	4½	31	36	1423
	176	3.94	4¼	4½	35	36	1606	3.99	4¼	4½	29	36	1331
	169	3.63	3¾	4	33	36	1346	3.70	3¾	4	31	32	1124
	161	3.61	3¾	4	32	36	1305	3.53	3¾	4	30	32	1088
	154	3.48	3¾	4	32	34	1233	3.35	3¾	4	28	32	1015
	147	3.17	3¼	3½	32	33	1047	3.19	3¼	3½	28	31	861
	140	3.33	3¼	3½	31	32	984	3.20	3¼	3½	28	30	833
	133	3.18	3¼	3½	30	32	952	3.20	3¼	3½	28	28	777
CB 125 N	126	3.07	3¼	3½	28	32	888	3.03	3¼	3½	27	28	750
	120	2.87	3¼	3½	28	30	833	2.75	2¾	3	25	28	595
	113	2.88	3¼	3½	28	29	805	2.77	2¾	3	24	28	571
	106	2.72	2¾	3	27	28	643	2.51	2¾	3	24	26	530
	99	2.51	2¾	3	25	28	595	2.52	2¾	3	24	24	490
	92	2.37	2¾	3	24	27	551	2.35	2¾	3	23	24	469
	85	2.26	2¼	2½	24	25	425	2.14	2¼	2½	21	24	357
	79	2.11	2¼	2½	23	24	391	1.99	2	2	20	23	261
	72	1.96	2	2	21	24	286	1.83	2	2	20	21	238
	65	1.82	2	2	20	23	261	1.66	2	2	19	20	215

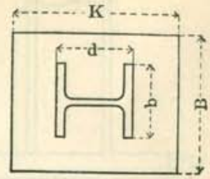
NOTE: Rolled Thickness includes allowance for planing on one side and is rounded up to nearest recommended standard thickness. Mill orders should specify the rolled thickness.

COLUMN

BASES

COLUMN BASES STANDARD

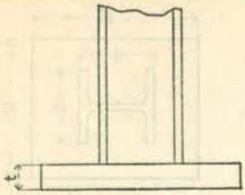
12 and 10 INCH COLUMNS



MAXIMUM BENDING STRESS, 18,000 POUNDS PER SQUARE INCH

Column Section No.	Weight per Foot, Lbs.	Load in Kips	Column Dimensions d, In.	Column Dimensions b, In.	Pressure per Sq. In. on Concrete 500 Pounds Thickness, t, In. Calculated	Finished	Rolled	B, In.	K, In.	Weight Rolled, Lbs.
	64	282	12.31	10.060	2.30	2¼	2½	24	24	408
CB 124 N	58	256	12.19	10.014	2.02	2	2	22	24	299
	53	234	12.06	10.000	1.81	2	2	20	24	272
	136	600	11.88	10.575	3.57	3¾	4	33	36	1346
	130	573	11.75	10.540	3.59	3¾	4	32	36	1305
	124	547	11.62	10.505	3.41	3¾	4	32	34	1233
	118	520	11.50	10.461	3.41	3¾	4	32	33	1197
	112	494	11.38	10.416	3.27	3¼	3½	31	32	984
	106	467	11.25	10.380	3.08	3¼	3½	29	32	920
	100	441	11.12	10.345	3.09	3¼	3½	28	32	888
	95	419	11.00	10.322	2.85	3¼	3½	28	30	833
CB 103 N	89	393	10.88	10.275	2.86	3¼	3½	28	28	777
	83	366	10.75	10.235	2.57	2¾	3	26	28	619
	77	340	10.62	10.195	2.59	2¾	3	25	28	595
	72	318	10.50	10.170	2.46	2¾	3	24	27	551
	66	291	10.38	10.120	2.30	2¼	2½	24	24	408
	60	265	10.25	10.075	2.06	2¼	2½	22	24	374
	54	238	10.12	10.030	2.08	2¼	2½	20	24	340
	49	216	10.00	10.000	1.80	2	2	20	22	249
	45	198	10.12	8.020	1.96	2	2	20	20	227
CB 102 N	41	181	10.00	8.000	1.67	2	2	18	20	204
	37	163	9.88	7.975	1.68	2	2	16	21	190
	33	146	9.75	7.965	1.41	1½	1½	16	19	129

NOTE: Rolled Thickness includes allowance for planing on one side and is rounded up to nearest recommended standard thickness. Mill orders should specify the rolled thickness.



COLUMN BASES
STANDARD

12 and 10 INCH COLUMNS

MAXIMUM BENDING STRESS, 18,000 POUNDS PER SQUARE INCH

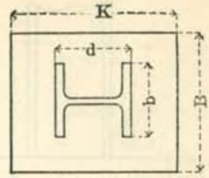
Column Section No.	Weight per Foot, Lbs.	Pressure per Sq. In. on Concrete: 625 Pounds: Thickness, t, In.: Calculated	625 Pounds: Thickness, t, In.: Finished	625 Pounds: Thickness, t, In.: Rolled	625 Pounds: B, In.	625 Pounds: K, In.	625 Pounds: Weight Rolled, Lbs.	750 Pounds: Thickness, t, In.: Calculated	750 Pounds: Thickness, t, In.: Finished	750 Pounds: Thickness, t, In.: Rolled	750 Pounds: B, In.	750 Pounds: K, In.	750 Pounds: Weight Rolled, Lbs.
	64	1.89	2	2	20	23	261	1.94	2	2	19	20	215
CB 124 N	58	1.90	2	2	20	21	238	1.77	2	2	18	20	194
	53	1.74	2	2	19	20	215	1.51	1½	1½	16	20	136
	136	3.41	3¾	4	30	32	1088	3.45	3¾	4	28	29	920
	130	3.30	3¼	3½	29	32	920	3.28	3¼	3½	27	28	750
	124	3.16	3¼	3½	28	31	861	3.11	3¼	3½	26	28	722
	118	3.10	3¼	3½	28	30	833	3.02	3¼	3½	25	28	694
	112	3.11	3¼	3½	28	28	777	3.04	3¼	3½	24	28	666
	106	2.96	3¼	3½	27	28	750	2.78	2¾	3	24	26	530
	100	2.80	2¾	3	26	28	619	2.78	2¾	3	24	25	510
CB 103 N	95	2.78	2¾	3	24	28	571	2.78	2¾	3	24	24	490
	89	2.64	2¾	3	24	27	551	2.44	2¾	3	22	24	449
	83	2.50	2¾	3	24	25	510	2.44	2¾	3	21	24	428
	77	2.35	2¾	3	23	24	469	2.28	2¼	2½	20	23	326
	72	2.22	2¼	2½	21	24	357	2.10	2¼	2½	20	21	297
	66	2.24	2¼	2½	20	24	340	2.10	2¼	2½	20	20	283
	60	1.89	2	2	20	21	238	1.81	2	2	18	20	204
	54	1.74	2	2	19	20	215	1.84	2	2	16	20	181
	49	1.66	2	2	18	20	194	1.50	1½	1½	16	18	122
	45	1.64	2	2	16	20	181	1.69	2	2	16	17	154
CB 102 N	41	1.49	1½	1½	16	18	122	1.52	1½	1½	15	16	102
	37	1.52	1½	1½	16	17	116	1.35	1½	1½	14	16	95
	33	1.36	1½	1½	15	16	102	1.35	1½	1½	14	14	83

NOTE: Rolled Thickness includes allowance for planing on one side and is rounded up to nearest recommended standard thickness. Mill orders should specify the rolled thickness.

COLUMN BASES

COLUMN BASES STANDARD

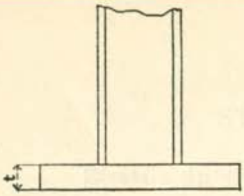
8 and 6 INCH COLUMNS



MAXIMUM BENDING STRESS, 18,000 POUNDS PER SQUARE INCH

Column Section No.	Weight per Foot, Lbs.	Load in Kips	Column Dimensions d, In.	Column Dimensions b, In.	Pressure per Sq. In. on Concrete 500 Pounds: Thickness, t, In. Calculated	Thickness, t, In. Finished	Thickness, t, In. Rolled	B, In.	K, In.	Weight Rolled, Lbs.
CB 83 N	67	296	9.062	8.285	2.51	2¾	3	24	25	510
	62	273	8.942	8.230	2.37	2¾	3	23	24	469
	58	256	8.810	8.230	2.26	2¼	2½	22	24	374
	53	234	8.678	8.175	2.27	2¼	2½	20	24	340
	48	212	8.562	8.115	2.00	2	2	20	22	249
	44	194	8.442	8.090	1.95	2	2	20	20	227
	40	176	8.312	8.075	1.75	2	2	18	20	204
	35	154	8.182	8.025	1.77	2	2	16	20	181
	33	146	8.124	8.010	1.63	2	2	16	19	172
	31	137	8.060	8.000	1.39	1½	1½	16	17	116
CB 82 N	30	132	8.196	6.559	1.55	2	2	16	17	154
	27	119	8.098	6.529	1.41	1½	1½	15	16	102
	24	106	8.000	6.500	1.27	1¼	1¼	14	16	79
CB 61 N	88	388	6.842	10.046	3.10	3¼	3½	28	28	777
	80	353	6.666	9.959	2.89	3¼	3½	28	25	694
	70	309	6.444	9.846	2.62	2¾	3	26	24	530
	60	264	6.216	9.733	2.34	2¾	3	24	22	449
	50	221	5.986	9.617	2.21	2¼	2½	23	20	326
	40	176	5.750	9.500	1.81	2	2	20	18	204

NOTE: Rolled Thickness includes allowance for planing on one side and is rounded up to nearest recommended standard thickness. Mill orders should specify the rolled thickness.



COLUMN BASES
STANDARD
8 and 6 INCH COLUMNS

MAXIMUM BENDING STRESS, 18,000 POUNDS PER SQUARE INCH

Column Section No.	Weight per Foot, Lbs.	625 Pounds: Thickness, t, In. Calculated	625 Pounds: Thickness, t, In. Finished	625 Pounds: Thickness, t, In. Rolled	625 Pounds: B, In.	625 Pounds: K, In.	625 Pounds: Weight Rolled, Lbs.	750 Pounds: Thickness, t, In. Calculated	750 Pounds: Thickness, t, In. Finished	750 Pounds: Thickness, t, In. Rolled	750 Pounds: B, In.	750 Pounds: K, In.	750 Pounds: Weight Rolled, Lbs.
	67	2.43	2¾	3	20	24	408	2.36	2¾	3	20	20	340
	62	2.14	2¼	2½	20	22	312	2.03	2¼	2½	18	20	255
	58	2.12	2¼	2½	20	20	283	2.06	2¼	2½	17	20	241
	53	1.97	2	2	19	20	215	2.08	2¼	2½	16	20	227
CB 83N	48	1.88	2	2	17	20	193	1.74	2	2	16	18	163
	44	1.89	2	2	16	20	181	1.68	2	2	16	16	145
	40	1.60	2	2	16	18	163	1.51	1½	1½	15	16	102
	35	1.52	1½	1½	16	16	109	1.34	1½	1½	14	15	89
	33	1.36	1½	1½	15	16	102	1.34	1½	1½	14	14	83
	31	1.32	1½	1½	14	16	95	1.17	1¼	1¼	13	14	64
	30	1.38	1½	1½	14	15	89	1.37	1½	1½	13	14	77
CB 82N	27	1.39	1½	1½	14	14	83	1.20	1¼	1¼	12	14	59
	24	1.23	1¼	1¼	13	14	64	1.13	1¼	1¼	10	14	50
	88	3.16	3¼	3½	28	22	698	3.53	3¾	4	28	19	603
	80	2.79	2¾	3	24	24	490	3.34	3¾	4	28	17	539
CB 61N	70	2.55	2¾	3	24	21	428	2.45	2¾	3	21	20	357
	60	2.23	2¼	2½	21	20	297	2.16	2¼	2½	20	18	255
	50	1.95	2	2	20	18	204	2.00	2	2	19	16	172
	40	1.67	2	2	18	16	163	1.69	2	2	16	15	136

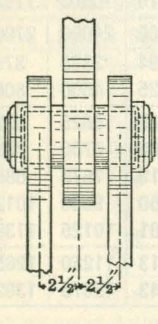
NOTE: Rolled Thickness includes allowance for planing on one side and is rounded up to nearest recommended standard thickness. Mill orders should specify the rolled thickness.

STRESSES IN RIVETS AND PINS

Rivets. In transmitting stresses between riveted pieces, it is customary to disregard friction and to proportion rivets to the entire stress to be transmitted. They must be of sufficient size and number to resist shear and to afford such bearing area as not to cause distortion of the metal at the rivet holes. In the case of beams which frame opposite and of single web girders, this latter condition often necessitates a greater thickness of web than required by the shearing stresses. In a plate girder with 5⁄16″ web, ¾″ rivets connecting the web with the flange angles would have a bearing value at 24,000 pounds unit stress of 5,630 pounds per rivet, while their value in double shear at 12,000 pounds unit stress is 10,600 pounds per rivet; and it might be necessary to increase the web thickness to ⅜″ or more in order that the pressure of the rivets upon the metal be not excessive.

Pins. Pins must be calculated for shearing, bending and bearing stresses, but one of the latter two will in most cases determine the size. When groups of bars are connected to the same pin, as in the lower chord of truss bridges, the size of the bars must be so chosen and the bars so placed that at no point on the pin will there be any excessive bending stress. When the size of pin has been determined from the bending stress, the thickness of the bars or web of the post should be investigated to provide sufficient bearing area, the bars being thickened or pin plates added if necessary.

The following is the formula for flexure applied to pins: $M = f \pi d^3 \div 32$ or $= f A d \div 8$, in which M = moment of forces for any section through pin, f=fiber stress per square inch in bending, A=the area of section, d=diameter π=3.14159. The forces are assumed to act in a plane passing through the axis of the pin.



Example 1.—Required the size of a pin carrying a load of 64,000 pounds, at a distance of 5 inches between points of support; maximum fiber stress 24,000 pounds per square inch.

Bending moment=64,000 x 5 ÷ 4=80,000 inch pounds; use a 3¼ inch pin; allowed moment: 80,900 inch pounds.

Example 2.—Required the thickness of metal in the top chord of a bridge to give sufficient bearing area to a 3⅜-inch pin, having to transmit a stress of 121,400 pounds; maximum bearing pressure 24,000 pounds per square inch.

The bearing value of a 3⅜-inch pin for 1 inch thickness of metal is 81,000 pounds; therefore, the thickness of metal required=121,400 ÷ 81,000=1½ inch, or each web of the chord must be ¾ inch thick, including pin plates.

RIVETS

Shearing and Bearing Values, in Pounds

½-INCH RIVETS—Area 0.19635 Square Inch

Shearing		Unit, Lbs. per Sq. In.	7500	8000	9000	10000	11000	12000	13500	15000
Shearing		Single Shear per Rivet	1473	1571	1767	1964	2160	2356	2651	2945
Shearing		Double Shear per Rivet	2945	3142	3534	3927	4320	4712	5301	5890
Bearing		Unit, Lbs. per Sq. In.	15000	16000	18000	20000	22000	24000	27000	30000
Bearing	Thickness, in Inches	⅛	938	1000	1125	1250	1375	1500	1688	1875
Bearing	Thickness, in Inches	3/16	1406	1500	1688	1875	2063	2250	2531	2813
Bearing	Thickness, in Inches	¼	1875	2000	2250	2500	2750	3000	3375	3750
Bearing	Thickness, in Inches	5/16	2344	2500	2813	3125	3438	3750	4219	4688
Bearing	Thickness, in Inches	⅜	2813	3000	3375	3750	4125	4500	5062	5625
Bearing	Thickness, in Inches	7/16	3281	3500	3938	4375	4813	5250	5906	6563
Bearing	Thickness, in Inches	½	3750	4000	4500	5000	5500	6000	6750	7500

⅝-INCH RIVETS—Area 0.30680 Square Inch

Shearing		Unit, Lbs. per Sq. In.	7500	8000	9000	10000	11000	12000	13500	15000
Shearing		Single Shear per Rivet	2301	2454	2761	3068	3375	3682	4142	4602
Shearing		Double Shear per Rivet	4602	4908	5522	6136	6750	7363	8284	9204
Bearing		Unit, Lbs. per Sq. In.	15000	16000	18000	20000	22000	24000	27000	30000
Bearing	Thickness, in Inches	⅛	1172	1250	1406	1563	1719	1875	2109	2344
Bearing	Thickness, in Inches	3/16	1758	1875	2109	2344	2578	2813	3164	3516
Bearing	Thickness, in Inches	¼	2344	2500	2813	3125	3438	3750	4219	4688
Bearing	Thickness, in Inches	5/16	2930	3125	3516	3906	4297	4688	5273	5859
Bearing	Thickness, in Inches	⅜	3516	3750	4219	4688	5156	5625	6328	7031
Bearing	Thickness, in Inches	7/16	4102	4375	4922	5469	6016	6563	7383	8203
Bearing	Thickness, in Inches	½	4688	5000	5625	6250	6875	7500	8438	9375
Bearing	Thickness, in Inches	9/16	5273	5625	6328	7031	7734	8438	9492	10547

¾-INCH RIVETS—Area 0.44179 Square Inch

Shearing		Unit, Lbs. per Sq. In.	7500	8000	9000	10000	11000	12000	13500	15000
Shearing		Single Shear per Rivet	3313	3534	3976	4418	4860	5301	5964	6627
Shearing		Double Shear per Rivet	6627	7069	7952	8836	9719	10603	11928	13254
Bearing		Unit, Lbs. per Sq. In.	15000	16000	18000	20000	22000	24000	27000	30000
Bearing	Thickness, in Inches	3/16	2109	2250	2531	2813	3094	3375	3797	4219
Bearing	Thickness, in Inches	¼	2813	3000	3375	3750	4125	4500	5063	5625
Bearing	Thickness, in Inches	5/16	3516	3750	4219	4688	5156	5625	6328	7031
Bearing	Thickness, in Inches	⅜	4219	4500	5063	5625	6188	6750	7594	8438
Bearing	Thickness, in Inches	7/16	4922	5250	5906	6563	7219	7875	8859	9844
Bearing	Thickness, in Inches	½	5625	6000	6750	7500	8250	9000	10125	11250
Bearing	Thickness, in Inches	9/16	6328	6750	7594	8438	9281	10125	11391	12656
Bearing	Thickness, in Inches	⅝	7031	7500	8438	9375	10313	11250	12656	14063
Bearing	Thickness, in Inches	11/16	7734	8250	9281	10313	11343	12375	13922	15469

Values above upper dotted lines are less than single shear.
Values below lower dotted lines are greater than double shear.

RIVETS

Shearing and Bearing Values, in Pounds

7/8-INCH RIVETS—Area 0.60132 Square Inch

Shearing	Unit, Lbs. per Sq. In.	7500	8000	9000	10000	11000	12000	13500	15000
	Single Shear per Rivet	4510	4811	5412	6013	6615	7216	8118	9020
	Double Shear per Rivet	9020	9621	10824	12026	13229	14432	16236	18040
Bearing	Unit, Lbs. per Sq. In.	15000	16000	18000	20000	22000	24000	27000	30000
Thickness, in Inches	1/4	3281	3500	3938	4375	4813	5250	5906	6563
	5/16	4102	4375	4922	5469	6016	6563	7383	8203
	3/8	4922	5250	5906	6563	7219	7875	8859	9844
	7/16	5742	6125	6891	7656	8422	9188	10336	11484
	1/2	6563	7000	7875	8750	9625	10500	11813	13125
	9/16	7383	7875	8859	9844	10828	11813	13289	14766
	5/8	8203	8750	9844	10938	12031	13125	14766	16406
	11/16	9023	9625	10828	12031	13234	14438	16242	18047
	3/4	9844	10500	11813	13125	14438	15750	17719	19688

1-INCH RIVETS—Area 0.78540 Square Inch

Shearing	Unit, Lbs. per Sq. In.	7500	8000	9000	10000	11000	12000	13500	15000
	Single Shear per Rivet	5891	6283	7069	7854	8639	9425	10603	11781
	Double Shear per Rivet	11781	12566	14137	15708	17279	18850	21206	23562
Bearing	Unit, Lbs. per Sq. In.	15000	16000	18000	20000	22000	24000	27000	30000
Thickness, in Inches	5/16	4688	5000	5625	6250	6875	7500	8438	9375
	3/8	5625	6000	6750	7500	8250	9000	10125	11250
	7/16	6563	7000	7875	8750	9625	10500	11813	13125
	1/2	7500	8000	9000	10000	11000	12000	13500	15000
	9/16	8438	9000	10125	11250	12375	13500	15188	16875
	5/8	9375	10000	11250	12500	13750	15000	16875	18750
	11/16	10313	11000	12375	13750	15125	16500	18563	20625
	3/4	11250	12000	13500	15000	16500	18000	20250	22500
	13/16	12188	13000	14625	16250	17875	19500	21938	24375

1 1/8-INCH RIVETS—Area 0.99402 Square Inch

Shearing	Unit, Lbs. per Sq. In.	7500	8000	9000	10000	11000	12000	13500	15000
	Single Shear per Rivet	7455	7952	8946	9940	10934	11928	13419	14910
	Double Shear per Rivet	14910	15904	17892	19880	21868	23856	26839	29821
Bearing	Unit, Lbs. per Sq. In.	15000	16000	18000	20000	22000	24000	27000	30000
Thickness, in Inches	7/16	7383	7875	8859	9844	10828	11813	13289	14766
	1/2	8438	9000	10125	11250	12375	13500	15188	16875
	9/16	9492	10125	11391	12656	13922	15188	17086	18984
	5/8	10547	11250	12656	14063	15469	16875	18984	21094
	11/16	11602	12375	13922	15469	17016	18563	20883	23203
	3/4	12656	13500	15188	16875	18563	20250	22781	25313
	13/16	13711	14625	16453	18281	20109	21938	24680	27422
	7/8	14766	15750	17719	19688	21656	23625	26578	29531
	15/16	15820	16875	18984	21094	23203	25313	28477	31641

Values above upper dotted lines are less than single shear.
Values below lower dotted lines are greater than double shear.

PINS

Bearing Values on Metal One Inch Thick, in Pounds

Diameter x 1 x Unit Stress

Pin		Fiber Stress in Pounds per Square Inch								
Dia., Inches	Area, Sq. In.	15000	16000	18000	20000	22000	24000	25000	27000	30000
1	.785	15000	16000	18000	20000	22000	24000	25000	27000	30000
1¼	1.227	18750	20000	22500	25000	27500	30000	31250	33750	37500
1½	1.767	22500	24000	27000	30000	33000	36000	37500	40500	45000
1¾	2.405	26250	28000	31500	35000	38500	42000	43750	47250	52500
2	3.142	30000	32000	36000	40000	44000	48000	50000	54000	60000
2¼	3.976	33750	36000	40500	45000	49500	54000	56250	60750	67500
2½	4.909	37500	40000	45000	50000	55000	60000	62500	67500	75000
2¾	5.940	41250	44000	49500	55000	60500	66000	68750	74250	82500
3	7.069	45000	48000	54000	60000	66000	72000	75000	81000	90000
3¼	8.296	48750	52000	58500	65000	71500	78000	81250	87750	97500
3½	9.621	52500	56000	63000	70000	77000	84000	87500	94500	105000
3¾	11.045	56250	60000	67500	75000	82500	90000	93750	101250	112500
4	12.566	60000	64000	72000	80000	88000	96000	100000	108000	120000
4¼	14.186	63750	68000	76500	85000	93500	102000	106250	114750	127500
4½	15.904	67500	72000	81000	90000	99000	108000	112500	121500	135000
4¾	17.721	71250	76000	85500	95000	104500	114000	118750	128250	142500
5	19.635	75000	80000	90000	100000	110000	120000	125000	135000	150000
5¼	21.648	78750	84000	94500	105000	115500	126000	131250	141750	157500
5½	23.758	82500	88000	99000	110000	121000	132000	137500	148500	165000
5¾	25.967	86250	92000	103500	115000	126500	138000	143750	155250	172500
6	28.274	90000	96000	108000	120000	132000	144000	150000	162000	180000
6¼	30.680	93750	100000	112500	125000	137500	150000	156250	168750	187500
6½	33.183	97500	104000	117000	130000	143000	156000	162500	175500	195000
6¾	35.785	101250	108000	121500	135000	148500	162000	168750	182250	202500
7	38.485	105000	112000	126000	140000	154000	168000	175000	189000	210000
7¼	41.282	108750	116000	130500	145000	159500	174000	181250	195750	217500
7½	44.179	112500	120000	135000	150000	165000	180000	187500	202500	225000
7¾	47.173	116250	124000	139500	155000	170500	186000	193750	209250	232500
8	50.265	120000	128000	144000	160000	176000	192000	200000	216000	240000
8¼	53.456	123750	132000	148500	165000	181500	198000	206250	222750	247500
8½	56.745	127500	136000	153000	170000	187000	204000	212500	229500	255000
8¾	60.132	131250	140000	157500	175000	192500	210000	218750	236250	262500
9	63.617	135000	144000	162000	180000	198000	216000	225000	243000	270000
9¼	67.201	138750	148000	166500	185000	203500	222000	231250	249750	277500
9½	70.882	142500	152000	171000	190000	209000	228000	237500	256500	285000
9¾	74.662	146250	156000	175500	195000	214500	234000	243750	263250	292500
10	78.540	150000	160000	180000	200000	220000	240000	250000	270000	300000
10¼	82.516	153750	164000	184500	205000	225500	246000	256250	276750	307500
10½	86.590	157500	168000	189000	210000	231000	252000	262500	283500	315000
10¾	90.763	161250	172000	193500	215000	236500	258000	268750	290250	322500
11	95.033	165000	176000	198000	220000	242000	264000	275000	297000	330000
11¼	99.402	168750	180000	202500	225000	247500	270000	281250	303750	337500
11½	103.869	172500	184000	207000	230000	253000	276000	287500	310500	345000
11¾	108.434	176250	188000	211500	235000	258500	282000	293750	317250	352500
12	113.097	180000	192000	216000	240000	264000	288000	300000	324000	360000

PINS

Bending Moments in Thousands of Inch Pounds

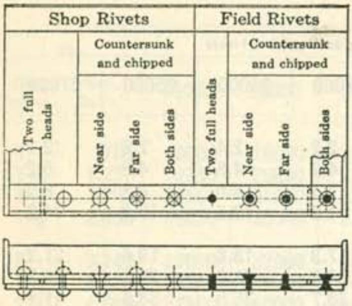
Diameter^3 x 0.098175 x Unit Stress

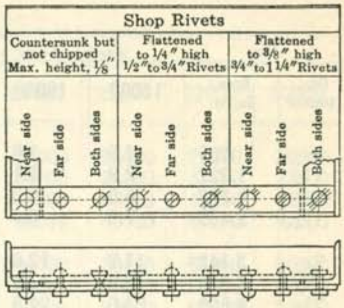
Pin		Fiber Stress in Pounds per Square Inch							
Dia., Inches	Area, Sq. In.	15000	16000	18000	20000	22000	24000	25000	27000
1	.785	1.5	1.6	1.8	2.0	2.2	2.4	2.5	2.7
1¼	1.227	2.9	3.1	3.5	3.8	4.2	4.6	4.8	5.2
1½	1.767	5.0	5.3	6.0	6.6	7.3	8.0	8.3	8.9
1¾	2.405	7.9	8.4	9.5	10.5	11.6	12.6	13.2	14.2
2	3.142	11.8	12.6	14.1	15.7	17.3	18.8	19.6	21.2
2¼	3.976	16.8	17.9	20.1	22.4	24.6	26.8	28.0	30.2
2½	4.909	23.0	24.5	27.6	30.7	33.7	36.8	38.3	41.4
2¾	5.940	30.6	32.7	36.8	40.8	44.9	49.0	51.0	55.1
3	7.069	39.8	42.4	47.7	53.0	58.3	63.6	66.3	71.6
3¼	8.296	50.6	53.9	60.7	67.4	74.1	80.9	84.3	91.0
3½	9.621	63.1	67.3	75.8	84.2	92.6	101.0	105.2	113.7
3¾	11.045	77.7	82.8	93.2	103.5	113.9	124.3	129.4	139.8
4	12.566	94.2	100.5	113.1	125.7	138.2	150.8	157.1	169.6
4¼	14.186	113.0	120.6	135.7	150.7	165.8	180.9	188.4	203.5
4½	15.904	134.2	143.1	161.0	178.9	196.8	214.7	223.7	241.6
4¾	17.721	157.8	168.3	189.4	210.4	231.5	252.5	263.0	284.1
5	19.635	184.1	196.4	220.9	245.4	270.0	294.5	306.8	331.3
5¼	21.648	213.1	227.3	255.7	284.1	312.5	340.9	355.2	383.6
5½	23.758	245.0	261.3	294.0	326.7	359.3	392.0	408.3	441.0
5¾	25.967	280.0	298.6	336.0	373.3	410.6	447.9	466.6	503.9
6	28.274	318.1	339.3	381.7	424.1	466.5	508.9	530.1	572.6
6¼	30.680	359.5	383.5	431.4	479.4	527.3	575.2	599.2	647.1
6½	33.183	404.4	431.4	485.3	539.2	593.1	647.1	674.0	728.0
6¾	35.785	452.9	483.1	543.5	603.9	664.3	724.6	754.8	815.2
7	38.485	505.1	538.8	606.1	673.5	740.8	808.2	841.8	909.2
7¼	41.282	561.2	598.6	673.4	748.2	823.1	897.9	935.3	1010.1
7½	44.179	621.3	662.7	745.5	828.4	911.2	994.0	1035.4	1118.3
7¾	47.173	685.5	731.2	822.6	914.0	1005.4	1096.8	1142.5	1233.9
8	50.265	754.0	804.3	904.8	1005.3	1105.8	1206.4	1256.6	1357.2
8¼	53.456	826.9	882.0	992.3	1102.5	1212.8	1323.0	1378.2	1488.4
8½	56.745	904.4	964.7	1085.3	1205.8	1326.4	1447.0	1507.3	1627.9
8¾	60.132	986.5	1052.3	1183.9	1315.4	1446.9	1578.5	1644.2	1775.8
9	63.617	1073.5	1145.1	1288.3	1431.4	1574.5	1717.7	1789.2	1932.4
9¼	67.201	1165.5	1243.2	1398.6	1554.0	1709.4	1864.8	1942.5	2097.9
9½	70.882	1262.6	1346.8	1515.1	1683.5	1851.8	2020.1	2104.3	2272.7
9¾	74.662	1364.9	1455.9	1637.9	1819.9	2001.9	2183.9	2274.9	2456.8
10	78.540	1472.6	1570.8	1767.1	1963.5	2159.8	2356.2	2454.4	2650.7
10¼	82.516	1585.9	1691.6	1903.0	2114.5	2325.9	2537.4	2643.1	2854.5
10½	86.590	1704.7	1818.4	2045.7	2273.0	2500.3	2727.6	2841.2	3068.5
10¾	90.763	1829.4	1951.4	2195.3	2439.2	2683.2	2927.1	3049.1	3293.0
11	95.033	1960.1	2090.7	2352.1	2613.4	2874.8	3136.1	3266.8	3528.1
11¼	99.402	2096.8	2236.5	2516.1	2795.7	3075.2	3354.8	3494.6	3774.2
11½	103.869	2239.7	2389.0	2687.6	2986.2	3284.9	3583.5	3732.8	4031.4
11¾	108.434	2388.9	2548.2	2866.7	3185.3	3503.8	3822.3	3981.6	4300.1
12	113.097	2544.7	2714.3	3053.6	3392.9	3732.2	4071.5	4241.2	4580.5

DETAILS FOR PUNCHING AND RIVETING

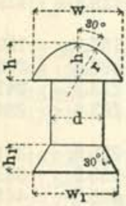
American Bridge Company Standard

Conventional Signs for Riveting





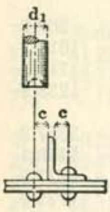
Dimensions of Structural Rivets



	Diameter of Rivet, d, Inches									
	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
w	11/16	7/8	1 1/16	1 1/4	1 7/16	1 5/8	1 13/16	2	2 3/16	2 3/8
h	5/16	3/8	7/16	1/2	5/8	11/16	3/4	7/8	15/16	1
r	7/16	9/16	11/16	13/16	15/16	1	1 1/8	1 1/4	1 3/8	1 1/2
w_1	9/16	3/4	1	1 3/16	1 3/8	1 9/16	1 3/4	2	2 3/16	2 3/8
h_1	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4

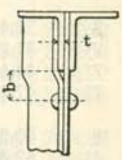
$w = 1\frac{1}{2}d + \frac{1}{8}''$ $\quad h = 0.425\,w$ $\quad r = 1\frac{1}{2}h.$

Driving Clearance



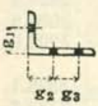
	Diameter of Rivet, d, Inches									
	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
d_1	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4
c	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2

Crimps



$b = t + 1\frac{1}{2}''$ (min. 2″)

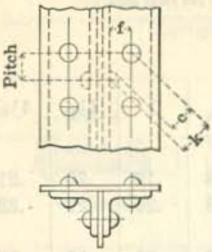
Gages for Angles

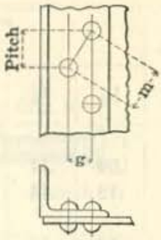


	Width of Leg, Inches														
	8	7	6	5	4	3 1/2	3	2 1/2	2	1 3/4	1 1/2	1 3/8	1 1/4	1	3/4
g_1	4 1/2	4	3 1/2	3	2 1/2	2	1 3/4	1 3/8	1 1/8	1	7/8	7/8	3/4	5/8	1/2
g_2	3	2 1/2	2 1/4	2											
g_3	3	3	2 1/2	1 3/4											
Max. rivet	1 1/8	1	7/8	7/8	7/8	7/8	7/8	3/4	5/8	1/2	3/8	3/8	3/8	1/4	1/4

RIVET SPACING

American Bridge Company Standard





Minimum Pitch for Machine Riveting

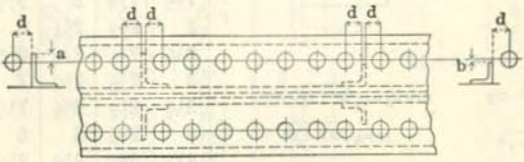
Dia. of Rivet	c	k	Distance, f, Inches 1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2⅜	2½	2¾	3
⅜	⅞	1³⁄₁₆	¼	0												
½	1	1⅜	¾	½	0											
⅝	1⅛	1⁹⁄₁₆	1⅛	1	¾	⅜	0									
¾	1¼	1¾		1¼	1⅛	1	¾	0								
⅞	1⅜	2			1½	1⅜	1⅛	⅞	⅝	0						
1	1½	2³⁄₁₆				1⅝	1½	1⅜	1⅛	⅞	½	0				
1⅛	1⅝	2⅜					1¾	1⅝	1½	1⅜	1⅛	⅞	0			
1¼	1¾	2⅝						2	1⅞	1¾	1½	1¼	1	⅝	0	
1⅜	1⅞	2¹³⁄₁₆							2⅛	2	1⅞	1¾	1½	1¼	½	0
1½	2	3								2¼	2⅛	2	1⅞	1⅝	1⅛	0

Minimum Pitch to Maintain 3 Diameters C. to C.

Dia. of Rivet	m	Distance, g, Inches 1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½	3¾	4	4¼	4½
⅜	1⅛	½	0													
½	1½	1⅛	⅞	0												
⅝	1⅞	1⅝	1⅜	1⅛	⅝	0										
¾	2¼	2	1⅞	1⅝	1⅜	1	0									
⅞	2⅝	2½	2⅜	2⅛	2	1¾	1⅜	¾	0							
1	3	2⅞	2¾	2⅝	2½	2¼	2	1⅝	1⅛	0						
1⅛	3⅜	3¼	3⅛	3	2⅞	2¾	2½	2¼	2	1½	⅞	0				
1¼	3¾	3⅝	3½	3⅜	3⅜	3¼	3	2¾	2½	2¼	1⅞	1⅜	0			
1⅜	4⅛	4	4	3⅞	3¾	3⅝	3½	3¼	3⅛	2⅞	2½	2⅛	1¾	1	0	
1½	4½	4⅜	4⅜	4¼	4⅛	4	3⅞	3¾	3½	3⅜	3⅛	2⅞	2½	2	1½	0

Cover Plate Riveting

a, Ins.	d, Ins.
½	2½
1	2⅝
1½	2¾
2	2¾
2½	2⅞
3	2⅞
3½	3
4	3⅛
5	3¼
6	3⅜



b, Ins.	d, Ins.
	2½
½	2⅜
¾	2¼
1	2¼
1¼	2⅛
1½	2
1¾	1¾
2	1½
2¼	1
2½	

REDUCTION OF AREA FOR RIVET HOLES

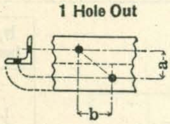
Area in Square Inches=Diameter of Hole by Thickness of Metal

For tension members rivet holes shall be taken as the diameter of the rivet plus 1/8″

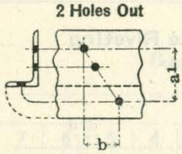
Thickness of Metal, Inches	Diameter of Hole in Inches											
	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1	1 1/16	1 1/8	1 1/4
3/16	.09	.11	.12	.13	.14	.15	.16	.18	.19	.20	.21	.23
1/4	.13	.14	.16	.17	.19	.20	.22	.23	.25	.27	.28	.31
5/16	.16	.18	.20	.21	.23	.25	.27	.29	.31	.33	.35	.39
3/8	.19	.21	.23	.26	.28	.30	.33	.35	.38	.40	.42	.47
7/16	.22	.25	.27	.30	.33	.36	.38	.41	.44	.46	.49	.55
1/2	.25	.28	.31	.34	.38	.41	.44	.47	.50	.53	.56	.63
9/16	.28	.32	.35	.39	.42	.46	.49	.53	.56	.60	.63	.70
5/8	.31	.35	.39	.43	.47	.51	.55	.59	.63	.66	.70	.78
11/16	.34	.39	.43	.47	.52	.56	.60	.64	.69	.73	.77	.86
3/4	.38	.42	.47	.52	.56	.61	.66	.70	.75	.80	.84	.94
13/16			.51	.56	.61	.66	.71	.76	.81	.86	.91	1.02
7/8			.55	.60	.66	.71	.77	.82	.88	.93	.98	1.09
15/16			.59	.64	.70	.76	.82	.88	.94	1.00	1.05	1.17
1			.63	.69	.75	.81	.88	.94	1.00	1.06	1.13	1.25
1 1/16					.80	.86	.93	1.00	1.06	1.13	1.20	1.33
1 1/8					.84	.91	.98	1.05	1.13	1.20	1.27	1.41
1 3/16					.89	.96	1.04	1.11	1.19	1.26	1.34	1.48
1 1/4					.94	1.02	1.09	1.17	1.25	1.33	1.41	1.56
1 5/16							1.15	1.23	1.31	1.39	1.48	1.64
1 3/8							1.20	1.29	1.38	1.46	1.55	1.72
1 7/16							1.26	1.35	1.44	1.53	1.62	1.80
1 1/2							1.31	1.41	1.50	1.59	1.69	1.88

PITCH OF RIVETS TO MAINTAIN NET SECTION

1 Hole Out



2 Holes Out



y=diameter of rivet + 1/8″

$a-y=\sqrt{a^2+b^2-2y}$ $\quad$ $a^1-2y=\sqrt{a^2+b^2-3y}$

$b=\sqrt{2ay+y^2}$ $\quad$ $b=\sqrt{2ay+y^2}$

Dimensions in Inches

a	3/4″ Rivet	7/8″ Rivet	a 1	3/4″ Rivet	7/8″ Rivet
	b	b		b	b
1	1 5/8	1 3/4	5	3 1/16	3 5/16
1 1/2	1 7/8	2	5 1/2	3 1/4	3 1/2
2	2 1/16	2 1/4	6	3 3/8	3 5/8
2 1/2	2 1/4	2 7/16	6 1/2	3 1/2	3 3/4
3	2 7/16	2 5/8	7	3 5/8	3 7/8
3 1/2	2 9/16	2 13/16	7 1/2	3 3/4	4
4	2 13/16	3	8	3 7/8	4 1/8
4 1/2	2 15/16	3 3/16	8 1/2	4	4 1/4

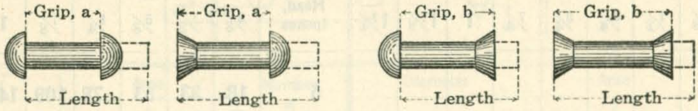
a, a^1 = sum of gages minus thickness of angle.
5/8″ rivets, can be taken at 1/8″ less than for 3/4″ rivets.
1″ rivets, can be taken at 1/8″ more than for 7/8″ rivets.

STRUCTURAL RIVETS

American Bridge Company Standard

Lengths of Field Rivets for Various Grips

Dimensions in Inches



Grip, a	½	⅝	¾	⅞	1
	Diameter of Rivet				
½	1⅝	1¾	1⅞	2	2⅛
⅝	1¾	1⅞	2	2⅛	2¼
¾	1⅞	2	2⅛	2¼	2⅜
⅞	2	2⅛	2¼	2⅜	2½
1	2¼	2⅜	2⅜	2½	2⅝
⅛	2⅜	2½	2½	2⅝	2¾
¼	2½	2⅝	2⅝	2¾	2⅞
⅜	2⅝	2¾	2¾	2⅞	3
½	2⅞	2⅞	3	3⅛	3¼
⅝	3	3	3⅛	3¼	3⅜
¾	3⅛	3¼	3¼	3½	3½
⅞	3¼	3⅜	3⅜	3⅝	3⅝
2	3½	3½	3⅝	3¾	3¾
⅛	3⅝	3⅝	3¾	3⅞	3⅞
¼	3¾	3⅞	3⅞	4	4⅛
⅜	4	4	4	4⅛	4¼
½	4⅛	4⅛	4⅛	4¼	4⅜
⅝	4¼	4¼	4¼	4⅜	4½
¾	4⅜	4⅜	4⅜	4½	4⅝
⅞	4⅝	4⅝	4⅝	4⅝	4¾
3		4¾	4¾	4⅞	4⅞
⅛		4⅞	4⅞	5	5⅛
¼		5	5	5⅛	5¼
⅜		5⅛	5⅛	5¼	5⅜
½		5⅜	5⅜	5⅜	5½
⅝		5½	5½	5½	5⅝
¾		5⅝	5⅝	5⅝	5¾
⅞		5¾	5¾	5¾	5⅞
4			5⅞	6	6
⅛			6	6⅛	6¼
¼			6⅛	6¼	6⅜
⅜			6⅜	6½	6½
½			6½	6⅝	6⅝
⅝			6⅝	6¾	6¾
¾			6¾	6⅞	6⅞
⅞			6⅞	7	7
5				7⅛	7⅛
⅛				7¼	7¼
¼				7⅜	7⅜
⅜				7⅝	7⅝
½				7¾	7¾
⅝				7⅞	7⅞
¾				8	8
⅞				8⅛	8⅛

Grip, b	½	⅝	¾	⅞	1
	Diameter of Rivet				
½	1	1	1⅛	1¼	1¼
⅝	1⅛	1¼	1¼	1⅜	1⅜
¾	1⅜	1⅜	1⅜	1½	1½
⅞	1½	1½	1½	1⅝	1⅝
1	1⅝	1⅝	1⅝	1¾	1¾
⅛	1¾	1¾	1⅞	1⅞	1⅞
¼	2	2	2	2	2
⅜	2⅛	2⅛	2⅛	2¼	2¼
½	2¼	2¼	2¼	2⅜	2⅜
⅝	2⅜	2⅜	2⅜	2½	2½
¾	2⅝	2⅝	2⅝	2⅝	2⅝
⅞	2¾	2¾	2¾	2¾	2¾
2	2⅞	2⅞	2⅞	2⅞	2⅞
⅛	3⅛	3	3	3	3
¼	3¼	3⅛	3⅛	3⅛	3¼
⅜	3⅜	3⅜	3⅜	3⅜	3⅜
½	3½	3½	3½	3½	3½
⅝	3¾	3⅝	3⅝	3⅝	3⅝
¾	3⅞	3¾	3¾	3¾	3¾
⅞	4	3⅞	3⅞	3⅞	3⅞
3		4⅛	4⅛	4⅛	4⅛
⅛		4¼	4¼	4¼	4¼
¼		4⅜	4⅜	4⅜	4⅜
⅜		4½	4½	4½	4½
½		4⅝	4⅝	4⅝	4⅝
⅝		4¾	4¾	4¾	4¾
¾		5	5	5	5
⅞		5⅛	5⅛	5⅛	5⅛
4			5¼	5¼	5¼
⅛			5⅜	5⅜	5⅜
¼			5½	5½	5½
⅜			5⅝	5⅝	5⅝
½			5¾	5¾	5¾
⅝			6	6	6
¾			6⅛	6⅛	6⅛
⅞			6¼	6¼	6¼
5				6⅜	6⅜
⅛				6½	6½
¼				6⅝	6⅝
⅜				6¾	6¾
½				6⅞	6⅞
⅝				7	7
¾				7¼	7¼
⅞				7⅜	7⅜

STRUCTURAL RIVETS

American Bridge Company Standard

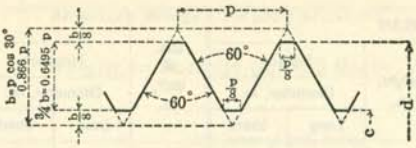
Weight in Pounds per 100 Rivets with Button Heads

Length Under Head, Inches	⅜	½	⅝	¾	⅞	1	1⅛	1¼	Length Under Head, Inches	⅜	½	⅝	¾	⅞	1	1⅛	1¼
									5	18	33	53	78	109	146	190	252
									⅛	18	34	54	80	111	149	193	256
1¼	6	12							¼	19	34	55	82	113	152	197	260
⅜	7	13							⅜	19	35	56	83	115	155	200	265
½	7	13	23	35	50	68	91	130	½	20	36	57	85	118	157	204	269
⅝	7	14	24	36	52	71	95	134	⅝	20	36	58	86	120	160	207	273
¾	8	15	25	37	54	74	98	139	¾	20	37	60	88	122	163	211	278
⅞	8	15	26	39	56	77	102	143	⅞	21	38	61	89	124	166	214	282
2	9	16	27	41	58	80	105	148	6	21	38	62	91	126	169	218	287
⅛	9	17	28	43	60	82	109	152	⅛	22	39	63	93	128	171	222	291
¼	9	18	29	44	62	85	112	156	¼	22	40	64	94	130	174	225	295
⅜	10	18	30	46	64	88	116	161	⅜	22	40	65	96	132	177	229	300
½	10	19	31	47	67	91	119	165	½	23	41	66	97	135	180	232	304
⅝	11	20	32	49	69	93	123	169	⅝	23	42	67	99	137	182	236	308
¾	11	20	34	50	71	96	126	174	¾	24	43	68	100	139	185	239	313
⅞	11	21	35	52	73	99	130	178	⅞	24	43	69	102	141	188	243	317
3	12	22	36	54	75	102	133	182	7	24	44	70	104	143	191	246	321
⅛	12	22	37	55	77	105	137	187	⅛	25	45	71	105	145	194	250	326
¼	13	23	38	57	79	107	141	191	¼	25	45	73	107	147	196	253	330
⅜	13	24	39	58	81	110	144	195	⅜	26	46	74	108	149	199	257	334
½	13	24	40	60	84	113	148	200	½	26	47	75	110	152	202	260	339
⅝	14	25	41	61	86	116	151	204	⅝	26	47	76	111	154	205	264	343
¾	14	26	42	63	88	118	155	208	¾	27	48	77	113	156	207	267	347
⅞	15	27	43	64	90	121	158	213	⅞	27	49	78	114	158	210	271	352
4	15	27	44	66	92	124	162	217	8	27	50	79	116	160	213	274	356
⅛	15	28	45	68	94	127	165	221	⅛	28	50	80	118	162	216	278	360
¼	16	29	47	69	96	130	169	226	¼	28	51	81	119	164	219	281	365
⅜	16	29	48	71	98	132	172	230	⅜	29	52	82	121	166	221	285	369
½	16	30	49	72	101	135	176	234	½	29	52	83	122	169	224	288	373
⅝	17	31	50	74	103	138	179	239	⅝	29	53	84	124	171	227	292	378
¾	17	31	51	75	105	141	183	243	¾	30	54	86	125	173	230	295	382
⅞	18	32	52	77	107	143	186	247	⅞	30	54	87	127	175	232	299	386

Button Heads	⅜	½	⅝	¾	⅞	1	1⅛	1¼
	Diameter of Rivets, Inches							
100 Heads as made on rivets, Pounds....	2.4	5.0	9.7	16.0	24.0	35.0	49.0	78.0
100 Heads as driven in work, Pounds. ..	1.9	4.0	7.5	12.5	18.5	27.0	37.5	51.0

SCREW THREADS

United States and American Bridge Company Standard



Diameter		Area		Number of Threads, per Inch	Diameter		Area		Number of Threads, per Inch
Total d, In.	Net c, In.	Total Dia., d, Sq. In.	Net Dia., c, Sq. In.		Total d, In.	Net c, In.	Total Dia., d, Sq. In.	Net Dia., c, Sq. In.	
¼	.185	.049	.027	20	2½	2.175	4.909	3.716	4
⅜	.294	.110	.068	16	2¾	2.425	5.940	4.619	4
½	.400	.196	.126	13					
⅝	.507	.307	.202	11	3	2.629	7.069	5.428	3½
¾	.620	.442	.302	10	3¼	2.879	8.296	6.509	3½
⅞	.731	.601	.419	9	3½	3.100	9.621	7.549	3¼
					3¾	3.317	11.045	8.641	3
1	.838	.785	.551	8					
1⅛	.939	.994	.693	7	4	3.567	12.566	9.993	3
1¼	1.064	1.227	.890	7	4¼	3.798	14.186	11.330	2⅞
1⅜	1.158	1.485	1.054	6	4½	4.028	15.904	12.741	2¾
1½	1.283	1.767	1.294	6	4¾	4.255	17.721	14.221	2⅝
1⅝	1.389	2.074	1.515	5½					
1¾	1.490	2.405	1.744	5	5	4.480	19.635	15.766	2½
1⅞	1.615	2.761	2.049	5	5¼	4.730	21.648	17.574	2½
					5½	4.953	23.758	19.268	2⅜
2	1.711	3.142	2.300	4½	5¾	5.203	25.967	21.262	2⅜
2¼	1.961	3.976	3.021	4½					
					6	5.423	28.274	23.095	2¼

BOLT HEADS AND NUTS

United States and American Bridge Company Standard

HEADS AND NUTS		U. S. Standard	A. B. Co. Standard
Head	Height, h	0.75 d + 1/16″	0.75 d
	Short Dia., f	1.50 d + ⅛″	1.50 d
Nut	Height, g	d	d
	Short Dia., f	1.50 d + ⅛″	1.50 d + ⅛″

Heads for Bolts 1½″ and under, A. B. Co. Standard.
Heads for Bolts 1⅝″ and over, U. S. Standard.

BOLT HEADS AND NUTS

American Bridge Company Standard

Dia. of Bolt, In.	HEAD: Hexagon Diameter, In. Long	HEAD: Hexagon Diameter, In. Short	HEAD: Height, In.	HEAD: Square Diameter, In. Long	HEAD: Square Diameter, In. Short	Dia. of Bolt, In.	NUT: Hexagon Diameter, In. Long	NUT: Hexagon Diameter, In. Short	NUT: Height In.	NUT: Square Diameter, In. Long	NUT: Square Diameter, In. Short
1/4	7/16	3/8	3/16	1/2	3/8	1/4	9/16	1/2	1/4	11/16	1/2
3/8	5/8	9/16	1/4	3/4	9/16	3/8	13/16	11/16	3/8	1	11/16
1/2	7/8	3/4	3/8	1 1/16	3/4	1/2	1	7/8	1/2	1 1/4	7/8
5/8	1 1/8	15/16	1/2	1 3/8	15/16	5/8	1 1/4	1 1/16	5/8	1 1/2	1 1/16
3/4	1 1/4	1 1/8	9/16	1 5/8	1 1/8	3/4	1 1/2	1 1/4	3/4	1 3/4	1 1/4
7/8	1 1/2	1 5/16	5/8	1 7/8	1 5/16	7/8	1 5/8	1 7/16	7/8	2	1 7/16
1	1 3/4	1 1/2	3/4	2 1/8	1 1/2	1	1 7/8	1 5/8	1	2 1/4	1 5/8
1 1/8	2	1 11/16	7/8	2 3/8	1 11/16	1 1/8	2 1/8	1 13/16	1 1/8	2 5/8	1 13/16
1 1/4	2 1/8	1 7/8	15/16	2 5/8	1 7/8	1 1/4	2 1/4	2	1 1/4	2 7/8	2
1 3/8	2 3/8	2 1/16	1	2 7/8	2 1/16	1 3/8	2 1/2	2 3/16	1 3/8	3 1/8	2 3/16
1 1/2	2 5/8	2 1/4	1 1/8	3 1/8	2 1/4	1 1/2	2 3/4	2 3/8	1 1/2	3 3/8	2 3/8
1 5/8	3	2 9/16	1 1/4	3 5/8	2 9/16	1 5/8	3	2 9/16	1 5/8	3 5/8	2 9/16
1 3/4	3 1/8	2 3/4	1 3/8	3 7/8	2 3/4	1 3/4	3 1/8	2 3/4	1 3/4	3 7/8	2 3/4
1 7/8	3 3/8	2 15/16	1 1/2	4 1/8	2 15/16	1 7/8	3 3/8	2 15/16	1 7/8	4 1/8	2 15/16
2	3 5/8	3 1/8	1 9/16	4 3/8	3 1/8	2	3 5/8	3 1/8	2	4 3/8	3 1/8
2 1/4	4	3 1/2	1 3/4	5	3 1/2	2 1/4	4	3 1/2	2 1/4	5	3 1/2
2 1/2	4 1/2	3 7/8	1 15/16	5 1/2	3 7/8	2 1/2	4 1/2	3 7/8	2 1/2	5 1/2	3 7/8
2 3/4	4 7/8	4 1/4	2 1/8	6	4 1/4	2 3/4	4 7/8	4 1/4	2 3/4	6	4 1/4
3	5 3/8	4 5/8	2 5/16	6 1/2	4 5/8	3	5 3/8	4 5/8	3	6 1/2	4 5/8
3 1/4	5 3/4	5	2 1/2	7	5	3 1/4	5 3/4	5	3 1/4	7	5
3 1/2	6 1/4	5 3/8	2 11/16	7 5/8	5 3/8	3 1/2	6 1/4	5 3/8	3 1/2	7 5/8	5 3/8
3 3/4	6 5/8	5 3/4	2 7/8	8 1/8	5 3/4	3 3/4	6 5/8	5 3/4	3 3/4	8 1/8	5 3/4
4	7	6 1/8	3 1/16	8 5/8	6 1/8	4	7	6 1/8	4	8 5/8	6 1/8
4 1/4	7 1/2	6 1/2	3 1/4	9 1/4	6 1/2	4 1/4	7 1/2	6 1/2	4 1/4	9 1/4	6 1/2
4 1/2	8	6 7/8	3 7/16	9 3/4	6 7/8	4 1/2	8	6 7/8	4 1/2	9 3/4	6 7/8
4 3/4	8 3/8	7 1/4	3 5/8	10 1/4	7 1/4	4 3/4	8 3/8	7 1/4	4 3/4	10 1/4	7 1/4
5	8 3/4	7 5/8	3 13/16	10 3/4	7 5/8	5	8 3/4	7 5/8	5	10 3/4	7 5/8
5 1/4	9 1/4	8	4	11 1/4	8	5 1/4	9 1/4	8	5 1/4	11 1/4	8
5 1/2	9 5/8	8 3/8	4 3/16	11 7/8	8 3/8	5 1/2	9 5/8	8 3/8	5 1/2	11 7/8	8 3/8
5 3/4	10 1/8	8 3/4	4 3/8	12 3/8	8 3/4	5 3/4	10 1/8	8 3/4	5 3/4	12 3/8	8 3/4
6	10 1/2	9 1/8	4 9/16	12 7/8	9 1/8	6	10 1/2	9 1/8	6	12 7/8	9 1/8

LENGTH OF BOLT THREADS

Length of Bolt, In.	Diameter of Bolt, Inches: 1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4
1 to 1 1/2	3/4	3/4	1	1 1/4					
1 5/8 to 2	3/4	3/4	1	1 1/4	1 1/2	1 1/2			
2 1/8 to 2 1/2	3/4	3/4	1	1 1/4	1 1/2	1 3/4	1 3/4		
2 5/8 to 3	7/8	7/8	1	1 1/4	1 1/2	1 3/4	1 3/4	2 1/4	
3 1/8 to 4	7/8	7/8	1 1/4	1 1/4	1 1/2	1 3/4	1 3/4	2 1/4	2 1/2
4 1/8 to 8	1	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4
8 1/8 to 12	1	1	1 1/2	1 3/4	2	2 1/4	2 1/2	3	3
12 1/8 to 20	1	1	1 1/2	2	2	2 1/4	2 1/2	3	3

Bolts not listed are threaded about 3 times the diameter; in no case are standard bolts threaded closer to the head than 1/4 inch.

BOLTS WITH SQUARE HEADS AND NUTS

American Bridge Company Standard

Weight in Pounds per 100 Bolts

Length Under Head, Inches	Diameter of Bolt, Inches								
	¼	5/16	⅜	7/16	½	⅝	¾	⅞	1
1	4	7	11	15	22	37	56		
1¼	4	7	11	16	23	39	59		
1½	5	8	12	17	24	41	62		
1¾	5	8	13	18	26	43	64		
2	5	9	14	19	27	45	67	101	144
2¼	6	9	15	20	28	47	71	104	150
2½	6	10	15	21	30	49	74	109	155
2¾	6	10	16	22	31	51	77	113	161
3	7	11	17	24	33	54	80	117	167
3½	7	12	18	25	35	58	86	126	178
4	8	13	20	28	38	62	92	134	189
4½	9	14	21	30	41	66	98	142	198
5	10	15	23	32	43	71	104	151	209
5½	10	16	25	34	46	75	111	159	220
6	11	17	26	36	49	79	117	168	232
6½			28	38	52	84	123	176	243
7			29	40	55	88	129	185	254
7½			31	42	57	92	136	193	265
8			32	45	60	97	142	202	276
9			34	49	65	105	154	218	298
10				53	71	114	167	235	320
12				61	82	131	192	269	364
14					93	148	217	303	409
Per Inch Additional	1.4	2.2	3.1	4.3	5.6	8.7	12.5	17.0	22.3

SQUARE NUTS AND BOLT HEADS

American Bridge Company Standard

Weight in Pounds for One Head and One Nut

Diameter of Bolt, Inches	1¼	1½	1¾	2	2½	3
Square Head and Nut.	2.05	3.51	5.48	8.08	15.5	26.2
Weight of Shank per Inch. . .	.3477	.5007	.6815	.8900	1.391	2.003

BOLTS WITH HEXAGON HEADS AND NUTS

American Bridge Company Standard

Weight in Pounds per 100 Bolts

Length Under Head, Inches	Diameter of Bolt, Inches ½	⅝	¾	⅞	1	Length Under Head, Inches	Diameter of Bolt, Inches ½	⅝	¾	⅞	1
1	19	33	52			8	58	92	137	194	264
1¼	20	34	54			8½	60	96	143	202	274
1½	22	36	57			9	63	100	149	210	285
1¾	23	38	60			9½	66	105	156	219	296
2	24	40	63	93	132	10	68	109	162	227	307
2¼	26	43	66	97	137	10½	71	114	168	236	318
2½	27	45	69	101	143	11	74	118	174	244	329
2¾	29	47	72	105	148	11½	77	122	181	253	341
3	30	49	75	109	154	12	80	127	187	261	352
3¼	31	51	78	114	160	12½	82	131	193	270	363
3½	33	54	82	118	165	13	85	135	199	278	374
3¾	34	56	85	122	171	13½	88	139	206	287	385
4	35	58	88	126	176	14	91	144	212	295	396
4¼	37	60	90	130	180	14½	93	148	218	304	407
4½	38	62	94	134	186	15	96	152	225	312	418
4¾	39	64	97	138	191	15½	99	157	231	321	430
5	41	66	100	143	197	16	102	161	237	329	441
5¼	42	68	103	147	202	16½	105	165	243	338	452
5½	44	71	106	151	208	17	107	170	250	346	463
5¾	45	73	109	156	213	17½	110	174	256	355	474
6	46	75	112	160	219	18	113	177	262	364	485
6¼	48	77	115	164	225	18½	116	183	268	372	496
6½	49	79	119	168	230	19	119	187	275	381	507
6¾	51	81	122	173	236	19½	121	191	281	389	519
7	52	84	125	177	241	20	124	196	287	398	530
7¼	53	86	128	181	247						
7½	55	88	131	185	252						
7¾	56	90	134	190	258						
Per Inch Additional	5.6	8.7	12.5	17.0	22.3	Per Inch Additional	5.6	8.7	12.5	17.0	22.3

HEXAGON NUTS AND BOLT HEADS

American Bridge Company Standard

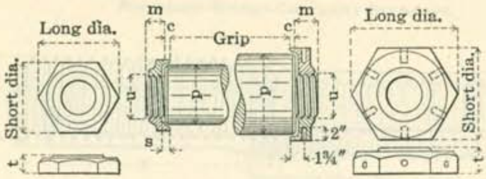
Weight in Pounds for One Head and One Nut

Diameter of Bolt, Inches	1¼	1½	1¾	2	2½	3
Hexagon Head and Nut....	1.73	2.95	4.61	6.79	13.0	22.0
Weight of Shank per Inch...	.3477	.5007	.6815	.8900	1.391	2.003

RECESSED PIN NUTS AND COTTER PINS

American Bridge Company Standard

Pressed Steel Nut PN 21 to 33



Cast Steel Nut PN 34 to 47

15/16″ Cored Holes

Thread: Shape, U. S. Standard. Pitch, 6 per Inch.

Diameter of Pin	PIN			NUT							
	Thread			Thickness	Diameter		Recess		Diameter Rough Hole	Weight, Pounds	Pattern No.
p	u	m	c	t	Short Dia.	Long Dia.	Rough Dia.	s			
2, 2¼	1½	1	⅛	⅞	3	3⅜	2⅝	¼	1¼	1	PN 21
2½, 2¾	2	1⅛	⅛	1	3⅝	4⅛	3⅛	¼	1¾	2	PN 22
3, *3¼, 3½	2½	1¼	⅛	1⅛	4⅜	5	3⅞	⅜	2¼	3	PN 23
*3¾, 4	3	1⅜	¼	1¼	4⅞	5⅝	4⅜	⅜	2¾	4	PN 24
*4¼, 4½, *4¾	3½	1½	¼	1⅜	5¾	6⅝	5¼	½	3¼	5	PN 25
5, *5¼	4	1⅝	¼	1½	6¼	7¼	5¾	½	3¾	6	PN 26
5½, *5¾, 6	4½	1¾	¼	1⅝	7	8⅛	6½	⅝	4¼	8	PN 27
*6¼, *6½	5	1⅞	⅜	1¾	7⅝	8⅞	7	⅝	4¾	10	PN 28
*6¾, 7	5½	2	⅜	1⅞	8⅛	9⅜	7½	¾	5¼	12	PN 29
*7¼, *7½	5½	2	⅜	1⅞	8⅝	10	8	¾	5¼	14	PN 30
*7¾, 8, *8¼	6	2¼	⅜	2⅛	9⅜	10⅞	8¾	¾	5¾	19	PN 31
*8½, *8¾, 9	6	2¼	⅜	2⅛	10¼	11⅞	9⅝	¾	5¾	24	PN 32
*9¼, *9½	6	2⅜	⅜	2¼	11¼	13	10⅝	¾	5¾	32	PN 33
*9¾, 10	6	2⅜	⅜	2¼	11¼	13	10⅝	¾	5¾	32	PN 33
11	6	2½	½	2⅞	12½	14⅜	11¾	¾	5¾	60	PN 34
12	6	2⅝	½	2⅞	13½	15⅝	12¾	¾	5¾	73	PN 35
13	7	2¾	½	2⅞	14½	16¾	13¾	¾	6¾	81	PN 36
14	7	3	½	2⅞	15½	17⅞	14¾	¾	6¾	94	PN 37
15	8	3	½	2⅞	16½	19	15¾	¾	7¾	103	PN 38
16	8	3⅛	½	3	17½	20⅛	16¾	¾	7¾	126	PN 39
17	9	3¼	½	3⅛	18½	21¼	17¾	¾	8¾	145	PN 40
18	9	3⅜	½	3¼	19½	22⅜	18¾	¾	8¾	173	PN 41
19	10	3½	½	3⅜	20½	23½	19¾	¾	9¾	196	PN 42
20	10	3½	½	3⅜	21½	24¾	20¾	¾	9¾	222	PN 43
21	11	3½	½	3⅜	22½	26	21¾	¾	10¾	240	PN 44
22	11	3½	½	3⅜	23½	27⅛	22¾	¾	10¾	266	PN 45
23	12	3½	½	3⅜	24½	28¼	23¾	¾	11¾	282	PN 46
24	12	3½	½	3⅜	25½	29⅜	24¾	¾	11¾	310	PN 47

* Special sizes.

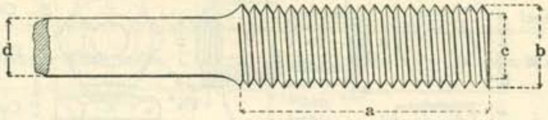
Horizontal or Vertical Cotter Pin Finished.

Horizontal Cotter Pin Over 2″ Finished.

PIN	HEAD	COTTER		PIN	HEAD	COTTER	
p	h	c	d	p	h	c	d
1¼	1½	2	¼	2¾	3⅛	4	⅜
1½	1¾	2½	¼	3	3½	5	½
1¾	2	2¾	¼	3¼	3¾	5	½
2	2⅜	3	⅜	3½	4	6	½
2¼	2⅝	3¼	⅜	3¾	4¼	6	½
2½	2⅞	3¾	⅜				

UPSET SCREW ENDS FOR SQUARE BARS

American Bridge Company Standard



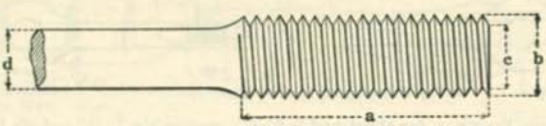
Thread: Shape and Pitch, U. S. Standard.

BAR			UPSET					
Side of Square d, Inches	Area, Sq. Inches	Weight per Foot, Lbs.	Diameter b, Inches	Length a, Inches	Additional Length for Upset + 10%, Inches	Diameter at Root of Thread c, Inches	Area At Root of Thread, Sq. Inches	Area Excess Over Area of Bar, %
* ¾	0.563	1.91	1⅛	4	4	0.939	0.693	23.2
* ⅞	0.766	2.60	1¼	4	4	1.064	0.890	16.2
1	1.000	3.40	1½	4	4	1.283	1.294	29.4
1⅛	1.266	4.30	1⅝	4	3½	1.389	1.515	19.7
1¼	1.563	5.31	1⅞	4½	4½	1.615	2.049	31.1
1⅜	1.891	6.43	2	4½	4	1.711	2.300	21.7
1½	2.250	7.65	2¼	5	5	1.961	3.021	34.3
1⅝	2.641	8.98	2⅜	5	4½	2.086	3.419	29.5
1¾	3.063	10.41	2½	5½	4½	2.175	3.716	21.3
1⅞	3.516	11.95	2¾	5½	5	2.425	4.619	31.4
2	4.000	13.60	2⅞	6	5	2.550	5.108	27.7
2⅛	4.516	15.35	3	6	4½	2.629	5.428	20.2
2¼	5.063	17.21	3¼	6½	5½	2.879	6.509	28.6
2⅜	5.641	19.18	3½	7	6½	3.100	7.549	33.8
2½	6.250	21.25	3¾	7	7	3.317	8.641	38.3
2⅝	6.891	23.43	3¾	7	5½	3.317	8.641	25.4
2¾	7.563	25.71	4	7½	6½	3.567	9.993	32.1
2⅞	8.266	28.10	4¼	8	7½	3.798	11.330	37.1
3	9.000	30.60	4¼	8	6	3.798	11.330	25.9
3⅛	9.766	33.20	4½	8½	7	4.028	12.741	30.5
3¼	10.563	35.91	4¾	8½	7½	4.255	14.221	34.6

*Upsets are special.

UPSET SCREW ENDS FOR ROUND BARS

American Bridge Company Standard



Thread: Shape and Pitch, U. S. Standard.

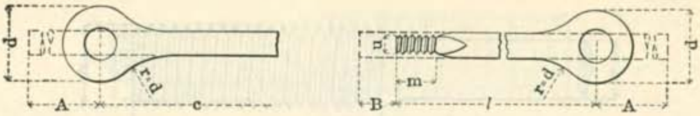
BAR			UPSET					
							Area	
Diameter d, Inches	Area, Sq. Inches	Weight per Foot, Lbs.	Diameter b, Inches	Length a, Inches	Additional Length for Upset + 10%, Inches	Diameter at Root of Thread c, Inches	At Root of Thread, Sq. Inches	Excess Over Area of Bar, %
* ¾	0.442	1.50	1	4	5	0.838	0.551	24.7
* ⅞	0.601	2.04	1¼	4	5½	1.064	0.890	48.0
1	0.785	2.67	1⅜	4	4	1.158	1.054	34.2
1⅛	0.994	3.38	1½	4	4	1.283	1.294	30.2
1¼	1.227	4.17	1⅝	4	4	1.389	1.515	23.5
1⅜	1.485	5.05	1¾	4	4	1.490	1.744	17.5
1½	1.767	6.01	2	4½	4½	1.711	2.300	30.2
1⅝	2.074	7.05	2⅛	4½	4	1.836	2.649	27.7
1¾	2.405	8.18	2¼	5	4	1.961	3.021	25.6
1⅞	2.761	9.39	2⅜	5	4	2.086	3.419	23.8
2	3.142	10.68	2½	5½	4	2.175	3.716	18.3
2⅛	3.547	12.06	2⅝	5½	3½	2.300	4.156	17.2
2¼	3.976	13.52	2⅞	6	4½	2.550	5.108	28.4
2⅜	4.430	15.06	3	6	4½	2.629	5.428	22.5
2½	4.909	16.69	3¼	6½	5½	2.879	6.509	32.6
2⅝	5.412	18.40	3¼	6½	4½	2.879	6.509	20.3
2¾	5.940	20.19	3½	7	5½	3.100	7.549	27.1
2⅞	6.492	22.07	3¾	7	6	3.317	8.641	33.1
3	7.069	24.03	3¾	7	5	3.317	8.641	22.2
3⅛	7.670	26.08	4	7½	6	3.567	9.993	30.3
3¼	8.296	28.21	4	7½	5	3.567	9.993	20.5
3⅜	8.946	30.42	4¼	8	5½	3.798	11.330	26.6
3½	9.621	32.71	4¼	8	5	3.798	11.330	17.8
3⅝	10.321	35.09	4½	8½	5½	4.028	12.741	23.4
3¾	11.045	37.55	4¾	8½	6	4.255	14.221	28.8
3⅞	11.793	40.10	4¾	8½	5½	4.255	14.221	20.6

*Upsets are special.

EYE BARS

American Bridge Company Standard

Ordinary Eye Bar **Adjustable Eye Bar**



Minimum length, l, for short end is 6′–6″, preferably 7′–0″.—Left thread.

Thread: Shape and Pitch, U. S. Standard.

HEADS FOR ALL BARS

Size of Bar Width In.	Thickness Max. In.	Thickness Min. In.	Head Dia. d In.	Head Max. Pin In.	Head Excess Head over Bar %	Add. Material A Ft. In.
2	1	½	4½	1¾	37.5	10½
			5½	2¾		1- 2½
			*6½	3¾		1- 7½
2½	1	⅝	6	2½	40.0	1- 1¾
			7	3½		1- 5¾
			*8	4½		1-10¾
3	1½	⅝	7½	3¼	41.7	1- 4½
			8½	4¼		1- 9½
			*9½	5¼		2- 2½
4	1¾	¾	10	4½	37.5	1- 9
		⅞	11	5½		2- 3
		1	*12	6½		2- 8
5	2	¾	12	5¼	35.0	1-10½
		1	13½	6¾		2- 6
		1	*15	8¼		3- 3
6	2	¾	14	5¾	37.5	2- 1
		1	14¾	6½		2- 4
		1	*16½	8¼		3- 2
7	2	1	16½	7	35.7	2- 6½
		1⅛	17½	8		2-11
		1⅛	*18½	9		3- 4
8	2	1	18	7	37.5	2- 5½
		1⅛	19	8		2- 9½
		1¼	*20	9		3- 4
9	2	1⅛	20	7½	38.9	2- 8½
		1¼	22	9½		3- 4½
10	2	1⅛	22½	9	35.0	3- 2½
		1¼	24	10½		3- 9
		1⅜	*25	11½		4- 1
12	2	1¼	26½	10	37.5	3- 6
		1⅜	28	11½		4- 2
		1½	*29½	13		4- 8
14	2	1⅜	31	12	35.7	4- 3
		1½	33	14		4-10
		1⅝	*34	15		5- 5
16	2	1¾	36	14	37.5	4- 9
		1⅞	*37½	16	34.4	5- 4

SCREW ENDS FOR ADJUSTABLE BARS

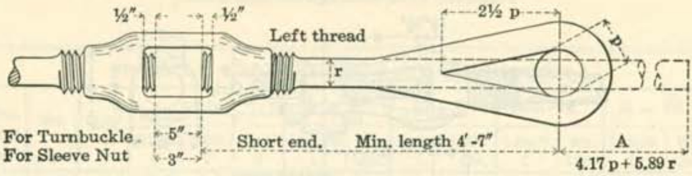
Size of Bar Width In.	Size of Bar Min. Thickness In.	Size of Bar Area In.²	Upset End Diam. u In.	Upset End Length m In.	Upset End Thds. per Inch	At Root of Thread Diam. In.	At Root of Thread Area In.²	At Root of Thread Excess Head over Bar %	Add. Material A Ft. In.
2	*⅝	1.25	1¾	4	5	1.49	1.74	39.6	1- 0
	¾	1.50	1⅞	4½	5	1.62	2.05	38.6	1- 0
	⅞	1.75	2	4½	4½	1.71	2.30	31.4	11
2½	*¾	1.88	2⅛	4½	4½	1.84	2.65	41.2	1- 0
	⅞	2.19	2¼	5	4½	1.96	3.02	38.1	1- 0
	1	2.50	2⅜	5	4	2.09	3.42	36.7	1- 0
3	*¾	2.25	2¼	5	4½	1.96	3.02	34.3	1- 0
	⅞	2.63	2½	5½	4	2.18	3.72	41.6	1- 1
	1	3.00	2½	5½	4	2.18	3.72	23.9	1- 1
4	*¾	3.00	2½	5½	4	2.18	3.72	23.9	1- 1
	⅞	3.50	2¾	5½	4	2.43	4.62	32.0	11
	1	4.00	3	6	3½	2.63	5.43	35.7	1- 1
	1⅛	4.50	3¼	6½	3½	2.88	6.51	44.6	1- 2
5	*¾	3.75	2⅞	6	3½	2.55	5.11	36.2	1- 0
	⅞	4.38	3	6	3½	2.63	5.43	24.1	11
	1	5.00	3¼	6½	3½	2.88	6.51	30.2	1- 0
	1⅛	5.63	3½	7	3¼	3.10	7.55	34.2	1- 1
	1¼	6.25	3¾	7	3	3.32	8.64	38.3	1- 2
6	*1	6.00	3½	7	3¼	3.10	7.55	25.8	1- 0
	1⅛	6.75	3¾	7	3	3.32	8.64	28.0	1- 0
	1¼	7.50	4	7½	3	3.57	9.99	33.2	1- 1
	1⅜	8.25	4¼	8	2⅞	3.80	11.3	37.3	1- 2
7	*1⅛	7.88	4	7½	3	3.57	9.99	26.9	1- 0
	1¼	8.75	4¼	8	2⅞	3.80	11.3	29.5	1- 1
	1⅜	9.63	4½	8½	2¾	4.03	12.7	32.4	1- 2
	1½	10.5	4¾	8½	2⅝	4.26	14.2	35.4	1- 2
8	*1⅛	9.0	4¼	8	2⅞	3.80	11.3	25.9	1- 0
	1¼	10.0	4½	8½	2¾	4.03	12.7	27.4	1- 1
	1⅜	11.0	4¾	8½	2⅝	4.26	14.2	29.3	1- 1
	1½	12.0	5	9	2½	4.48	15.8	31.4	1- 2
	1⅝	13.0	5¼	9½	2½	4.73	17.6	35.2	1- 3
9	*1⅜	12.4	5	9¼	2½	4.48	15.8	28.3	1- 2
	1½	13.5	5¼	9¼	2½	4.73	17.6	30.2	1- 1
	1⅝	14.6	5½	9¾	2⅜	4.95	19.3	31.7	1- 1
10	*1⅜	13.8	5¼	9¼	2½	4.73	17.6	27.8	1- 1
	1½	15.0	5½	9¾	2⅜	4.95	19.3	28.9	1- 1
	1⅝	16.3	5¾	10	2⅜	5.20	21.3	30.8	1- 1
12	*1½	18.0	6	10½	2¼	5.42	23.1	28.3	1- 1
	1⅝	19.5	6¼	10¾	2¼	5.73	25.8	29.6	1- 1
	1¾	21.0	6½	11	2⅛	5.89	27.3	29.7	1- 1

NOTE—For Bars 14″ x 1¾″ (and thicker) with 33″ head add material "A" = 4′-5½″.
Pin holes to be deducted in estimating weight.

*Bars are special.

LOOP RODS AND STUB ENDS

American Bridge Company Standard



Thread: Shape and Pitch, U. S. Standard.

Length A for One Loop in Feet and Inches

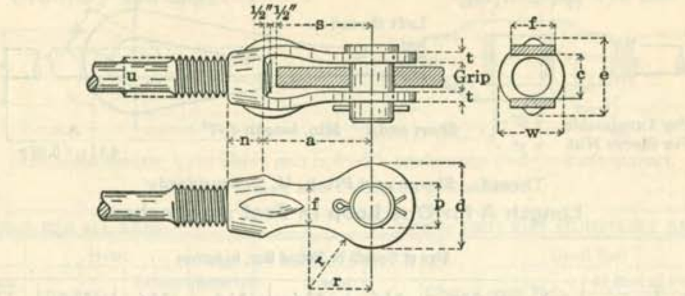
Diam. of Pin, p	Size of Square or Round Bar, in Inches										
	¾	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2
1⅛	0- 9½	0-10	0-11	0-11½							
1¼	0-10	0-10½	0-11½	1- 0	1- 1						
1½	0-11	0-11½	1- 0½	1- 1	1- 2	1- 2½					
1¾	1- 0	1- 0½	1- 1½	1- 2	1- 3	1- 3½	1- 4½	1- 5	1- 6		
2	1- 1	1- 1½	1- 2½	1- 3	1- 4	1- 4½	1- 5½	1- 6	1- 7	1- 7½	1- 8½
2¼	1- 2	1- 3	1- 3½	1- 4½	1- 5	1- 5½	1- 6½	1- 7	1- 8	1- 8½	1- 9½
2½	1- 3	1- 4	1- 4½	1- 5½	1- 6	1- 7	1- 7½	1- 8	1- 9	1- 9½	1-10½
2¾	1- 4	1- 5	1- 5½	1- 6½	1- 7	1- 8	1- 8½	1- 9½	1-10	1-11	1-11½
3	1- 5	1- 6	1- 6½	1- 7½	1- 8	1- 9	1- 9½	1-10½	1-11	2- 0	2- 0½
*3¼	1- 6	1- 7	1- 7½	1- 8½	1- 9	1-10	1-10½	1-11½	2- 0	2- 1	2- 1½
3½	1- 7½	1- 8	1- 8½	1- 9½	1-10	1-11	1-11½	2- 0½	2- 1	2- 2	2- 2½
*3¾	1- 8½	1- 9	1-10	1-10½	1-11	2- 0	2- 0½	2- 1½	2- 2	2- 3	2- 3½
4	1- 9½	1-10	1-11	1-11½	2- 0½	2- 1	2- 2	2- 2½	2- 3	2- 4	2- 4½
*4¼		1-11	2- 0	2- 0½	2- 1½	2- 2	2- 3	2- 3½	2- 4½	2- 5	2- 6
4½		2- 0	2- 1	2- 1½	2- 2½	2- 3	2- 4	2- 4½	2- 5½	2- 6	2- 7
*4¾		2- 1	2- 2	2- 2½	2- 3½	2- 4	2- 5	2- 5½	2- 6½	2- 7	2- 8
5		2- 2½	2- 3	2- 3½	2- 4½	2- 5	2- 6	2- 6½	2- 7½	2- 8	2- 9
*5¼			2- 4	2- 5	2- 5½	2- 6	2- 7	2- 7½	2- 8½	2- 9	2-10
5½			2- 5	2- 6	2- 6½	2- 7½	2- 8	2- 9	2- 9½	2-10	2-11
*5¾			2- 6	2- 7	2- 7½	2- 8½	2- 9	2-10	2-10½	2-11½	3- 0
6			2- 7	2- 8	2- 8½	2- 9½	2-10	2-11	2-11½	3- 0½	3- 1
*6¼				2- 9	2- 9½	2-10½	2-11	3- 0	3- 0½	3- 1½	3- 2
6½				2-10	2-10½	2-11½	3- 0	3- 1	3- 1½	3- 2½	3- 3
*6¾				2-11	3- 0	3- 0½	3- 1	3- 2	3- 2½	3- 3½	3- 4
7				3- 0	3- 1	3- 1½	3- 2½	3- 3	3- 3½	3- 4½	3- 5

*Pins are special. Maximum shipping length of long end=35 feet.

Dia. of Round	¾		⅞	1	1⅛	1¼	1⅜		1½	1⅝	1¾	1⅞	2
Side of Square		¾	⅞		1	1⅛		1¼	1⅜		1½	1⅝	1¾
Dia. of Upset, u	1	1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2⅜	2½
Length of Upset, m	4	4	4	4	4	4	4	4½	4½	4½	5	5	5½
Length, l	9½	9½	10	10½	10½	11	11½	11½	11½	11½	12	12½	13

CLEVISES

American Bridge Company Standard



Grip=thickness of plate + ¼" but must not exceed dimension, c.

Thread: Shape and Pitch, U. S. Standard.

Clevis Number	UPSET Min.	UPSET Max.	PIN Min.	PIN Max.	HEAD			FORK				NUT			Weight, Pounds
	u	u	p	p	d	t	r	f	s	c	a	n	w	e	
3	1	1⅛	1	1½	3	½	2¼	1½	4	1¼	5	1½	2¼	3$\frac{1}{16}$	4
4	1⅛	1⅝	1¼	2	4	½	3	2	5	1¾	6	1¾	2⅞	3⅝	8
5	1½	2⅛	1½	2½	5	⅝	3¾	2½	6	2¼	7	2¼	3¾	4½	17
6	2	2⅝	2	3	6	¾	4½	3	7	2¾	8	2½	4⅜	5⅜	26
7	2¼	3	2½	3½	7	⅞	5¼	3½	8	3¼	9	3	5	6$\frac{3}{16}$	40

CLEVIS NUMBERS FOR VARIOUS RODS AND PINS

RODS Round	RODS Square	RODS Upset	PINS 1	1¼	1½	1¾	2	2¼	2½	2¾	3	3¼	3½
¾	......	1	3	3	3								
......	¾	1⅛	3	3	3	4	4						
⅞	⅞	1¼		4	4	4	4						
1	......	1⅜		4	4	4	4						
1⅛	1	1½		4	4	4	4	5	5				
1¼	1⅛	1⅝		4	4	4	4	5	5				
1⅜	......	1¾			5	5	5	5	5				
......	1¼	1⅞			5	5	5	5	5				
1½	1⅜	2			5	5	5	5	5	6	6		
1⅝	......	2⅛			5	5	5	5	5	6	6		
1¾	1½	2¼					6	6	6	6	6	7	7
1⅞	1⅝	2⅜					6	6	6	6	6	7	7
2	1¾	2½					6	6	6	6	6	7	7
2⅛	......	2⅝					6	6	6	6	6	7	7
......	1⅞	2¾							7	7	7	7	7
2¼	2	2⅞							7	7	7	7	7
2⅜	2⅛	3							7	7	7	7	7

Clevises above and to right of zigzag line may be used with forks straight, clevises below and to left of this line should have forks closed so as not to overstrain pin.

TURNBUCKLES AND SLEEVE NUTS

American Bridge Company Standard

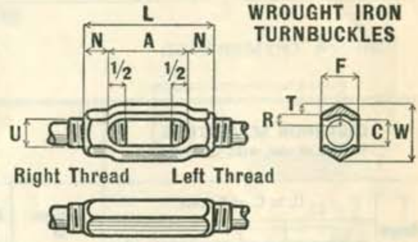
Threads U. S. Standard. Short end of rod to have left hand thread.

	Diam. of Screw U	Max. Width W	Nut N	Clear C	STRAP Width F	STRAP Thick. T	STRAP Rad. R	A = 6″ Length L	A = 6″ Wt. Lbs.	A = 9″ Length L	A = 9″ Wt. Lbs.	A = 12″ Length L	A = 12″ Wt. Lbs.	A = 18″ Length L	A = 18″ Wt. Lbs.	A = 24″ Length L	A = 24″ Wt. Lbs.
WROUGHT IRON	1″	2 5/16″	1 1/2″	1″	1 3/8″	1/2″	1/2″	9″	2.6	...	...	15″	4.3	21″	6.3	27″	8.3
	1 1/8	2 5/8	1 11/16	1 1/8	1 1/2	1/2	1/2	9 3/8	3.0	...	...	15 3/8	5.1	21 3/8	7.3	27 3/8	9.1
	1 1/4	2 3/4	1 7/8	1 1/4	1 5/8	9/16	9/16	9 3/4	3.6	...	...	15 3/4	5.6	21 3/4	7.9	27 3/4	10.3
	1 3/8	3	2 1/16	1 3/8	1 7/8	5/8	5/8	10 1/8	4.5	...	...	...	...	...	...	...	...
	1 1/2	3 7/16	2 1/4	1 1/2	2	5/8	11/16	10 1/2	6.3	...	...	16 1/2	10.0	22 1/2	13.6	28 1/2	17.5
	1 5/8	3 9/16	2 7/16	1 5/8	2 3/16	11/16	3/4	10 7/8	6.9	...	...	...	...	...	...	...	...
	1 3/4	3 7/8	2 5/8	1 3/4	2 1/4	3/4	3/4	11 1/4	8.6	...	...	...	...	23 1/4	20.0	29 1/4	26.9
	2	4 3/4	3	2	3	15/16	7/8	12	16.5	...	...	...	...	...	...	30	44.5
	2 1/4	5 3/8	3 3/8	2 1/4	3 1/4	1	1	12 3/4	20.8	...	...	...	...	...	...	30 3/4	54.0
	2 1/2	5 7/8	3 3/4	2 1/2	3 11/16	1 3/16	1 1/8	13 1/2	28.3	...	...	...	...	...	...	31 1/2	67.0
	2 3/4	6 1/8	4 1/8	2 3/4	4	1 1/4	1 1/4	14 1/4	41.0	17 1/4″	42.8	...	...	...	...	...	...
	3	6 1/8	4 1/2	3	4	1 1/4	1 3/8	15	41.0	18	39.8	...	...	...	...	...	...

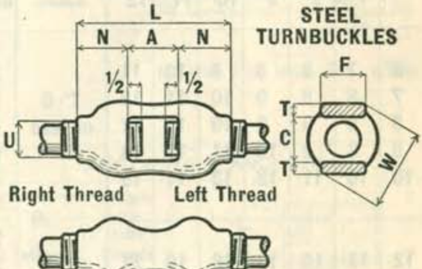
	Diam. of Screw U	Max. Width W	Nut N	Clear C	STRAP Width F	STRAP Thick. T	Length L	Wt. in Lbs.	
PRESSED STEEL	3 1/4″	7″	4 7/8″	3 3/4″	4″	1 1/8″	15 3/4″	55	A = 6″
	3 1/2	7 1/2	5 1/4	3 7/8	4 1/2	1 3/16	16 1/2	61	
	3 3/4	8 3/8	5 5/8	4 1/8	5 1/4	1 1/4	17 1/4	98	
	4	9 3/8	6	4 5/8	6	1 3/8	18	118	
	4 1/4	10 1/8	6 1/4	5	6 1/2	1 1/2	21 1/2	158	A = 9″
	4 1/2	10 3/4	6 3/4	5 3/8	6 1/2	1 3/4	22 1/2	173	
	4 3/4	11 3/8	7 1/4	5 1/2	6 1/2	2	23 1/2	198	
	5	12	7 1/2	5 7/8	6 1/2	2 1/4	24	231	
CAST STEEL	3 1/4	7 3/4	4 7/8	3 7/8	4 1/4	1 3/8	15 3/4	62	A = 6″
	3 1/2	8 1/4	5 1/4	4 1/4	4 3/8	1 1/2	16 1/2	79	
	3 3/4	9	5 5/8	4 1/2	4 3/4	1 5/8	17 1/4	94	
	4	9 1/2	6	4 3/4	5 1/4	1 3/4	18	116	
	4 1/4	10 1/2	6 3/8	5 1/4	5 5/8	1 7/8	21 3/4	158	A = 9″
	4 1/2	11	6 3/4	5 1/2	6 1/8	1 7/8	22 1/2	173	
	4 3/4	11 1/2	7 1/8	5 3/4	6 1/2	2	23 1/4	198	
	5	12	7 1/2	6	7	2	24	231	
	5 1/4	12 1/2	7 7/8	6 1/4	7 3/8	2 1/8	24 3/4	264	
	5 1/2	13 1/4	8 1/4	6 1/2	7 3/4	2 1/4	25 1/2	301	
	5 3/4	13 3/4	8 5/8	6 3/4	8	2 3/8	26 1/4	344	
	6	14 1/2	9	7	8 1/4	2 5/8	27	400	
	6 1/4	15	9 3/8	7 1/4	8 1/2	2 3/4	27 3/4	487	
	6 1/2	15 1/2	9 3/4	7 1/2	8 3/4	2 7/8	28 1/2	583	

	Diam. of Screw U	Max. Width M	Nut N	Clear C	Short Diam. S	Thick. T	Length L	Wt. in Lbs.
SLEEVE NUTS	4″	7 1/8″	4 1/2″	4 1/4″	6 1/8″	15/16″	13″	63
	4 1/4	7 1/2	4 3/4	4 1/2	6 1/2	1	13 1/2	73
	4 1/2	8	5	4 3/4	6 7/8	1 1/16	14	84
	4 3/4	8 3/8	5 1/4	5	7 1/4	1 1/8	14 1/2	98
	5	8 7/8	5 1/2	5 1/4	7 5/8	1 3/16	15	110
	5 1/4	9 1/4	5 3/4	5 1/2	8	1 1/4	15 1/2	122
	5 1/2	9 3/4	6	5 3/4	8 3/8	1 5/16	16	142
	5 3/4	10 1/8	6 1/4	6	8 3/4	1 3/8	16 1/2	157
	6	10 5/8	6 1/2	6 1/4	9 1/8	1 7/16	17	176

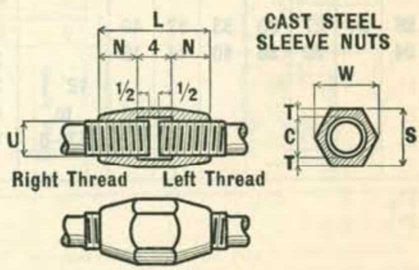
WROUGHT IRON TURNBUCKLES



STEEL TURNBUCKLES



CAST STEEL SLEEVE NUTS

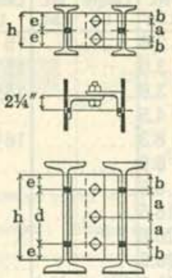


BEAM SEPARATORS

American Bridge Company Standard

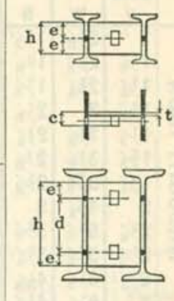
ANGLE SEPARATORS

Beams	d	h	e	a	b
6″		4½	2¼	2¼	1⅛
7		5	2½	2½	1¼
8		5½	2¾	3	1¼
9		6½	3¼	3	1¾
10		7½	3¾	3	2¼
12	6	9	1½	3	1½
15	9	12	1½	4½	1½
15	9	11¼	1⅛	4½	1⅛
18	9	14	2½	4½	2½
20	12	16	2	6	2
24	12	20	4	6	4



CAST IRON SEPARATORS

Beams	d	h	e	c	t
6″		4½	2¼	2¼	½
7		5	2½	2¼	½
8		5½	2¾	2¼	½
9		6½	3¼	2¼	½
10		7½	3¾	2¼	½
12	6	9	1½	2¼	½
15	9	12	1½	2¼	½
18	9	14	2½	2⅜	⅝
20	12	16	2	2⅜	⅝
24	12	20	4	2⅜	⅝



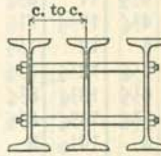
CAST IRON SEPARATORS
Weight of one, with ¾″ bolts

Beams	C. to C. of Beams 7″	8″	9″	10″	11″	12″
6″	7	8	9	9	10	11
7	8	8	9	10	11	12
8	8	9	9	10	11	12
9	8	9	10	11	12	13
10	10	11	12	13	14	15
12	13	15	16	18	19	21
15	16	17	19	21	23	25
18	22	24	27	29	32	34
20	24	27	30	33	37	40
24		32	36	40	44	48

PIPE SEPARATORS AND RODS
Total weight for Beam Girders and Grillages

Length of Beams	No. of Bms.	C. to C. of Beams 7″	8″	9″	10″	11″	12″
7′-0 or less	2	10	11	12	13	14	15
	3	17	19	21	23	25	27
	4	24	27	30	33	36	39
	5	31	35	39	43	47	51
7′-1 to 12′-0	2	15	17	18	20	21	23
	3	26	29	32	35	38	41
	4	36	41	45	50	54	59
	5	47	53	59	65	71	77
12′-1 to 17′-0	2	20	22	24	26	28	30
	3	34	38	42	46	50	54
	4	48	54	60	66	72	78
	5	62	70	78	86	94	102

1″ Pipe ¾″ Rods



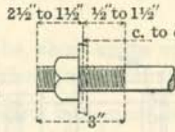
For beams 10″ or less, take one-half of the tabulated weight.

TIE RODS AND ANCHORS

American Bridge Company Standard

¾-INCH TIE RODS

Total Lengths of Tie Rods = C. to C. Lengths + 3 Inches

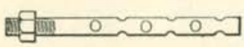


Total Weights, in Pounds, Two Square Nuts included

C. to C.	Weight	C. to C.	Weight	C. to C.	Weight	C. to C.	Weight	C. to C.	Weight	C. to C.	Weight
3'-0"	5.30	4'-0"	6.80	5'-0"	8.30	6'-0"	9.80	7'-0"	11.30	8'-0"	12.80
3'-3"	5.67	4'-3"	7.17	5'-3"	8.67	6'-3"	10.17	7'-3"	11.67	8'-3"	13.17
3'-6"	6.05	4'-6"	7.55	5'-6"	9.05	6'-6"	10.55	7'-6"	12.05	8'-6"	13.55
3'-9"	6.42	4'-9"	7.92	5'-9"	9.42	6'-9"	10.92	7'-9"	12.42	8'-9"	13.92

ANCHORS

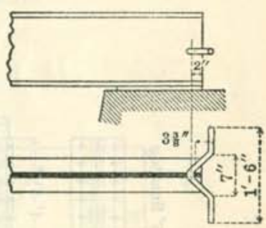
SWEDGE BOLT



Diameter	Length	Weight
Inches	Feet - Inches	Pounds
1	1-0	3.1
1¼	1-3	6.1
1½	1-3	8.9

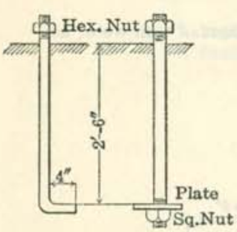
Weight includes Nut

GOVERNMENT ANCHOR



¾" Rod 1' 9" long. Wt., 3 lbs.

BUILT-IN ANCHOR BOLTS



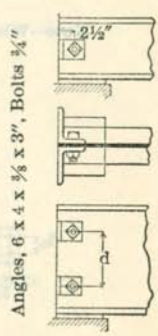
Anchors 2½" and Under

Anchors over 2½"

In general, Built-In Anchor Bolts should extend into the Masonry not less than 2'-6", and farther when necessary.

ANGLE WALL ANCHORS

Depth of Beam, Inches	D, Inches	Weight with Bolts, Pounds
10" and Under		7
12	6	
15	9	
18	9	14
20	12	
24	12	

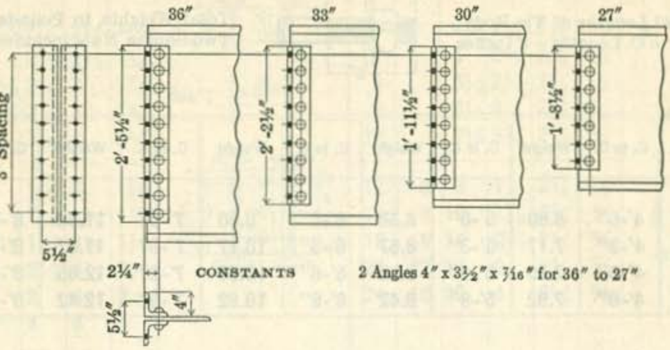


BEAM CONNECTIONS

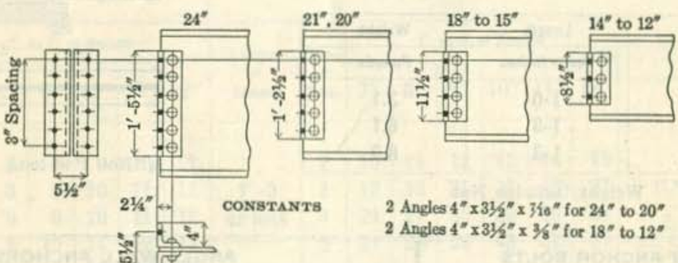
AMERICAN BRIDGE COMPANY STANDARD

SERIES A CONNECTIONS

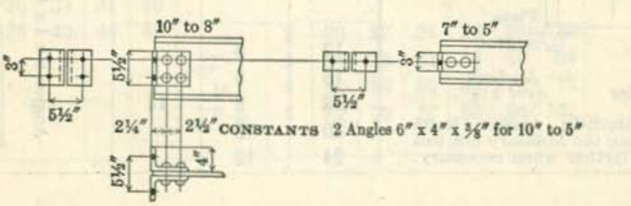
RIVETS ⅞"—HOLES 15/16"



Note—When additional web rivets are required, on account of thin webs, use series H connections.



Note—When additional web rivets are required, on account of thin webs, use series H connections.



BEAM CONNECTIONS

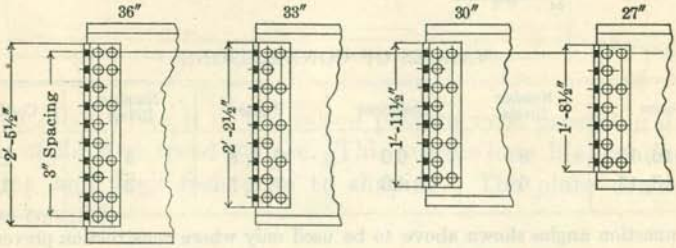
AMERICAN BRIDGE COMPANY STANDARD

SERIES H CONNECTIONS

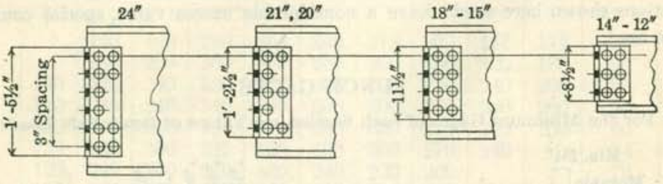
RIVETS ⅞"—HOLES 15/16"

To be used where thin webs, short spans or concentrated loads may require additional rivets. These angles are special and must be detailed.

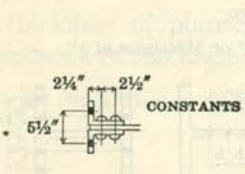
Value of rivets in outstanding legs must be investigated, single row with larger holes, or double rows in wider leg, may be used to develop required strength.

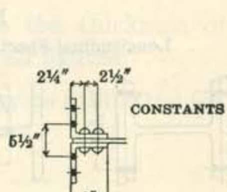


2 Angles 6" x 4" or 6" x 6" x 7/16" for 36" to 27"



2 Angles 6" x 4" or 6" x 6" x 7/16" for 24" to 20"
2 Angles 6" x 4" or 6" x 6" x ⅜" for 18" to 12"



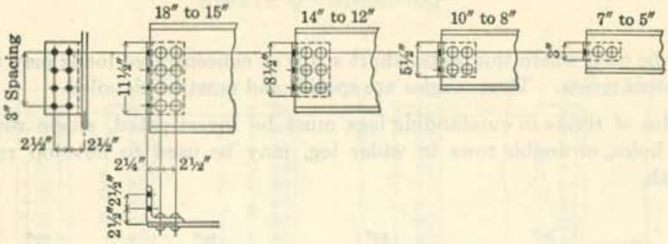


BEAM CONNECTIONS

AMERICAN BRIDGE COMPANY STANDARD

SPECIAL CONNECTION ANGLES

RIVETS $\frac{7}{8}$"—HOLES $\frac{15}{16}$"



VALUES OF CONNECTIONS

Beams	Number Rivets	Coefficient	Beams	Number Rivets	Coefficient
18, 16, 15	8	6.0	10, 9, 8	4	2.3
14, 13, 12	6	4.0	7, 6, 5	2	0.8

Connection angles shown above to be used only where construction prevents the use of double angles.

For beams over 18", avoid one-sided connections where practicable.

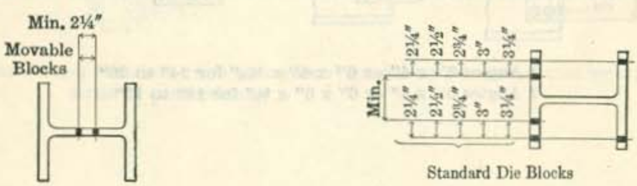
Value of connection is equal to coefficient given in table multiplied by value of one rivet or bolt.

Use value in whichever leg the value of rivet is the smaller.

Considering bearing value of metal connected, for large duplication where the connections shown here would have a considerable excess value, special connections may be used.

PUNCH GAGES

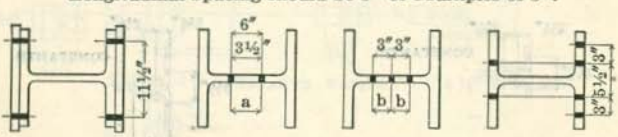
For the Minimum Gages of each Section see Tables of Beam Safe Loads.



Standard Die Blocks

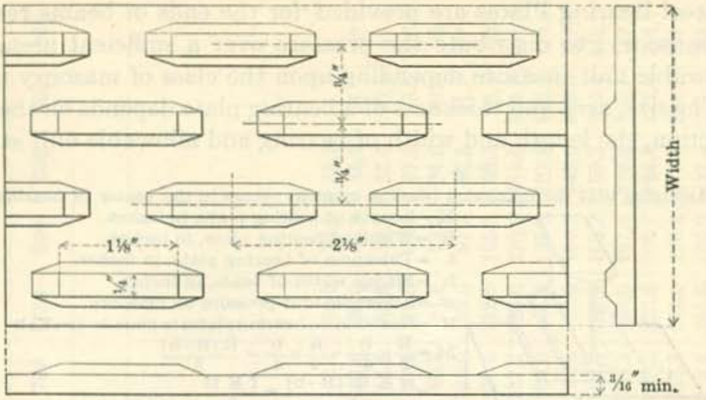
DRILL GAGES

Longitudinal Spacing should be 3" or Multiples of 3".



NOTE:—Maximum a and b as large as column will permit but variations from figures given should be avoided if possible

FLOOR PLATE—M 41



This Floor Plate is of the raised pattern type providing a maximum of flat-top tread surface. This insures long life, comfortable walking and high resistance to slipping. The plate drains and cleans readily.

It is recommended for floors, sidewalk openings, stair and traffic treads where a safe, secure foothold is required.

EXTREME DIMENSIONS OF FLOOR PLATE—Section M-41

Thickness, Inches	WIDTH AND LENGTH, INCHES										Max. Diam. Inches	Weight per Sq. Ft. Pounds
	Over 6 to 12	Over 12 to 24	Over 24 to 36	Over 36 to 48	Over 48 to 60	Over 60 to 66	Over 66 to 72	Over 72 to 78	Over 78 to 84	Over 84 to 90		
¾		120	180	280	264	240	218	200	187	174	90	31.7
⅝		180	200	300	300	260	260	240	220	180	90	26.6
½	120	240	240	320	360	300	300	270	240	200	90	21.5
7/16	120	240	240	340	360	300	300	270	240	200	90	19.0
⅜	120	240	300	340	360	300	300	270	240	200	90	16.4
5/16	120	240	300	320	360	300	300	270	240		84	13.9
¼	120	240	300	320	360	240	220	200			78	11.3
3/16	120	240	300	320	360	240	200	180			78	8.8

The long dimension of the raised figure is in the direction of rolling and the length of plate required should always correspond to this direction.

The thickness of plate furnished is the thickness of the flat plate exclusive of the height of the raised figures.

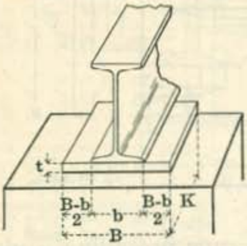
Inquiries for plates over ¾″ thick may be submitted for consideration.

BEARING PLATES

Steel Bearing Plates are provided for the ends of beams resting on masonry, to distribute the pressure over a sufficient area, the allowable unit pressure depending upon the class of masonry used.

The size, area and thickness of a bearing plate depends on the end reaction, the length and width of bearing and allowable unit stress.

Assuming that the maximum bending moment occurs in the center of bearing:



K = Length of bearing plate, in inches.
B = Width of bearing plate, in inches.
t = Thickness of bearing plate, in inches.
b = Flange width of beam, in inches.
w = Allowable unit pressure on masonry.
R = Reaction on bearing plates in pounds = w x K x B

$$M = \frac{R}{2} \times \frac{B}{4} - \frac{R}{2} \times \frac{b}{4} = \frac{R\,(B-b)}{8}$$

$$= \frac{w\,K\,B\,(B-b)}{8} = \frac{f\,K\,t^2}{6}$$

$$t = \sqrt{\frac{3\,w\,B\,(B-b)}{4\,f}}, \quad B\,(B-b) = \frac{4\,f\,t^2}{3\,w}$$

Taking moments at toe of beam flange, for cantilever projection $\frac{B-b}{2}$

$$M = \frac{w\,K(B-b)^2}{8} = \frac{f\,K\,t^2}{6} \qquad t = \tfrac{1}{2}\,(B-b)\sqrt{\frac{3\,w}{f}}$$

These formulas give lower values for M and t, and are applicable only when it can be assumed that middle part, b, of the plate is rigidly held in place, and that there are no bending stresses in center of plate.

Special Bearing Plates

Plates of special sizes may be computed from the foregoing formulas or from the Projection Coefficients, B(B-b), after the required surface of the bearing plate has been determined from the reaction of the beam and the allowable pressure on the masonry.

Example: Required a bearing plate with a wall bearing of 20 inches on masonry sustaining a safe unit pressure of 250 pounds per square inch, to distribute the end reaction of a 24″ x 100 lb. beam, supporting a uniformly distributed load over a span of 11 feet, beam and plates calculated for fiber stress of 18,000 pounds.

Reaction, R, of 24″ x 100 lb. beam, 11 ft. span = 107,800 pounds.
Area of Plate = Reaction ÷ Unit Pressure, 107,800 ÷ 250 = 431.2 sq. inches.
Dimensions of Bearing Plate: K = 22″, B = 20″, Area = 440 sq. inches.
Projection Coefficient: B (B-b), 20 (20–7.25) = 255.0.
Referring to table of Projection Coefficients: nearest value for unit pressure of 250 pounds and fiber stress of 18,000 pounds is 253.5, given for a 1⅝″-plate.

Exact value from formula:— $t = \sqrt{\frac{3\,w\,B\,(B-b)}{4\,f}}$

$$= \sqrt{\frac{3 \times 250 \times 20\,(20-7.25)}{4 \times 18{,}000}} = 1.63''.$$

PROJECTION COEFFICIENTS, B (B-b), FOR VARIOUS VALUES OF w AND t

Thickness Inches	Unit Pressure, w, in Pounds Per Square Inch																			
	100	150	200	250	300	350	400	450	500	550	600	625	650	700	750	800	850	900	950	1000
t	Fiber Stress 18,000 Pounds																			
3/8	33.8	22.5																		
1/2	60.0	40.0	30.0																	
5/8	93.8	62.5	46.9	37.5	31.3															
3/4	135.0	90.0	67.5	54.0	45.0	38.6	33.8													
7/8	183.8	122.5	91.9	73.5	61.3	52.5	45.9	40.8	36.8											
1	240.0	160.0	120.0	96.0	80.0	68.6	60.0	53.3	48.0	43.6	40.0	38.4	36.9							
1 1/8	303.8	202.5	151.9	121.5	101.3	86.8	75.9	67.5	60.8	55.2	50.6	48.6	46.7	43.4	40.5	38.0	35.7			
1 1/4	375.0	250.0	187.5	150.0	125.0	107.1	93.8	83.3	75.0	68.2	62.5	60.0	57.7	53.6	50.0	46.9	44.1	41.7	39.5	37.5
1 3/8	453.8	302.5	226.9	181.5	151.3	129.6	113.4	100.8	90.8	82.5	75.6	72.6	69.8	64.8	60.5	56.7	53.4	50.4	47.8	45.4
1 1/2		360.0	270.0	216.0	180.0	154.3	135.0	120.0	108.0	98.2	90.0	86.4	83.1	77.2	72.0	67.5	63.5	60.0	56.8	54.0
1 5/8		422.5	316.9	253.5	211.3	181.1	158.4	140.8	126.8	115.2	105.6	101.4	97.5	90.5	84.5	79.2	74.6	70.4	66.7	63.4
1 3/4		490.0	367.5	294.0	245.0	210.0	183.8	163.3	147.0	133.6	122.5	117.6	113.1	105.0	98.0	91.9	86.5	81.7	77.4	73.5
1 7/8			421.9	337.5	281.3	241.1	210.9	187.5	168.8	153.4	140.6	135.0	129.8	120.6	112.5	105.5	99.3	93.8	88.8	84.4
2			480.0	384.0	320.0	274.3	240.0	213.3	192.0	174.6	160.0	153.6	147.7	137.2	128.0	120.0	113.0	106.7	101.0	96.0
2 1/8				433.5	361.3	309.6	270.9	240.8	216.8	197.1	180.6	173.4	166.7	154.8	144.5	135.5	127.5	120.4	114.1	108.4
2 1/4				486.0	405.0	347.1	303.8	270.0	243.0	220.9	202.5	194.4	186.9	173.6	162.0	151.9	143.0	135.0	127.9	121.5
2 3/8					451.3	386.8	338.4	300.8	270.8	246.2	225.6	216.6	208.3	193.4	180.5	169.2	159.3	150.4	142.5	135.4
2 1/2					500.0	428.6	375.0	333.3	300.0	272.8	250.0	240.0	230.8	214.3	200.0	187.5	176.5	166.7	157.9	150.0
2 5/8						472.5	413.4	367.5	330.8	300.7	275.6	264.6	254.4	236.3	220.5	206.7	194.6	183.8	174.1	165.4
2 3/4							453.8	403.3	363.0	330.0	302.5	290.4	279.2	259.3	242.0	226.9	213.6	201.7	191.0	181.5
2 7/8							495.9	440.8	396.8	360.7	330.6	317.4	305.2	283.4	264.5	248.0	233.4	220.4	208.8	198.4
3								480.0	432.0	392.8	360.0	345.6	332.3	308.6	288.0	270.0	254.2	240.0	227.3	216.0

FLOOR PLATES

Flat Rectangular Plates

Rectangular steel plates, plain, checkered or indented, are frequently used in mill floor construction, supported by the floor beams on two sides or on all four sides and more or less securely fixed to the flanges of the supporting beams.

The resistance of rectangular plates to superimposed loads may be obtained from the formulas given below; the formulas given for plates supported on four sides apply generally to rectangular plates subjected to pressures normal to surface of plates.

M = Bending moment, due to uniform or concentrated load, inch-pounds.
f = Unit fiber stress, pounds per square inch.
w = Unit load, pounds per square inch.
a, b = Sides of plate, inches, ($a<b$) t = Thickness of plate, inches.
c = Perpendicular distance, from corner to diagonal, d, of plate, inches.
ϕ = Limiting values for steel plates, fixed and not fixed to supports (v. Bach).

When plates are fixed at edges in such a manner as to take full advantage of continuity, $\phi = \frac{9}{16}$ for uniformly distributed loads and $1\frac{1}{4}$ for loads concentrated in the center. When they are fixed at edges so that the full continuity effect cannot be safely assumed, ϕ must be increased in proportion as the degree of fixation is decreased. The maximum values of ϕ are $\frac{3}{4}$ and $1\frac{1}{2}$ respectively.

Plate supported on two sides, a—Uniformly distributed load.

$$M = \frac{w\,a\,b^2}{8} = f\,S \qquad S = \frac{a\,t^2}{6} \qquad f = \tfrac{3}{4}\,b^2\,\frac{w}{t^2}$$

Plate supported on four sides, a, b—Uniformly distributed load.

$$f = \phi\,\tfrac{1}{2}\,\frac{a^2\,b^2}{a^2+b^2}\,\frac{w}{t^2} \qquad f = \phi\,\tfrac{1}{2}\,c^2\,\frac{w}{t^2} \qquad \phi = \tfrac{9}{16} \text{ to } \tfrac{3}{4}$$

Plate supported on four sides, a, b—Concentrated load in center.

$$f = \phi\,\tfrac{3}{2}\,\frac{ab}{a^2+b^2}\,\frac{P}{t^2} \qquad f = \phi\,\tfrac{3}{2}\,\frac{c}{d}\,\frac{P}{t^2} \qquad \phi = 1\tfrac{1}{4} \text{ to } 1\tfrac{1}{2}$$

Buckle Plates

Buckle plates are generally used on highway bridges with paved floors, and may be subjected to concentrated live loads, due to the weight of truck wheels and to a uniform load due to the paving.

The resistance of buckle plates, when the buckle is turned up and in compression may be computed from the formulas (Winkler):

Total uniformly distributed load

$$W = 4\,f\,d\,t, \text{ pounds per buckle.}$$

Total concentrated load, in addition to uniform dead load.

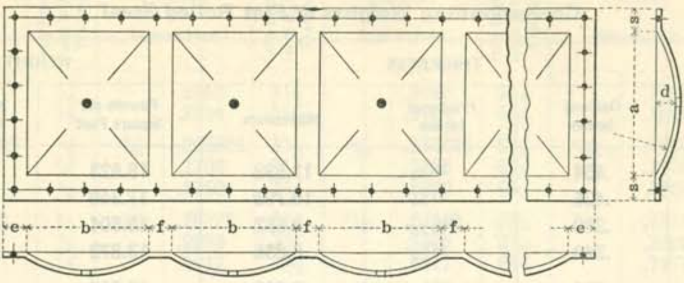
$$P = \frac{t\,(100\,f\,d\,t - 25.2\,w\,a\,b)}{6\,d + 15\,t}, \text{ pounds per buckle}$$

a, b = Sides. t = Thickness. d = Rise of Buckle, inches.
w = Unit load, pounds per sq. inch. f = Allowable fiber stress, 9,000 lbs. per sq. inch.

Buckle plates are generally placed with the convex side of the buckle turned down and in tension, in which case the strength of the buckle plates is about three times greater.

BUCKLE PLATES

American Bridge Company Standard



Size of Buckle, Inches			Die No.	Size of Buckle, Inches			Die No.	Size of Buckle, Inches			Die No.
a	b	d		a	b	d		a	b	d	
21	21	2½	39	36	36	2	13	45	37	3	6
				36	37	3	29	45	42	3	24
23½	24	2½	38					45	45	3	5
23½	28½	2½	36	37	36	3	28				
23½	47	2½	18	37	38	3	26	47	23½	2½	17
				37	45	3	7	47	42	3	4
24	23½	2½	37					47	54	3½	2
24	30	2½	30	38	37	3	27				
								48	48	3	34
26	44	2	12	41	42	3	23				
								51¼	61	4	16
28½	23½	2½	35	42	41	3	22				
				42	45	3	25	54	47	3½	1
30	24	2½	31	42	47	3	3				
30	30	2½	21	42	66	3½	32	61	51¼	4	15
30	33	2½	20					66	42	3½	33
				44	26	2	11				
32	44	2	10	44	32	2	9				
				44	44	2	8				
33	30	2½	19								
33	33	3	14								

MAXIMUM WIDTH=94″ for plates not over 12 ft. long. 71″ for plates not over 35 ft. long.
MAXIMUM LENGTH=35 ft. Plates of greater length can be obtained by splicing.
ALLOWABLE OVERRUN in length or width must be given on drawing, where clearance is close.

END FLANGES	e=2″ Minimum	18″ Maximum	
SIDE FLANGES	s=2″ Minimum	6½″ Maximum	4″ or less, preferred.
FILLETS	f=2″ Minimum	6″ Maximum	4″ or less, preferred.

END FLANGES to be made alike if possible. If over 18″, stiffen with angles across plate.

SIDE FLANGES to be made alike if possible. When side flanges must be of unequal width, the plate should be ordered wide enough to make two flanges of the greater width. After plate is buckled, it will be sheared to required width.

BUCKLES can be lengthwise or crosswise of plate, but different sizes should not be used in the same plate. Plates are buckled one buckle at a time, and the number of buckles is determined by size of buckles, fillets and end flanges, and by length of plate that can be fabricated.

A plate 35 ft. long could have:—14 buckles No. 11, b=2′-2″, with f=3½″ and e=5¼″ or 9 buckles No. 12, b=3′-8″, with f=2¼″ and e=3″.

CONNECTION HOLES are usually for ⅝″, ¾″ or ⅞″ rivets or bolts. Holes of different sizes in the same plate increase the cost. SPACING: Crosswise, usually 6″, with 4½″ Min. Lengthwise, from 6″ to 12″. Odd spaces at ends, in even ¼″.

DRAWING must show **Top View** of plate, give **Die Number**, and state whether buckles are turned **up** or **down**. When buckles are turned **down**, the drawing must show a **Drain Hole** in the center of each buckle.

BIRMINGHAM WIRE GAGE (B. W. G.)

Equivalents in Inches and Millimeters

Corresponding Weights of Flat Rolled Steel

Gage Number	THICKNESS			WEIGHT	
	Decimal Inches	Fractional Inches	Millimeters	Pounds per Square Foot	Kilograms per Square Meter
0000	.454	29/64	11.532	18.523	90.438
000	.425	27/64	10.795	17.340	84.661
00	.380	49/128	9.652	15.504	75.697
0	.340	11/32	8.636	13.872	67.729
1	.300	19/64	7.620	12.240	59.761
2	.284	9/32	7.214	11.587	56.573
3	.259	33/128	6.579	10.567	51.593
4	.238	15/64	6.045	9.710	47.410
5	.220	7/32	5.588	8.976	43.825
6	.203	13/64	5.156	8.282	40.438
7	.180	23/128	4.572	7.344	35.856
8	.165	21/128	4.191	6.731	32.868
9	.148	19/128	3.759	6.038	29.482
10	.134	17/128	3.404	5.467	26.693
11	.120	15/128	3.048	4.896	23.904
12	.109	7/64	2.769	4.447	21.713
13	.095	3/32	2.413	3.876	18.924
14	.083	21/256	2.108	3.386	16.534
15	.072	37/512	1.829	2.938	14.343
16	.065	33/512	1.651	2.652	12.948
17	.058	15/256	1.473	2.366	11.554
18	.049	25/512	1.245	1.999	9.761
19	.042	11/256	1.067	1.714	8.366
20	.035	9/256	.889	1.428	6.972
21	.032	1/32	.813	1.306	6.374
22	.028	7/256	.711	1.142	5.578
23	.025	13/512	.635	1.020	4.980
24	.022	11/512	.559	0.898	4.382
25	.020	5/256	.508	0.816	3.984
26	.018	9/512	.457	0.734	3.586
27	.016	1/64	.406	0.653	3.187
28	.014	7/512	.356	0.571	2.789
29	.013	13/1024	.330	0.530	2.590
30	.012	3/256	.305	0.490	2.390
31	.010	5/512	.254	0.408	1.992
32	.009	9/1024	.229	0.367	1.793
33	.008	1/128	.203	0.326	1.594
34	.007	7/1024	.178	0.286	1.394
35	.005	5/1024	.127	0.204	0.996
36	.004	1/256	.102	0.163	0.797

Unless otherwise specified, all orders for flat rolled steel in gages will be executed to Birmingham Wire Gage.

DECIMAL OF AN INCH AND OF A FOOT

Fractions of Inch or Foot		Inch Equivalents to Foot Fractions	Fractions of Inch or Foot		Inch Equivalents to Foot Fractions	Fractions of Inch or Foot		Inch Equivalents to Foot Fractions	Fractions of Inch or Foot		Inch Equivalents to Foot Fractions
	.0052	1/16		.2552	3 1/16		.5052	6 1/16		.7552	9 1/16
	.0104	1/8		.2604	3 1/8		.5104	6 1/8		.7604	9 1/8
1/64	.015625	3/16	17/64	.265625	3 3/16	33/64	.515625	6 3/16	49/64	.765625	9 3/16
	.0208	1/4		.2708	3 1/4		.5208	6 1/4		.7708	9 1/4
	.0260	5/16		.2760	3 5/16		.5260	6 5/16		.7760	9 5/16
1/32	.03125	3/8	9/32	.28125	3 3/8	17/32	.53125	6 3/8	25/32	.78125	9 3/8
	.0365	7/16		.2865	3 7/16		.5365	6 7/16		.7865	9 7/16
	.0417	1/2		.2917	3 1/2		.5417	6 1/2		.7917	9 1/2
3/64	.046875	9/16	19/64	.296875	3 9/16	35/64	.546875	6 9/16	51/64	.796875	9 9/16
	.0521	5/8		.3021	3 5/8		.5521	6 5/8		.8021	9 5/8
	.0573	11/16		.3073	3 11/16		.5573	6 11/16		.8073	9 11/16
1/16	.0625	3/4	5/16	.3125	3 3/4	9/16	.5625	6 3/4	13/16	.8125	9 3/4
	.0677	13/16		.3177	3 13/16		.5677	6 13/16		.8177	9 13/16
	.0729	7/8		.3229	3 7/8		.5729	6 7/8		.8229	9 7/8
5/64	.078125	15/16	21/64	.328125	3 15/16	37/64	.578125	6 15/16	53/64	.828125	9 15/16
	.0833	1		.3333	4		.5833	7		.8333	10
	.0885	1 1/16		.3385	4 1/16		.5885	7 1/16		.8385	10 1/16
3/32	.09375	1 1/8	11/32	.34375	4 1/8	19/32	.59375	7 1/8	27/32	.84375	10 1/8
	.0990	1 3/16		.3490	4 3/16		.5990	7 3/16		.8490	10 3/16
	.1042	1 1/4		.3542	4 1/4		.6042	7 1/4		.8542	10 1/4
7/64	.109375	1 5/16	23/64	.359375	4 5/16	39/64	.609375	7 5/16	55/64	.859375	10 5/16
	.1146	1 3/8		.3646	4 3/8		.6146	7 3/8		.8646	10 3/8
	.1198	1 7/16		.3698	4 7/16		.6198	7 7/16		.8698	10 7/16
1/8	.1250	1 1/2	3/8	.3750	4 1/2	5/8	.6250	7 1/2	7/8	.8750	10 1/2
	.1302	1 9/16		.3802	4 9/16		.6302	7 9/16		.8802	10 9/16
	.1354	1 5/8		.3854	4 5/8		.6354	7 5/8		.8854	10 5/8
9/64	.140625	1 11/16	25/64	.390625	4 11/16	41/64	.640625	7 11/16	57/64	.890625	10 11/16
	.1458	1 3/4		.3958	4 3/4		.6458	7 3/4		.8958	10 3/4
	.1510	1 13/16		.4010	4 13/16		.6510	7 13/16		.9010	10 13/16
5/32	.15625	1 7/8	13/32	.40625	4 7/8	21/32	.65625	7 7/8	29/32	.90625	10 7/8
	.1615	1 15/16		.4115	4 15/16		.6615	7 15/16		.9115	10 15/16
	.1667	2		.4167	5		.6667	8		.9167	11
11/64	.171875	2 1/16	27/64	.421875	5 1/16	43/64	.671875	8 1/16	59/64	.921875	11 1/16
	.1771	2 1/8		.4271	5 1/8		.6771	8 1/8		.9271	11 1/8
	.1823	2 3/16		.4323	5 3/16		.6823	8 3/16		.9323	11 3/16
3/16	.1875	2 1/4	7/16	.4375	5 1/4	11/16	.6875	8 1/4	15/16	.9375	11 1/4
	.1927	2 5/16		.4427	5 5/16		.6927	8 5/16		.9427	11 5/16
	.1979	2 3/8		.4479	5 3/8		.6979	8 3/8		.9479	11 3/8
13/64	.203125	2 7/16	29/64	.453125	5 7/16	45/64	.703125	8 7/16	61/64	.953125	11 7/16
	.2083	2 1/2		.4583	5 1/2		.7083	8 1/2		.9583	11 1/2
	.2135	2 9/16		.4635	5 9/16		.7135	8 9/16		.9635	11 9/16
7/32	.21875	2 5/8	15/32	.46875	5 5/8	23/32	.71875	8 5/8	31/32	.96875	11 5/8
	.2240	2 11/16		.4740	5 11/16		.7240	8 11/16		.9740	11 11/16
	.2292	2 3/4		.4792	5 3/4		.7292	8 3/4		.9792	11 3/4
15/64	.234375	2 13/16	31/64	.484375	5 13/16	47/64	.734375	8 13/16	63/64	.984375	11 13/16
	.2396	2 7/8		.4896	5 7/8		.7396	8 7/8		.9896	11 7/8
	.2448	2 15/16		.4948	5 15/16		.7448	8 15/16		.9948	11 15/16
1/4	.2500	3	1/2	.5000	6	3/4	.7500	9	1	1.0000	12

SUBJECT INDEX

PRODUCTS

BLAST FURNACE PRODUCTS

Basic Pig Iron
Bessemer Pig Iron
Ferro-Manganese ©
Ballast Slag ©
Bank Slag
Concrete Slag ©
Crushed Slag ©
Granulated Slag
Sand Slag ©

ROLLING MILL PRODUCTS

Semi-Finished Products

- Ingots
- Blooms
- Billets
- Slabs
- Sheet Bars

Structural Products

- C B Sections
- Standard Beams
- Special Light Beams ♦
- H Beams
- Channels
- Ship Building Channels
- Car Building Sections
- Bulb Angles
- Angles
- Tees
- Elevator Tees ©
- Conductor Tees ©
- Zees
- Cross Tie Sections ©
- Carnegie Steel Sheet Piling ©
- Miscellaneous Sections

Plate Products

- Sheared Plates
  - Rectangular
  - Circular
  - Sketch
- Universal-Mill Plates
- Base Plates for Columns and Machinery
- Floor Plates
- Skelp

Bar Products

- Agricultural Sections
- Angles
- Automobile Body Sections
- Automobile Bumper Sections
- Automobile Rim Sections
- Barrel Sections ©
- Bevel Sections
- Cam Sections ©
- Can Ring Sections ©
- Casement Sections
- Channels
- Concrete Reinforcement Bars
- Cooperage Steel ©
- Crescents ©
- Flat Discs for Automobile Parts ©
- Flat Rolled Steel
- Flats under ¼″
- Grooved Flats ©
- Half Ovals
- Half Rounds
- Hame Sections ©
- Hexagons
- Hoop and Band Steel
- Key Sections
- Locking Bar Sections ©
- Magneto Sections ©
- Neck Yoke Sections ©
- Nut Sections
- Ovals
- Pipe Coupling Sections
- Pole Cap Sections ©
- Pole Sections ©
- Round Cornered Squares
- Round Edge Flats
- Rounds
- Scarfed Skelp
- Skelp
- Special Sections of Various Kinds
- Spring Steel Sections
- Square Edge Flats
- Squares
- Tees
- Window Sash Sections
- Zees

©—Carnegie Steel Company only.
♦—Illinois Steel Company only.

PRODUCTS

ROLLING MILL PRODUCTS—Concluded

Wrought and Forged Steel Products

Axles—
- Untreated
- Annealed
- Quenched and Tempered ©
- Electric Railway Car
- Steam Railroad Car
- Locomotive Driving
- Locomotive Trailing
- Tender
- Mine Car ©
- Industrial Car ©
- Armature Shafts—Alloy ◆
- Armature Shafts—Carbon

Wheels—
- Rim Toughened ©
- Solid Wrought, Carbon Steel
- Electric Railway
- Steam Railroad
- Industrial Car ©
- Mine Locomotive ©
- Industrial Locomotive ©
- Crane Track ©

Miscellaneous Circular Sections ©
Fly Wheel Blanks for Trucks ©
Brake Drums for Trucks ©

Railroad Track Products

Standard Rails
Heavy Rails, 50 pounds and over
Light Rails, under 50 pounds
Miscellaneous Rails
G E O Track Material ©
Angle Splice Bars
Fish Plates
Tie Plates
Riser Plates
Frog Fillers ©
Reinforcing Bars ©
Screw Spikes
Track Spikes
Track Bolts
Cross Ties for Railroads ©
Cross Ties for Mine Track ©
Cross Ties for Portable Track ©

Fabricated Products

Steel Mine Timbers ©
Gangway Sets and Mine Props ©
Carnegie Steel Sheet Piling ©

GRADES

Open-Hearth
Bessemer
Open-Hearth Alloy
Electric Furnace Alloy ◆
U S S Stainless and Heat Resisting Steels

COKE AND COKE BY-PRODUCTS

Blast Furnace Coke
Foundry Coke
Domestic or Nut Coke
Coke Breeze

Benzol—
- Industrial Pure
- Industrial 90%
- Motor

Toluol, Industrial
Xylol, Industrial
Naphtha—
- Industrial Refined Light
- Industrial Crude Heavy
- Industrial High Test

Ammoniacal Liquor
Ammonium Sulphate
Crude Naphthalene
Tar
Creosote Oil ©
Cresylic Acid ©
Phenol ©
Cresol ©
By-Product Coke Oven Gas

©—Carnegie Steel Company only.
◆—Illinois Steel Company only.

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES OF UNITED STATES STEEL CORPORATION

AMERICAN BRIDGE COMPANY

General Offices: 71 Broadway, New York, N. Y.

STEEL STRUCTURES OF ALL CLASSES

Bridges
Buildings
Columns
Girders
Roof Trusses
Barges
Poles
Towers
Turntables
Sub-Stations
Heroult Electric Furnaces

AMERICAN SHEET AND TIN PLATE COMPANY

General Offices: Frick Building, Pittsburgh, Pa.

SHEET AND TIN MILL PRODUCTS FOR ALL PURPOSES

Black Sheets—
- Box Annealed
- Blue Annealed
- Metal Furniture
- Vitreous Enameling
- Special

Electrical Sheets
Automobile Sheets
Full Finished Sheets
U S S Stainless and Heat Resisting Steel Sheets

Blued Sheets—
- Keystone-Wellsville Polished
- Blued Stove Pipe Stock

Long Terne Sheets
American Galvannealed Sheets

Galvanized Sheets—
- American Zinc Coated
- Apollo Best Bloom
- Apollo-Keystone
- Corrugated
- Formed Roofing and Siding Products

Bright Tin Plates—
- American Cokes
- American Charcoals

Terne Plates—
- American Ternes
- American Old Style Ternes
- U. S. Eagle Ternes
- Fire Door Ternes
- Keystone Long and Short Ternes

Tin Mill Black

AMERICAN STEEL AND WIRE COMPANY

General Offices: 208 South La Salle Street, Chicago, Ill.

WIRE AND WIRE PRODUCTS

Aerial Tramways
Bale Ties
Barbed Wire
Cold Rolled Strip Steel
Concrete Reinforcement
Electrical Wire
Flat Wire
Hoops
Nails
Netting
Odd-Shaped Wire
Piano Wire
Plain Wire
Rail Bonds
Screw Stock
Spikes
Springs
Steel Gates
Steel Posts
Tacks
Telegraph Wire
Telephone Wire
Trolley Wire
Welding Wire
Wire Fence
Wire Rope
Wire for Manufacturing Purposes
U S S Stainless and Heat Resisting Steels

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES OF UNITED STATES STEEL CORPORATION

THE CANADIAN BRIDGE COMPANY, LTD.

General Offices: Walkerville, Ontario, Canada

STEEL STRUCTURES OF ALL CLASSES

Railway Bridges
Highway Bridges
Ferry Aprons
Mill Buildings
Office Buildings
Oil Storage Tanks
Poles, Galvanized
Radio Masts, Galvanized
Towers, Galvanized
Turntables

CANADIAN STEEL CORPORATION, LTD.

General Offices: Ojibway, Ontario, Canada

WIRE AND WIRE PRODUCTS

Bale Ties
Barbed Wire
Galvanized Wire
Plain Wire
Spring Wire
Welding Wire
Wire Fence
Wire Hoops
Wire for Various Purposes
Chain Link Protective Fence
Chain Link Protective Gates
Steel Gates and Posts
Concrete Reinforcement
Staples
Sheets, Galvanized—
- Apollo
- Apollo-Keystone

Tin Plates—
- Coke
- Charcoal

CYCLONE FENCE COMPANY

General Offices: Waukegan, Ill.

ORNAMENTAL AND PROTECTIVE FENCE

Chain Link Protective Fence
Chain Link Road Guard
Ornamental Iron Fence
Ornamental Lawn Fence
Chain Link Conveyor Belting
Screen Cloth
Woven Wire Partitions

FEDERAL SHIPBUILDING AND DRY DOCK COMPANY

General Offices: Lincoln Highway, Kearny, N. J.

SHIPS AND STEEL FABRICATION

Builders and Repairers of—
- Merchant Ships
- Barges, Dredges, Lighters

Heavy Machine Work
Steel Fabrication

THE LORAIN STEEL COMPANY

General Offices: 545 Central Ave., Johnstown, Pa.

Special Trackwork and Accessories—
- Crane Rails
- Lift-Bridge Rails
- Draw-Bridge Guides
- Crossings
- Expansion Joints
- Frogs
- Switches

Common Steel Castings—
- Bridge Shoes
- Column Bases
- Foundation Bases

Manganese Steel Castings
Other Alloy Steel Castings
Grey Iron Castings

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES OF UNITED STATES STEEL CORPORATION

NATIONAL TUBE COMPANY

General Offices: Frick Building, Pittsburgh, Pa.

NATIONAL WELDED AND NATIONAL-SHELBY SEAMLESS STEEL TUBULAR PRODUCTS, SIZES FROM ⅛″ TO 96″ DIAMETER

Standard Pipe
Copper Steel Pipe
Line Pipe, Casing, Tubing
Drive Pipe
Rotary Drill Pipe
Hammer-weld Pipe
Boiler Tubes
Seamless Mechanical Tubing
Aircraft Tubing
Seamless Alloy Tubing
Special Dipped and Coated Pipe
Talbot Lined Pipe
Cement Lined Pipe
Trolley Poles, Line Poles
Cylinders, Seamless Couplings
Rotary Rolled Pipe
Electric Welded Pipe
U S S Stainless and
Heat Resisting Steels—
Pipes and Tubes

OIL WELL SUPPLY COMPANY

General Offices: Clark Building, Pittsburgh, Pa.

OIL FIELD DRILLING AND PUMPING EQUIPMENT

"OILWELL", "IMPERIAL", "WILSON-SNYDER" AND "ERIE BALL" PRODUCTS

Drop Forgings
Steel and Iron Castings
Erie Ball Steam Engines
Swaged Nipples and Bull Plugs
Special Fittings
Wilson-Snyder Pumping Machinery

TENNESSEE COAL, IRON AND RAILROAD COMPANY

General Offices: Brown-Marx Building, Birmingham, Ala.

ROLLED, FORGED AND CAST STEEL PRODUCTS

Structural Shapes
Plates
Bars
Small Shapes
Flats
Cotton Ties
Axles
Forgings
Steel Castings
Rails
Rail Accessories
Pig Iron
Sheets—
Black
Blue Annealed
Galvanized

UNIVERSAL ATLAS CEMENT COMPANY

General Offices: 208 South La Salle St., Chicago, Ill.

Atlas Portland Cement
Universal Portland Cement
Atlas Lumnite Cement
Atlas White Portland Cement
Atlas Waterproofed White Portland Cement

PUBLICATIONS

CARNEGIE STEEL COMPANY

Pocket Companion
Carnegie Shape Book
Rails and Angle Bars
Railway Steel Cross Ties
Light Rails—Mine and Industrial Steel Cross Ties
G E O Track Construction
Wrought Steel Wheels and other Circular Sections
Forged Steel Axles
Standard Specifications
Carnegie Steel Sheet Piling
Steel Weights and Measures
The Making, Shaping and Treating of Steel
Methods of Chemical Analysis of Various Products, etc.
U S S Stainless and Heat Resisting Alloy Steels

ILLINOIS STEEL COMPANY

Pocket Companion
Illinois Shape Book
Rails and Angle Bars
Light Rails and Fastenings
Special Light Structural Beams
Car Sill Sections
U S S Stainless and Heat Resisting Alloy Steels

DISTRICT OFFICES:

Birmingham, Brown-Marx Building, 2000 First Avenue, North,
Boston, Statler Office Building, 20 Providence Street,
Buffalo, The Marine Trust Co. Building, 233-239 Main Street,
Chicago, 208 South La Salle Street,
Cincinnati, Union Trust Building, Fourth and Walnut Streets,
Cleveland, Rockefeller Building, 614 Superior Avenue, N. W.,
Denver, First National Bank Building, 17th and Stout Streets,
Detroit, Buhl Building, 535 Griswold Street,
New Orleans, Maison Blanche, 921 Canal Street,
New York, Empire Building, 71 Broadway,
Philadelphia, Widener Building, Chestnut and Juniper Streets,
Pittsburgh, Carnegie Building, 434 Fifth Avenue,
St. Louis, Mississippi Valley Trust Building, 506 Olive Street,
St. Paul, Merchants National Bank Building, Fourth & Robert Streets,
Washington, Wilkins Building, 1512 H Street, N. W.

EXPORT DISTRIBUTORS:

UNITED STATES STEEL PRODUCTS CO.

New York, Hudson Terminal Building, 30 Church Street.

PACIFIC COAST DISTRIBUTORS:

COLUMBIA STEEL CO.

San Francisco, Russ Building, 235 Montgomery Street,
Los Angeles, 2087 East Slauson Avenue,
Portland, 777 Nicolai Street,
Seattle, Fourth Avenue South and Connecticut Street,
Honolulu, T. H., Castle and Cook Building.

MEMORANDA

MEMORANDA

In the interest of simplification and standardization of wide flange structural steel sections, the manufacturers (Bethlehem Steel Corporation-Carnegie Steel Company-Illinois Steel Company) have revised their respective groups, aiming to make them as nearly interchangeable as mill conditions and economical operations will permit. Generally these modifications are along the lines of reduction in number and weight of sections and the elimination of overlapping groups. The advantage of this step both to the manufacturer and the user is too self evident to require detailed explanation.

The revised series of C B sections presented in the enclosed copy of the abridged edition of the Pocket Companion represents a joint compilation of Carnegie Steel Company and Illinois Steel Company. In addition to data pertaining to the C B series, information is also given covering the more commonly rolled sections used in structural design, as well as in car and ship building.

This edition bearing the date 1931 cancels and supersedes all earlier editions of the Pocket Companion, and while abridged in character it contains all information ordinarily required by the user of structural shapes. New size of book and new style of type have been selected to make this book practicable, convenient and legible.

The new sections of the C B series will be available July 1st, 1931, after which date there will be no rollings of the present C B sections.

CARNEGIE STEEL COMPANY
PITTSBURGH, PA.

May 5, 1931