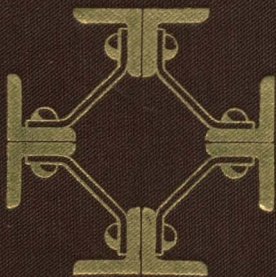


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The Gray Column



Tables of Safe Loads

Column and Connection Details, with methods of fire-proofing columns and some conveniently arranged tables for

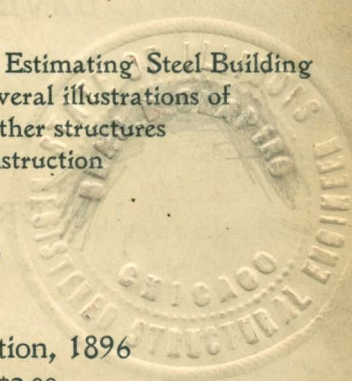
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In Designing, Detailing and Estimating Steel Building Construction, with several illustrations of Buildings and other structures during construction



Fourth Edition, 1896

Price, \$2.00



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for Steel Construction, or per-
mits for the use of "Gray
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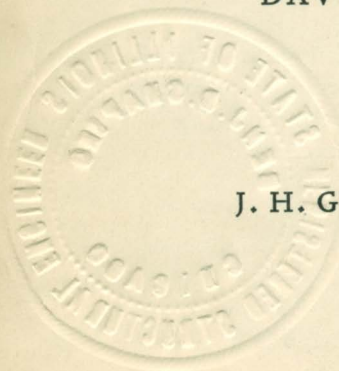
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Preface to 4th Edition, 1896.

In this edition of "Column Tables," the object has been to give sufficient data, that the system of "Gray Column Construction," as applied to Steel Skeleton Buildings, may be clearly shown.

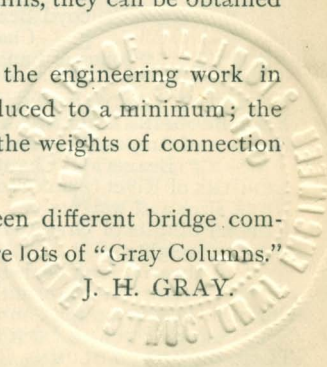
The primary result of the method of construction is an entirely independent steel structure, thoroughly braced and vertical, which does not need partitions or walls, either inside or out, to keep it in position, and capable of supporting all of the other materials used in the construction of the building.

As the Columns can be manufactured by any bridge company, and the angles and plates used in their construction are rolled by all structural mills, they can be obtained readily at any time.

In addition to the above, the engineering work in connection with the steel is reduced to a minimum; the cost, and time of erection, and the weights of connection details are materially lessened.

During the past year fourteen different bridge companies have furnished one or more lots of "Gray Columns."

J. H. GRAY.



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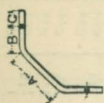
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GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{T}$

9-INCH SQUARE COLUMNS.

Dimensions of Angles.		Properties.		Safe Loads.			E	Gauge of Angles.	C to C Tie Plates.	Tie Plate Dimensions.						Mark of Tie Plates.	Size of Rivets.
No. Pieces.	Length of Legs	Thick.	Area Square Inches.	I.	r.	Column Lengths.				Width	Thick.	Length	A	B	C		
						12 ft.	16 ft.	20 ft.	30 ft.								
8	2 x 2 1/2	3/4	8.48	64	2.7	115	110	100	80	8	6 1/2	2"	1 1/4	1	a	5/8	
8	2 x 3	1 1/8	10.48	76	2.7	145	135	125	100	8	6 1/4	2	1 3/8	1 1/8	a ⁰	5/8	
8	2 x 3 1/2	1 1/4	12.40	89	2.7	175	160	150	115	8	6	2	1 1/8	1 1/8	a ¹	5/8	
8	2 x 3 3/4	1 1/2	14.24	102	2.7	200	185	170	135	8	5 3/4	2	1 1/8	1 1/8	a ²	5/8	
8	2 x 3 1/2	1 1/2	16.00	115	2.7	225	205	190	150	8	5 1/2	2	1	1 1/4	a ³	5/8	
8	2 x 3	3/4	9.52	66	2.6	130	120	110	85	8	6 1/2	2	1 1/4	1	a	5/8	
8	2 x 3	5/8	11.76	80	2.6	160	150	140	105	8	6 1/4	2	1 3/8	1 1/8	a ⁰	5/8	
8	2 x 3	3/8	13.84	93	2.6	190	175	160	125	8	6	2	1 1/8	1 1/8	a ¹	5/8	
8	2 x 3	1/2	16.00	106	2.6	220	205	190	145	8	5 3/4	2	1 1/8	1 1/8	a ²	5/8	
8	2 x 3	1/2	18.00	119	2.6	250	230	210	165	8	5 1/2	2	1	1 1/4	a ³	5/8	



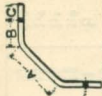
10-INCH SQUARE COLUMNS.

8	2 1/2 x 3 1/2	3/4	9.52	95	3.1	135	130	120	100	8	7 1/4	2 3/4	1 1/4	1	b	5/8
8	2 1/2 x 3 1/2	5/8	11.76	115	3.1	170	160	150	120	8	7	2 3/4	1 1/4	1 1/8	b ⁰	5/8
8	2 1/2 x 3 1/2	1/2	13.84	134	3.1	200	185	175	145	8	6 3/4	2 3/4	1 1/2	1 1/8	b ¹	5/8
8	2 1/2 x 3 1/2	1/2	16.00	154	3.1	230	215	200	165	8	6 1/2	2 3/4	1 1/2	1 1/8	b ²	5/8
8	2 1/2 x 3 1/2	1/2	18.00	173	3.1	260	240	225	185	8	6 1/4	2 3/4	1 1/2	1 1/8	b ³	5/8
8	2 1/2 x 3	3/4	10.48	97	3.0	150	140	130	105	8	7 1/4	2 3/4	1 1/4	1	b	5/8
8	2 1/2 x 3	5/8	12.96	117	3.0	185	175	160	130	8	7	2 3/4	1 1/4	1 1/8	b ⁰	5/8
8	2 1/2 x 3	1/2	15.86	138	3.0	220	205	190	155	8	6 3/4	2 3/4	1 1/2	1 1/8	b ¹	5/8
8	2 1/2 x 3	1/2	17.76	159	3.0	255	235	220	180	8	6 1/2	2 3/4	1 1/2	1 1/8	b ²	5/8
8	2 1/2 x 3	1/2	20.00	179	3.0	285	265	250	205	8	6 1/4	2 3/4	1 1/2	1 1/8	b ³	5/8

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{r}$

12-INCH SQUARE COLUMNS.

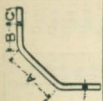


Dimensions of Angles.		Properties.		Safe Loads.				Gauge of Angle of	C to C Tie Plates.	Tie Plate Dimensions.					Mark of Tie Plates.	Size of Rivets.	
No. Pieces.	Length of Legs	Thick	Area Square Inches.	I.	r.	Column Lengths.				Width	Thick	Length	A	B			C
						12 ft.	16 ft.	20 ft.	30 ft.								
8	2½ x 3½	⅝	11.76	172	3.8	175	165	160	140	4¾"	2 6"	8	3½	1½	1	C ⁰	5/8
8	2½ x 2½	⅝	13.84	202	3.8	205	195	185	160	4 1/16"	2 6"	8	3½	1½	1	C ¹	5/8
8	3 x 2½	⅝	18.96	198	3.9	195	185	175	150	3¾	2 6"	8	3½	1½	1	C ¹	5/8
8	3 x 2½	⅝	15.36	234	3.9	230	220	205	180	3 1/16"	2 6"	8	3½	1½	1	C ¹	5/8
8	3 x 3	⅝	14.24	206	3.8	210	200	190	165	3¾	2 6"	8	3½	1½	1	C ⁰	¾
8	3 x 3	⅝	16.88	241	3.8	250	240	225	195	3 1/8"	2 6"	8	3½	1½	1	C ¹	¾
8	3 x 3	⅝	19.52	276	3.8	290	275	260	225	3 3/8"	2 6"	8	3½	1½	1	C ²	¾
8	3 x 3½	⅝	15.44	209	3.7	230	215	205	180	3¾	2 6"	8	3½	1½	1	C ¹⁰	¾
8	3 x 3½	⅝	18.40	245	3.7	270	260	245	210	3 1/8"	2 6"	8	3½	1½	1	C ¹¹	¾
8	3 x 3½	⅝	21.20	282	3.7	315	300	280	245	3 1/2"	2 6"	8	3½	1½	1	C ¹²	¾
8	3 x 3½	⅝	24.00	318	3.7	355	340	320	275	3 1/16"	2 6"	8	3½	1½	1	C ¹³	¾
8	3 x 4	⅝	16.72	213	3.5	245	230	220	185	3¾	2 6"	8	3½	1½	1	C ¹⁰	¾
8	3 x 4	⅝	19.84	249	3.5	290	275	260	220	3 1/4"	2 6"	8	3½	1½	1	C ¹¹	¾
8	3 x 4	⅝	22.96	285	3.5	335	320	300	255	3 1/2"	2 6"	8	3½	1½	1	C ¹²	¾
8	3 x 4	⅝	26.00	321	3.5	380	360	340	290	3 1/16"	2 6"	8	3½	1½	1	C ¹³	¾
8	3 x 4	⅝	28.96	357	3.5	425	405	380	325	3 3/8"	2 6"	9	3½	1½	1	C ¹⁴	¾
8	3 x 4½	⅝	21.36	253	3.4	310	295	280	235	3 1/4"	2 6"	8	3½	1½	1	C ¹¹	¾
8	3 x 4½	⅝	24.72	288	3.4	360	340	320	275	3 3/2"	2 6"	8	3½	1½	1	C ¹²	¾
8	3 x 4½	⅝	28.00	324	3.4	410	385	365	310	3 5/8"	2 6"	8	3½	1½	1	C ¹³	¾
8	3 x 4½	⅝	31.20	359	3.4	455	430	405	345	3 1/2"	2 6"	9	3½	1½	1	C ¹⁴	¾
8	3 x 5	⅝	22.88	255	3.3	335	315	295	250	3 1/4"	2 6"	9	3½	1½	1	C ¹¹	¾
8	3 x 5	⅝	26.48	291	3.3	385	365	340	290	3 3/2"	2 6"	9	3½	1½	1	C ¹²	¾
8	3 x 5	⅝	30.00	327	3.3	435	410	385	325	3 5/8"	2 6"	9	3½	1½	1	C ¹³	¾
8	3 x 5	⅝	33.44	363	3.3	485	460	430	365	3 1/2"	2 6"	9	3½	1½	1	C ¹⁴	¾

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57¹/_r

13-INCH SQUARE COLUMNS.

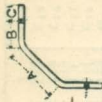


No. Pieces.	Dimensions of Angles.		Properties.				Safe Loads.				E	Gauge of Angles.	C to C Tie Plates.	Tie Plate Dimensions.					Mark of Tie Plates.	Size of Rivets.
	Length of Legs	Thick.	Area Square Inches.	I.	r.	Column Lengths.				Width.				Thick.	Length.	A	B	C		
						12 ft.	16 ft.	20 ft.	30 ft.											
8	2½ x 2½	1½	11.76	205	4.1	175	170	160	140	5½"	1½	2' 6"	8	1½	9¾	3¾	11½	1	d ⁰	5/8
8	3 x 2½	1½	12.96	234	4.2	195	185	180	160	4½	1½	2' 6"	8	1½	9¾	3¾	11½	1	d ⁰	5/8
8	3 x 3	1½	14.24	244	4.1	215	205	195	170	4½	1½	2' 6"	8	1½	9¾	3¾	11½	1½	d ²⁰	¾
8	3 x 3	¾	16.88	285	4.1	255	240	230	205	4½	1½	2' 6"	8	1½	9¾	3¾	11½	1½	d ²¹	¾
8	3 x 3	1½	19.52	326	4.1	295	280	265	235	4½	1½	2' 6"	8	1½	8¾	3¾	11½	1½	d ²²	¾
8	3 x 3	½	22.00	367	4.1	330	315	300	265	3½	1½	2' 6"	8	1½	8¾	3¾	11½	1½	d ²³	¾
8	3 x 4	¾	19.84	340	3.9	295	280	270	235	4¾	1½	2' 6"	8	1½	9½	3¾	11½	1½	d ²¹	¾
8	3 x 4	1½	22.96	340	3.9	345	325	310	270	4½	1½	2' 6"	8	1½	8¾	3¾	11½	1½	d ²²	¾
8	3 x 4	1½	26.00	380	3.9	390	370	350	305	4	1½	2' 6"	8	1½	8¾	3¾	11½	1½	d ²³	¾
8	3 x 4	1½	28.96	419	3.9	435	410	390	340	3½	2½	2' 6"	9	1½	8¾	3¾	11½	1½	c ¹⁰	¾
8	3 x 4	1½	31.84	458	3.9	475	455	430	375	3½	2½	2' 6"	9	1½	8¾	3¾	11½	1½	c ¹¹	¾
8	3 x 4	1½	34.72	497	3.9	520	495	470	410	3½	2½	2' 6"	9	1½	8¾	3¾	11½	1½	c ¹²	¾
8	3 x 4	1½	37.52	437	3.9	560	535	510	445	3½	2½	2' 6"	9	1½	7¾	3¾	11½	1½	c ¹³	¾
8	3 x 4	1½	40.24	576	3.9	600	575	545	475	3½	2½	2' 6"	9	1½	7¾	3¾	11½	1½	c ¹⁴	¾
8	3 x 5	¾	22.88	308	3.6	335	320	305	260	4¾	1½	2' 6"	8	1½	9½	3¾	11½	1½	d ²¹	¾
8	3 x 5	1½	25.48	349	3.6	390	370	350	300	4½	1½	2' 6"	8	1½	8¾	3¾	11½	1½	d ²²	¾
8	3 x 5	1½	30.00	390	3.6	445	420	400	340	4	1½	2' 6"	8	1½	8¾	3¾	11½	1½	d ²³	¾
8	3 x 5	1½	33.44	431	3.6	495	470	450	380	3½	2½	2' 6"	9	1½	8¾	3¾	11½	1½	c ¹⁰	¾
8	3 x 5	1½	36.88	472	3.6	545	515	495	420	3½	2½	2' 6"	9	1½	8¾	3¾	11½	1½	c ¹¹	¾
8	3 x 5	1½	40.24	512	3.6	595	565	535	455	3½	2½	2' 6"	9	1½	8¾	3¾	11½	1½	c ¹²	¾
8	3 x 5	1½	43.52	552	3.6	645	610	575	495	3½	2½	2' 6"	9	1½	7¾	3¾	11½	1½	c ¹³	¾
8	3 x 5	1½	46.72	591	3.6	690	655	620	530	3½	2½	2' 6"	9	1½	7¾	3¾	11½	1½	c ¹⁴	¾

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SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{r}$

14-INCH SQUARE COLUMNS.



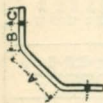
No. Pieces.	Dimensions of Angles.		Properties.		Safe Loads.				E	Gauges of Plates.	C to C Tie Plates.	Tie Plate Dimensions.						Mark of Tie Plates.	Size of Rivets.	
	Length of Legs	Thick	Area Square Inches.	I.	r.	Column Lengths.						Width.	Thick.	Length.	A	B	C			
						12 ft.	16 ft.	20 ft.												30 ft.
8	2 1/2 x 2 1/2	5/16	11.76	238	4.5	180	170	165	145	5 1/2"	1 3/8	9 7/8	5 1/4	1 1/8	1 1/8	f ⁰	5/8			
8	2 1/2 x 2 1/2	3/8	12.84	280	4.6	210	200	195	170	5 7/8	1 1/2	9 7/8	5 1/4	1 1/8	1 1/8	f ⁰	5/8			
8	3 x 2 1/2	5/16	13.96	274	4.6	195	190	180	160	5 1/4	1 3/8	9 7/8	5 1/4	1 1/8	1 1/8	f ¹	5/8			
8	3 x 2 1/2	3/8	15.36	325	4.6	235	225	215	190	5 7/8	1 1/2	9 7/8	5 1/4	1 1/8	1 1/8	f ¹	5/8			
8	3 x 3	5/16	14.24	286	4.5	215	205	200	180	5 1/4	1 3/8	10 1/8	4 1/2	1 1/4	1 1/4	e ⁰	3/4			
8	3 x 3	3/8	16.88	336	4.5	255	245	235	210	5 1/8	1 1/2	9 7/8	4 1/2	1 1/2	1 1/2	e ¹	3/4			
8	3 x 3	5/16	19.52	386	4.5	295	285	275	245	4 7/8	1 1/2	9 7/8	4 1/2	1 1/2	1 1/2	e ²	3/4			
8	3 x 3 1/2	5/16	15.44	293	4.3	235	225	215	190	5 1/8	1 3/8	10 1/8	4 1/2	1 1/4	1 1/4	e ⁰	3/4			
8	3 x 3 1/2	3/8	18.40	340	4.3	280	265	255	225	5 1/8	1 1/2	9 7/8	4 1/2	1 1/2	1 1/2	e ¹	3/4			
8	3 x 3 1/2	5/16	21.20	386	4.3	320	305	295	260	4 1/8	1 1/2	9 7/8	4 1/2	1 1/2	1 1/2	e ²	3/4			
8	3 x 3 1/2	3/8	24.00	433	4.3	365	350	330	295	4 1/4	1 1/2	9 7/8	4 1/2	1 1/2	1 1/2	e ³	3/4			
8	3 x 3 1/2	5/16	26.72	479	4.3	405	385	370	330	4 3/8	2 1/8	9 7/8	3 3/4	1 1/2	1 1/2	d ²⁰	3/4			
8	3 x 3 1/2	3/8	29.36	526	4.3	445	425	405	360	4 3/8	2 1/8	9 7/8	3 3/4	1 1/2	1 1/2	d ²¹	3/4			
8	3 x 3 1/2	5/16	32.00	572	4.3	485	465	445	395	4 1/8	2 1/8	8 7/8	3 3/4	1 1/2	1 1/2	d ²²	3/4			
8	3 x 3 1/2	3/8	34.48	619	4.3	520	500	480	425	4	2 1/8	8 7/8	3 3/4	1 1/2	1 1/2	d ²³	3/4			
8	3 x 3 1/2	5/16	36.96	666	4.3	560	535	515	455	3 1/8	2 1/8	8 3/8	3 3/4	1 1/2	1 1/2	d ²⁴	3/4			
8	3 x 4	5/16	16.72	300	4.2	250	240	230	205	5 1/8	1 3/8	10 1/8	4 1/2	1 1/4	1 1/4	e ⁰	3/4			
8	3 x 4	3/8	19.84	348	4.2	300	285	275	240	5 1/8	1 1/2	9 7/8	4 1/2	1 1/2	1 1/2	e ¹	3/4			
8	3 x 4	5/16	22.96	396	4.2	345	330	315	280	4 1/8	1 1/2	9 7/8	4 1/2	1 1/2	1 1/2	e ²	3/4			
8	3 x 4	3/8	26.00	444	4.2	390	375	360	315	4 1/4	1 1/2	9 7/8	4 1/2	1 1/2	1 1/2	e ³	3/4			
8	3 x 4	5/16	28.96	491	4.2	435	420	400	350	4 1/8	2 1/8	9 7/8	3 3/4	1 1/2	1 1/2	d ²⁰	3/4			
8	3 x 4	3/8	31.84	539	4.2	480	460	440	385	4 1/8	2 1/8	9 7/8	3 3/4	1 1/2	1 1/2	d ²¹	3/4			
8	3 x 4	5/16	34.72	587	4.2	525	505	480	420	4 1/8	2 1/8	8 7/8	3 3/4	1 1/2	1 1/2	d ²²	3/4			
8	3 x 4	3/8	37.52	635	4.2	565	540	520	455	4 1/8	2 1/8	8 5/8	3 3/4	1 1/2	1 1/2	d ²³	3/4			
8	3 x 4	5/16	40.24	683	4.2	605	580	555	490	3 1/8	2 1/8	8 3/8	3 3/4	1 1/2	1 1/2	d ²⁴	3/4			

8	3	x4½	¾	21.36	360	4.0	320	305	290	255	5½	1½	2	6	8	8	9%	4½	1½	1½	e¹	¾
8	3	x4½	⅞	24.72	409	4.0	370	355	340	295	4½	1½	2	6	8	8	9%	4½	1½	1½	e²	¾
8	3	x4½	⅞	28.00	451	4.0	420	400	380	335	4½	1½	2	6	8	8	9%	4½	1½	1½	e³	¾
8	3	x4½	⅞	31.20	505	4.0	470	450	425	375	4½	2½	2	6	9	9	9%	3¾	1½	1½	d²¹	¾
8	3	x4½	⅞	34.40	553	4.0	515	495	470	410	4½	2½	2	6	9	9	9%	3¾	1½	1½	d²²	¾
8	3	x4½	⅞	37.44	601	4.0	560	535	510	445	4½	2½	2	6	9	9	8%	3¾	1½	1½	d²³	¾
8	3	x4½	⅞	40.48	649	4.0	605	580	550	485	4	2½	2	6	9	9	8%	3¾	1½	1½	d²⁴	¾
8	3	x4½	⅞	43.44	697	4.0	650	625	590	520	3½	2½	2	6	9	9	8%	3¾	1½	1½	I	¾
8	3	x5	¾	22.88	365	4.0	345	325	310	270	5½	1½	2	6	8	8	9%	4½	1½	1½	e¹	¾
8	3	x5	⅞	26.48	414	4.0	395	380	360	315	4½	1½	2	6	8	8	9%	4½	1½	1½	e²	¾
8	3	x5	⅞	30.00	463	4.0	450	430	410	355	4½	1½	2	6	8	8	9%	4½	1½	1½	e³	¾
8	3	x5	⅞	33.44	512	4.0	500	480	455	400	4½	2½	2	6	9	9	9%	3¾	1½	1½	d²⁰	¾
8	3	x5	⅞	36.88	560	4.0	550	530	505	440	4½	2½	2	6	9	9	9%	3¾	1½	1½	d²¹	¾
8	3	x5	⅞	40.24	609	4.0	605	575	550	480	4½	2½	2	6	9	9	8%	3¾	1½	1½	d²²	¾
8	3	x5	⅞	43.52	658	4.0	655	625	595	520	4	2½	2	6	9	9	8%	3¾	1½	1½	d²³	¾
8	3	x5	⅞	46.72	706	4.0	700	670	635	560	3½	2½	2	6	9	9	8%	3¾	1½	1½	d²⁴	¾
8	8	3½ x3	⅞	15.44	320	4.5	235	225	215	190	4½	1½	2	6	8	8	10%	4½	1½	1½	e⁰	¾
8	8	3½ x3	⅞	18.40	373	4.5	280	270	255	230	4½	1½	2	6	8	8	9%	4½	1½	1½	e¹	¾
8	8	3½ x3	⅞	21.30	425	4.5	320	310	295	265	4½	1½	2	6	8	8	9%	4½	1½	1½	e²	¾
8	8	3½ x3	⅞	24.00	477	4.5	365	350	335	300	4½	1½	2	6	8	8	9%	4½	1½	1½	e³	¾
8	8	3½ x3	⅞	26.72	529	4.5	405	390	375	335	3½	1½	2	6	9	9	9%	3¾	1½	1½	d¹⁰	¾
8	8	3½ x3	⅞	29.36	581	4.5	445	430	410	365	3½	1½	2	6	9	9	9%	3¾	1½	1½	d¹¹	¾
8	8	3½ x3	⅞	32.00	633	4.5	485	470	450	400	3½	1½	2	6	9	9	8%	3¾	1½	1½	d¹²	¾
8	8	3½ x3	⅞	34.48	685	4.5	525	505	485	430	3½	1½	2	6	9	9	8%	3¾	1½	1½	d¹³	¾
8	8	3½ x3½	¾	19.84	389	4.4	300	290	275	245	4½	1½	2	6	8	8	9%	4½	1½	1½	e¹	¾
8	8	3½ x3½	⅞	22.96	441	4.4	350	335	320	285	4½	1½	2	6	8	8	9%	4½	1½	1½	e²	¾
8	8	3½ x3½	⅞	26.00	493	4.4	395	380	360	320	4½	1½	2	6	8	8	9%	4½	1½	1½	e³	¾
8	8	3½ x3½	⅞	28.96	545	4.4	440	420	405	360	4½	2½	2	6	9	9	9%	3¾	1½	1½	d²⁰	¾
8	8	3½ x3½	⅞	31.92	597	4.4	485	465	445	395	4½	2½	2	6	9	9	9%	3¾	1½	1½	d²¹	¾
8	8	3½ x3½	⅞	34.72	649	4.4	525	505	485	430	4½	2½	2	6	9	9	8%	3¾	1½	1½	d²²	¾
8	8	3½ x3½	⅞	37.52	701	4.4	570	545	525	465	4½	2½	2	6	9	9	8%	3¾	1½	1½	d²³	¾
8	8	3½ x3½	⅞	40.24	753	4.4	610	585	560	500	4½	2½	2	6	9	9	8%	3¾	1½	1½	d²⁴	¾

GRAY COLUMNS. Patented, Dec. 1862.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57¹/_r

14-INCH SQUARE COLUMNS.

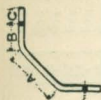


No. Pieces.	Dimension of Angles.		Properties.				Safe Loads.				E.	Gauge of Angles.	C to C Tie Plates.	Tie Plate Dimensions.						Mark of Tie Plates.	Size of Rivets.
	Length of Legs		Area Square Inches.	I.	I.	Column Lengths.				Width.				Thick.	Length.	A	B	C			
	Thick.	12 ft.				16 ft.	20 ft.	30 ft.													
8	3 1/2 x 4	3/8	21.36	396	4.3	325	310	295	260	4 1/8"	1 1/8	2' 6"	8	1 1/8	9 7/8	4 1/2	1 1/2	1 1/8	e ¹	3/4	
8	3 1/2 x 4	7/16	24.72	450	4.3	375	360	345	305	4 1/4	1 1/8	2' 6"	8	1 1/8	9 5/8	4 1/2	1 1/2	1 1/8	e ²	3/4	
8	3 1/2 x 4	1/2	28.00	504	4.3	425	405	390	345	4 1/2	1 1/8	2' 6"	8	1 1/8	9 3/8	4 1/2	1 1/2	1 1/8	e ³	3/4	
8	3 1/2 x 4	5/16	31.20	557	4.3	470	455	435	385	4 1/4	2 7/8	2' 6"	9	1 1/8	9 1/8	3 3/4	1 1/2	1 1/4	d ²⁰	3/4	
8	3 1/2 x 4	3/8	34.40	611	4.3	520	500	475	425	3 1/4	2 1/2	2' 6"	9	1 1/8	9 1/8	3 3/4	1 1/2	1 1/4	d ²¹	3/4	
8	3 1/2 x 4	1/2	37.44	664	4.3	565	545	520	460	3 1/2	2 1/2	2' 6"	9	1 1/8	8 7/8	3 3/4	1 1/2	1 1/4	d ²²	3/4	
8	3 1/2 x 4	3/4	41.48	717	4.3	615	585	560	500	3 1/2	2 1/8	2' 6"	9	1 1/8	8 5/8	3 3/4	1 1/2	1 1/4	d ²³	3/4	
8	3 1/2 x 4	1 1/8	43.44	770	4.3	660	630	605	535	3 1/8	2 1/8	2' 6"	9	1 1/8	8 3/8	3 3/4	1 1/2	1 1/4	d ²⁴	3/4	
8	3 1/2 x 5	3/8	24.40	407	4.0	365	350	330	290	4 7/8	1 7/8	2' 6"	8	1 1/8	9 7/8	4 1/2	1 1/2	1 1/8	e ¹	3/4	
8	3 1/2 x 5	7/16	28.24	461	4.0	425	405	385	340	4 1/2	1 7/8	2' 6"	8	1 1/8	9 5/8	4 1/2	1 1/2	1 1/8	e ²	3/4	
8	3 1/2 x 5	1/2	32.00	515	4.0	480	460	435	385	4 1/2	1 7/8	2' 6"	8	1 1/8	9 3/8	4 1/2	1 1/2	1 1/8	e ³	3/4	
8	3 1/2 x 5	5/16	35.76	570	4.0	535	510	490	425	3 7/8	2 7/8	2' 6"	9	1 1/8	9 1/8	3 3/4	1 1/2	1 1/4	d ²⁰	3/4	
8	3 1/2 x 5	3/8	39.36	624	4.0	590	565	535	470	3 1/4	2 7/8	2' 6"	9	1 1/8	9 1/8	3 3/4	1 1/2	1 1/4	d ²¹	3/4	
8	3 1/2 x 5	1/2	42.96	678	4.0	645	615	585	515	3 1/2	2 1/2	2' 6"	9	1 1/8	8 7/8	3 3/4	1 1/2	1 1/4	d ²²	3/4	
8	3 1/2 x 5	3/4	46.48	732	4.0	700	665	635	555	3 1/2	2 1/8	2' 6"	9	1 1/8	8 5/8	3 3/4	1 1/2	1 1/4	d ²³	3/4	
8	3 1/2 x 5	1 1/8	50.00	786	4.0	750	715	680	600	3 1/8	2 1/8	2' 6"	9	1 1/8	8 3/8	3 3/4	1 1/2	1 1/4	d ²⁴	3/4	
8	3 1/2 x 5	3/8	53.36	840	4.0	800	765	730	640	2 1/8	2 1/8	2' 6"	9	1 1/8	8 1/8	3 3/4	1 1/2	1 1/4	d ²⁵	3/4	
8	3 1/2 x 6	3/8	27.36	410	3.8	405	385	370	320	4 7/8	1 7/8	2' 6"	8	1 1/8	9 5/8	4 1/2	1 1/2	1 1/8	e ¹	3/4	
8	3 1/2 x 6	7/16	31.76	468	3.8	475	450	430	370	4 3/8	1 7/8	2' 6"	8	1 1/8	9 3/8	4 1/2	1 1/2	1 1/8	e ²	3/4	
8	3 1/2 x 6	1/2	36.00	526	3.8	535	510	485	420	4 1/8	1 7/8	2' 6"	9	1 1/8	9 3/8	4 1/2	1 1/2	1 1/8	e ³	3/4	
8	3 1/2 x 6	5/16	40.24	584	3.8	600	570	540	470	4	2 1/8	2' 6"	9	1 1/8	9 1/8	3 3/4	1 1/2	1 1/4	d ²⁰	3/4	
8	3 1/2 x 6	3/8	44.40	641	3.8	660	630	600	520	3 1/8	2 1/8	2' 6"	9	1 1/8	9 1/8	3 3/4	1 1/2	1 1/4	d ²¹	3/4	
8	3 1/2 x 6	1/2	48.48	698	3.8	725	690	655	565	3 1/8	2 1/8	2' 6"	9	1 1/8	8 7/8	3 3/4	1 1/2	1 1/4	d ²²	3/4	

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 I

15-INCH SQUARE COLUMNS.

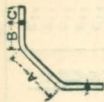


Dimensions of Angles.		Properties.		Safe Loads.				F.	Gauge of Angles.	C to C Tie Plates.	Tie Plate Dimensions.						Mark of Tie Plates.	Size of Rivets.
No. of Pieces.	Length of Legs.	Area Square Inches.	I.	r.	Column Lengths.						Width.	Thick.	Length.	A.	B.	C.		
					12 ft.	16 ft.	20 ft.	30 ft.										
8	2½ x 2½	11.76	279	4.9	180	175	165	150	6 9/16"	2 6"	9	5½	11½	1	f10	5/8		
8	2½ x 2½	13.84	319	4.9	210	205	195	180	6 5/8"	2 6"	9	5½	11½	1	f11	5/8		
8	3 x 2½	12.96	316	4.9	200	190	185	165	5 11/16"	2 6"	9	5½	11½	1	f10	5/8		
8	3 x 2½	15.36	373	4.9	235	225	220	200	5 3/4"	2 6"	9	5½	11½	1	f11	5/8		
8	3 x 3	14.24	331	4.8	220	210	200	180	5 11/16"	2 6"	9	5½	11½	1 1/4	f20	3/4		
8	3 x 3	16.88	386	4.8	260	250	240	215	5 3/4"	2 6"	9	5½	11½	1 1/4	f21	3/4		
8	3 x 3	19.52	441	4.8	300	290	275	250	5 7/8"	2 6"	9	5½	11½	1 1/4	f22	3/4		
8	3 x 3	22.00	496	4.8	335	320	310	280	5 3/4"	2 6"	9	5½	11½	1 1/4	f23	3/4		
8	3 x 3	24.48	550	4.8	375	360	345	310	5 7/8"	2 6"	9	5½	11½	1 1/4	f24	3/4		
8	3 x 3	26.88	605	4.8	410	395	380	340	5	2 6"	9	5½	11½	1 1/4	f25	3/4		
8	3½ x 3	15.44	370	4.9	235	225	220	200	5 3/8"	2 6"	9	5½	11½	1 1/4	f20	3/4		
8	3½ x 3	18.40	434	4.9	280	270	260	235	5 1/2"	2 6"	9	5½	11½	1 1/4	f21	3/4		
8	3½ x 3	21.20	498	4.9	325	315	300	270	5	2 6"	9	5½	11½	1 1/4	f22	3/4		
8	3½ x 3	24.00	563	4.9	370	355	340	310	4 11/8	2 6"	9	5½	11½	1 1/4	f23	3/4		
8	3½ x 3½	19.84	451	4.7	305	290	280	250	5 3/8"	2 6"	9	5½	11½	1 1/4	f21	3/4		
8	3½ x 3½	22.96	512	4.7	350	335	325	290	5 1/2"	2 6"	9	5½	11½	1 1/4	f22	3/4		
8	3½ x 3½	26.00	572	4.7	400	380	365	330	5	2 6"	9	5½	11½	1 1/4	f23	3/4		
8	3½ x 3½	28.96	633	4.7	445	425	410	365	4 11/8	2 6"	9	5½	11½	1 1/4	e15	3/4		
8	3½ x 3½	31.92	693	4.7	490	470	450	405	4 3/4	2 6"	9	5½	11½	1 1/4	e14	3/4		
8	3½ x 3½	34.72	754	4.7	530	510	490	440	4 7/8	2 6"	9	5½	11½	1 1/4	e15	3/4		
8	3½ x 3½	37.52	814	4.7	575	555	530	475	4 7/8	2 6"	9	5½	11½	1 1/4	e16	3/4		
8	3½ x 3½	40.24	875	4.7	615	595	570	510	4 1/2	2 6"	9	5½	11½	1 1/4	e17	3/4		
8	3½ x 3½			4.7					4 1/2	2 6"	9	5½	11½	1 1/4	e18	3/4		

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA $17100-57\frac{1}{r}$

15-INCH SQUARE COLUMNS.



No. Pieces	Dimensions of Angles.		Properties.		Safe Loads.				E.	Gauge of Angles.	C to C Tie Plates.	Tie Plate Dimensions.						Mark of Tie Plates.	Size of Rivets.	
	Length of Legs	Thick.	Area Square Inches.	I.	r.	Column Lengths.						Width.	Thick.	Length.	A	B	C			
						12 ft.	16 ft.	20 ft.												30 ft.
8	3 1/2 x 4	3/8	21.36	461	4.6	325	315	300	270	5 3/8"	2 6"	9	3 1/2	1 1/2	1 3/8	f21	3/4			
8	3 1/2 x 4	1/2	24.72	523	4.6	375	360	345	310	5 1/8"	2 6	9	3 1/2	1 1/2	1 3/8	f22	3/4			
8	3 1/2 x 4	5/8	28.00	585	4.6	425	410	395	350	5	2 6	9	3 1/2	1 3/8	1 3/8	f23	3/4			
8	3 1/2 x 4	3/4	31.20	647	4.6	475	460	440	390	4 13/16	2 6	9	3 1/2	1 3/8	1 3/8	e14	3/4			
8	3 1/2 x 4	7/8	34.40	710	4.6	525	505	485	435	4 3/8	2 6	9	3 1/2	1 3/8	1 3/8	e15	3/4			
8	3 1/2 x 4	1 1/8	37.44	773	4.6	570	550	525	470	4 7/8	2 6	9	3 1/2	1 3/8	1 3/8	e16	3/4			
8	3 1/2 x 4	1 1/4	40.48	836	4.6	620	595	570	510	4 7/8	2 6	9	3 1/2	1 3/8	1 3/8	e17	3/4			
8	3 1/2 x 4	1 3/8	43.44	899	4.6	665	640	610	550	4 13/16	2 6	9	3 1/2	1 3/8	1 3/8	e18	3/4			
8	3 1/2 x 5	3/8	24.40	476	4.4	370	355	340	300	5 3/8	2 6	9	3 1/2	1 1/2	1 3/8	f21	3/4			
8	3 1/2 x 5	1/2	28.24	540	4.4	430	410	395	350	5 1/8"	2 6	9	3 1/2	1 1/2	1 3/8	f22	3/4			
8	3 1/2 x 5	5/8	32.00	604	4.4	485	465	445	395	5	2 6	9	3 1/2	1 3/8	1 3/8	f23	3/4			
8	3 1/2 x 5	3/4	35.76	668	4.4	545	520	500	445	4 13/16	2 6	9	3 1/2	1 3/8	1 3/8	e14	3/4			
8	3 1/2 x 5	7/8	39.36	731	4.4	600	577	550	490	4 3/8	2 6	9	3 1/2	1 3/8	1 3/8	e15	3/4			
8	3 1/2 x 5	1 1/8	42.96	795	4.4	650	620	600	535	4 7/8	2 6	9	3 1/2	1 3/8	1 3/8	e16	3/4			
8	3 1/2 x 5	1 1/4	46.48	859	4.4	705	680	630	575	4 1/2	2 6	9	3 1/2	1 3/8	1 3/8	e17	3/4			
8	3 1/2 x 5	1 3/8	50.00	923	4.4	755	730	700	620	4 1/2	2 6	9	3 1/2	1 3/8	1 3/8	e18	3/4			
8	3 1/2 x 5	7/8	53.36	986	4.4	810	780	745	655	3 7/8	2 6	9	3 1/2	1 3/8	1 3/8	e19	3/4			
8	3 1/2 x 6	3/8	31.76	555	4.1	480	455	435	385	5 5/8"	2 6	9	3 1/2	1 1/2	1 3/8	f22	3/4			
8	3 1/2 x 6	1/2	36.00	619	4.1	540	520	495	435	5 1/8"	2 6	9	3 1/2	1 1/2	1 3/8	f23	3/4			
8	3 1/2 x 6	5/8	40.24	683	4.1	605	580	550	485	4 13/16	2 6	9	3 1/2	1 1/2	1 3/8	e14	3/4			
8	3 1/2 x 6	3/4	44.40	747	4.1	670	640	610	535	4 3/4	2 6	9	3 1/2	1 1/2	1 3/8	e15	3/4			
8	3 1/2 x 6	7/8	48.48	811	4.1	730	700	665	585	4 7/8	2 6	9	3 1/2	1 1/2	1 3/8	e16	3/4			
8	3 1/2 x 6	1 1/8	52.48	875	4.1	790	755	720	635	4 3/8	2 6	9	3 1/2	1 1/2	1 3/8	e17	3/4			
8	3 1/2 x 6	1 1/4	56.48	939	4.1	850	815	775	680	4 1/2	2 6	9	3 1/2	1 1/2	1 3/8	e18	3/4			
8	3 1/2 x 6	7/8	60.40	1003	4.1	910	870	830	730	4	2 6	9	3 1/2	1 1/4	1 3/8	e19	3/4			

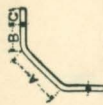
8	4	x4	3%	22.88	512	4.7	350	335	325	290	4.7	2 1/2	2	6	9	3%	10 7/8	4 1/2	1 3/4	1 3/8	e11	3/4
8	4	x4	1 1/2%	26.48	583	4.7	405	390	375	335	4.7	2 1/2	2	6	9	3%	10 5/8	4 1/2	1 1/2	1 1/8	e12	3/4
8	4	x4	1%	30.00	653	4.7	460	440	425	380	4.7	2 1/2	2	6	9	3%	10 3/8	4 1/2	1 1/8	1 1/4	e13	3/4
8	4	x4	3/8%	33.44	723	4.7	510	490	475	425	3 3/8	2 1/2	2	6	9	3%	10 1/8	4 1/2	1 1/4	1 1/8	e14	3/4
8	4	x4	3/8%	36.88	794	4.7	565	545	520	470	3 1/2	2 1/2	2	6	9	3%	9 7/8	4 1/2	1 1/2	1 1/8	e15	3/4
8	4	x4	3/8%	40.24	864	4.7	615	595	570	510	3 1/2	2 1/2	2	6	9	3%	9 5/8	4 1/2	1 1/8	1 1/8	e16	3/4
8	4	x4	3/8%	43.52	934	4.7	665	640	615	550	3 1/2	2 1/2	2	6	9	3%	9 3/8	4 1/2	1 1/8	1 1/8	e17	3/4
8	4	x4	1 1/8%	46.72	1005	4.7	715	690	660	595	3 1/2	2 1/2	2	6	9	3%	9 1/8	4 1/2	1 1/8	1 1/8	e18	3/4
8	4	x5	7/8%	30.00	606	4.4	455	435	420	375	4 5/8	2 1/2	2	6	9	3%	10 5/8	4 1/2	1 1/4	1 3/8	e12	3/4
8	4	x5	1 1/2%	34.00	677	4.4	515	495	475	425	4 1/2	2 1/2	2	6	9	3%	10 3/8	4 1/2	1 1/8	1 1/8	e13	3/4
8	4	x5	1%	38.00	747	4.4	575	555	530	470	3 1/8	2 1/2	2	6	9	3%	10 1/8	4 1/2	1 1/8	1 1/4	e14	3/4
8	4	x5	3/8%	41.84	817	4.4	635	610	585	520	3 3/4	2 1/2	2	6	9	3%	9 7/8	4 1/2	1 1/2	1 1/8	e15	3/4
8	4	x5	3/8%	45.76	887	4.4	695	665	640	570	3 3/8	2 1/2	2	6	9	3%	9 5/8	4 1/2	1 1/8	1 1/8	e16	3/4
8	4	x5	3/8%	49.52	957	4.4	755	720	690	615	3 3/8	2 1/2	2	6	9	3%	9 3/8	4 1/2	1 1/8	1 1/8	e17	3/4
8	4	x5	1 1/8%	53.20	1027	4.4	810	775	740	660	3 3/8	2 1/2	2	6	9	3%	9 1/8	4 1/2	1 1/8	1 1/8	e18	3/4
8	4	x5	7/8%	56.88	1098	4.4	865	830	795	705	3	2 1/2	2	6	9	3%	8 7/8	4 1/2	1 1/4	1 1/8	e19	3/4
8	4	x6	7/8%	33.44	613	4.2	505	485	465	410	4 5/8	2 1/2	2	6	9	3%	10 5/8	4 1/2	1 1/8	1 3/8	e12	3/4
8	4	x6	1 1/2%	38.00	684	4.2	575	550	525	465	4 1/2	2 1/2	2	6	9	3%	10 3/8	4 1/2	1 1/8	1 1/8	e13	3/4
8	4	x6	1%	42.48	756	4.2	640	615	585	520	3 1/8	2 1/2	2	6	9	3%	10 1/8	4 1/2	1 1/8	1 1/4	e14	3/4
8	4	x6	3/8%	46.88	828	4.2	710	680	650	570	3 1/4	2 1/2	2	6	9	3%	9 7/8	4 1/2	1 1/2	1 1/8	e15	3/4
8	4	x6	3/8%	51.28	900	4.2	775	740	710	625	3 1/8	2 1/2	2	6	9	3%	9 5/8	4 1/2	1 1/8	1 1/8	e16	3/4
8	4	x6	1 1/8%	55.52	972	4.2	840	805	765	680	3 1/8	2 1/2	2	6	9	3%	9 3/8	4 1/2	1 1/8	1 1/8	e17	3/4
8	4	x6	1 1/8%	59.76	1044	4.2	905	865	825	730	3 3/8	2 1/2	2	6	9	3%	9 1/8	4 1/2	1 1/8	1 1/8	e18	3/4
8	4	x6	7/8%	63.92	1116	4.2	965	925	885	780	3	2 1/2	2	6	9	3%	8 7/8	4 1/2	1 1/4	1 1/8	e19	3/4

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA $17100 - 57 \frac{1}{r}$

16-INCH SQUARE COLUMNS.

Dimensions of Angles.		Properties.		Safe Loads.				E	Gauge or Angles	C to C Tie Plates.	Tie Plate Dimensions.					Mark of The Plates.	Size of Rivets.
No. Pieces.	Length of Legs	Area Square Inches.	I.	r.	12 ft.	16 ft.	20 ft.				30 ft.	Width.	Thick.	Length.	A		
8	$2\frac{1}{2} \times 2\frac{1}{2}$	11.76	320	5.2	180	175	170	155	$7\frac{1}{8}$	2'6"	$9\frac{3}{8}$	6	$1\frac{1}{4}$	1	g^0	$\frac{5}{8}$	
8	$2\frac{1}{2} \times 2\frac{1}{2}$	13.84	374	5.2	215	205	200	180	$7\frac{1}{16}$	2'6	$9\frac{3}{8}$	6	$1\frac{1}{8}$	$1\frac{1}{8}$	g^1	$\frac{5}{8}$	
8	$2\frac{1}{2} \times 2\frac{1}{2}$	16.00	427	5.2	245	240	230	210	$6\frac{7}{8}$	2'6	$9\frac{3}{8}$	6	$1\frac{1}{8}$	$\frac{7}{8}$	g^2	$\frac{5}{8}$	
8	$2\frac{1}{2} \times 2\frac{1}{2}$	18.00	481	5.2	280	270	260	235	$6\frac{1}{2}$	2'6	$9\frac{3}{8}$	6	$1\frac{1}{8}$	$1\frac{1}{8}$	g^3	$\frac{5}{8}$	
8	3 x 3	14.24	380	5.1	220	210	205	185	$6\frac{5}{8}$	2'6	$9\frac{3}{8}$	6	$1\frac{1}{2}$	$1\frac{1}{4}$	g^{10}	$\frac{3}{4}$	
8	3 x 3	16.88	443	5.1	260	250	240	220	$6\frac{1}{8}$	2'6	$9\frac{3}{8}$	6	$1\frac{1}{8}$	$1\frac{1}{8}$	g^{11}	$\frac{3}{4}$	
8	3 x 3	19.52	507	5.1	300	290	280	255	$5\frac{3}{4}$	2'6	$9\frac{3}{8}$	6	$1\frac{3}{8}$	$1\frac{1}{8}$	g^{12}	$\frac{3}{4}$	
8	3 x 3	22.00	570	5.1	340	325	315	285	$6\frac{1}{8}$	2'6	$9\frac{3}{8}$	6	$1\frac{5}{8}$	$1\frac{1}{8}$	g^{13}	$\frac{3}{4}$	
8	3 x 3	24.48	633	5.1	380	365	350	320	$5\frac{7}{8}$	2'6	$9\frac{3}{8}$	6	$1\frac{3}{4}$	1	g^{14}	$\frac{3}{4}$	
8	3 x 3	26.88	696	5.1	415	400	385	350	$5\frac{1}{2}$	2'6	$9\frac{3}{8}$	6	$1\frac{3}{8}$	$1\frac{1}{8}$	g^{15}	$\frac{3}{4}$	
8	$3\frac{1}{2} \times 3\frac{1}{2}$	19.84	517	5.0	305	295	285	255	$5\frac{1}{2}$	2'6	$9\frac{3}{8}$	6	$1\frac{1}{8}$	$1\frac{1}{8}$	g^{11}	$\frac{3}{4}$	
8	$3\frac{1}{2} \times 3\frac{1}{2}$	22.96	588	5.0	355	340	330	300	$5\frac{5}{8}$	2'6	$9\frac{3}{8}$	6	$1\frac{1}{8}$	$1\frac{1}{8}$	g^{12}	$\frac{3}{4}$	
8	$3\frac{1}{2} \times 3\frac{1}{2}$	26.00	660	5.0	400	385	370	335	$5\frac{7}{8}$	2'6	$9\frac{3}{8}$	6	$1\frac{1}{8}$	$1\frac{1}{8}$	g^{13}	$\frac{3}{4}$	
8	$3\frac{1}{2} \times 3\frac{1}{2}$	28.96	731	5.0	445	430	415	375	$5\frac{1}{2}$	2'6	$9\frac{3}{8}$	5 $\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{1}{4}$	f^{20}	$\frac{3}{4}$	
8	$3\frac{1}{2} \times 3\frac{1}{2}$	31.92	802	5.0	490	475	455	415	$5\frac{1}{8}$	2'6	$9\frac{3}{8}$	5 $\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{1}{8}$	f^{21}	$\frac{3}{4}$	
8	$3\frac{1}{2} \times 3\frac{1}{2}$	34.72	873	5.0	535	515	500	450	$4\frac{7}{8}$	2'6	$9\frac{3}{8}$	5 $\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{1}{8}$	f^{22}	$\frac{3}{4}$	
8	$3\frac{1}{2} \times 3\frac{1}{2}$	37.52	944	5.0	580	560	540	485	$4\frac{1}{2}$	2'6	$9\frac{3}{8}$	5 $\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{1}{8}$	f^{23}	$\frac{3}{4}$	

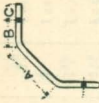


8	4	x4	3/8	22.88	588	5.0	350	340	325	300	5 1/2	1 1/8	2' 6"	9	3/8	11 1/4	6	1 1/8	1 1/8	g ¹¹	3/4
8	4	x4	7/8	26.48	669	5.0	410	395	380	345	5 1/8	1 1/8	2 6	9	3/8	11	6	1 3/8	1 1/8	g ¹²	3/4
8	4	x4	1/2	30.00	750	5.0	460	445	430	390	5 3/8	1 1/8	2 6	9	3/8	10 3/4	6	1 5/8	1 1/8	g ¹³	3/4
8	4	x4	1 1/8	33.44	831	5.0	515	500	480	435	4 1 1/8	2 1/8	2 6	9	3/8	10 3/4	5 1/4	1 1/8	1 1/8	f ²⁰	3/4
8	4	x4	5/8	36.88	912	5.0	570	550	530	480	4 3/4	2 1/8	2 6	9	3/8	10 5/8	5 1/4	1 1/8	1 1/8	f ²¹	3/4
8	4	x4	1 1/4	40.24	994	5.0	620	600	575	520	4 1 1/8	2 1/8	2 6	9	3/8	10 3/8	5 1/4	1 1/8	1 1/8	f ²²	3/4
8	4	x4	3/4	43.52	1075	5.0	670	650	625	565	4 3/8	2 1/8	2 6	9	3/8	10 1/2	5 1/4	1 3/8	1 1/8	f ²³	3/4
8	4	x4	1 1/8	46.72	1156	5.0	720	695	670	605	4 1 1/8	2 1/8	2 6	9	3/8	9 7/8	5 1/4	1 1/8	1	f ²⁴	3/4
8	4	x5	7/8	30.00	700	4.8	460	445	425	385	5 1/8	1 1/8	2 6	9	3/8	11	6	1 3/8	1 1/8	g ¹²	3/4
8	4	x5	1/2	34.00	782	4.8	520	500	485	435	4 7/8	1 1/8	2 6	9	3/8	10 3/4	6	1 5/8	1 1/8	g ¹³	3/4
8	4	x5	1 1/8	38.00	864	4.8	585	560	540	485	4 1 1/8	2 1/8	2 6	9	3/8	10 7/8	5 1/4	1 1/8	1 1/8	f ²⁰	3/4
8	4	x5	5/8	41.84	945	4.8	645	620	595	535	4 1/2	2 1/8	2 6	9	3/8	10 5/8	5 1/4	1 1/2	1 1/8	f ²¹	3/4
8	4	x5	1 1/4	45.76	1026	4.8	705	675	650	585	4 1 1/8	2 1/8	2 6	9	3/8	10 3/8	5 1/4	1 1/8	1 1/8	f ²²	3/4
8	4	x5	3/4	49.52	1107	4.8	760	730	705	635	4 1/8	2 1/8	2 6	9	3/8	10 1/2	5 1/4	1 3/8	1 1/8	f ²³	3/4
8	4	x5	1 1/8	53.20	1188	4.8	815	785	755	680	3 1 1/8	2 1/8	2 6	9	3/8	9 7/8	5 1/4	1 1/8	1	f ²⁴	3/4
8	4	x5	7/8	56.88	1269	4.8	875	840	810	730	3 3/4	2 1/8	2 6	9	3/8	9 5/8	5 1/4	1 1/4	1 1/8	f ²⁵	3/4
8	4	x6	7/8	33.44	730	4.6	510	490	470	420	5 1/8	1 1/8	2 6	9	3/8	11	6	1 3/8	1 1/8	g ¹²	3/4
8	4	x6	1/2	38.00	810	4.6	580	560	535	480	4 7/8	1 1/8	2 6	9	3/8	10 3/4	6	1 5/8	1 1/8	g ¹³	3/4
8	4	x6	1 1/8	42.48	891	4.6	650	625	600	535	4 1 1/8	2 1/8	2 6	9	3/8	10 7/8	5 1/4	1 1/8	1 1/8	f ²⁰	3/4
8	4	x6	5/8	46.88	972	4.6	715	690	660	590	4 1/2	2 1/8	2 6	9	3/8	10 5/8	5 1/4	1 1/8	1 1/8	f ²¹	3/4
8	4	x6	1 1/4	51.28	1053	4.6	785	755	720	645	4 1 1/8	2 1/8	2 6	9	3/8	10 3/8	5 1/4	1 1/8	1 1/8	f ²²	3/4
8	4	x6	3/4	55.52	1134	4.6	850	815	780	700	4 1/8	2 1/8	2 6	9	3/8	10 1/2	5 1/4	1 3/8	1 1/8	f ²³	3/4
8	4	x6	1 1/8	59.76	1215	4.6	915	880	840	755	3 1 1/8	2 1/8	2 6	9	3/8	9 7/8	5 1/4	1 1/8	1	f ²⁴	3/4
8	4	x6	7/8	63.92	1296	4.6	975	940	900	805	3 3/4	2 1/8	2 6	9	3/8	9 5/8	5 1/4	1 1/4	1 1/8	f ²⁵	3/4

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57¹/_T

18-INCH SQUARE COLUMNS.



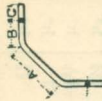
Dimensions of Angles.		Properties.			Safe Loads.				E	Gauges of	C to C Tie Plates.	Tie Plate Dimensions.						Mark of Tie Plates.	Size of Rivets.
No. Pieces.	Length of Legs	Area Square Inches.	I.	r.	Column Lengths.							Thick.	Width.	Length.	A	B	C		
					12 ft.	16 ft.	20 ft.	30 ft.											
8	2½ x 2½	11.76	411	5.9	185	180	170	160	8½"	1½	2' 6"	9	3	12%	7½	1½	1	k ⁰	¾
8	2½ x 2½	13.84	480	5.9	215	210	205	185	8½"	1½	2' 6"	9	3	12½	7½	1½	1½	k ¹	¾
8	2½ x 2½	16.00	550	5.9	250	240	235	215	8½"	1½	2' 6"	9	3	12¾	7½	1½	1½	k ²	¾
8	2½ x 2½	18.00	620	5.9	280	275	265	245	8½"	1½	2' 6"	9	3	12½	7½	1½	1½	k ³	¾
8	3 x 3	14.24	489	5.8	220	215	210	190	8½"	1½	2' 6"	9	3	12%	7½	1½	1½	k ¹⁰	¾
8	3 x 3	16.88	575	5.8	265	255	245	225	7½	1½	2' 6"	9	3	12½	7½	1½	1½	k ¹¹	¾
8	3 x 3	19.52	660	5.8	305	295	285	265	7½	1½	2' 6"	9	3	12¾	7½	1½	1½	k ¹²	¾
8	3 x 3	22.00	740	5.8	345	335	325	300	7½	1½	2' 6"	9	3	12½	7½	1½	1½	k ¹³	¾
8	3 x 3	24.48	832	5.8	380	370	360	330	7½	1½	2' 6"	9	3	11%	7½	1½	1	k ¹⁴	¾
8	3½ x 3½	19.84	666	5.7	310	300	290	265	7½	1½	2' 6"	9	3	12½	7½	1½	1½	k ¹¹	¾
8	3½ x 3½	22.96	759	5.7	360	345	335	310	7½	1½	2' 6"	9	3	12¾	7½	1½	1½	k ¹²	¾
8	3½ x 3½	26.00	851	5.7	405	395	380	350	6½	1½	2' 6"	9	3	12½	7½	1½	1½	k ¹³	¾
8	3½ x 3½	28.96	943	5.7	450	440	425	390	6½	1½	2' 6"	9	3	11%	7½	1½	1	k ¹⁴	¾
8	3½ x 3½	31.92	1035	5.7	500	485	470	430	6½	2½	2' 6"	9	3	12	6¾	1½	1½	h ⁵	¾
8	3½ x 3½	34.72	1127	5.7	540	525	510	465	6½	2½	2' 6"	9	3	11¾	6¾	1½	1½	h ⁶	¾
8	3½ x 3½	37.52	1220	5.7	585	570	550	505	6½	2½	2' 6"	9	3	11½	6¾	1½	1½	h ⁷	¾

8	4	x4	7 $\frac{1}{2}$	26.48	871	5.7	415	400	390	355	6 $\frac{3}{8}$	1 $\frac{7}{8}$	2	6	9	3 $\frac{1}{2}$	12 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{5}{8}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	k ¹²	3 $\frac{1}{4}$
8	4	x4	1 $\frac{1}{2}$	30.00	975	5.7	470	455	440	405	6 $\frac{1}{8}$	1 $\frac{7}{8}$	2	6	9	3 $\frac{1}{2}$	12 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{1}{4}$	1 $\frac{1}{8}$	1	k ¹²	3 $\frac{1}{4}$
8	4	x4	1 $\frac{1}{8}$	33.44	1078	5.7	520	505	490	450	6	1 $\frac{7}{8}$	2	6	9	3 $\frac{1}{2}$	11 $\frac{7}{8}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1	1	k ¹⁴	3 $\frac{1}{4}$
8	4	x4	5 $\frac{1}{8}$	36.88	1182	5.7	575	560	540	495	5 $\frac{1}{8}$	2 $\frac{1}{2}$	2	6	9	3 $\frac{1}{2}$	12	6 $\frac{3}{4}$	1 $\frac{7}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁸	3 $\frac{1}{4}$
8	4	x4	1 $\frac{1}{2}$	40.24	1285	5.7	630	610	590	540	5 $\frac{5}{8}$	2 $\frac{1}{2}$	2	6	9	3 $\frac{1}{2}$	11 $\frac{3}{4}$	6 $\frac{3}{4}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁶	3 $\frac{1}{4}$
8	4	x4	3 $\frac{1}{4}$	43.52	1389	5.7	680	660	640	585	5 $\frac{7}{8}$	2 $\frac{1}{2}$	2	6	9	3 $\frac{1}{2}$	11 $\frac{1}{2}$	6 $\frac{3}{4}$	1 $\frac{5}{8}$	1 $\frac{1}{8}$	1	h ⁷	3 $\frac{1}{4}$
8	4	x4	1 $\frac{1}{2}$	46.72	1492	5.7	730	710	685	630	5 $\frac{1}{4}$	2 $\frac{1}{2}$	2	6	9	3 $\frac{1}{2}$	11 $\frac{1}{4}$	6 $\frac{3}{4}$	1 $\frac{1}{4}$	1	1	h ⁸	3 $\frac{1}{4}$
8	4	x5	1 $\frac{1}{8}$	30.00	908	5.4	465	450	435	400	6 $\frac{7}{8}$	1 $\frac{7}{8}$	2	6	9	3 $\frac{1}{2}$	12 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{5}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	k ¹²	3 $\frac{1}{4}$
8	4	x5	1 $\frac{1}{2}$	34.00	1014	5.4	530	510	495	450	6 $\frac{1}{4}$	1 $\frac{7}{8}$	2	6	9	3 $\frac{1}{2}$	12 $\frac{1}{2}$	7 $\frac{1}{2}$	1 $\frac{1}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	k ¹³	3 $\frac{1}{4}$
8	4	x5	1 $\frac{1}{8}$	38.00	1121	5.4	590	570	550	505	6 $\frac{1}{8}$	1 $\frac{7}{8}$	2	6	9	3 $\frac{1}{2}$	11 $\frac{7}{8}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1	1	k ¹⁴	3 $\frac{1}{4}$
8	4	x5	5 $\frac{1}{8}$	41.84	1228	5.4	650	630	610	555	5 $\frac{7}{8}$	2 $\frac{1}{2}$	2	6	9	3 $\frac{1}{2}$	12	6 $\frac{3}{4}$	1 $\frac{7}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁵	3 $\frac{1}{4}$
8	4	x5	1 $\frac{1}{2}$	45.76	1335	5.4	710	690	665	610	5 $\frac{1}{2}$	2 $\frac{1}{2}$	2	9	12	3 $\frac{1}{2}$	11 $\frac{3}{4}$	6 $\frac{3}{4}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁶	3 $\frac{1}{4}$
8	4	x5	3 $\frac{1}{4}$	49.52	1442	5.4	770	745	720	655	5 $\frac{5}{8}$	2 $\frac{1}{2}$	2	9	12	3 $\frac{1}{2}$	11 $\frac{1}{2}$	6 $\frac{3}{4}$	1 $\frac{5}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁷	3 $\frac{1}{4}$
8	4	x5	1 $\frac{1}{2}$	53.20	1549	5.4	830	800	775	705	5 $\frac{7}{8}$	2 $\frac{1}{2}$	2	9	12	3 $\frac{1}{2}$	11 $\frac{1}{4}$	6 $\frac{3}{4}$	1 $\frac{1}{4}$	1	1	h ⁸	3 $\frac{1}{4}$
8	4	x5	7 $\frac{1}{8}$	56.88	1656	5.4	885	855	825	755	5 $\frac{1}{2}$	2 $\frac{1}{2}$	2	9	12	3 $\frac{1}{2}$	11	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁹	3 $\frac{1}{4}$
8	5	x5	1 $\frac{1}{8}$	33.44	1077	5.6	520	505	490	450	5 $\frac{1}{8}$	1 $\frac{7}{8}$	2	6	9	3 $\frac{1}{2}$	12 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{5}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	k ¹²	3 $\frac{1}{4}$
8	5	x5	1 $\frac{1}{2}$	38.00	1206	5.6	590	575	555	510	4 $\frac{7}{8}$	1 $\frac{7}{8}$	2	6	9	3 $\frac{1}{2}$	12 $\frac{1}{2}$	7 $\frac{1}{2}$	1 $\frac{1}{4}$	1 $\frac{1}{8}$	1	k ¹³	3 $\frac{1}{4}$
8	5	x5	1 $\frac{1}{8}$	42.48	1335	5.6	660	640	620	570	4 $\frac{1}{2}$	1 $\frac{7}{8}$	2	6	9	3 $\frac{1}{2}$	11 $\frac{7}{8}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1	1	k ¹⁴	3 $\frac{1}{4}$
8	5	x5	5 $\frac{1}{8}$	46.88	1465	5.6	730	710	685	630	4 $\frac{1}{2}$	2 $\frac{1}{2}$	2	6	9	3 $\frac{1}{2}$	12	6 $\frac{3}{4}$	1 $\frac{7}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁵	3 $\frac{1}{4}$
8	5	x5	1 $\frac{1}{2}$	51.26	1595	5.6	800	775	750	690	4 $\frac{1}{8}$	2 $\frac{1}{2}$	2	9	12	3 $\frac{1}{2}$	11 $\frac{3}{4}$	6 $\frac{3}{4}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁶	3 $\frac{1}{4}$
8	5	x5	3 $\frac{1}{4}$	55.52	1725	5.6	865	840	810	745	4 $\frac{1}{8}$	2 $\frac{1}{2}$	2	9	12	3 $\frac{1}{2}$	11 $\frac{1}{2}$	6 $\frac{3}{4}$	1 $\frac{5}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁷	3 $\frac{1}{4}$
8	5	x5	1 $\frac{1}{2}$	59.68	1855	5.6	930	900	875	800	3 $\frac{1}{2}$	2 $\frac{1}{2}$	2	9	12	3 $\frac{1}{2}$	11 $\frac{1}{4}$	6 $\frac{3}{4}$	1 $\frac{1}{4}$	1	1	h ⁸	3 $\frac{1}{4}$
8	5	x5	7 $\frac{1}{8}$	63.92	1985	5.6	1000	965	935	855	3 $\frac{3}{4}$	2 $\frac{1}{2}$	2	9	12	3 $\frac{1}{2}$	11	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁹	3 $\frac{1}{4}$

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57¹/₄

20-INCH SQUARE COLUMNS.



No Pieces.	Dimensions of Angles.		Properties		Safe Loads.				E	Gang of Angles.	C to C Tie Plates.	Tie Plate Dimensions.						Mark of Tie Plates.	Size of Rivets.	
	Length of Legs	Thick.	Area Square Inches.	I.	I.	Column Lengths.						Width.	Thick.	Length.	A	B	C			
						12 ft.	16 ft.	20 ft.												30 ft.
8	2½ x 3½	¾	13.84	6.6	6.6	220	210	205	190	9%	2' 6"	9	¾	14¼	8½	1½	1½	m ¹	¾	
8	2½ x 2½	½	16.00	6.6	6.6	250	245	240	220	9½	2 6	9	¾	14	8½	1½	7%	m ²	¾	
8	2½ x 3½	½	18.00	7.6	6.6	285	275	270	250	9½	2 6	9	¾	13¾	8½	1½	1½	m ³	¾	
8	3 x 3	¾	16.88	7.23	6.5	265	260	250	235	9¼	2 6	9	¾	14¼	8½	1½	1½	m ¹¹	¾	
8	3 x 3	½	19.52	8.24	6.5	305	300	290	270	9½	2 6	9	¾	14	8½	1½	1½	m ¹²	¾	
8	3 x 3	½	22.00	9.25	6.5	345	340	330	305	8%	2 6	9	¾	13¾	8½	1½	1½	m ¹³	¾	
8	3 x 3	½	24.48	10.26	6.5	385	375	365	340	8½	2 6	9	¾	13½	8½	1½	1	m ¹⁴	¾	
8	3 x 3	¾	26.88	11.27	6.5	425	415	400	375	8½	2 6	9	¾	13¼	8½	1½	1½	m ¹⁵	¾	
8	3½ x 3½	¾	19.84	8.34	6.4	310	305	295	275	8%	2 6	9	¾	14¼	8½	1½	1½	m ¹¹	¾	
8	3½ x 3½	½	22.96	9.49	6.4	360	350	340	320	8½	2 6	9	¾	14	8½	1½	1½	m ¹²	¾	
8	3½ x 3½	¾	26.00	10.64	6.4	410	400	385	360	8¼	2 6	9	¾	13¾	8½	1½	1½	m ¹³	¾	
8	3½ x 3½	½	28.96	11.79	6.4	455	445	430	400	8½	2 6	9	¾	13½	8½	1½	1	m ¹⁴	¾	
8	3½ x 3½	¾	31.92	12.93	6.4	505	490	475	440	7%	2 6	9	¾	13¼	8½	1½	1½	m ¹⁵	¾	
8	3½ x 3½	½	34.72	14.08	6.4	550	535	520	480	7½	2 6	9	¾	13¾	7½	1½	1½	k ²¹	¾	
8	3½ x 3½	¾	37.42	15.23	6.4	590	575	560	520	7½	2 6	9	¾	13½	7½	1½	1½	k ²²	¾	
8	3½ x 3½	½	40.24	16.38	6.4	635	620	600	560	7½	2 6	9	¾	12¾	7½	1½	1	k ²³	¾	
8	4 x 4	½	26.48	10.92	6.4	415	405	395	365	7¾	2 6	9	¾	14	8½	1½	1½	m ¹²	¾	
8	4 x 4	¾	30.00	12.23	6.4	470	460	445	415	7½	2 6	9	¾	13¾	8½	1½	1½	m ¹³	¾	
8	4 x 4	½	33.44	13.54	6.4	525	515	500	460	7¾	2 6	9	¾	13½	8½	1½	1	m ¹⁴	¾	

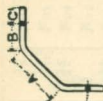
8	4	x4	3/8	36.88	1485	6.4	580	565	550	510	7 1/8	1 7/8	2 6	9	3/8	13 3/4	8 1/2	1 1/8	1 1/8	m ¹⁵	3/4
8	4	x4	1 1/8	40.28	1615	6.4	635	620	600	560	7	2 1/8	2 6	9	3/8	13 3/8	7 1/2	1 1/8	1 1/8	k ²¹	3/4
8	4	x4	3/4	43.52	1746	6.4	685	665	650	600	6 1/8	2 1/8	2 6	9	3/8	13 1/2	7 1/2	1 1/8	1 1/8	k ²²	3/4
8	4	x4	1 1/8	46.72	1876	6.4	740	720	700	645	6 5/8	2 1/8	2 6	9	3/8	12 7/8	7 1/2	1 1/8	1 1/8	k ²³	3/4
8	4	x5	7/8	30.00	1146	6.1	470	460	445	410	7 7/8	1 7/8	2 6	9	3/8	14	8 1/2	1 5/8	1 5/8	m ²²	7/8
8	4	x5	1/2	34.00	1282	6.1	535	520	505	465	7 1/8	1 7/8	2 6	9	3/8	13 3/4	8 1/2	1 5/8	1 5/8	m ²³	7/8
8	4	x5	5/8	38.00	1118	6.1	600	580	565	520	7 1/2	1 7/8	2 6	9	3/8	13 1/4	8 1/2	1 1/2	1 1/2	m ²⁴	7/8
8	4	x5	3/8	41.84	1554	6.1	655	640	620	575	7 1/8	1 7/8	2 6	9	3/8	13 1/4	8 1/2	1 1/8	1 1/8	m ²⁵	7/8
8	4	x5	1 1/8	45.76	1690	6.1	720	700	680	625	7 1/8	2 1/8	2 9	12	3/8	13 3/8	7 1/2	1 1/8	1 1/8	k ³¹	7/8
8	4	x5	3/4	49.52	1826	6.1	780	755	735	680	6 1/8	2 1/8	2 9	12	3/8	13 1/8	7 1/2	1 1/8	1 1/8	k ³²	7/8
8	4	x5	1 1/8	53.20	1962	6.1	835	815	790	730	6 3/4	2 1/8	2 9	12	3/8	12 7/8	7 1/2	1 1/8	1 1/8	k ³³	7/8
8	4	x5	7/8	56.88	2098	6.1	895	870	845	780	6 1/8	2 1/8	2 9	12	3/8	12 5/8	7 1/2	1 5/8	1 5/8	k ³⁴	7/8
8	5	x5	1/2	38.00	1525	6.3	600	580	565	525	6 1/4	1 7/8	2 9	12	3/8	13 3/4	8 1/2	1 1/8	1 1/8	m ²²	7/8
8	5	x5	5/8	42.48	1686	6.3	670	650	630	585	6 1/8	1 7/8	2 9	12	3/8	13 1/2	8 1/2	1 1/2	1 1/2	m ²⁴	7/8
8	5	x5	3/8	46.88	1847	6.3	740	720	700	645	5 7/8	1 7/8	2 9	12	3/8	13 1/4	8 1/2	1 1/8	1 1/8	m ²⁵	7/8
8	5	x5	1 1/8	51.36	2008	6.3	810	785	765	710	5 1/4	2 1/8	2 9	12	3/8	13 3/8	7 1/2	1 1/8	1 1/8	k ³¹	7/8
8	5	x5	3/4	55.52	2169	6.3	875	850	825	765	5 1/2	2 1/8	2 9	12	3/8	13 1/8	7 1/2	1 1/8	1 1/8	k ³²	7/8
8	5	x5	1 1/8	59.68	2331	6.3	940	915	890	825	5 1/8	2 1/8	2 9	12	3/8	12 7/8	7 1/2	1 1/8	1 1/8	k ³³	7/8
8	5	x5	7/8	63.92	2492	6.3	1005	980	950	880	5 1/8	2 1/8	2 9	12	3/8	12 5/8	7 1/2	1 5/8	1 5/8	k ³⁴	7/8
8	6	x6	1/2	46.00	1816	6.2	725	705	685	635	4 7/8	1 7/8	2 9	12	3/8	13 3/4	8 1/2	1 1/8	1 1/8	m ²³	7/8
8	6	x6	5/8	51.44	2009	6.2	810	785	765	710	4 1/8	1 7/8	2 9	12	3/8	13 1/2	8 1/2	1 1/2	1 1/2	m ²⁴	7/8
8	6	x6	3/8	56.88	2202	6.2	895	870	845	785	4 1/2	1 7/8	2 9	12	3/8	13 1/4	8 1/2	1 1/8	1 1/8	m ²⁵	7/8
8	6	x6	1 1/8	62.24	2395	6.2	980	955	925	855	4 1/8	2 1/8	2 9	12	3/8	13 3/8	7 1/2	1 1/8	1 1/8	k ³¹	7/8
8	6	x6	3/4	67.52	2588	6.2	1065	1035	1005	930	4 5/8	2 1/8	3 0	15	3/8	13 1/8	7 1/2	1 1/8	1 1/8	k ³²	7/8
8	6	x6	1 1/8	72.72	2781	6.2	1145	1115	1080	1000	4 7/8	2 1/8	3 0	15	3/8	12 7/8	7 1/2	1 1/8	1 1/8	k ³³	7/8
8	6	x6	7/8	77.92	2974	6.2	1230	1195	1160	1075	4 3/4	2 1/8	3 0	15	3/8	12 5/8	7 1/2	1 5/8	1 5/8	k ³⁴	7/8
8	6	x6	1 1/8	83.20	3167	6.2	1310	1275	1235	1145	4 1/8	2 1/8	3 0	15	3/8	12 3/8	7 1/2	1 1/8	1 1/8	k ³⁵	7/8
8	6	x6	1	88.40	3559	6.2	1395	1355	1315	1215	3 7/8	2 1/8	3 0	15	3/8	12 1/8	7 1/2	1 1/2	1 1/2	k ³⁶	7/8

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{r}$

30-INCH SQUARE COLUMNS.

No. Pieces.	Dimensions of Angles.		Properties.				Safe Loads.				E.	Gauge of Angles.	C to C Tie Plates.	Tie Plate Dimensions.						Mark of Tie Plates.	Size of Rivets.
	Length of Legs	Thickness	Area Square Inches.	I.		r.	Column Lengths.							Thick.	Length.	A.	B.	C.			
				I.	r.		12 ft.	16 ft.	20 ft.	30 ft.											
8	3½ x 3½	½	26.0	2555	9.9	420	415	405	390	10½	2½	5' 0"	14½	21¼	14½	21¼	14½	1½	n ³	¾	
8	3½ x 3½	⅞	29.0	2846	9.9	470	460	455	435	10¾	2½	5 0	14½	21	14½	21	14½	1½	n ⁴	¾	
8	3½ x 3½	1	31.9	3136	9.9	515	510	500	480	10¾	2½	5 0	14½	20¾	14½	20¾	14½	1½	n ⁵	¾	
8	4 x 4	½	30.0	2925	9.8	485	480	470	450	10½	2½	5 0	14½	21¼	14½	21¼	14½	1½	n ³	¾	
8	4 x 4	⅞	33.4	3239	9.8	540	535	525	500	10¾	2½	5 0	14½	21	14½	21	14½	1½	n ⁴	¾	
8	4 x 4	1	36.8	3552	9.8	595	585	575	550	10¾	2½	5 0	14½	20¾	14½	20¾	14½	1½	n ⁵	¾	
8	4 x 4	1¼	40.2	3865	9.8	655	640	630	600	10½	2½	5 0	14½	20½	14½	20½	14½	1½	n ⁶	¾	
8	4 x 4	¾	43.5	4179	9.8	707	695	685	650	10	2½	5 0	14½	20¼	14½	20¼	14½	1½	n ⁷	¾	
8	5 x 4	½	34.0	3393	9.9	550	540	535	510	10½	2½	5 0	14½	21¼	14½	21¼	14½	1½	n ³	¾	
8	5 x 4	⅞	38.0	3770	9.9	615	605	595	570	10¾	2½	5 0	14½	21	14½	21	14½	1½	n ⁴	¾	
8	5 x 4	1	41.8	4147	9.9	680	670	655	630	10¾	2½	5 0	14½	20¾	14½	20¾	14½	1½	n ⁵	¾	
8	5 x 4	1¼	45.7	4524	9.9	740	730	715	685	10½	2½	5 0	14½	20½	14½	20½	14½	1½	n ⁶	¾	
8	5 x 4	¾	49.5	4901	9.9	805	790	775	745	10	2½	5 0	14½	20¼	14½	20¼	14½	1½	n ⁷	¾	
8	5 x 5	½	38.0	3626	9.7	615	605	595	570	10½	2½	5 0	14½	21¼	14½	21¼	14½	1½	n ³	¾	
8	5 x 5	⅞	42.4	4030	9.7	690	675	665	635	10¾	2½	5 0	14½	21	14½	21	14½	1½	n ⁴	¾	
8	5 x 5	1	46.9	4433	9.7	760	750	735	700	10¾	2½	5 0	14½	20¾	14½	20¾	14½	1½	n ⁵	¾	
8	5 x 5	1¼	51.3	4837	9.7	835	820	805	770	10½	2½	5 0	14½	20½	14½	20½	14½	1½	n ⁶	¾	
8	5 x 5	¾	55.5	5241	9.7	900	885	870	830	10	2½	5 0	14½	20¼	14½	20¼	14½	1½	n ⁷	¾	



8	6 x6	5%	56.9	5286	9.6	925	905	890	850	10%	2%	5'0"	35	5%	20%	14%	11%	1 1/8	n ⁵	7%	
8	6 x6	1 1/8	62.2	5759	9.6	1010	990	975	930	10%	2%	5 0	35	5%	20 1/2	14 1/2	1%	1 1/8	n ⁶	7%	
8	6 x6	3/4	67.5	6231	9.6	1095	1075	1055	1010	10	2%	5 0	35	5%	20 1/4	14 1/2	1 1/8	1 1/8	n ⁷	7%	
4	pls. 14"	3/4	109.5	10435	9.7	1780	1750	1715	1640	9%	2 3/4	5 0	35	5%	19 3/4	12	2%	1 5/8	p ⁷	7%	
8	6 x6	3/4																			
4	pls. 14	3/4	154.5	14606	9.7	2510	2465	2425	2315	8%	2 3/4	5 0	35	5%	18 3/8	11	2%	1 5/8	r ⁷	7%	
4	" 15	3/4																			
8	6 x6	3/4	199.5	18358	9.6	3240	3185	3125	2985	6%	2 3/4	5 0	35	5%	17 1/2	10	2%	1 5/8	s ⁷	7%	
4	pls. 14	3/4																			
8	" 15	7%	231.9	20571	9.4	3765	3695	3630	3460	7	2 3/4	5 0	35	1 1/8	16 1/2	9 1/2	2	1 1/2	t ⁹	7%	
8	6 x6	7%																			
4	pls. 14	1	264.4	22688	9.2	4285	4200	4130	3930	7 1/2	2 3/4	5 0	35	1 1/8	15 1/2	9	1%	1 3/8	u	7%	
8	" 15	1																			
8	6 x6	1																			

GRAY COLUMNS. Patented, Dec. 1892.

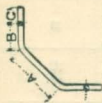
SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA $17100 - 57 \frac{1}{r}$

9-INCH WALL COLUMNS.

Dimensions of Angles.		Properties.		Safe Loads.			E	Angles of C to Tie	Tie Plate Dimensions.						Tie Plate Marks.		Size of Rivets.		
No. Pieces.	Length of Legs	Thick.	Area Square Inches.	I.	r.	Column Lengths.			Width.	Thick.	Length Plate Bent	Length Plate Straight	A	B	C	Bent Plate		Straight Plate	
						12 ft.	16 ft.	20 ft.									30 ft.		
6	2 x 2½	¼	6.36	33	1.9	80	70	60	40	8	6½	8	2	1¼	1	1	a	A	5/8
6	2 x 2½	⅝	7.86	28	1.9	100	90	80	50	8	6¼	7½	2	1¼	1½	1½	a ^o	A ^o	5/8
6	2 x 2½	¾	9.30	34	1.9	120	105	90	60	8	6	7¾	2	1½	1½	1½	a ¹	A ¹	5/8
6	2 x 2½	⅞	10.68	39	1.9	135	120	105	65	8	5¾	7½	2	1½	1½	1½	a ²	A ²	5/8
6	2 x 2½	1	12.00	43	1.9	150	135	115	75	8	5½	7½	2	1	1¼	1¼	a ³	A ³	5/8
6	2 x 3	¼	7.14	25	1.8	90	80	70	40	8	6½	8	2	1¼	1	1	a	A	5/8
6	2 x 3	⅝	8.82	29	1.8	110	100	85	50	8	6¼	7½	2	1¼	1½	1½	a ^o	A ^o	5/8
6	2 x 3	¾	10.38	34	1.8	130	115	100	60	8	6	7¾	2	1½	1½	1½	a ¹	A ¹	5/8
6	2 x 3	⅞	12.00	39	1.8	150	130	115	70	8	5¾	7½	2	1½	1½	1½	a ²	A ²	5/8
6	2 x 3	1	13.50	44	1.8	170	145	130	80	8	5½	7½	2	1	1¼	1¼	a ³	A ³	5/8

10-INCH WALL COLUMNS.

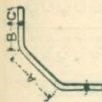
6	2½ x 2½	¼	7.14	35	2.2	95	85	75	55	8	7¼	8	2½	1¼	1	1	b	B	5/8
6	2½ x 2½	⅝	8.82	43	2.2	115	105	95	65	8	7	7½	2½	1¼	1½	1½	b ^o	B ^o	5/8
6	2½ x 2½	¾	10.38	50	2.2	140	125	110	80	8	6¾	7¾	2½	1½	1½	1½	b ¹	B ¹	5/8
6	2½ x 2½	⅞	12.00	58	2.2	160	145	130	90	8	6½	7½	2½	1½	1½	1½	b ²	B ²	5/8
6	2½ x 2½	1	13.50	65	2.2	180	160	145	100	8	6¼	7½	2½	1	1¼	1¼	b ³	B ³	5/8
6	2½ x 3	¼	7.86	35	2.1	105	90	80	60	8	7¼	8	2½	1¼	1	1	b	B	5/8
6	2½ x 3	⅝	9.72	43	2.1	130	115	100	70	8	7	7½	2½	1¼	1½	1½	b ^o	B ^o	5/8
6	2½ x 3	¾	11.52	51	2.1	150	135	120	85	8	6¾	7¾	2½	1½	1½	1½	b ¹	B ¹	5/8
6	2½ x 3	⅞	13.32	59	2.1	175	160	140	100	8	6½	7½	2½	1½	1½	1½	b ²	B ²	5/8
6	2½ x 3	1	15.00	66	2.1	200	180	160	110	8	6¼	7½	2½	1	1¼	1¼	b ³	B ³	5/8



GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57¹/_r

12-INCH WALL COLUMNS.



No. Pieces.	Dimensions of Angles.		Properties.				Safe Loads.						Tie Plate Dimensions.						Tie Plate Marks.		Size of Rivets.		
	Length of Legs	Thick.	Area Square Inches.	I.		r.	Column Lengths.			E	Gauge of Angles.		C to C Tie Plates.	Width.	Thick.	Length	Straight Plate.	A	B	C		Bent Plate.	Straight Plate.
				I.	r.		12 ft.	16 ft.	20 ft.		30 ft.	Angles.											
6	2½ x 2½	⅝	8.82	64	2.7	120	115	105	80	4¾	1¾	2 6	8	8	8½	10¾	3¼	11½	1	C ⁰	C ⁰	C ⁰	5/8
6	2½ x 2½	¾	10.38	74	2.7	145	135	125	95	4½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ⁰	C ⁰	C ⁰	5/8
6	3 x 3	⅝	9.72	76	2.8	135	125	115	95	3¾	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 3	¾	11.52	88	2.8	160	150	140	110	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 3	⅝	10.68	78	2.7	150	140	125	100	3¾	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ⁰	C ⁰	C ⁰	5/8
6	3 x 3	¾	12.66	92	2.7	175	165	150	120	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 3	⅝	14.64	106	2.7	205	190	175	140	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ²	C ²	C ²	5/8
6	3 x 3½	⅝	11.58	78	2.6	160	150	135	105	3¾	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ⁰	C ⁰	C ⁰	5/8
6	3 x 3½	¾	13.80	93	2.6	190	175	160	125	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 3½	⅝	15.90	108	2.6	220	205	185	145	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 3½	¾	18.00	122	2.6	250	230	210	165	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ²	C ²	C ²	5/8
6	3 x 4	⅝	12.54	80	2.5	170	160	145	110	3¾	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ⁰	C ⁰	C ⁰	5/8
6	3 x 4	¾	14.88	94	2.5	205	190	170	130	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 4	⅝	17.22	108	2.5	240	200	200	150	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 4	¾	19.50	122	2.5	270	245	225	170	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ²	C ²	C ²	5/8
6	3 x 4	⅝	21.72	136	2.5	300	275	250	190	3½	1½	2 6	9	9	7½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 4½	¾	16.02	97	2.4	220	200	180	135	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 4½	⅝	18.54	111	2.4	250	230	210	160	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 4½	¾	21.00	121	2.4	285	265	240	180	3½	1½	2 6	8	8	8½	10¾	3¼	11½	1	C ²	C ²	C ²	5/8
6	3 x 4½	⅝	23.40	139	2.4	320	295	265	200	3½	1½	2 6	9	9	7½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 5	¾	17.16	99	2.4	230	210	195	145	3½	1½	2 6	9	9	7½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 5	⅝	19.86	114	2.4	270	250	225	170	3½	1½	2 6	9	9	7½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8
6	3 x 5	¾	22.50	130	2.4	305	280	255	190	3½	1½	2 6	9	9	7½	10¾	3¼	11½	1	C ²	C ²	C ²	5/8
6	3 x 5	⅝	25.08	141	2.4	340	310	285	215	3½	1½	2 6	9	9	7½	10¾	3¼	11½	1	C ¹	C ¹	C ¹	5/8

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{2}$

13-INCH WALL COLUMNS.

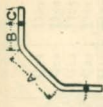


No. Pieces.	Dimensions of Angles.		Properties.				Safe Loads.				E	Gauge of Plates.	C to Tie	Tie Plate Dimensions.						Tie Plate Marks.		Size of Rivets.			
	Length of Legs	Thick	Area Square Inches.	I.	r.	Column Lengths.				Length Bent Plate.				Length Straight Plate.	A	B	C	Bent Plate.	Straight Plate.						
						12 ft.	16 ft.	20 ft.	30 ft.											Width.	Thick.		Length Bent Plate.	Length Straight Plate.	
6	2½ x 2½	1½	8.82	74	2.9	125	115	105	85	5½"	1½	2 6"	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1	d°	D°	5/8
6	3 x 2½	1½	9.72	87	3.0	140	130	120	100	4½	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1	d°	D°	5/8
6	3 x 3	1½	10.68	90	2.9	150	140	130	105	4½	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1¼	d ²⁰	D ²⁰	¾
6	3 x 3	¾	12.66	106	2.9	180	165	155	125	4½	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1¼	d ²¹	D ²¹	¾
6	3 x 3	1½	14.64	121	2.9	205	195	180	145	4½	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1½	d ²²	D ²²	¾
6	3 x 3	1½	16.50	136	2.9	235	220	205	165	3½	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1½	d ²³	D ²³	¾
6	3 x 4	¾	14.88	111	2.7	210	195	180	140	4½	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1½	d ²¹	D ²¹	¾
6	3 x 4	1½	17.22	126	2.7	240	225	205	165	4½	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1½	d ²²	D ²²	¾
6	3 x 4	1½	19.50	142	2.7	275	255	235	185	4	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1½	d ²³	D ²³	¾
6	3 x 4	1½	21.72	157	2.7	305	280	260	205	3½	1½	2 6	9	1½	9	10¾	12¾	3¾	12¾	3¾	12¾	1½	c ¹⁰	C ¹⁰	¾
6	3 x 4	1½	23.88	172	2.7	335	310	285	225	3½	1½	2 6	9	1½	9	10¾	12¾	3¾	12¾	3¾	12¾	1½	c ¹¹	C ¹¹	¾
6	3 x 4	1½	26.04	187	2.7	365	340	310	245	3½	1½	2 6	9	1½	9	10¾	12¾	3¾	12¾	3¾	12¾	1½	c ¹²	C ¹²	¾
6	3 x 4	1½	28.14	202	2.7	395	365	335	265	3½	1½	2 6	9	1½	9	10¾	12¾	3¾	12¾	3¾	12¾	1½	c ¹³	C ¹³	¾
6	3 x 4	1½	30.18	217	2.7	425	390	360	285	3½	1½	2 6	9	1½	9	10¾	12¾	3¾	12¾	3¾	12¾	1½	c ¹⁴	C ¹⁴	¾
6	3 x 5	¾	17.16	116	2.6	240	220	200	155	4½	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1½	d ²¹	D ²¹	¾
6	3 x 5	1½	19.86	133	2.6	275	255	235	180	4½	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1½	d ²²	D ²²	¾
6	3 x 5	1½	22.50	150	2.6	310	290	265	205	4	1½	2 6	8	1½	8	9¾	11¾	3¾	11¾	3¾	11¾	1½	d ²³	D ²³	¾
6	3 x 5	1½	25.08	167	2.6	350	320	295	230	3½	1½	2 6	9	1½	9	10¾	12¾	3¾	12¾	3¾	12¾	1½	c ¹⁰	C ¹⁰	¾
6	3 x 5	1½	27.66	183	2.6	385	355	325	255	3½	1½	2 6	9	1½	9	10¾	12¾	3¾	12¾	3¾	12¾	1½	c ¹¹	C ¹¹	¾
6	3 x 5	1½	30.18	199	2.6	420	385	355	275	3½	1½	2 6	9	1½	9	10¾	12¾	3¾	12¾	3¾	12¾	1½	c ¹²	C ¹²	¾
6	3 x 5	1½	32.64	215	2.6	455	420	385	300	3½	1½	2 6	9	1½	9	10¾	12¾	3¾	12¾	3¾	12¾	1½	c ¹³	C ¹³	¾
6	3 x 5	1½	35.04	231	2.6	485	450	415	320	3½	1½	2 6	9	1½	9	10¾	12¾	3¾	12¾	3¾	12¾	1½	c ¹⁴	C ¹⁴	¾

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{r}$

14-INCH WALL COLUMNS.

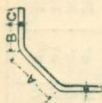


No Pieces	Dimensions of Angles.		Properties.				Safe Loads.				E	Gauge of Angles.	C to C Tie Plates.	Width.	Thick.	Length Bent Plate.	Length Straight Plate.	Tie Plate Dimensions.			Tie Plate Marks.		Size of Rivets.
	Length of Legs	Thick.	Area Square Inches.	I.		Column Lengths.				A								B	C	Bent Plate	Straight Plate		
				r.	r.	12 ft.	16 ft.	20 ft.	30 ft.														
6	2½ x 2½	5/8	8.82	85	3.1	125	120	110	90	5 1/8	1 5/8	2 6/8"	8	5/8	9 7/8	12 3/4	5 1/4	1 5/8	1	f ⁰	F ⁰	F ⁰	5/8
6	2½ x 2½	3/4	10.38	100	3.1	150	140	130	105	5 5/8	1 5/8	2 6	8	9 5/8	12 5/8	5 1/4	1 1/4	1 1/8	1 1/8	f ¹	F ¹	F ¹	5/8
6	3 x 2½	5/8	9.72	100	3.2	140	130	120	100	5 1/4	1 5/8	2 6	8	9 7/8	12 3/4	5 1/4	1 5/4	1	f ⁰	F ⁰	F ⁰	5/8	
6	3 x 2½	3/4	11.52	118	3.2	165	155	145	120	5 1/2	1 5/8	2 6	8	9 5/8	12 5/8	5 1/4	1 1/4	1 1/8	1 1/8	f ¹	F ¹	F ¹	5/8
6	3 x 3	5/8	10.68	103	3.1	155	145	135	110	5 1/4	1 7/8	2 6	8	10 1/8	12 3/4	4 1/2	1 1/2	1 1/4	1 1/4	e ⁰	E ⁰	E ⁰	3/4
6	3 x 3	3/4	12.66	122	3.1	180	170	160	130	5 1 1/2	1 7/8	2 6	8	9 7/8	12 5/8	4 1/2	1 1/2	1 1/2	1 1/2	e ¹	E ¹	E ¹	3/4
6	3 x 3	7/8	14.64	141	3.1	210	195	185	150	4 7/8	1 7/8	2 6	8	9 5/8	12 1/2	4 1/2	1 1/2	1 1/2	1 1/2	e ²	E ²	E ²	3/4
6	3 x 3 1/2	5/8	11.58	107	3.0	165	155	145	120	5 5/8	1 7/8	2 6	8	10 1/8	12 3/4	4 1/2	1 1/2	1 1/2	1 1/4	e ⁰	E ⁰	E ⁰	3/4
6	3 x 3 1/2	3/4	13.80	124	3.0	195	185	170	140	5 1/2	1 7/8	2 6	8	9 7/8	12 5/8	4 1/2	1 1/2	1 1/2	1 1/2	e ¹	E ¹	E ¹	3/4
6	3 x 3 1/2	7/8	15.90	142	3.0	225	210	200	160	4 1 1/8	1 7/8	2 6	8	9 5/8	12 1/2	4 1/2	1 1/2	1 1/2	1 1/2	e ²	E ²	E ²	3/4
6	3 x 3 1/2	1	18.00	160	3.0	255	240	225	185	4 3/4	1 7/8	2 6	8	9 3/8	12 3/8	4 1/2	1 1/2	1 1/2	1 1/2	e ³	E ³	E ³	3/4
6	3 x 3 1/2	1 1/8	20.04	177	3.0	285	270	250	205	4 5/8	2 1/8	2 6	9	9 3/8	12 3/4	3 3/4	1 1/2	1 1/2	1 1/2	d ²⁰	D ²⁰	D ²⁰	3/4
6	3 x 3 1/2	1 1/4	22.02	194	3.0	315	295	275	225	4 3/4	2 1/8	2 6	9	9 3/8	12 1/8	3 1/2	1 1/2	1 1/2	1 1/2	d ²¹	D ²¹	D ²¹	3/4
6	3 x 3 1/2	1 1/2	24.00	211	3.0	345	320	300	245	4 1/2	2 1/8	2 6	9	9 3/8	12	3 1/2	1 1/2	1 1/2	1 1/2	d ²²	D ²²	D ²²	3/4
6	3 x 3 1/2	1 3/4	25.86	228	3.0	370	345	325	265	4	2 1/8	2 6	9	9 3/8	11 7/8	3 3/4	1 1/2	1 1/2	1 1/2	d ²³	D ²³	D ²³	3/4
6	3 x 3 1/2	1 7/8	27.72	245	3.0	395	370	345	285	3 11/8	2 1/8	2 6	9	9 3/8	11 3/4	3 3/4	1 1/2	1 1/2	1 1/2	d ²⁴	D ²⁴	D ²⁴	3/4
6	3 x 4	5/8	12.54	110	2.9	180	165	155	125	5 5/8	1 7/8	2 6	8	10 1/8	12 3/4	4 1/2	1 1/2	1 1/2	1 1/4	e ⁰	E ⁰	E ⁰	3/4
6	3 x 4	3/4	14.88	128	2.9	210	195	185	150	5 1/8	1 7/8	2 6	8	9 7/8	12 5/8	4 1/2	1 1/2	1 1/2	1 1/2	e ¹	E ¹	E ¹	3/4
6	3 x 4	7/8	17.22	146	2.9	245	230	210	170	4 1 1/8	1 7/8	2 6	8	9 5/8	12 1/2	4 1/2	1 1/2	1 1/2	1 1/2	e ²	E ²	E ²	3/4
6	3 x 4	1	19.50	164	2.9	275	260	240	195	4 3/4	1 7/8	2 6	8	9 3/8	12 3/8	4 1/2	1 1/2	1 1/2	1 1/2	e ³	E ³	E ³	3/4

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{T}$

14-INCH WALL COLUMNS.



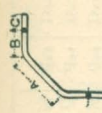
No. of Pieces	Dimensions of Angles.		Properties.		Safe Loads.				E	Gauge of Angles of C to C Tie Plates.	Tie Plate Dimensions.				Tie Plate Marks.		Size of Rivets.				
	Length of Legs	Thick.	Area Square Inches	I.	r.	Column Lengths.					Thick.	Length Bent Plate.	Length Straight Plate.	A	B	C		Bent Plate.	Straight Plate.		
						12 ft.	16 ft.	20 ft.												30 ft.	
6	3	x4	$\frac{9}{16}$	21.72	182	2.9	310	290	270	215	2 1/8	9	3 3/4	12 1/4	3 3/4	1 1/8	1 1/4	1 1/4	d ²⁰	D ²⁰	3/4
6	3	x4	$\frac{7}{8}$	23.88	200	2.9	340	315	295	240	2 3/8	9	3 3/4	12 3/8	3 3/4	1 1/8	1 1/8	1 1/8	d ²¹	D ²¹	3/4
6	3	x4	$\frac{11}{16}$	26.04	218	2.9	370	345	320	260	2 1/2	9	3 3/4	12	3 3/4	1 1/8	1 1/8	1 1/8	d ²²	D ²²	3/4
6	3	x4	$\frac{1}{4}$	28.14	236	2.9	400	375	345	280	2 1/8	9	3 3/4	11 7/8	3 3/4	1 1/8	1 1/8	1 1/8	d ²³	D ²³	3/4
6	3	x4	$\frac{11}{16}$	30.18	254	2.9	430	400	370	300	2 1/2	9	3 3/4	11 3/4	3 3/4	1	1	1	d ²⁴	D ²⁴	3/4
6	3	x4 1/2	3/8	16.02	132	2.9	225	210	195	160	1 7/8	8	4 1/2	12 5/8	4 1/2	1 1/2	1 1/2	1 1/2	e ¹	E ¹	3/4
6	3	x4 1/2	$\frac{1}{2}$	18.54	151	2.9	265	245	230	185	1 7/8	8	4 1/2	12 1/2	4 1/2	1 1/8	1 1/8	1 1/8	e ²	E ²	3/4
6	3	x4 1/2	$\frac{1}{2}$	21.00	170	2.9	300	280	260	210	1 7/8	8	4 1/2	12 3/8	4 1/2	1 1/8	1 1/8	1 1/8	e ³	E ³	3/4
6	3	x4 1/2	$\frac{1}{2}$	23.40	188	2.9	330	310	290	235	2 1/8	9	3 3/4	12 1/2	3 3/4	1 1/2	1 1/2	1 1/2	d ²⁰	D ²⁰	3/4
6	3	x4 1/2	$\frac{5}{8}$	25.80	206	2.9	365	340	320	255	2 1/8	9	3 3/4	12 1/2	3 3/4	1 1/2	1 1/2	1 1/2	d ²¹	D ²¹	3/4
6	3	x4 1/2	$\frac{11}{16}$	28.08	225	2.9	400	375	345	280	2 1/8	9	3 3/4	12	3 3/4	1 1/8	1 1/8	1 1/8	d ²²	D ²²	3/4
6	3	x4 1/2	$\frac{1}{4}$	30.36	244	2.9	430	405	375	300	2 1/8	9	3 3/4	11 7/8	3 3/4	1 1/8	1 1/8	1 1/8	d ²³	D ²³	3/4
6	3	x4 1/2	$\frac{11}{16}$	32.58	262	2.9	465	435	400	325	2 1/8	9	3 3/4	11 3/4	3 3/4	1 1/8	1	1	d ²⁴	D ²⁴	3/4
6	3	x5	3/8	17.16	131	2.8	240	225	210	165	1 7/8	8	4 1/2	12 5/8	4 1/2	1 1/2	1 1/2	e ¹	E ¹	3/4	
6	3	x5	$\frac{1}{2}$	19.86	150	2.8	280	260	240	190	1 7/8	8	4 1/2	12 1/2	4 1/2	1 1/8	1 1/8	e ²	E ²	3/4	
6	3	x5	$\frac{5}{8}$	22.50	170	2.8	315	295	275	220	1 7/8	8	4 1/2	12 3/8	4 1/2	1 3/8	1 1/8	e ³	E ³	3/4	
6	3	x5	$\frac{11}{16}$	25.08	190	2.8	355	330	305	245	2 1/8	9	3 3/4	12 1/2	3 3/4	1 1/8	1 1/8	d ²⁰	D ²⁰	3/4	
6	3	x5	$\frac{1}{8}$	27.66	209	2.8	390	365	335	270	2 1/8	9	3 3/4	12 1/2	3 3/4	1 1/2	1 1/2	d ²¹	D ²¹	3/4	
6	3	x5	$\frac{11}{16}$	30.18	228	2.8	425	395	370	295	2 1/8	9	3 3/4	12	3 3/4	1 1/8	1 1/8	d ²²	D ²²	3/4	
6	3	x5	$\frac{1}{4}$	32.64	247	2.8	460	430	395	315	2 1/8	9	3 3/4	11 7/8	3 3/4	1 3/8	1 1/8	d ²³	D ²³	3/4	
6	3	x5	$\frac{11}{16}$	35.04	266	2.8	495	460	425	340	2 1/8	9	3 3/4	11 3/4	3 3/4	1 1/8	1	d ²⁴	D ²⁴	3/4	

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57¹/_r

14-INCH WALL COLUMNS.

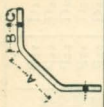
Dimensions of Angles.		Properties.		Safe Loads.			E	Gauge of Plates.	C to C Tie Plates.	Tie Plate Dimensions.				Tie Plate Marks.		Size of Rivets.				
No. Pieces.	Length of Legs	Thick.	Area Square Inches.	I.	r.	Column Lengths.				Length Bent Plate.	Length Upright Plate.	A	B	C	Bent Plate.		Straight Plate.			
						12 ft.	16 ft.	20 ft.	30 ft.											
6	3 1/2 x 3	1 5/8	11.58	119	3.2	165	155	145	120	4 5/8"	1 7/8	2 6"	8	10 1/2	4 1/2	4 1/2	1 1/4	e ⁰	E ⁰	3/4
6	3 1/2 x 3	3/8	13.80	139	3.2	200	185	175	145	4 7/8	1 7/8	2 6	8	9 7/8	4 1/2	4 1/2	1 5/8	e ¹	E ¹	3/4
6	3 1/2 x 3	1 1/8	15.90	159	3.2	230	215	200	170	4 7/8	1 7/8	2 6	8	9 7/8	4 1/2	4 1/2	1 5/8	e ²	E ²	3/4
6	3 1/2 x 3	5/8	18.00	179	3.2	260	245	230	190	4 7/8	1 7/8	2 6	8	9 7/8	4 1/2	4 1/2	1 5/8	e ³	E ³	3/4
6	3 1/2 x 3	3/4	20.04	199	3.2	290	275	255	210	3 7/8	1 7/8	2 6	9	9 3/8	3 3/4	3 3/4	1 1/2	d ¹⁰	D ¹⁰	3/4
6	3 1/2 x 3	5/8	22.02	219	3.2	320	300	280	235	3 1/4	1 7/8	2 6	9	9 3/8	3 3/4	3 3/4	1 1/4	d ¹¹	D ¹¹	3/4
6	3 1/2 x 3	1 1/4	24.00	240	3.2	345	325	305	255	3 1/2	1 7/8	2 6	9	8 7/8	3 3/4	3 3/4	1 1/4	d ¹²	D ¹²	3/4
6	3 1/2 x 3	3/4	25.86	260	3.2	375	350	330	275	3 1/8	1 7/8	2 6	9	8 5/8	3 3/4	3 3/4	1 5/8	d ¹³	D ¹³	3/4
6	3 1/2 x 3 1/2	3/8	14.88	143	3.1	215	200	185	155	4 7/8	1 7/8	2 6	8	9 7/8	4 1/2	4 1/2	1 5/8	e ¹	E ¹	3/4
6	3 1/2 x 3 1/2	1 1/8	17.22	165	3.1	245	230	215	180	4 7/8	1 7/8	2 6	8	9 7/8	4 1/2	4 1/2	1 5/8	e ²	E ²	3/4
6	3 1/2 x 3 1/2	5/8	19.50	187	3.1	280	260	245	205	4 1/8	1 7/8	2 6	8	9 3/8	4 1/2	4 1/2	1 5/8	e ³	E ³	3/4
6	3 1/2 x 3 1/2	3/4	21.72	209	3.1	310	290	275	225	3 7/8	2 1/8	2 6	9	9 3/8	3 3/4	3 3/4	1 1/2	d ²⁰	D ²⁰	3/4
6	3 1/2 x 3 1/2	5/8	23.94	230	3.1	345	320	300	250	3 1/4	2 1/8	2 6	9	9 3/8	3 3/4	3 3/4	1 1/2	d ²¹	D ²¹	3/4
6	3 1/2 x 3 1/2	1 1/4	26.04	250	3.1	375	350	330	270	3 1/2	2 1/8	2 6	9	8 7/8	3 3/4	3 3/4	1 1/2	d ²²	D ²²	3/4
6	3 1/2 x 3 1/2	3/4	28.14	270	3.1	405	380	355	295	3 1/2	2 1/8	2 6	9	8 5/8	3 3/4	3 3/4	1 5/8	d ²³	D ²³	3/4
6	3 1/2 x 3 1/2	1 1/8	30.18	290	3.1	435	405	380	315	3 3/8	2 1/8	2 6	9	8 7/8	3 3/4	3 3/4	1 1/4	d ²⁴	D ²⁴	3/4
6	3 1/2 x 4	3/8	16.02	149	3.0	230	215	200	165	4 7/8	1 7/8	2 6	8	9 7/8	4 1/2	4 1/2	1 5/8	e ¹	E ¹	3/4
6	3 1/2 x 4	1 1/8	18.54	170	3.0	265	250	230	190	4 7/8	1 7/8	2 6	8	9 7/8	4 1/2	4 1/2	1 5/8	e ²	E ²	3/4
6	3 1/2 x 4	5/8	21.00	191	3.0	300	280	260	215	4 1/8	1 7/8	2 6	8	9 3/8	4 1/2	4 1/2	1 5/8	e ³	E ³	3/4
6	3 1/2 x 4	3/4	23.40	212	3.0	335	315	290	240	3 7/8	2 1/8	2 6	9	9 3/8	3 3/4	3 3/4	1 1/2	d ²⁰	D ²⁰	3/4
6	3 1/2 x 4	5/8	25.80	233	3.0	370	345	320	265	3 1/4	2 1/8	2 6	9	9 3/8	3 3/4	3 3/4	1 1/2	d ²¹	D ²¹	3/4
6	3 1/2 x 4	1 1/4	28.08	253	3.0	400	375	350	285	3 1/2	2 1/8	2 6	9	8 7/8	3 3/4	3 3/4	1 5/8	d ²²	D ²²	3/4
6	3 1/2 x 4	3/4	30.36	273	3.0	435	405	380	310	3 1/4	2 1/8	2 6	9	8 5/8	3 3/4	3 3/4	1 5/8	d ²³	D ²³	3/4
3	3 1/2 x 4	1 1/8	32.58	293	3.0	465	435	405	330	3 3/8	2 1/8	2 6	9	8 7/8	3 3/4	3 3/4	1 5/8	d ²⁴	D ²⁴	3/4



GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{r}$

14-INCH WALL COLUMNS.

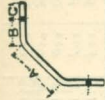


No Pieces	Dimensions of Angles.		Properties.		Safe Loads.				E	Gauge of Angles.	C to C Plates.	Tie Plate Dimensions.						Tie Plate Marks.		Size of Rivets.	
	Length of Legs	Thick	Area Square Inches.	I.	r.	Column Lengths.						Length Plate.	Bent Plate.	Length Strain Plate.	A	B	C	Bent Plate.	Strain Plate.		
						12 ft.	16 ft.	20 ft.													30 ft.
6	3½x5	¾	18.30	154	2.9	260	240	225	180	4½	26	8	1½	1½	1½	e¹	E¹	¾			
6	3½x5	7⁄8	21.18	176	2.9	300	280	260	210	4¼	26	8	1½	1½	1½	e²	E²	¾			
6	3½x5	½	24.00	198	2.9	340	320	295	240	4½	26	8	1½	1½	1½	e³	E³	¾			
6	3½x5	7⁄8	26.82	220	2.9	380	355	330	265	3¾	26	9	1½	1½	1½	d²⁰	D²⁰	¾			
6	3½x5	¾	29.52	241	2.9	420	390	365	295	3½	26	9	1½	1½	1½	d²¹	D²¹	¾			
6	3½x5	1½	32.22	263	2.9	460	430	395	320	3½	26	9	1½	1½	1½	d²²	D²²	¾			
6	3½x5	¾	34.86	284	2.9	495	460	430	355	3½	26	9	1½	1½	1½	d²³	D²³	¾			
6	3½x5	1½	37.50	306	2.9	535	500	460	375	3½	26	9	1½	1½	1	d²⁴	D²⁴	¾			
6	3½x5	¾	40.02	327	2.9	570	530	495	400	2½	26	9	1½	1½	1½	d²⁵	D²⁵	¾			
6	3½x6	¾	20.52	161	2.8	290	270	250	200	4½	26	8	1½	1½	1½	e¹	E¹	¾			
6	3½x6	7⁄8	23.82	184	2.8	335	310	290	230	4¾	26	8	1½	1½	1½	e²	E²	¾			
6	3½x6	½	27.00	207	2.8	380	355	330	260	4½	26	9	1½	1½	1½	e³	E³	¾			
6	3½x6	7⁄8	30.18	230	2.8	425	395	365	295	4	26	9	1½	1½	1½	d²⁰	D²⁰	¾			
6	3½x6	¾	33.30	252	2.8	475	440	405	325	3½	26	9	1½	1½	1½	d²¹	D²¹	¾			
6	3½x6	1½	36.36	275	2.8	515	475	440	355	3½	26	9	1½	1½	1½	d²²	D²²	¾			

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57¹/_r

15-INCH WALL COLUMNS.

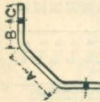


Dimensions of Angles.		Properties.		Safe Loads.				E	Gauge of Angles.	C to C Tie Plates.	Tie Plate Dimensions.						Tie Plate Marks.		Size of Rivets.		
No. Pieces.	Length of Legs	Thick	Area Square Inches.	I.	r.	Column Lengths.					Length Bent Plate.	Length Straight Plate.	A	B	C	Bent Plate.	Straight Plate.				
						12 ft.	16 ft.	20 ft.	30 ft.												
6	2½ x 2½	⅝	8.82	96	3.3	125	120	115	95	15½	2' 6"	9	3½	10½	13¾	5¼	1½	1	f ¹⁰	F ¹⁰	5/8
6	2½ x 2½	⅝	10.38	113	3.3	150	140	135	110	16½	2' 6"	9	3½	10½	13¾	5¼	1½	1	f ¹¹	F ¹¹	5/8
6	3 x 2½	⅝	9.72	112	3.4	140	135	125	105	15½	2' 6"	9	3½	10½	13¾	5¼	1½	1	f ¹⁰	F ¹⁰	5/8
6	3 x 2½	⅝	11.52	133	3.4	170	160	150	125	18½	2' 6"	9	3½	10½	13¾	5¼	1½	1	f ¹¹	F ¹¹	5/8
6	3 x 3	⅝	10.68	116	3.3	155	145	140	115	17½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²⁰	F ²⁰	¾
6	3 x 3	⅝	12.66	138	3.3	185	175	160	140	18½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²¹	F ²¹	¾
6	3 x 3	⅝	14.64	159	3.3	210	200	190	160	19½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²²	F ²²	¾
6	3 x 3	⅝	16.50	180	3.3	240	225	215	180	20½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²³	F ²³	¾
6	3 x 3	⅝	18.36	200	3.3	265	250	235	200	21½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²⁴	F ²⁴	¾
6	3 x 3	⅝	20.16	220	3.3	295	275	260	220	22½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²⁵	F ²⁵	¾
6	3½ x 3	⅝	11.58	134	3.4	170	160	150	125	17½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²⁰	F ²⁰	¾
6	3½ x 3	⅝	13.80	160	3.4	200	190	180	150	18½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²¹	F ²¹	¾
6	3½ x 3	⅝	15.90	184	3.4	230	220	205	175	19½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²²	F ²²	¾
6	3½ x 3	⅝	18.00	208	3.4	265	250	235	200	21½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²³	F ²³	¾
6	3½ x 3½	⅝	14.88	166	3.3	215	205	190	160	17½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²¹	F ²¹	¾
6	3½ x 3½	⅝	17.22	189	3.3	250	235	220	185	19½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²²	F ²²	¾
6	3½ x 3½	⅝	19.50	212	3.3	285	265	250	210	21½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	f ²³	F ²³	¾
6	3½ x 3½	⅝	21.72	235	3.3	315	300	280	235	22½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	e ¹⁴	F ¹⁴	¾
6	3½ x 3½	⅝	23.94	258	3.3	350	330	310	260	24½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	e ¹⁵	F ¹⁵	¾
6	3½ x 3½	⅝	26.04	281	3.3	380	360	335	280	25½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	e ¹⁶	F ¹⁶	¾
6	3½ x 3½	⅝	28.14	304	3.3	410	385	365	305	27½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	e ¹⁷	F ¹⁷	¾
6	3½ x 3½	⅝	30.18	327	3.3	440	415	390	325	28½	2' 6"	9	3½	10½	13¾	5¼	1½	1¼	e ¹⁸	F ¹⁸	¾

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA $17100 - 57 \frac{1}{r}$

15-INCH WALL COLUMNS.



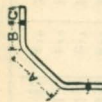
No. Pieces	Dimensions of Angles.		Properties.				Safe Loads.				E	Gauge of Angles.	C to C Tie Plates.	Tie Plate Dimensions.						Tie Plate Marks.		Size of Rivets.	
	Length of Legs	Thick.	Area Square Inches.	I.		Column Lengths.				I				Thick.	Length Bent	Straight Plate.	A	B	C	Bent Plate.	Straight Plate.		
				I.	r.	12 ft.	16 ft.	20 ft.	30 ft.														
6	3½x4	¾	16.02	169	3.3	235	220	205	175	5¾	17½	26	26	9	36	105½	185½	5¼	1½	1½	f ²¹	F ²¹	¾
6	3½x4	1½	18.54	193	3.3	270	255	240	200	5½	17½	26	26	9	36	103½	181½	5¼	1½	1½	f ²²	F ²²	¾
6	3½x4	1½	21.00	217	3.3	305	290	270	225	5	17½	26	26	9	36	101½	183½	5¼	1½	1½	f ²³	F ²³	¾
6	3½x4	1½	23.40	241	3.3	340	320	300	255	4½	21½	26	26	9	36	101½	181½	4½	1½	1½	e ¹⁴	E ¹⁴	¾
6	3½x4	1½	25.80	265	3.3	375	355	335	280	4½	21½	26	26	9	36	97½	187½	4½	1½	1½	e ¹⁵	E ¹⁵	¾
6	3½x4	1½	28.08	289	3.3	405	385	360	305	4½	21½	26	26	9	36	95½	185½	4½	1½	1½	e ¹⁶	E ¹⁶	¾
6	3½x4	1½	30.36	313	3.3	440	415	390	330	4¼	21½	26	26	9	36	93½	183½	4½	1½	1½	e ¹⁷	E ¹⁷	¾
6	3½x4	1½	32.58	336	3.3	470	445	420	355	4½	21½	26	26	9	36	91½	181½	4½	1½	1½	e ¹⁸	E ¹⁸	¾
6	3½x5	¾	18.30	178	3.1	265	245	230	190	5¾	17½	26	26	9	36	105½	185½	5¼	1½	1½	f ²¹	F ²¹	¾
6	3½x5	1½	21.18	203	3.1	305	285	265	220	5½	17½	26	26	9	36	103½	183½	5¼	1½	1½	f ²²	F ²²	¾
6	3½x5	1½	24.00	228	3.1	345	325	305	250	5	17½	26	26	9	36	101½	183½	5¼	1½	1½	f ²³	F ²³	¾
6	3½x5	1½	26.82	253	3.1	385	365	340	280	4½	21½	26	26	9	36	101½	181½	4½	1½	1½	e ¹⁴	E ¹⁴	¾
6	3½x5	1½	29.52	278	3.1	425	400	375	310	4½	21½	26	26	9	36	97½	187½	4½	1½	1½	e ¹⁵	E ¹⁵	¾
6	3½x5	1½	32.22	303	3.1	465	435	405	335	4½	21½	26	26	9	36	95½	185½	4½	1½	1½	e ¹⁶	E ¹⁶	¾
6	3½x5	1½	34.86	327	3.1	500	470	440	365	4½	21½	26	26	9	36	93½	183½	4½	1½	1½	e ¹⁷	E ¹⁷	¾
6	3½x5	1½	37.50	351	3.1	540	505	475	390	4½	21½	26	26	9	36	91½	181½	4½	1½	1½	e ¹⁸	E ¹⁸	¾
6	3½x5	1½	40.02	375	3.1	575	540	505	410	3½	21½	26	26	9	36	87½	183½	4½	1½	1½	e ¹⁹	E ¹⁹	¾
6	3½x6	1½	23.82	211	3.0	340	320	295	245	5½	17½	26	26	9	36	103½	183½	5¼	1½	1½	f ²²	F ²²	¾
6	3½x6	1½	27.00	237	3.0	385	360	335	275	5½	17½	26	26	9	36	101½	183½	5¼	1½	1½	f ²³	F ²³	¾
6	3½x6	1½	30.18	263	3.0	430	405	375	310	4½	21½	26	26	9	36	101½	181½	4½	1½	1½	e ¹⁴	E ¹⁴	¾
6	3½x6	1½	33.30	289	3.0	475	445	415	340	4¾	21½	26	26	9	36	97½	187½	4½	1½	1½	e ¹⁵	E ¹⁵	¾
6	3½x6	1½	36.36	315	3.0	520	485	455	370	4½	21½	26	26	9	36	95½	185½	4½	1½	1½	e ¹⁶	E ¹⁶	¾

6	3½x6	¾	39.36	3.10	3.0	565	530	490	400	4¾	2½	2'6"	9	¾	9¾	127%	4½	1¾	e ¹⁷	E ¹⁷
6	3½x6	1½	42.36	365	3.0	605	570	530	430	4½	2½	2'6	9	¾	9½	12¾	4½	1½	e ¹⁸	E ¹⁸
6	3½x6	¾	45.30	390	3.0	650	610	565	465	4	2½	2'6	9	¾	8%	12¾	4½	1¼	e ¹⁹	E ¹⁹
6	4x4	¾	17.16	195	3.3	250	235	220	180	4½	2½	2'6	9	¾	10%	13½	4½	1¾	e ¹¹	E ¹¹
6	4x4	1½	19.86	222	3.3	290	275	255	215	4¼	2½	2'6	9	¾	10%	13½	4½	1½	e ¹²	E ¹²
6	4x4	¾	22.50	250	3.3	325	310	290	245	4½	2½	2'6	9	¾	10%	13¾	4½	1½	e ¹³	E ¹³
6	4x4	1½	25.08	277	3.3	365	345	325	270	3%	2½	2'6	9	¾	10%	13¾	4½	1½	e ¹⁴	E ¹⁴
6	4x4	¾	27.66	304	3.3	405	380	355	300	3½	2½	2'6	9	¾	9%	13½	4½	1½	e ¹⁵	E ¹⁵
6	4x4	1½	30.18	332	3.3	440	415	390	330	3½	2½	2'6	9	¾	9%	13	4½	1½	e ¹⁶	E ¹⁶
6	4x4	¾	32.64	360	3.3	475	450	420	355	3½	2½	2'6	9	¾	9%	127%	4½	1¾	e ¹⁷	E ¹⁷
6	4x4	1½	35.04	387	3.3	510	480	450	380	3½	2½	2'6	9	¾	9%	12¾	4½	1¾	e ¹⁸	E ¹⁸
6	4x5	1½	22.50	234	3.2	325	305	285	240	4½	2½	2'6	9	¾	10%	13½	4½	1½	e ¹²	E ¹²
6	4x5	½	25.50	262	3.2	370	345	325	270	4%	2½	2'6	9	¾	10%	13¾	4½	1½	e ¹³	E ¹³
6	4x5	1½	28.50	290	3.2	415	390	365	305	3½	2½	2'6	9	¾	10%	13¼	4½	1¼	e ¹⁴	E ¹⁴
6	4x5	¾	31.38	317	3.2	455	430	400	335	3¾	2½	2'6	9	¾	9%	13%	4½	1½	e ¹⁵	E ¹⁵
6	4x5	1½	34.32	345	3.2	500	470	440	365	3½	2½	2'6	9	¾	9%	13	4½	1½	e ¹⁶	E ¹⁶
6	4x5	¾	37.14	373	3.2	540	505	475	395	3¾	2½	2'6	9	¾	9%	127%	4½	1¾	e ¹⁷	E ¹⁷
6	4x5	1½	39.90	400	3.2	580	545	510	425	3½	2½	2'6	9	¾	9%	12¾	4½	1½	e ¹⁸	E ¹⁸
6	4x5	¾	42.66	428	3.2	620	580	545	455	3	2½	2'6	9	¾	8%	12¾	4½	1¼	e ¹⁹	E ¹⁹
6	4x6	1½	25.08	241	3.1	360	340	315	260	4½	2½	2'6	9	¾	10%	13½	4½	1½	e ¹²	E ¹²
6	4x6	½	28.50	270	3.1	410	385	360	295	4%	2½	2'6	9	¾	10%	13¾	4½	1½	e ¹³	E ¹³
6	4x6	1½	31.86	299	3.1	460	430	405	330	3½	2½	2'6	9	¾	10%	13¼	4½	1¼	e ¹⁴	E ¹⁴
6	4x6	¾	35.16	328	3.1	505	475	445	365	3¾	2½	2'6	9	¾	9%	13½	4½	1½	e ¹⁵	E ¹⁵
6	4x6	1½	38.46	356	3.1	555	520	485	400	3½	2½	2'6	9	¾	9%	13	4½	1½	e ¹⁶	E ¹⁶
6	4x6	¾	41.64	385	3.1	600	565	525	435	3%	2½	2'6	9	¾	9%	127%	4½	1¾	e ¹⁷	E ¹⁷
6	4x6	1½	44.82	414	3.1	645	600	565	470	3½	2½	2'6	9	¾	9%	12¾	4½	1½	e ¹⁸	E ¹⁸
6	4x6	¾	47.94	442	3.1	690	650	605	500	3	2½	2'6	9	¾	8%	12¾	4½	1¼	e ¹⁹	E ¹⁹

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{r}$

16-INCH WALL COLUMNS.



No Pieces	Dimensions of Angles.		Properties.		Safe Loads.				E	Gauge of Angles or C to C Tie Plates.	Tie Plate Dimensions.						Tie Plate Marks.		Size of Rivets		
	Length of Legs	Thickness	Area Square Inches.	r.	12 ft.	16 ft.	20 ft.	30 ft.			Width.	Thick.	Length Bent Plate	Length Straight Plate	A	B	C	Bent Plate		Straight Plate	
6	2½ x 2½	⅞	8.82	3.6	130	120	115	100	7¼"	1½	2' 6"	9	¾	11½	14¾	6	1¾	1	g ⁰	G ⁰	⅝
6	2½ x 2½	¾	10.38	3.6	150	145	135	115	7⅞	1½	2' 6"	9	¾	11¼	14½	6	1⅞	⅞	g ¹	G ¹	⅝
6	2½ x 2½	⅞	12.00	3.6	175	165	160	135	6⅞	1½	2' 6"	9	¾	11	14½	6	1½	¾	g ²	G ²	⅝
6	2½ x 2½	½	13.50	3.6	200	185	180	150	6⅞	1½	2' 6"	9	¾	10¾	14¾	6	1⅞	⅞	g ³	G ³	⅝
6	3 x 3	⅞	10.68	3.5	155	150	140	120	6⅝	1½	2' 6"	9	¾	11½	14¾	6	1½	1¼	g ¹⁰	G ¹⁰	¾
6	3 x 3	¾	12.66	3.5	185	175	165	140	6⅞	1½	2' 6"	9	¾	11¼	14½	6	1⅞	1⅞	g ¹¹	G ¹¹	¾
6	3 x 3	⅞	14.64	3.5	215	205	190	165	6⅞	1½	2' 6"	9	¾	11	14½	6	1½	1½	g ¹²	G ¹²	¾
6	3 x 3	½	16.50	3.5	240	230	215	185	6½	1½	2' 6"	9	¾	10¾	14¾	6	1⅞	1⅞	g ¹³	G ¹³	¾
6	3 x 3	⅞	18.36	3.5	270	255	240	205	5⅞	1½	2' 6"	9	¾	10½	14¾	6	1¼	1	g ¹⁴	G ¹⁴	¾
6	3 x 3	¾	20.16	3.5	295	280	265	225	5½	1½	2' 6"	9	¾	10¼	14½	6	1⅞	⅞	g ¹⁵	G ¹⁵	¾
6	3½ x 3½	¾	14.88	3.5	220	205	195	165	5½	1½	2' 6"	9	¾	11¼	14½	6	1⅞	1⅞	g ¹¹	G ¹¹	¾
6	3½ x 3½	⅞	17.22	3.5	255	240	225	190	5⅞	1½	2' 6"	9	¾	11	14½	6	1½	1½	g ¹²	G ¹²	¾
6	3½ x 3½	½	19.50	3.5	285	270	255	220	5⅞	1½	2' 6"	9	¾	10¾	14¾	6	1⅞	1⅞	g ¹³	G ¹³	¾
6	3½ x 3½	⅞	21.72	3.5	320	300	285	245	5¼	2½	2' 6"	9	¾	10½	14¼	5¼	1⅞	1¼	f ²⁰	F ²⁰	¾
6	3½ x 3½	¾	23.94	3.5	350	335	315	270	5½	2½	2' 6"	9	¾	10½	14½	5¼	1½	1⅞	f ²¹	F ²¹	¾
6	3½ x 3½	½	26.04	3.5	385	365	340	290	4⅞	2½	2' 6"	9	¾	10¾	14	5¼	1⅞	1½	f ²²	F ²²	¾
6	3½ x 3½	¾	28.14	3.5	415	395	370	315	4½	2½	2' 6"	9	¾	10½	13¾	5¼	1½	1⅞	f ²³	F ²³	¾

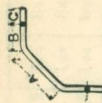
6	4	x4	3%	17.16	221	3.5	250	240	225	190	5½"	1%	2'6"	9	3%	11¼	14%	6	1½	g ₁₁	G ₁₁	¾
6	4	x4	½	19.86	252	3.5	290	275	260	225	5½	1%	2'6"	9	3%	11	14%	6	1½	g ₁₂	G ₁₂	¾
6	4	x4	½	22.50	283	3.5	330	315	295	250	5½	1%	2'6"	9	3%	10¾	14%	6	1½	g ₁₃	G ₁₃	¾
6	4	x4	½	25.08	314	3.5	370	350	330	280	4½	2%	2'6"	9	3%	10%	14%	5½	1½	f ₂₀	F ₂₀	¾
6	4	x4	½	27.66	345	3.5	405	385	365	310	4¾	2%	2'6"	9	3%	10½	14%	5½	1½	f ₂₁	F ₂₁	¾
6	4	x4	½	30.18	376	3.5	445	420	400	340	4½	2%	2'6"	9	3%	10¾	14	5½	1½	f ₂₂	F ₂₂	¾
6	4	x4	¾	32.64	407	3.5	480	455	430	365	4¾	2%	2'6"	9	3%	10½	13%	5½	1½	f ₂₃	F ₂₃	¾
6	4	x4	¾	35.04	439	3.5	515	490	460	395	4½	2%	2'6"	9	3%	9%	13%	5½	1½	f ₂₄	F ₂₄	¾
6	4	x5	½	22.50	265	3.4	330	310	295	250	5½	1%	2'6"	9	3%	11	14%	6	1½	g ₁₂	G ₁₂	¾
6	4	x5	½	25.50	296	3.4	375	350	330	280	4¾	1%	2'6"	9	3%	10¾	14%	6	1½	g ₁₃	G ₁₃	¾
6	4	x5	½	28.50	327	3.4	415	395	370	315	4½	2%	2'6"	9	3%	10%	14%	5½	1½	f ₂₀	F ₂₀	¾
6	4	x5	½	31.38	359	3.4	460	435	410	345	4½	2%	2'6"	9	3%	10½	14%	5½	1½	f ₂₁	F ₂₁	¾
6	4	x5	½	34.32	390	3.4	505	475	445	380	4½	2%	2'6"	9	3%	10¾	14	5½	1½	f ₂₂	F ₂₂	¾
6	4	x5	¾	37.14	422	3.4	545	515	485	410	4½	2%	2'6"	9	3%	10%	13%	5½	1½	f ₂₃	F ₂₃	¾
6	4	x5	¾	39.90	453	3.4	585	550	520	440	3½	2%	2'6"	9	3%	9%	13%	5½	1½	f ₂₄	F ₂₄	¾
6	4	x5	¾	42.66	484	3.4	625	590	555	470	3¾	2%	2'6"	9	3%	9%	13%	5½	1½	f ₂₅	F ₂₅	¾
6	4	x6	½	25.08	279	3.3	365	345	325	270	5½	1%	2'6"	9	3%	11	14%	6	1½	g ₁₂	G ₁₂	¾
6	4	x6	½	28.50	311	3.3	415	390	370	310	4%	1%	2'6"	9	3%	10¾	14%	6	1½	g ₁₃	G ₁₃	¾
6	4	x6	½	31.86	343	3.3	465	440	410	345	4½	2%	2'6"	9	3%	10%	14%	5½	1½	f ₂₀	F ₂₀	¾
6	4	x6	¾	35.16	375	3.3	510	485	455	380	4½	2%	2'6"	9	3%	10½	14%	5½	1½	f ₂₁	F ₂₁	¾
6	4	x6	¾	38.46	407	3.3	560	530	500	415	4½	2%	2'6"	9	3%	10¾	14	5½	1½	f ₂₂	F ₂₂	¾
6	4	x6	¾	41.64	440	3.3	605	570	540	450	4½	2%	2'6"	9	3%	10%	13%	5½	1½	f ₂₃	F ₂₃	¾
6	4	x6	¾	44.82	472	3.3	655	615	580	485	3½	2%	2'6"	9	3%	9%	13%	5½	1½	f ₂₄	F ₂₄	¾
6	4	x6	¾	47.94	504	3.3	700	660	620	520	3¾	2%	2'6"	9	3%	9%	13%	5½	1½	f ₂₅	F ₂₅	¾

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{r}$

18-INCH WALL COLUMNS.

Dimensions of Angles.		Properties.			Safe Loads.				E	Gauge of C to C Tie Plates.	Width.	Thick.	Length Bent Plate.	Length Straight Plate.	Tie Plate Dimensions.			Tie Plate Marks.		Size of Rivets
No. Pieces.	Length of Legs	Area Square Inches.	I.	r.	12 ft.	16 ft.	20 ft.	30 ft.							A	B	C	Bent Plate	Straight Plate	
6	2½ x 2½	8.82	141	4.0	130	125	120	105	8½"	1½	9	¾	127½	16¾	7½	1½	1	K ⁰	9 Plates	¾
6	2½ x 2½	10.38	166	4.0	155	150	140	125	8½"	1½	9	¾	125½	16½	7½	1½	1½	K ¹	9 Plates	¾
6	2½ x 2½	12.00	192	4.0	180	170	165	140	8½"	1½	9	¾	123½	16½	7½	1½	¾	K ²	9 Plates	¾
6	2½ x 2½	13.50	216	4.0	200	190	185	160	8½"	1½	9	¾	121½	16½	7½	1½	1½	K ³	9 Plates	¾
6	3 x 3	10.68	171	4.0	160	150	145	125	8½"	1½	9	¾	127½	16¾	7½	1½	1¼	K ¹⁰	9 Plates	¾
6	3 x 3	12.66	203	4.0	190	180	170	150	7½"	1½	9	¾	125½	16½	7½	1½	1½	K ¹¹	9 Plates	¾
6	3 x 3	14.64	234	4.0	220	210	200	175	7½"	1½	9	¾	123½	16½	7½	1½	1½	K ¹²	9 Plates	¾
6	3 x 3	16.50	266	4.0	245	235	225	195	7½"	1½	9	¾	121½	16½	7½	1½	1½	K ¹³	9 Plates	¾
6	3 x 3	18.36	298	4.0	275	260	250	220	7½"	1½	9	¾	117½	16¼	7½	1½	1	K ¹⁴	9 Plates	¾
6	3½ x 3½	14.88	238	4.0	225	210	200	180	7¼"	1½	9	¾	125½	16½	7½	1½	1½	K ¹¹	9 Plates	¾
6	3½ x 3½	17.22	272	4.0	260	245	235	205	7¼"	1½	9	¾	123½	16½	7½	1½	1½	K ¹²	9 Plates	¾
6	3½ x 3½	19.50	306	4.0	290	280	265	230	6½"	1½	9	¾	121½	16½	7½	1½	1½	K ¹³	9 Plates	¾
6	3½ x 3½	21.72	340	4.0	325	310	295	260	6½"	1½	9	¾	117½	16¼	7½	1½	1	K ¹⁴	9 Plates	¾
6	3½ x 3½	23.94	373	4.0	360	340	325	285	6½"	2½	9	¾	12	16½	6¾	1½	1½	H ⁵	9 Plates	¾
6	3½ x 3½	26.04	406	4.0	390	370	355	310	6½"	2½	9	¾	11¼	16	6¾	1½	1½	H ⁶	9 Plates	¾
6	3½ x 3½	28.14	440	4.0	420	405	385	335	6½"	2½	9	¾	11½	15½	6¾	1½	1½	H ⁷	9 Plates	¾

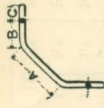


6	4	x4	1 $\frac{1}{2}$	19.86	318	4.0	295	285	270	235	6 $\frac{3}{8}$ "	1 $\frac{1}{8}$	2' 6"	9	$\frac{3}{8}$	12 $\frac{3}{8}$	16 $\frac{1}{2}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	k ¹²	K ¹²	$\frac{3}{4}$
6	4	x4	$\frac{1}{2}$	22.50	357	4.0	335	320	305	270	6 $\frac{1}{8}$	1 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	12 $\frac{3}{8}$	16 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	k ¹³	K ¹³	$\frac{3}{4}$
6	4	x4	1 $\frac{1}{8}$	25.08	396	4.0	375	360	340	300	6	1 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	11 $\frac{7}{8}$	16 $\frac{3}{4}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1	1 $\frac{1}{8}$	k ¹⁴	K ¹⁴	$\frac{3}{4}$
6	4	x4	$\frac{5}{8}$	27.66	434	4.0	415	395	375	330	5 $\frac{1}{8}$	2 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	12	16 $\frac{1}{2}$	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁵	H ⁵	$\frac{3}{4}$
6	4	x4	1 $\frac{1}{2}$	30.18	472	4.0	455	430	410	360	5 $\frac{5}{8}$	2 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	11 $\frac{3}{4}$	16	6 $\frac{3}{4}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁶	H ⁶	$\frac{3}{4}$
6	4	x4	$\frac{3}{4}$	32.64	511	4.0	490	465	445	390	5 $\frac{7}{8}$	2 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	11 $\frac{1}{2}$	15 $\frac{7}{8}$	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁷	H ⁷	$\frac{3}{4}$
6	4	x4	1 $\frac{1}{8}$	35.04	550	4.0	525	500	480	420	5 $\frac{1}{4}$	2 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	11 $\frac{1}{4}$	15 $\frac{3}{4}$	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1	h ⁸	H ⁸	$\frac{3}{4}$
6	4	x5	1 $\frac{1}{8}$	22.50	333	3.8	335	320	300	265	6 $\frac{1}{8}$	1 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	12 $\frac{3}{8}$	16 $\frac{1}{2}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	k ¹²	K ¹²	$\frac{3}{4}$
6	4	x5	$\frac{1}{2}$	25.50	374	3.8	380	360	345	300	6 $\frac{1}{4}$	1 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	12 $\frac{3}{8}$	16 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	k ¹³	K ¹³	$\frac{3}{4}$
6	4	x5	1 $\frac{1}{8}$	28.50	414	3.8	425	405	385	335	6 $\frac{1}{2}$	1 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	11 $\frac{7}{8}$	16 $\frac{1}{4}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1	1 $\frac{1}{8}$	k ¹⁴	K ¹⁴	$\frac{3}{4}$
6	4	x5	$\frac{5}{8}$	31.38	455	3.8	465	445	425	365	5 $\frac{7}{8}$	2 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	12	16 $\frac{1}{8}$	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁵	H ⁵	$\frac{3}{4}$
6	4	x5	1 $\frac{1}{2}$	34.32	496	3.8	510	485	460	400	5 $\frac{1}{2}$	2 $\frac{1}{8}$	2 9	12	$\frac{3}{8}$	11 $\frac{3}{4}$	16	6 $\frac{3}{4}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁶	H ⁶	$\frac{3}{4}$
6	4	x5	$\frac{3}{4}$	37.14	536	3.8	555	525	500	435	5 $\frac{1}{2}$	2 $\frac{1}{8}$	2 9	12	$\frac{3}{8}$	11 $\frac{1}{2}$	15 $\frac{7}{8}$	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁷	H ⁷	$\frac{3}{4}$
6	4	x5	1 $\frac{1}{8}$	39.90	576	3.8	595	565	535	465	5 $\frac{1}{8}$	2 $\frac{1}{8}$	2 9	12	$\frac{3}{8}$	11 $\frac{1}{4}$	15 $\frac{3}{4}$	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1	1 $\frac{1}{8}$	h ⁸	H ⁸	$\frac{3}{4}$
6	4	x5	$\frac{7}{8}$	42.66	616	3.8	635	605	575	500	5 $\frac{1}{2}$	2 $\frac{1}{8}$	2 9	12	$\frac{3}{8}$	11	15 $\frac{5}{8}$	6 $\frac{3}{4}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁹	H ⁹	$\frac{3}{4}$
6	5	x5	1 $\frac{1}{8}$	25.08	415	4.0	375	360	345	300	5 $\frac{1}{8}$	1 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	12 $\frac{3}{8}$	16 $\frac{1}{2}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	k ¹²	K ¹²	$\frac{3}{4}$
6	5	x5	$\frac{1}{2}$	28.50	467	4.0	425	410	390	340	4 $\frac{7}{8}$	1 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	12 $\frac{3}{8}$	16 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	k ¹³	K ¹³	$\frac{3}{4}$
6	5	x5	1 $\frac{1}{8}$	31.86	518	4.0	480	455	435	380	4 $\frac{1}{2}$	1 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	11 $\frac{7}{8}$	16 $\frac{1}{4}$	7 $\frac{1}{2}$	1 $\frac{1}{8}$	1	1 $\frac{1}{8}$	k ¹⁴	K ¹⁴	$\frac{3}{4}$
6	5	x5	$\frac{5}{8}$	35.16	569	4.0	530	505	480	420	4 $\frac{1}{2}$	2 $\frac{1}{8}$	2 6	9	$\frac{3}{8}$	12	16 $\frac{1}{8}$	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁵	H ⁵	$\frac{3}{4}$
6	5	x5	1 $\frac{1}{2}$	38.52	621	4.0	580	555	525	460	4 $\frac{5}{8}$	2 $\frac{1}{8}$	2 9	12	$\frac{3}{8}$	11 $\frac{3}{4}$	16	6 $\frac{3}{4}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁶	H ⁶	$\frac{3}{4}$
6	5	x5	$\frac{3}{4}$	41.64	672	4.0	625	600	570	500	4 $\frac{1}{2}$	2 $\frac{1}{8}$	2 9	12	$\frac{3}{8}$	11 $\frac{1}{2}$	15 $\frac{7}{8}$	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁷	H ⁷	$\frac{3}{4}$
6	5	x5	1 $\frac{1}{8}$	44.76	723	4.0	670	640	610	535	3 $\frac{1}{8}$	2 $\frac{1}{8}$	2 9	12	$\frac{3}{8}$	11 $\frac{1}{4}$	15 $\frac{3}{4}$	6 $\frac{3}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1	h ⁸	H ⁸	$\frac{3}{4}$
6	5	x5	$\frac{7}{8}$	47.94	775	4.0	720	685	655	570	3 $\frac{1}{4}$	2 $\frac{1}{8}$	2 9	12	$\frac{3}{8}$	11	15 $\frac{5}{8}$	6 $\frac{3}{4}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	h ⁹	H ⁹	$\frac{3}{4}$

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA $17100 - 57 \frac{1}{r}$

20-INCH WALL COLUMNS.



No. Pieces.	Dimensions of Angles.		Properties.				Safe Loads.				E.	Gauge of Angles.	C to C Tie Plates.	Width.	Tie Plate Dimensions.						Tie Plate Marks.		Size of Rivets.
	Length of Legs	Thick	Area Square Inches	I.		Column Lengths.				Thick.					Length Bent Plate.	Length Straight Plate.	A	B	C	Bent Plate.	Straight Plate.		
				I.	r.	12 ft.	16 ft.	20 ft.	30 ft.														
6	2½ x 2½	¾	10.38	207	4.4	155	150	145	125	9%	2 6/16	9	14¼	18½	8½	1½	1½	1½	m ¹	M ¹	¾		
6	2½ x 2½	⅞	12.00	236	4.4	180	175	165	145	9½	2 6/16	9	14	18½	8½	1½	1½	1½	m ²	M ²	¾		
6	2½ x 2½	1½	13.50	266	4.4	205	195	185	165	9½	2 6/16	9	13¾	18½	8½	1½	1½	1½	m ³	M ³	¾		
6	3 x 3	¾	12.66	251	4.4	190	185	175	155	9¼	2 6/16	9	14¼	18½	8½	1½	1½	1½	m ¹¹	M ¹¹	¾		
6	3 x 3	⅞	14.64	287	4.4	220	210	205	180	9½	2 6/16	9	14	18½	8½	1½	1½	1½	m ¹²	M ¹²	¾		
6	3 x 3	1½	16.50	323	4.4	250	240	230	205	8½	2 6/16	9	13¾	18½	8½	1½	1½	1½	m ¹³	M ¹³	¾		
6	3 x 3	1½	18.36	359	4.4	280	265	255	225	8½	2 6/16	9	13½	18½	8½	1½	1½	1½	m ¹⁴	M ¹⁴	¾		
6	3 x 3	5/8	20.16	394	4.4	305	295	280	250	8½	2 6/16	9	13¼	18½	8½	1½	1½	1½	m ¹⁵	M ¹⁵	¾		
6	3½ x 3½	¾	14.88	293	4.4	225	215	205	185	8½	2 6/16	9	14¼	18½	8½	1½	1½	1½	m ¹¹	M ¹¹	¾		
6	3½ x 3½	⅞	17.22	334	4.4	260	250	240	215	8½	2 6/16	9	14	18½	8½	1½	1½	1½	m ¹²	M ¹²	¾		
6	3½ x 3½	1½	19.50	375	4.4	295	285	270	240	8¼	2 6/16	9	13¾	18½	8½	1½	1½	1½	m ¹³	M ¹³	¾		
6	3½ x 3½	1½	21.72	416	4.4	330	315	300	270	8½	2 6/16	9	13½	18½	8½	1½	1½	1½	m ¹⁴	M ¹⁴	¾		
6	3½ x 3½	5/8	23.94	457	4.4	365	350	335	295	7½	2 6/16	9	13¼	18½	8½	1½	1½	1½	m ¹⁵	M ¹⁵	¾		
6	3½ x 3½	1½	26.04	498	4.4	395	380	365	325	7½	2 6/16	9	13¾	18½	8½	1½	1½	1½	k ²¹	K ²¹	¾		
6	3½ x 3½	1½	28.14	539	4.4	425	410	395	350	7½	2 6/16	9	13½	17½	7½	1½	1½	1½	k ²²	K ²²	¾		
6	3½ x 3½	1½	30.18	580	4.4	460	440	420	375	7½	2 6/16	9	13¾	17¾	7½	1½	1½	1½	k ²³	K ²³	¾		
6	4 x 4	⅞	19.86	393	4.4	300	290	275	245	7¾	2 6/16	9	14	18½	8½	1½	1½	1½	m ¹²	M ¹²	¾		
6	4 x 4	1½	22.50	440	4.4	340	325	315	280	7½	2 6/16	9	13¾	18½	8½	1½	1½	1½	m ¹³	M ¹³	¾		
6	4 x 4	1½	25.08	487	4.4	380	365	350	310	7½	2 6/16	9	13½	18½	8½	1½	1½	1½	m ¹⁴	M ¹⁴	¾		
6	4 x 4	5/8	27.66	534	4.4	420	405	385	345	7½	2 6/16	9	13¼	18½	8½	1½	1½	1½	m ¹⁵	M ¹⁵	¾		
6	4 x 4	1½	30.18	582	4.4	460	440	420	375	7	2 6/16	9	13¾	18	7½	1½	1½	1½	k ²¹	K ²¹	¾		
6	4 x 4	5/8	32.64	629	4.4	495	475	455	405	6½	2 6/16	9	13½	17½	7½	1½	1½	1½	k ²²	K ²²	¾		
6	4 x 4	1½	35.04	677	4.4	535	510	490	435	6½	2 6/16	9	12¾	17¾	7½	1½	1½	1½	k ²³	K ²³	¾		

6	4	x5	1 $\frac{7}{8}$	22.50	414	4.2	340	325	310	275	7 $\frac{7}{8}$	1 $\frac{7}{8}$	2' 0"	9	3 $\frac{3}{8}$	14	18 $\frac{1}{2}$	8 $\frac{1}{2}$	1 $\frac{5}{8}$	m ²²	M ²²	7 $\frac{7}{8}$
6	4	x5	1 $\frac{1}{2}$	25.50	463	4.2	385	370	350	310	7 $\frac{11}{8}$	1 $\frac{7}{8}$	2' 6"	9	3 $\frac{3}{8}$	13 $\frac{3}{4}$	18 $\frac{3}{8}$	8 $\frac{1}{2}$	1 $\frac{6}{8}$	m ²³	M ²³	7 $\frac{7}{8}$
6	4	x5	1 $\frac{5}{8}$	28.50	513	4.2	430	410	395	350	7 $\frac{1}{2}$	1 $\frac{7}{8}$	2' 6"	9	3 $\frac{3}{8}$	13 $\frac{1}{2}$	18 $\frac{1}{4}$	8 $\frac{1}{2}$	1	m ²⁴	M ²⁴	7 $\frac{7}{8}$
6	4	x5	5 $\frac{7}{8}$	31.38	562	4.2	475	455	435	380	7 $\frac{5}{8}$	1 $\frac{7}{8}$	2' 6"	9	3 $\frac{3}{8}$	13 $\frac{3}{4}$	18 $\frac{3}{8}$	8 $\frac{1}{2}$	1 $\frac{6}{8}$	m ²⁶	M ²⁶	7 $\frac{7}{8}$
6	4	x5	1 $\frac{1}{8}$	34.32	612	4.2	520	495	475	420	7 $\frac{1}{2}$	2 $\frac{1}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{3}{8}$	18	7 $\frac{1}{2}$	1 $\frac{11}{8}$	k ³¹	K ³¹	7 $\frac{7}{8}$
6	4	x5	3 $\frac{3}{4}$	37.14	661	4.2	560	535	515	455	6 $\frac{11}{8}$	2 $\frac{1}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{1}{2}$	17 $\frac{7}{8}$	7 $\frac{1}{2}$	1 $\frac{13}{8}$	k ³²	K ³²	7 $\frac{7}{8}$
6	4	x5	1 $\frac{1}{8}$	39.90	711	4.2	605	575	550	485	6 $\frac{3}{4}$	2 $\frac{1}{8}$	2' 9"	12	3 $\frac{3}{8}$	12 $\frac{7}{8}$	17 $\frac{3}{4}$	7 $\frac{1}{2}$	1 $\frac{11}{8}$	k ³³	K ³³	7 $\frac{7}{8}$
6	4	x5	7 $\frac{7}{8}$	42.66	761	4.2	645	615	590	520	6 $\frac{15}{8}$	2 $\frac{1}{8}$	2' 9"	12	3 $\frac{3}{8}$	12 $\frac{5}{8}$	17 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{15}{8}$	k ³⁴	K ³⁴	7 $\frac{7}{8}$
6	5	x5	1 $\frac{1}{2}$	28.50	573	4.4	435	415	400	355	6 $\frac{1}{4}$	1 $\frac{7}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{3}{4}$	18 $\frac{3}{8}$	8 $\frac{1}{2}$	1 $\frac{6}{8}$	m ²³	M ²³	7 $\frac{7}{8}$
6	5	x5	1 $\frac{5}{8}$	31.86	635	4.4	485	465	445	400	6 $\frac{1}{8}$	1 $\frac{7}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{1}{2}$	18 $\frac{1}{4}$	8 $\frac{1}{2}$	1 $\frac{1}{2}$	m ²⁴	M ²⁴	7 $\frac{7}{8}$
6	5	x5	5 $\frac{7}{8}$	35.16	697	4.4	535	515	490	440	5 $\frac{7}{8}$	1 $\frac{7}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{3}{4}$	18 $\frac{3}{8}$	8 $\frac{1}{2}$	1 $\frac{6}{8}$	m ²⁶	M ²⁶	7 $\frac{7}{8}$
6	5	x5	1 $\frac{1}{8}$	38.52	759	4.4	585	560	540	480	5 $\frac{11}{8}$	2 $\frac{1}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{3}{8}$	18	7 $\frac{1}{2}$	1 $\frac{11}{8}$	k ³¹	K ³¹	7 $\frac{7}{8}$
6	5	x5	3 $\frac{3}{4}$	41.64	820	4.4	635	605	580	520	5 $\frac{1}{2}$	2 $\frac{1}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{1}{2}$	17 $\frac{7}{8}$	7 $\frac{1}{2}$	1 $\frac{13}{8}$	k ³²	K ³²	7 $\frac{7}{8}$
6	5	x5	1 $\frac{1}{8}$	44.76	882	4.4	680	655	625	560	5 $\frac{15}{8}$	2 $\frac{1}{8}$	2' 9"	12	3 $\frac{3}{8}$	12 $\frac{7}{8}$	17 $\frac{3}{4}$	7 $\frac{1}{2}$	1 $\frac{11}{8}$	k ³³	K ³³	7 $\frac{7}{8}$
6	5	x5	7 $\frac{7}{8}$	47.94	943	4.4	730	700	670	600	5 $\frac{1}{8}$	2 $\frac{1}{8}$	2' 9"	12	3 $\frac{3}{8}$	12 $\frac{5}{8}$	17 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{15}{8}$	k ³⁴	K ³⁴	7 $\frac{7}{8}$
6	6	x6	1 $\frac{1}{2}$	34.50	714	4.5	525	505	485	435	4 $\frac{7}{8}$	1 $\frac{7}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{3}{4}$	18 $\frac{3}{8}$	8 $\frac{1}{2}$	1 $\frac{6}{8}$	m ²³	M ²³	7 $\frac{7}{8}$
6	6	x6	1 $\frac{5}{8}$	38.58	792	4.5	590	565	540	485	4 $\frac{11}{8}$	1 $\frac{7}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{1}{2}$	18 $\frac{1}{4}$	8 $\frac{1}{2}$	1	m ²⁴	M ²⁴	7 $\frac{7}{8}$
6	6	x6	5 $\frac{7}{8}$	42.66	870	4.5	650	625	600	535	4 $\frac{1}{2}$	1 $\frac{7}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{3}{4}$	18 $\frac{3}{8}$	8 $\frac{1}{2}$	1 $\frac{6}{8}$	m ²⁶	M ²⁶	7 $\frac{7}{8}$
6	6	x6	1 $\frac{1}{8}$	46.68	948	4.5	710	685	655	585	4 $\frac{11}{8}$	2 $\frac{1}{8}$	2' 9"	12	3 $\frac{3}{8}$	13 $\frac{3}{8}$	18	7 $\frac{1}{2}$	1 $\frac{11}{8}$	k ³¹	K ³¹	7 $\frac{7}{8}$
6	6	x6	3 $\frac{3}{4}$	50.64	1027	4.5	770	740	710	635	4 $\frac{5}{8}$	2 $\frac{1}{8}$	3' 0"	15	3 $\frac{3}{8}$	13 $\frac{1}{2}$	17 $\frac{7}{8}$	7 $\frac{1}{2}$	1 $\frac{13}{8}$	k ³²	K ³²	7 $\frac{7}{8}$
6	6	x6	1 $\frac{1}{8}$	54.54	1105	4.5	835	800	765	685	4 $\frac{15}{8}$	2 $\frac{1}{8}$	3' 0"	15	3 $\frac{3}{8}$	12 $\frac{7}{8}$	17 $\frac{3}{4}$	7 $\frac{1}{2}$	1 $\frac{11}{8}$	k ³³	K ³³	7 $\frac{7}{8}$
6	6	x6	5 $\frac{7}{8}$	58.44	1183	4.5	890	855	820	735	4 $\frac{1}{4}$	2 $\frac{1}{8}$	3' 0"	15	3 $\frac{3}{8}$	12 $\frac{5}{8}$	17 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{15}{8}$	k ³⁴	K ³⁴	7 $\frac{7}{8}$
6	6	x6	1 $\frac{1}{8}$	62.40	1261	4.5	950	915	875	785	4 $\frac{15}{8}$	2 $\frac{1}{8}$	3' 0"	15	3 $\frac{3}{8}$	12 $\frac{3}{8}$	17 $\frac{1}{2}$	7 $\frac{1}{2}$	1 $\frac{6}{8}$	k ³⁵	K ³⁵	7 $\frac{7}{8}$
6	6	x6	1	66.30	1340	4.5	1015	970	930	835	3 $\frac{7}{8}$	2 $\frac{1}{8}$	3' 0"	15	3 $\frac{3}{8}$	12 $\frac{1}{8}$	17 $\frac{3}{8}$	7 $\frac{1}{2}$	1 $\frac{1}{2}$	k ³⁶	K ³⁶	7 $\frac{7}{8}$

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{r}$

30-INCH WALL COLUMNS.



No. Pieces	Dimensions of Angles.		Properties.		Safe Loads.				E	Gauge of Angles.	C to C Tie Plates.	Width	Thick.	Tie Plate Dimensions.						Tie Plate Marks.		Size of Rivets.
	Length of Legs	Thick.	Area Square Inches	I.	r.	Column Lengths.								Length Bent Plate.	Length Straight Plate.	A	B	C	Bent Plate.	Straight Plate.		
						12 ft.	16 ft.	20 ft.													30 ft.	
6	3½ x 3½	½	19.50	876	6.7	310	300	290	270	10½	5'0"	35	½	21¼	28¾	14½	21½	1½	n³	n³	¾	
6	3½ x 3½	⅝	21.72	974	6.7	345	335	325	305	10¾	5 0	35	½	21	28¼	14½	2	1¼	n⁴	n⁴	¾	
6	3½ x 3½	¾	23.94	1072	6.7	380	370	360	335	10¾	5 0	35	½	20¾	28¾	14½	1½	1½	n⁵	n⁵	¾	
6	4 x 4	½	22.50	1013	6.7	355	345	335	315	10½	5 0	35	½	21¼	28¾	14½	21½	1½	n³	n³	¾	
6	4 x 4	⅝	25.08	1122	6.7	395	385	375	350	10¾	5 0	35	½	21	28¼	14½	2	1¼	n⁴	n⁴	¾	
6	4 x 4	¾	27.66	1231	6.7	440	425	415	385	10¾	5 0	35	½	20¾	28¾	14½	1½	1½	n⁵	n⁵	¾	
6	4 x 4	⅞	30.18	1340	6.7	480	465	455	420	10¾	5 0	35	½	20½	28	14½	1½	1½	n⁶	n⁶	¾	
6	4 x 4	¾	32.64	1449	6.7	515	505	490	455	10	5 0	35	½	20¼	27¾	14½	1½	1½	n⁷	n⁷	¾	
6	5 x 4	½	25.50	1194	6.8	405	395	385	360	10½	5 0	35	½	21¼	28¾	14½	21½	1½	n³	n³	¾	
6	5 x 4	⅝	28.50	1301	6.8	450	440	430	400	10¾	5 0	35	½	21	28¼	14½	2	1¼	n⁴	n⁴	¾	
6	5 x 4	¾	31.38	1408	6.8	495	485	470	440	10¾	5 0	35	½	20¾	28¾	14½	1½	1½	n⁵	n⁵	¾	
6	5 x 4	⅞	34.32	1515	6.8	545	530	515	480	10¾	5 0	35	½	20½	28	14½	1½	1½	n⁶	n⁶	¾	
6	5 x 4	¾	37.14	1623	6.8	590	575	560	520	10	5 0	35	½	20¼	27¾	14½	1½	1½	n⁷	n⁷	¾	
6	5 x 5	½	28.50	1272	6.7	450	440	430	400	10½	5 0	35	½	21¼	28¾	14½	21½	1½	n³	n³	¾	
6	5 x 5	⅝	31.86	1413	6.7	505	490	480	445	10¾	5 0	35	½	21	28¼	14½	2	1¼	n⁴	n⁴	¾	
6	5 x 5	¾	35.16	1554	6.7	555	540	530	490	10¾	5 0	35	½	20¾	28¾	14½	1½	1½	n⁵	n⁵	¾	
6	5 x 5	⅞	38.52	1695	6.7	610	595	580	540	10¾	5 0	35	½	20½	28	14½	1½	1½	n⁶	n⁶	¾	
6	5 x 5	¾	41.64	1837	6.7	660	645	625	585	10	5 0	35	½	20¼	27¾	14½	1½	1½	n⁷	n⁷	¾	

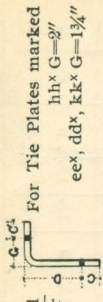
6	6	x6	5/8	42.66	1899	6.7	675	660	640	600	10 3/4	2 1/8	5'0"	35	5/8	20 3/4	28 3/8	14 1/2	1 1/8	1 3/8	n ⁵	N ⁵	7/8
6	6	x6	1 1/8	46.68	2071	6.7	740	720	700	655	10 1/2	2 1/8	5 0	35	5/8	20 1/2	28	14 1/2	1 1/8	1 1/8	n ⁶	N ⁶	7/8
6	6	x6	3/4	50.64	2244	6.7	805	780	760	710	10	2 1/8	5 0	35	5/8	20 3/4	27 7/8	14 3/4	1 1/8	1 1/8	n ⁷	N ⁷	7/8
3	Pls. 14		3/4	82.14	3880	6.9	1305	1270	1240	1160	9 3/4	2 3/4	5 0	35	5/8	19 3/4	26 1/4	12	2 1/4	1 5/8	p ⁷	P ⁷	7/8
6	6	x6	3/4																				
3	Pls. 14		3/4	115.89	5565	6.9	1840	1795	1750	1635	8 3/4	2 3/4	5 0	35	5/8	18 3/8	24 3/4	11	2 1/4	1 5/8	r ⁷	R ⁷	7/8
6	6	x6	3/4																				
3	Pls. 14		3/4	149.65	7091	6.9	2380	2320	2260	2115	6 1/2	2 3/4	5 0	35	5/8	17 1/2	23 1/4	10	2 1/8	1 5/8	s ⁷	S ⁷	7/8
6	6	x6	3/4																				
3	Pls. 14		7/8	173.97	8006	6.8	2765	2695	2625	2450	7	2 3/4	5 0	35	1 1/8	16 1/2	22 1/4	9 1/2	2	1 1/2	t ⁹	T ⁹	7/8
6	6	x6	7/8																				
3	Pl. 14		1	198.3	8637	6.7	3150	3065	2985	2785	7 1/2	2 3/4	5 0	35	1 1/8	15 1/2	21 1/4	9	1 1/8	1 3/8	u	U	7/8
6	6	x6	1																				

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57

10 1/2-INCH CORNER COLUMNS.

Dimensions of 90° Bent Tie Plates only are given in this table. For Dimensions of other Bent Plates see table for 14-Inch Square Column.



For Tie Plates marked

hh x G=2"

ee x, dd x, kk x G=1 3/4"

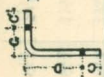
Dimensions of Angles.		Properties.		Safe Loads.			E	Gang. of Angles.	C to C Tie Plates.	Tie Plate Dimensions.					Mark, 90° Plate.	Size of Rivets.		
No. Pieces.	Length of Legs	Area Square Inches.	I.	r.	Column Lengths.					Width.	Thick.	Length 90° Pl.	C	C'			D	
					12 ft.	16 ft.	20 ft.	30 ft.										
4	3 3/2 x 3	9.83	118	3.5	145	135	130	110	1 1/2 1 3/4	2'6"	8	5/16	9 1/2	1 1/4	1 1/4	5 1/16	ee ⁰	3/4
1	3 x 3				165	155	150											
4	3 3/2 x 3	11.31	139	3.5	165	155	150	125	1 1/2 1 3/4	2'6"	8	5/16	9 1/2	1 1/8	1 1/4	5 1/2	ee ¹	3/4
1	3 x 3				185	175	175											
4	3 1/2 x 3	13.35	145	3.5	195	185	175	150	1 1/2 1 3/4	2'6"	8	3/8	9 1/2	1 1/8	1 1/4	5 1/8	ee ²	3/4
1	3 x 3				205	195	195											
4	3 1/2 x 3	14.75	159	3.5	215	205	195	165	1 1/2 1 3/4	2'6"	8	3/8	9 1/2	1 1/8	1 1/4	5 5/8	ee ³	3/4
1	3 x 3				230	220	220											
4	3 1/2 x 3	16.72	172	3.5	245	230	220	185	1 1/2 1 3/4	2'6"	9	3/8	9 1/2	1	1 1/4	5 1/2	dd ¹⁰	3/4
1	3 x 3				265	255	255											
4	3 1/2 x 3	18.04	186	3.5	265	250	235	200	1 1/2 1 3/4	2'6"	9	3/8	9 1/2	1 1/8	1 1/4	5 3/4	dd ¹¹	3/4
1	3 x 3				285	270	270											
4	3 1/2 x 3	19.36	199	3.5	285	270	255	215	1 1/2 1 3/4	2'6"	9	3/8	9 1/2	7/8	1 1/4	5 1/8	dd ¹²	3/4
1	3 x 3				305	285	285											
4	3 1/2 x 3	20.60	213	3.5	305	285	270	230	1 1/2 1 3/4	2'6"	9	3/8	9 1/2	1 1/8	1 1/4	5 7/8	dd ¹³	3/4
1	3 x 3				175	165	165											
4	3 1/2 x 3 1/2	12.03	139	3.4	175	165	155	130	1 1/2 1 3/4	2'6"	8	5/16	9 1/2	1 1/8	1 1/4	5 1/2	ee ¹	3/4
1	3 x 3				195	185	185											
4	3 1/2 x 3 1/2	14.23	158	3.4	205	195	185	155	1 1/2 1 3/4	2'6"	8	3/8	9 1/2	1 1/8	1 1/4	5 1/8	ee ²	3/4
1	3 x 3				215	205	205											
4	3 1/2 x 3 1/2	15.75	177	3.4	230	215	205	175	1 1/2 1 3/4	2'6"	8	3/8	9 1/2	1 1/8	1 1/4	5 5/8	ee ³	3/4
1	3 x 3				205	195	195											

4	$\frac{3}{8} \times \frac{3}{8}$	$\frac{1}{8}$	17.84	196	3.4	260	245	230	195	$\frac{3}{8}$	$\frac{2}{8}$	9	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	dd ¹⁰	$\frac{3}{4}$	
1	$\frac{3}{8} \times \frac{3}{8}$	$\frac{5}{8}$	19.32	215	3.4	280	265	250	210	3 $\frac{1}{8}$	$\frac{2}{8}$	9	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	dd ¹¹	$\frac{3}{4}$	
4	$\frac{3}{8} \times \frac{3}{8}$	$\frac{1}{8}$	20.72	234	3.4	305	285	270	230	3 $\frac{1}{2}$	$\frac{2}{8}$	9	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	dd ¹²	$\frac{3}{4}$	
1	$\frac{3}{8} \times \frac{3}{8}$	$\frac{5}{8}$	22.12	253	3.4	325	305	290	245	3 $\frac{1}{8}$	$\frac{2}{8}$	9	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	dd ¹³	$\frac{3}{4}$	
4	$\frac{3}{8} \times \frac{3}{8}$	$\frac{3}{4}$	23.48	272	3.4	345	325	305	260	3 $\frac{3}{8}$	$\frac{2}{8}$	9	$\frac{3}{8}$	9 $\frac{1}{8}$	1	1 $\frac{1}{4}$	5 $\frac{1}{8}$	dd ⁰	$\frac{3}{4}$	
1	$\frac{3}{8} \times \frac{3}{8}$	$\frac{5}{8}$	12.79	141	3.3	185	175	165	140	4 $\frac{1}{8}$	$\frac{1}{8}$	8	$\frac{1}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	ee ¹	$\frac{3}{4}$	
4	$\frac{3}{8} \times \frac{3}{8}$	$\frac{3}{8}$	15.11	160	3.3	220	205	195	165	4 $\frac{1}{4}$	$\frac{1}{8}$	8	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	ee ²	$\frac{3}{4}$	
1	$\frac{3}{8} \times \frac{3}{8}$	$\frac{1}{2}$	16.75	180	3.3	245	230	215	180	4 $\frac{1}{8}$	$\frac{1}{8}$	8	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	ee ³	$\frac{3}{4}$	
4	$\frac{3}{8} \times \frac{3}{8}$	$\frac{1}{2}$	18.96	199	3.3	275	260	245	205	3 $\frac{3}{8}$	$\frac{2}{8}$	9	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	dd ¹⁰	$\frac{3}{4}$	
1	$\frac{3}{8} \times \frac{3}{8}$	$\frac{5}{8}$	20.56	219	3.3	300	280	265	220	3 $\frac{1}{8}$	$\frac{2}{8}$	9	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	dd ¹¹	$\frac{3}{4}$	
4	$\frac{3}{8} \times \frac{3}{8}$	$\frac{3}{8}$	22.08	238	3.3	320	305	285	240	3 $\frac{1}{2}$	$\frac{2}{8}$	9	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	dd ¹²	$\frac{3}{4}$	
1	$\frac{3}{8} \times \frac{3}{8}$	$\frac{1}{8}$	23.60	258	3.3	345	325	305	255	3 $\frac{1}{8}$	$\frac{2}{8}$	9	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	dd ¹³	$\frac{3}{4}$	
4	$\frac{3}{8} \times \frac{3}{8}$	$\frac{3}{4}$	25.08	277	3.3	365	345	325	270	3 $\frac{1}{2}$	$\frac{2}{8}$	9	$\frac{3}{8}$	9 $\frac{1}{8}$	1	1 $\frac{1}{4}$	5 $\frac{1}{8}$	dd ⁰	$\frac{3}{4}$	
1	$\frac{3}{8} \times \frac{3}{8}$	$\frac{5}{8}$	14.31	145	3.2	205	195	180	150	4 $\frac{1}{8}$	$\frac{1}{8}$	8	$\frac{1}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	ee ¹	$\frac{3}{4}$	
4	$\frac{3}{8} \times \frac{3}{8}$	$\frac{3}{8}$	16.23	165	3.2	235	220	205	170	4 $\frac{1}{4}$	$\frac{1}{8}$	8	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	ee ²	$\frac{3}{4}$	
1	$\frac{3}{8} \times \frac{3}{8}$	$\frac{1}{2}$	18.75	185	3.2	270	255	240	200	4 $\frac{1}{8}$	$\frac{1}{8}$	8	$\frac{3}{8}$	9 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{4}$	5 $\frac{1}{8}$	ee ³	$\frac{3}{4}$	
4	$\frac{3}{8} \times \frac{3}{8}$	$\frac{1}{2}$																		
1	$\frac{3}{8} \times \frac{3}{8}$	$\frac{1}{2}$																		

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 $\frac{1}{r}$

10 1/2 - INCH CORNER COLUMNS.



For Tie Plates marked
hh x G = 2"
ee x, dd x, kk x G = 1 3/4"

Dimensions of 90° Bent Tie Plates only are given in this table. For dimensions of other Bent Plates see table for 14-Inch Square Column.

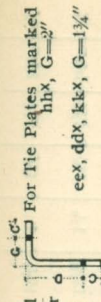
No. of Pieces.	Dimensions of Angles.		Properties.				Safe Loads.				E	Gauge of Angles.	C to C Tie Plates.	Tie Plate Dimensions.						Size of Rivets.
	Length of Legs	Thick	Area Square Inches.	I.	r.	Column Lengths.				Width				Thick	Length 90° Pl.	C	C'	D	Mark 90° Plate.	
						12 ft.	16 ft.	20 ft.	30 ft.											
4	3 1/2 x 5	1 5/8	21.24	205	3.2	305	290	270	225	3 3/8	2 6"	9	3 8	9 1/8	1 1/4	5 7/8	dd ¹⁰	3/4		
1	3 x 3	5/8																	335	315
4	3 1/2 x 5	5/8	23.04	225	3.2	360	340	315	265	3 1/2	2 6	9	3 8	9 1/8	1 7/8	5 7/8	dd ¹²	3/4		
1	3 x 3	5/8																	385	360
4	3 1/2 x 5	1 1/2	26.60	265	3.2	410	385	360	300	3 5/8	2 6	9	3 8	9 1/8	1	5 1/8	dd ⁰	3/4		
1	3 x 3	5/8																	435	410
4	3 1/2 x 5	1 3/8	28.36	285	3.2	225	210	195	160	4 1/8	2 6	8	8 5/8	9 1/8	1 3/8	5 1/2	ee ¹	3/4		
1	3 x 3	5/8																	265	250
4	3 1/2 x 5	1 1/2	20.75	189	3.0	295	280	260	210	4 7/8	2 6	9	3 8	9 1/8	1 7/8	5 5/8	dd ¹³	3/4		
1	3 x 3	5/8																	335	315
4	3 1/2 x 5	1 5/8	23.48	209	3.0	365	340	320	260	3 1/8	2 6	9	3 8	9 1/8	1 3/4	5 1/2	dd ¹¹	3/4		
1	3 x 3	5/8																	395	370
4	3 1/2 x 5	1 1/2	27.60	249	3.0	225	210	195	160	4 1/8	2 6	8	8 5/8	9 1/8	1 3/8	5 1/2	ee ¹	3/4		
1	3 x 3	5/8																	265	250

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57—r

12½ AND 13-INCH CORNER COLUMNS.

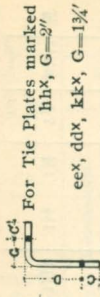
Dimensions of 90° Bent Tie Plates only are given in this table. For dimensions of other bent plates see table for 18 in. sq col.



No. Pieces	Dimensions of Angles.		Properties.				Safe Loads.				E	Gauges of Angles of	C to C Tie Plates.	Tie Plate Dimensions.						Mark 90° Plate.	Size of Rivets.
	Length of Legs	Thick	Area Square Inches.	I.	r.	Column Lengths.				Width.				Thick	Length 90° Pl.	C	C¹	ID			
						12 ft.	16 ft.	20 ft.	30 ft.												
4	3½ x 3½	¾	12.03	224	4.3	180	175	165	145	7¼	{ 1 7/8 } { 1 3/4 }	2' 6"	9	¾	11½	1 1/8	1 ¼	7½	kk¹¹	¾	
1	3 x 3	¾				205	195	185	165												7 1/8
4	3½ x 3½	1 1/8	13.59	256	4.3	240	230	215	195	6 7/8	{ 1 7/8 } { 1 3/4 }	2 6	9	¾	11½	1 1/8	1 ¼	7 1/8	kk¹²	¾	
1	3 x 3	¾				260	250	240	210												6 1/8
4	3½ x 3½	1 1/2	15.75	288	4.3	290	280	265	235	6 1/2	{ 2 1/8 } { 1 3/4 }	2 6	9	¾	11½	1 1/8	1 ¼	7 1/2	kk¹³	¾	
1	3 x 3	1/2				314	300	285	255												6 1/8
4	3½ x 3½	1 5/8	17.23	320	4.3	314	300	285	255	6 1/8	{ 2 1/8 } { 1 3/4 }	2 6	9	¾	11½	1 1/8	1 ¼	7 1/8	kk¹⁴	¾	
1	3 x 3	1/2				328	314	300	285												6 1/8
4	3½ x 3½	5/8	19.32	352	4.3	352	342	332	312	6 1/2	{ 2 1/8 } { 1 3/4 }	2 6	9	¾	11½	1 1/8	1 ¼	7 1/2	kk¹¹	¾	
1	3 x 3	5/8				364	354	344	324												6 1/8
4	3½ x 3½	1 1/8	20.72	384	4.3	384	374	364	344	6 1/8	{ 2 1/8 } { 1 3/4 }	2 6	9	¾	11½	1 1/8	1 ¼	7 1/8	kk¹²	¾	
1	3 x 3	5/8				396	386	376	356												6 1/8

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 r 12½ AND 13-INCH CORNER COLUMNS.



For Tie Plates marked
hhx, G=2r
Dimensions of 90° Bent Tie Plates only are
given in this table. For dimensions of
other bent plates see table for 18 in. sq. col.

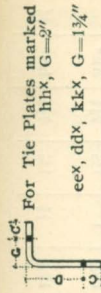
No. Pieces	Dimensions of Angles.		Properties.			Safe Loads.			E	Angles of Gauges or	C to C Tie Plates.	Tie Plate Dimensions.					Size of Rivets.		
	Length of Legs	Thick.	Area Square Inches.	I.	r.	Column Lengths.						Thick.	Length	C	C'	D		Mark	
						12 ft.	16 ft.	20 ft.											30 ft.
4 1	3½ x 3½	¾	22.12	415	4.3	335	320	305	270	6½	2' 6"	9	¾	11½	1½	1¼	7½	kk ¹³	¾
4 1	4 x 4	1½	15.72	295	4.3	235	225	215	190	6¾	2 6	9	¾	12½	1½	1½	7½	hh ⁶	¾
4 1	4 x 4	1½	18.95	335	4.3	275	265	250	225	6½	2 6	9	¾	12½	1½	1½	7½	hh ⁷	¾
4 1	4 x 4	1½	19.97	375	4.3	300	290	275	245	6	2 6	9	¾	12½	1	1½	7½	hh ⁸	¾
4 1	4 x 4	5/8	22.43	415	4.3	340	325	310	275	5½	2 6	9	¾	12½	1½	1½	7½	hh ⁸	¾
4 1	4 x 4	1½	24.11	455	4.3	365	350	335	295	5½	2 6	9	¾	12½	1½	1½	7½	hh ⁶	¾
4 1	4 x 4	¾	26.45	495	4.3	400	385	365	325	5½	2 6	9	¾	12½	1½	1½	7½	hh ⁷	¾
4 1	4 x 4	1½	28.05	536	4.3	425	405	390	345	5¼	2 6	9	¾	12½	1	1½	7½	hh ⁸	¾

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 r

13 AND 14-INCH CORNER COLUMNS.

Dimensions of 90° Bent Tie Plates only are given in this table. For dimensions of other bent plates see table for 18 in. sq. col.

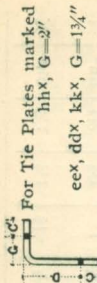


No. Pieces.	Dimensions of Angles.		Properties.			Safe Loads.				E.	Gauges of Angles.	C to C Tie Plates.	Tie Plate Dimensions.					Mark of 90° Plate.	Size of Rivets.	
	Length of Legs	Thick	Area Square Inches	I.	r.	Column Lengths.			Width.				Thick	Len of Pl.	C	C'	D			
						12 ft.	16 ft.	20 ft.												30 ft.
4 1	4 x5 3 1/2 x3 1/2	1 1/8 3/8	17.48	307	4.2	265	250	240	210	6 1/8	{ 1 1/8 / 2 }	2' 6"	9	3/8	12 1/8	1 1/8	1 1/2	7 1/8	hh ⁶	3/4
4 1	4 x5 3 1/2 x3 1/2	1/2 1/2	20.25	346	4.2	305	290	280	245	6 1/4	{ 1 7/8 / 2 }	2 6	9	3/8	12 3/8	1 1/8	1 1/2	7 5/8	hh ⁷	3/4
4 1	4 x5 3 1/2 x3 1/2	9/16 1/2	22.25	386	4.2	335	320	305	270	6 1/8	{ 1 7/8 / 2 }	2 6	9	3/8	12 1/8	1	1 1/2	7 1/8	hh ⁸	3/4
4 1	4 x5 3 1/2 x3 1/2	5/8 5/8	24.91	425	4.2	375	360	345	305	5 7/8	{ 2 1/8 / 2 }	2 6	9	3/8	12 3/8	1 1/8	1 1/2	7 1/2	hh ⁸	3/4
4 1	4 x5 3 1/2 x3 1/2	1 1/8 3/8	26.87	465	4.2	405	390	370	325	5 1/8	{ 2 1/8 / 2 }	2 9	12	3/8	12 1/8	1 1/8	1 1/2	7 1/8	hh ⁶	3/4
4 1	4 x5 3 1/2 x3 1/2	3/4 3/4	29.45	504	4.2	445	425	405	360	5 1/2	{ 2 1/8 / 2 }	2 9	12	3/8	12 3/8	1 1/8	1 1/2	7 5/8	hh ⁷	3/4
4 1	4 x5 3 1/2 x3 1/2	1 1/8 3/4	31.29	544	4.2	470	450	430	380	5 1/8	{ 2 1/8 / 2 }	2 9	12	3/8	12 1/8	1	1 1/2	7 1/8	hh ⁸	3/4
4 1	4 x5 3 1/2 x3 1/2	7/8 3/4	33.13	584	4.2	500	480	455	405	5 1/8	{ 2 1/8 / 2 }	2 9	12	3/8	12 3/8	1 1/8	1 1/2	7 3/4	hh ⁹	3/4

GRAY COLUMNS. Patented, Dec. 1892.

SAFE LOADS IN THOUSANDS OF POUNDS BY FORMULA 17100—57 r 13 AND 14-INCH CORNER COLUMNS.

Dimensions of 90° Bent Tie Plates only are given in this table. For dimensions of other bent plates see table for 18 in. sq. col.



For Tie Plates marked
hhx, G=2"

eeX, ddX, kkX, G=1 1/4"

Dimensions of Angles.		Properties.			Safe Loads.				E	Gauge of Angles.	C to C Tie Plates.	Tie Plate Dimensions.					Mark Plate.	Size of Rivets.	
No. Pieces.	Length of Legs	Thick.	Area Square Inches	I.	r.	12 ft.	16 ft.	20 ft.				30 ft.	Width.	Thick.	Length.	C			C'
4	5 x 5 3 1/2 x 3 1/2	1 1/2	19.97	377	4.3	300	290	275	245	5 1/8"	2' 6"	9	3/8	12 3/8	1 1/8	1 1/2	7 1/8	hh ^e	3/4
4	5 x 5 3 1/2 x 3 1/2	1 1/2	22.25	422	4.3	335	320	310	275	4 7/8	2 6	9	3/8	12 1/8	1 1/8	1 1/2	7 5/8	hh ⁷	3/4
4	5 x 5 3 1/2 x 3 1/2	1 1/2	24.49	467	4.3	370	355	340	300	4 1 1/8	2 6	9	3/8	12 3/8	1	1 1/2	7 1 1/8	hh ^e	3/4
4	5 x 5 3 1/2 x 3 1/2	1 1/2	27.43	512	4.3	415	400	380	335	4 1/2	2 6	9	3/8	12 3/8	1 1/8	1 1/2	7 1/2	hh ^s	3/4
4	5 x 5 3 1/2 x 3 1/2	1 1/2	29.67	557	4.3	450	430	410	365	4 1/8	2 9	12	3/8	12 3/8	1 1/8	1 1/2	7 7/8	hh ^e	3/4
4	5 x 5 3 1/2 x 3 1/2	1 1/2	32.45	602	4.3	490	470	450	400	4 1/8	2 9	12	3/8	12 3/8	1 1/8	1 1/2	7 5/8	hh ⁷	3/4
4	5 x 5 3 1/2 x 3 1/2	1 1/2	34.53	647	4.3	525	500	480	425	3 1 1/8	2 9	12	3/8	12 3/8	1	1 1/2	7 1 1/8	hh ^s	3/4
4	5 x 5 3 1/2 x 3 1/2	1 1/2	36.65	691	4.3	555	530	510	450	3 3/4	2 9	12	3/8	12 3/8	1 1/8	1 1/2	7 3/4	hh ^e	3/4

ECCENTRIC LOADS ON GRAY COLUMNS.

Number of rivets required in the two sets of tie plates nearest the point of application of the load:

For $\frac{5}{8}$ -inch rivets, .00011 P = N

“ $\frac{3}{4}$ “ “ .00008 P = N

“ $\frac{7}{8}$ “ “ .00006 P = N

“ 1 “ “ .00004 P = N

P = total eccentric load applied.

N = number of rivets required.

N = the number of rivets required to transmit $\frac{3}{4}$ P from point of application of load upon one member of the column to the other three members.

The same result may be arrived at by the following formula, from which the above co-efficients were derived: $\frac{.75 P}{2 \times S}$ in which P = total eccentric load applied and S = value of one rivet in single shear.

RANKINE'S FORMULA FOR ECCENTRIC LOADS.

L = load.

d^0 = distance from center of column to point of application.

d^1 = distance from center of column to extreme fibre.

K = allowed strain per square inch from table pages 46-47.

r^2 = radius of gyration squared, for column used.

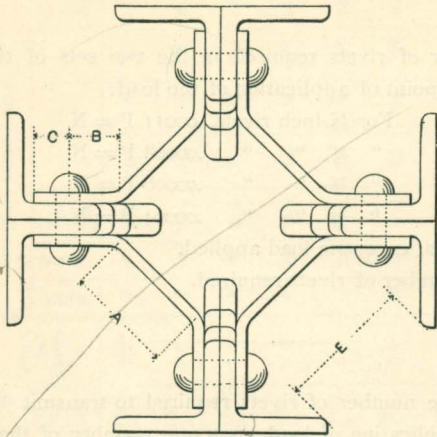
A = total area required for load.

A^1 = area required for load itself.

A^0 = area required for load account of bending.

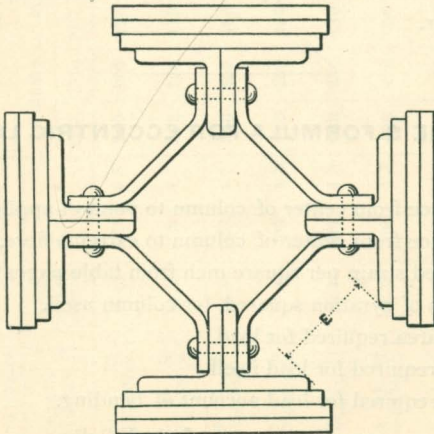
$$A = A^1 + A^0 = \frac{L}{K} + \frac{L d^1 d^0}{K r^2}$$

SQUARE COLUMNS.



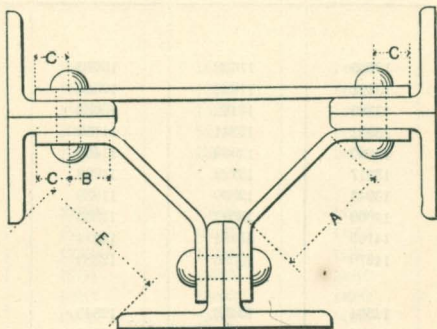
PLAN OF COLUMN SHOWING METHOD OF INCREASING SECTIONAL AREA.

For Dimensions A, B, C, E, see Tables of Safe Loads.



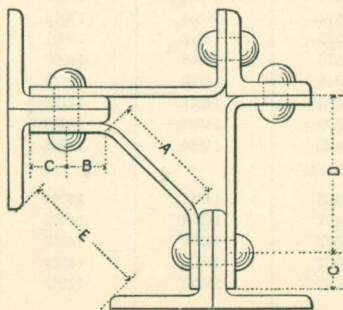
30-INCH COLUMN.

COLUMNS FOR WALLS AND CORNERS OF BUILDINGS.



WALL COLUMN.

For Dimensions A, B, C, D, E, see Tables of Safe Loads.



CORNER COLUMN.

STRAINS PER SQUARE INCH FOR VARIOUS VALUES OF "r" FROM 2 TO 9, VARYING BY 10THS.

BY THE FORMULA $17100-57\frac{1}{r}$

For 12, 16, 20 and 30 ft. Lengths.

"r"	12 feet.	16 feet.	20 feet.	30 feet.
2.0	12996	11628	10260	6840
2.1	13191	11888	10585	7329
2.2	13369	12128	10882	7773
2.3	13531	12341	11152	8178
2.4	13680	12540	11400	8550
2.5	13817	12722	11628	8893
2.6	13943	12890	11839	9203
2.7	14060	13047	12033	9500
2.8	14169	13191	12214	9772
2.9	14270	13326	12383	10024
3.0	14364	13452	12540	10260
3.1	14452	13570	12687	10480
3.2	14535	13680	12825	10687
3.3	14613	13784	12954	10882
3.4	14686	13881	13076	11065
3.5	14755	13973	13191	11237
3.6	14820	14059	13300	11400
3.7	14882	14142	13403	11554
3.8	14940	14220	13500	11700
3.9	14995	14293	13592	11839
4.0	15048	14364	13680	11970
4.1	15098	14430	13763	12095
4.2	15146	14494	13843	12215
4.3	15191	14554	13919	12328
4.4	15235	14612	13991	12436
4.5	15276	14668	14060	12540
4.6	15316	14720	14126	12639
4.7	15353	14771	14189	12734
4.8	15390	14820	14250	12825
4.9	15425	14866	14308	12912
5.0	15458	14911	14364	12996
5.1	15491	14954	14417	13076
5.2	15522	14995	14469	13154
5.3	15551	15035	14519	13229
5.4	15580	15073	14567	13300

**STRAINS PER SQUARE INCH FOR VARIOUS VALUES OF
"r" FROM 2 TO 9 VARYING BY 10THS.**

BY THE FORMULA $17100-57\frac{1}{r}$

For 12, 16, 20 and 30 ft. Lengths.

"r"	12 feet.	16 feet.	20 feet.	30 feet.
5.5	15608	15110	14613	13369
5.6	15634	15145	14657	13436
5.7	15660	15180	14700	13500
5.8	15685	15213	14741	13562
5.9	15709	15245	14781	13622
6.0	15732	15276	14820	13680
6.1	15754	15306	14858	13736
6.2	15776	15335	14894	13790
6.3	15797	15363	14929	13843
6.4	15817	15390	14962	13894
6.5	15837	15416	14995	13943
6.6	15856	15442	15027	13991
6.7	15875	15467	15058	14038
6.8	15893	15490	15088	14082
6.9	15911	15514	15118	14126
7.0	15927	15536	15146	14169
7.1	15944	15559	15173	14210
7.2	15960	15580	15200	14250
7.3	15976	15601	15226	14289
7.4	15991	15621	15252	14327
7.5	16006	15641	15276	14364
7.6	16020	15660	15300	14400
7.7	16034	15679	15323	14435
7.8	16048	15697	15346	14469
7.9	16061	15715	15368	14503
8.0	16074	15732	15390	14535
8.1	16087	15749	15411	14567
8.2	16100	15765	15432	14598
8.3	16111	15781	15452	14628
8.4	16123	15797	15471	14657
8.5	16134	15812	15491	14686
8.6	16146	15827	15509	14714
8.7	16157	15842	15528	14742
8.8	16167	15856	15546	14769

REPORT OF TESTS OF 14-INCH GRAY COLUMNS

TESTED IN THE HYDRAULIC MACHINE OF THE "KEYSTONE BRIDGE WORKS," AT PITTSBURG, PA., JULY 19, 1893. BY C. P. BUCHANAN, JR.

14-in. Column. 11-ft. 0-in. Long. Area. Section. 19.1 Sq. in.

Loads.	Compression in Inches		Deflections in Inches.			
			Vertical.		Horizontal.	
	Under L'd.	Permanent	Under L'd.	Perm't.	Under L'd.	Perm't.
49400	.0132	.0005	.010	.000	.030	.010
100100	.0297	.0000	.015	.000	.040	.010
149500	.0373	.0013	.020	.005	.070	.040
200200	.0490	.0025	.020	.005	.080	.050
224900	.0565	.0053	.020	.005	.090	.050
249600	.0622	.0053	.025	.010	.110	.060
275600	.0695	.0042	.030	.010	.120	.070
300300	.0745	.0048	.030	.015	.130	.090
325000	.0788	.0061	.030	.010	.130	.080
349700	.0865	.0066	.030	.010	.130	.080
374400	.0920	.0068	.030	.010	.130	.080
400400	.0988	.0070	.030	.010	.130	.090
425100	.1035	.0075	.030	.010	.130	.090
449800	.1107	.0077	.030	.010	.130	.090
474500	.1170	.0078	.030	.010	.140	.090
500500	.1230	.0083	.030	.010	.140	.090
525200	.1299	.0098	.030	.005	.140	.090
549900	.1363	.0129	.035	.005	.140	.100
574600	.1430	.0143	.020	.005	.140	.100
600600	.1507	.0172	.015	.005	.140	.100
650000	.1663	.0225	.005	.000	.150	.110
699400	.1861	.0311	.005	.000	.160	.130
750100	.2270	.0645	.000	.000	.240	.210
764400	.3845	.2370	.050	.045	.550	???

"E," computed from movement between 200,200 lbs. and 400,400 lbs., is 27,750,000 lbs. Breaking strain per square inch column section is 40,020 lbs. Column failed by crippling to the left between center and forward end.

REPORT OF

TESTS OF 14-INCH GRAY COLUMNS

TESTED IN THE HYDRAULIC MACHINE OF THE "KEYSTONE BRIDGE WORKS," AT PITTSBURG, PA., JULY 19, 1893. BY C. P. BUCHANAN, JR.

14-In. Column. 11 ft. 0 in. Long. Area Section 19.1 Sq. In.

Loads.	Compression in Inches		Deflections in Inches.			
			Vertical.		Horizontal.	
	Under L'd.	Permanent	Under L'd.	Perman't	Under L'd.	Perman't
43400	.0080	.0001	.000	.000	.010	.000
100100	.0274	.0171	.020	.005	.010	.030
149500	.0379	.0213	.030	.005	.000	.030
200200	.0504	.0249	.040	.010	???	.060
224900	.0579	.0263	.045	.010	???	.060
249600	.0629	.0273	.045	.010	???	.060
275600	.0694	.0279	.060	.020	.020	.060
300300	.0754	.0291	.060	.020	.020	.060
325000	.0804	.0291	.070	.010	.020	.080
369700	.0879	.0301	.070	.030	.020	.080
374400	.0960	.0302	.080	.020	.020	.080
400400	.1022	.0312	.080	.020	.020	.080
425100	.1086	.0316	.080	.020	.020	.080
449800	.1166	.0326	.090	.025	.020	.080
475500	.1224	.0329	.090	.029	.020	.080
500500	.1301	.0339	.095	.029	.020	.080
525200	.1362	.0360	.100	.030	.020	.080
549900	.1429	.0359	.100	.030	.020	.080
574600	.1518	.0377	.105	.030	.020	.080
600600	.1604	.0390	.120	.035	.020	.080
650000	.1784	.0444	.120	.035	.020	.080
699200	.2021	.0549	.130	.050	.015	.080
750100	.2561	.0851	.140	.080	.060	.100
751400	.3329	.1579	.170	.090	.310	.220

"E," computed from the movement between 200,200 lbs. and 400,400 lbs., is 26,680,000 lbs. Breaking strain per square inch of column section is 39,349 lbs. Column failed by crippling to the right and upward between centre and plunger end.

REPORT OF

TESTS OF 14-INCH GRAY COLUMNS

TESTED IN THE HYDRAULIC MACHINE OF THE "KEYSTONE BRIDGE WORKS," AT PITTSBURG, PA., JULY 19, 1893. BY C. P. BUCHANAN, JR.

14-In. Column. 11-ft. 0-in. Long. Area Section. 19.1 Sq. in.

Loads.	Compression in Inches		Deflections in Inches.			
			Vertical.		Horizontal.	
	Under L'd.	Permanent	Under L'd.	Perm'nt.	Under L'd.	Perm'nt.
49400	.0587	.0035	.000	.000	.025	.005
100100	.0847	.0092	.005	.000	.075	.025
149500	.1040	.0064	.000	.005	.095	.035
200200	.1212	.0027	.010	.000	.125	.055
224900	.1292	.0040	.010	.010	.125	.055
249600	.1370	.0047	.007	.010	.145	.085
275600	.1449	.0077	.010	.010	.145	.085
300300	.1512	.0112	.020	.015	.145	.095
325000	.1582	.0110	.020	.015	.145	.095
349700	.1643	.0140	.030	.020	.145	.095
374400	.1722	.0177	.025	.020	.145	.095
400400	.1787	.0204	.030	.020	.145	.095
425100	.1865	.0234	.030	.020	.145	.095
449800	.1937	.0262	.030	.025	.150	.095
474500	.2012	.0293	.030	.025	.150	.105
500500	.2097	.0315	.036	.025	.155	.105
525200	.2171	.0384	.035	.030	.155	.105
549900	.2237	.0431	.035	.030	.155	.105
574600	.2319	.0549	.040	.035	.155	.115
600600	.2422	.0594	.040	.035	.155	.115
650000	.2624	.0812	.050	.040	.155	.125
699400	.2912	.1162	.060	.050	.175	.145
741000	.4447	.2826	.085	.010	.625	.525

"E," computed from movement between 200,200 lbs. and 400,400 lbs., is 24,030,000 lbs. Breaking strain per square inch column section is 38,800 lbs. Column failed by crippling to the right near the forward end. The ends of this column were not milled square according to the report of Mr. Buchanan.

REPORT OF

TESTS OF 14-INCH GRAY COLUMNS

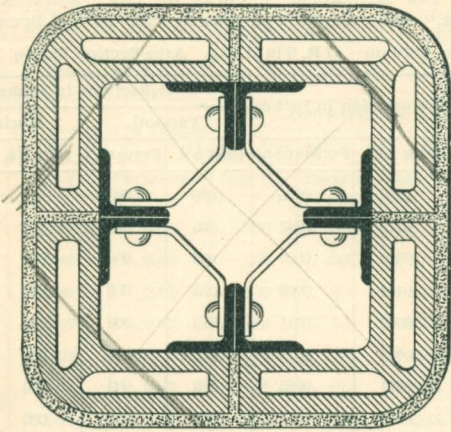
TESTED IN THE HYDRAULIC MACHINE OF THE "KEYSTONE BRIDGE WORKS," AT PITTSBURG, PA., JULY 19, 1893. BY C. P. BUCHANAN, JR.

14-In. Column. 11 ft. 0 in. Long. Area Section 19.1 Sq. In.

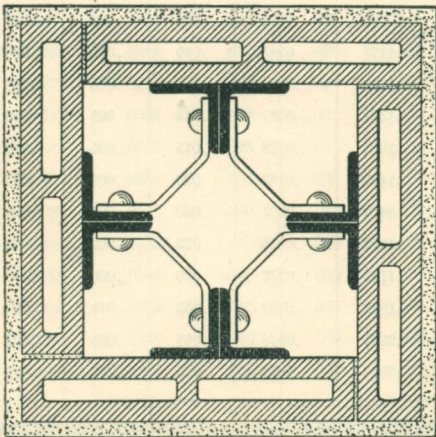
Loads.	Compression in Inches		Deflections in Inches.			
			Vertical.		Horizontal.	
	Under l'd.	Permanent	Under l'd.	Perman't	Under l'd.	Perman't
49400	.0080	.0005	.000	.000	.020	.000
101100	.0245	.0047	.005	.000	.020	.000
149500	.0370	.0067	.005	.000	.020	.000
200200	.0484	.0069	.005	.000	.020	.010
224900	.0569	.0071	.010	.000	.030	.020
249600	.0615	.0079	.015	.000	.050	.040
275600	.0677	.0085	.010	.000	.070	.060
300300	.0742	.0097	.010	.002	.080	.070
325000	.0807	.0171	.010	.002	.080	.080
349700	.0864	.0117	.010	.005	.080	.080
374400	.0927	.0120	.010	.005	.080	.080
400400	.1007	.0132	.015	.000	.080	.080
425100	.1047	.0138	.015	.000	.080	.080
449800	.1127	.0145	.015	.000	.080	.080
475500	.1185	.0155	.015	.003	.080	.080
500500	.1267	.0167	.015	.005	.080	.080
525200	.1332	.0178	.015	.005	.080	.060
549900	.1402	.0189	.020	.005	.080	.080
574600	.1479	.0207	.020	.005	.080	.080
600600	.1562	.0226	.025	.005	.080	.080
650000	.1725	.0272	.030	.005	.080	.080
699400	.1932	.0363	.035	.015	.090	.080
750100	.2307	.0516	.065	.035	.100	.080
764400	.3232	.1652	.285	.215	.080	???

"E," computed from the movement between 200,200 lbs. and 400,400 lbs., is 26,680,000 lbs. Breaking strain per square inch of column section is 40,020 lbs. Column failed by crippling upward at rear or plunger end.

METHODS OF FIRE-PROOFING COLUMNS.

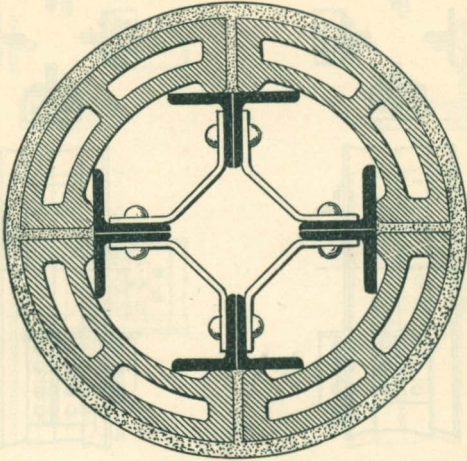


SQUARE, ROUND CORNERS.

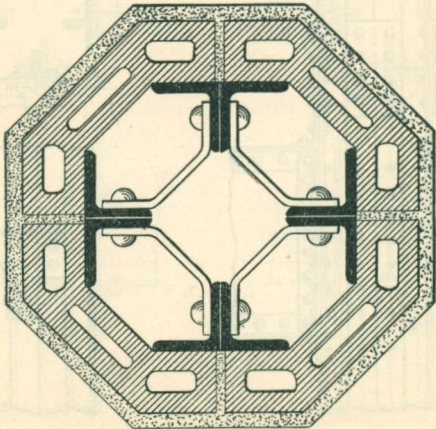


SQUARE.

METHODS OF FIRE-PROOFING COLUMNS.

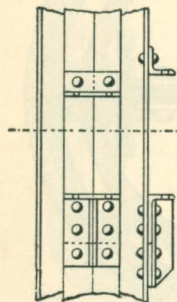
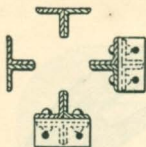


ROUND.

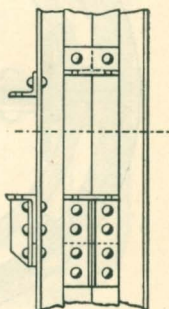
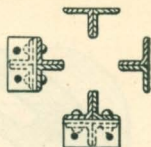


OCTAGON.

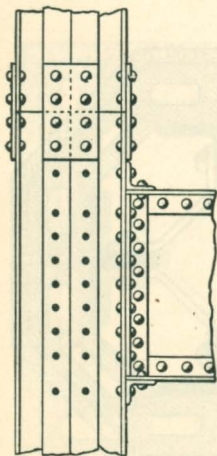
BRACKET CONNECTIONS.



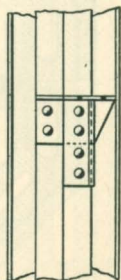
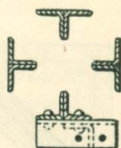
CONNECTION FOR
12-INCH BEAM.



CONNECTION FOR
15-INCH BEAM.

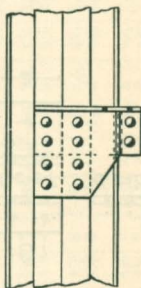
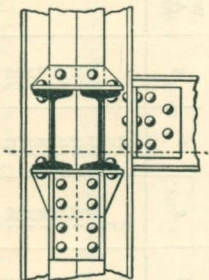
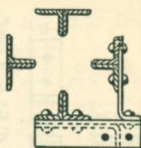
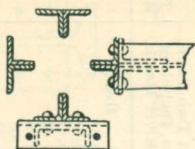


CONNECTION FOR PLATE
GIRDERS—COLUMN SPLICE.



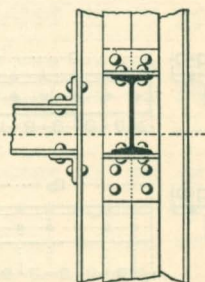
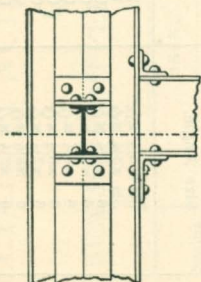
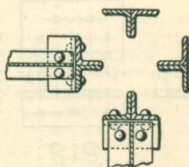
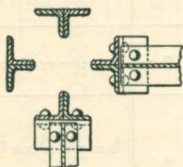
ECCENTRIC CONNECTION
FOR 12-INCH BEAM.

BRACKET CONNECTIONS.



CONNECTIONS FOR
TWO BEAMS.

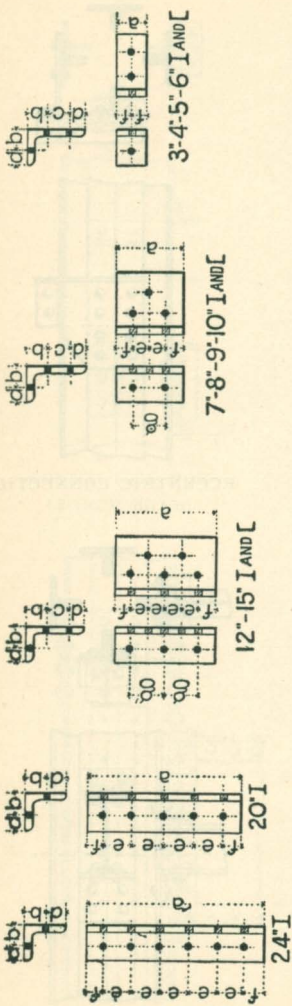
ECCENTRIC CONNECTION.



CONNECTION FOR
5, 6, 7 AND 8-INCH BEAMS.

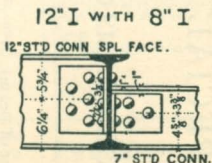
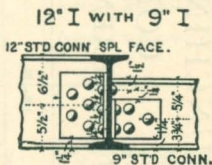
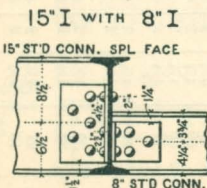
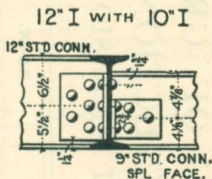
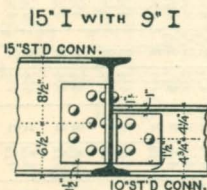
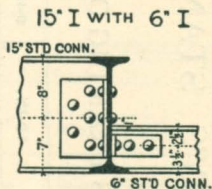
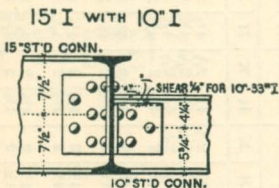
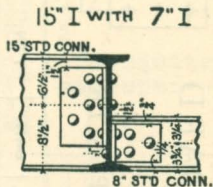
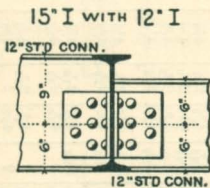
CONNECTION FOR
9 AND 10-INCH BEAMS.

GRAY'S STANDARD BEAM AND CHANNEL CONNECTIONS.

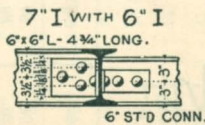
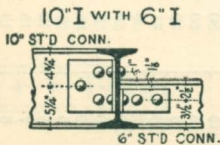
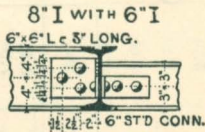
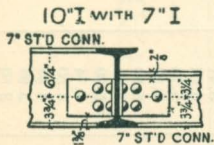
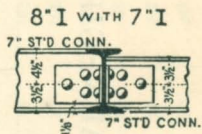
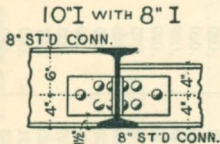
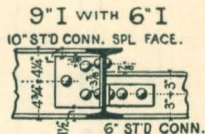
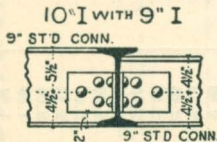
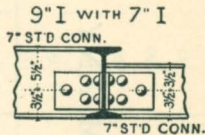
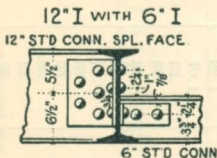
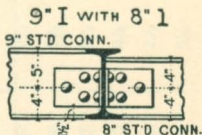
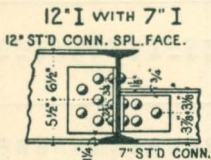


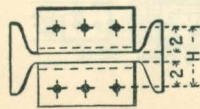
Size I or E.	Size Angle.	a	b	c	d	e	f	g	Weight Two Conn. Angles, Including Shop Rivet Heads.	No. Field Rivets.
24"	3 1/2" x 3 1/2" x 7/16"	1'	6"	1 1/2"	1 1/2"	3"	1 1/2"	---	31. lbs.	12
20	3 1/2" x 3 1/2" x 7/16"	1	3	1 1/2"	1 1/2"	3	1 1/2"	---	25.84	10
15	6" x 3 1/2" x 7/16"	0	10	2 1/2"	1 1/2"	1 3/4"	1 1/2"	3 1/2"	23.84	6
12	6" x 3 1/2" x 7/16"	0	8 1/2"	2 1/2"	1 1/2"	1 3/4"	1 1/2"	2 3/4"	20.47	6
10	6" x 3 1/2" x 7/16"	0	6 1/2"	2 1/2"	1 1/2"	1 3/4"	1 1/2"	3 1/2"	15.42	4
9	6" x 3 1/2" x 7/16"	0	5	2 1/2"	1 1/2"	1 1/4"	1 1/2"	2 1/2"	12.05	4
8	6" x 3 1/2" x 7/16"	0	5	2 1/2"	1 1/2"	1 1/4"	1 1/2"	2 1/2"	12.05	4
7	6" x 3 1/2" x 7/16"	0	4 3/4"	2 1/2"	1 1/2"	1 1/4"	1 1/2"	2 1/4"	11.49	4
6	6" x 3 1/2" x 7/16"	0	4 3/4"	2 1/2"	1 1/2"	1 1/4"	1 1/2"	---	6.72	2
5	6" x 3 1/2" x 7/16"	0	2 3/4"	2 1/2"	1 1/2"	---	1 3/8"	---	6.72	2
4	6" x 3 1/2" x 7/8"	0	1 3/4"	2 1/2"	1 1/2"	---	7/8"	---	4.05	2
3	6" x 3 1/2" x 7/8"	0	1 1/4"	2 1/2"	1 1/2"	---	7/8"	---	4.05	2

CONNECTIONS FOR BEAMS OF DIFFERENT SIZES.

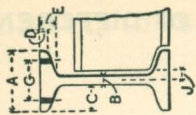


CONNECTIONS FOR BEAMS OF DIFFERENT SIZES.



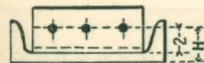


STEEL BEAMS.



CARNEGIE STEEL COMPANY.

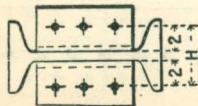
Size.	Weight.	A	B	Va.	C	D	E	G	H	J
24	80	6.95	.50	.012	3.23	.60	1.12	4.00	4 $\frac{5}{8}$	$\frac{3}{8}$
20	80	7.00	.60	.015	3.20	.66	1.14	4.00	4 $\frac{1}{2}$	$\frac{1}{2}$
20	64	6.25	.50	.015	2.88	.55	.98	3.50	4 $\frac{5}{8}$	$\frac{3}{8}$
15	80	6.41	.77	.020	2.82	.84	1.23	3.50	4 $\frac{7}{8}$	$\frac{1}{2}$
15	60	6.04	.54	.020	2.75	.73	1.07	3.25	4 $\frac{5}{8}$	$\frac{3}{8}$
15	50	5.75	.45	.020	2.65	.55	.95	3.00	4 $\frac{6}{8}$	$\frac{3}{8}$
15	41	5.50	.40	.020	2.55	.40	.78	3.00	4 $\frac{1}{2}$	$\frac{1}{2}$
12	40	5.50	.39	.025	2.55	.50	.88	3.00	4 $\frac{1}{2}$	$\frac{1}{2}$
12	32	5.25	.35	.025	2.45	.35	.72	2.75	4 $\frac{1}{2}$	$\frac{1}{2}$
10	33	5.00	.37	.029	2.32	.47	.82	2.75	4 $\frac{1}{2}$	$\frac{1}{2}$
10	25	4.74	.31	.029	2.22	.32	.65	2.50	4 $\frac{1}{2}$	$\frac{1}{2}$
9	21	4.50	.27	.033	2.12	.28	.60	2.50	4 $\frac{1}{2}$	$\frac{1}{2}$
8	18	4.25	.25	.037	2.00	.26	.56	2.25	4 $\frac{1}{2}$	$\frac{1}{4}$
7	15	3.98	.21	.042	1.89	.25	.53	2.25	4 $\frac{3}{8}$	$\frac{1}{4}$
6	13	3.50	.23	.049	1.54	.25	.50	2.00	4 $\frac{3}{8}$	$\frac{1}{4}$
5	10	3.00	.22	.059	1.38	.23	.44	1.75	4 $\frac{3}{8}$	$\frac{1}{4}$
4	7	2.59	.17	.074	1.21	.20	.38	1.50	4 $\frac{1}{8}$	$\frac{1}{8}$



STEEL CHANNELS.

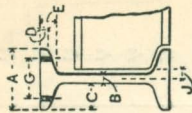
CARNEGIE STEEL COMPANY.

Size.	Weight.	A	B	Va.	C	D	E	G	H	J
15	33.	3.40	.40	.020	3.00	.40	.85	1.88	2½	⅝
12	20.	2.87	.26	.025	2.60	.32	.71	1.63	2⅝	¾
10	16.5	2.66	.27	.029	2.40	.28	.64	1.50	2⅝	¾
9	14.	2.45	.25	.033	2.20	.26	.59	1.38	2⅝	¾
8	11.	2.20	.21	.037	2.00	.25	.55	1.25	2⅝	⅝
7	9.5	2.01	.21	.042	1.80	.23	.50	1.13	2⅝	⅝
6	8.	1.89	.20	.049	1.70	.22	.47	1.00	2¼	⅝
5	6.5	1.77	.17	.059	1.60	.21	.45	1.00	2¼	⅝
4	5.5	1.67	.17	.074	1.50	.20	.43	1.00	2¼	⅝



STEEL BEAMS.

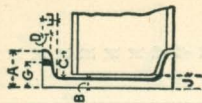
PENCOYD IRON WORKS.



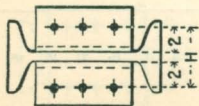
Size.	Weight.	A	B	Va.	C	D	F	G	H	J
20	78.	6.75	.59	.007	3.16	.63	1.09	4.50	4 1/8	1/8
20	64.8	6.25	.50	.007	2.88	.56	.97	4.00	4 3/8	3/8
15	57.6	6.09	.50	.020	2.80	.61	1.00	4.00	4 5/8	3/8
15	49.3	5.80	.45	.020	2.67	.50	.88	3.75	4 1/8	3/8
15	41.4	5.61	.41	.020	2.61	.42	.78	3.50	4 1/2	1/2
12	39.4	5.25	.40	.025	2.42	.52	.84	3.00	4 1/2	1/2
12	30.6	5.00	.34	.025	2.34	.34	.67	3.00	4 1/2	1/2
10	35.2	5.06	.42	.029	2.31	.48	.78	3.00	4 1/2	1/2
10	23.2	4.50	.30	.029	2.10	.30	.59	2.50	4 7/8	1/2
9	20.3	4.30	.28	.033	2.01	.28	.56	2.50	4 7/8	1/2
8	17.2	4.00	.26	.037	1.87	.26	.52	2.25	4 3/8	1/2
7	14.4	3.75	.24	.042	1.75	.24	.48	2.25	4 3/8	1/2
6	11.9	3.40	.22	.049	1.59	.22	.44	2.00	4 3/8	1/2
5	9.2	3.00	.20	.059	1.40	.20	.40	1.75	4 3/8	1/2
4	6.2	2.30	.16	.074	1.07	.20	.35	1.38	4 1/4	1/4

STEEL CHANNELS.

PENCOYD IRON WORKS.

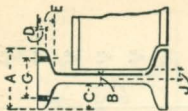


Size.	Weight.	A	B	Va.	C	D	E	G	H	J
15	32.	3.49	.39	.020	3.10	.41	.72	2.00	2 1/16	3/8
12	20.16	2.95	.30	.025	2.65	.30	.58	1.75	2 3/8	7/16
10	16.4	2.50	.25	.029	2.25	.36	.64	1.38	2 1/8	3/4
9	12.96	2.36	.23	.033	2.13	.25	.53	1.31	2 5/16	3/4
8	11.	2.28	.22	.037	2.06	.22	.44	1.25	2 1/8	5/16
7	8.4	1.95	.17	.042	1.78	.25	.44	1.13	2 1/4	5/16
6	7.5	1.95	.20	.049	1.75	.19	.38	1.13	2 1/4	5/16
5	6.1	1.80	.19	.059	1.61	.19	.34	1.13	2 1/4	5/16
4	5.2	1.63	.19	.074	1.44	.17	.33	.94	2 1/4	5/16

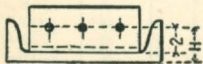


STEEL BEAMS.

JONES & LAUGHLINS.



Size.	Weight.	A	B	Va.	C	D	E	G	H	J
15	59.	5.97	.47	.020	2.75	.75	1.13	3.25	4 $\frac{1}{2}$	$\frac{3}{8}$
15	48.	5.73	.41	.020	2.66	.50	.91	3.00	4 $\frac{1}{8}$	$\frac{3}{8}$
15	39	5.48	.38	.020	2.55	.375	.75	3.00	4 $\frac{1}{2}$	$\frac{1}{8}$
12	38	5.47	.34	.025	2.56	.47	.84	3.00	4 $\frac{1}{2}$	$\frac{1}{8}$
12	30.	5.22	.31	.025	2.45	.33	.70	2.75	4 $\frac{1}{8}$	$\frac{1}{8}$
10	32.	4.94	.31	.029	2.31	.44	.81	2.75	4 $\frac{1}{8}$	$\frac{1}{8}$
10	23.8	4.72	.28	.029	2.22	.31	.63	2.50	4 $\frac{1}{8}$	$\frac{1}{8}$
9	19.75	4.39	.27	.033	2.06	.28	.56	2.50	4 $\frac{3}{8}$	$\frac{1}{4}$
8	18.	4.25	.25	.037	2.00	.25	.56	2.25	4 $\frac{3}{8}$	$\frac{1}{4}$
7	15.25	4.00	.25	.042	1.88	.25	.50	2.25	4 $\frac{3}{8}$	$\frac{1}{4}$
6	12.75	3.50	.25	.049	1.63	.25	.47	2.00	4 $\frac{3}{8}$	$\frac{1}{4}$
5	10.	2.85	.22	.059	1.31	.31	.50	1.75	4 $\frac{3}{8}$	$\frac{1}{4}$
4	6.85	2.56	.19	.075	1.19	.20	.39	1.50	4 $\frac{1}{8}$	$\frac{1}{4}$

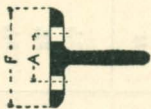
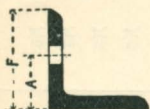


STEEL CHANNELS.

JONES & LAUGHLINS.

Size.	Weight.	A	B	Va.	C	D	E	G	H	J
15	30.	3.38	.38	.020	3.00	.38	.69	1.88	2 ¹ / ₁₆	1/2
12	19.	2.84	.28	.025	2.56	.31	.53	1.63	2 ⁵ / ₁₆	3/8
10	14.75	2.56	.25	.029	2.31	.25	.50	1.50	2 ¹ / ₁₆	3/8
9	12.3	2.44	.23	.033	2.20	.23	.44	1.38	2 ⁵ / ₁₆	3/8
8	10.	2.13	.22	.037	1.91	.22	.41	1.25	2 ⁵ / ₁₆	5/16
7	8.3	2.00	.20	.042	1.80	.19	.38	1.13	2 ¹ / ₄	5/16
6	7.	1.86	.19	.049	1.67	.19	.34	1.00	2 ¹ / ₄	5/16
5	6.5	1.66	.22	.059	1.44	.22	.38	1.00	2 ¹ / ₄	5/16
4	5.	1.56	.19	.075	1.38	.19	.34	1.00	2 ¹ / ₄	5/16

STANDARD GAUGES FOR ANGLES, TEES AND ZEES.



Flange F	Gauge A	Rivet or Bolt	Flange F	Gauge A	Rivet or Bolt	Depth D	Flange F	Gauge A	Rivet or Bolt
7"	3½"	1"	5"	2¾"	¾"	6"	3½"	2"	1"
6	3½	1	4½	2½	¾	5	3¼	1¾	¾
5	2¾	1	4	1½	¾	4	3	1¾	¾
4½	2½	1	3½	1½	¾	3	2¾	1½	¾
4	2¼	1	3	1½	¾				
3½	2	1	2¾	1¼	½				
3¼	1¾	¾	2½	1½	½				
3	1¾	¾	2¼	1½	½				
2¾	1½	¾	2	1	½				
2½	1½	¾	1¾	¾	½				
2¼	1¼	¾	1½	¾	¾				
2	1½	¾	1¼	¾	¾				
1¾	1½	¾	1	½	¾				
1½	1½	½							
1½	¾	½							
1¼	1½	½							
1½	¾	½							
1½	¾	¾							
1½	¾	¾							
1	¾	¾							
¾	½	¾							
¾	¾	¾							

WEIGHTS AND AREAS OF ANGLES.

EQUAL LEGS.

CARNEGIE.

Size in Inches	Thickness Metal.	Weight per ft.	Area.	Size in Inches.	Thickness Metal.	Weight per ft.	Area.
6 x6	$\frac{7}{8}$	33.1	9.74	$2\frac{1}{2} \times 2\frac{1}{2}$	$\frac{1}{2}$	7.7	2.25
6 x6	$\frac{1}{2}$	30.9	9.09	$2\frac{1}{2} \times 2\frac{1}{2}$	$\frac{7}{8}$	6.8	2.00
6 x6	* $\frac{3}{4}$	28.7	8.44	$2\frac{1}{2} \times 2\frac{1}{2}$	* $\frac{3}{8}$	5.9	1.73
6 x6	$\frac{1}{2}$	26.5	7.78	$2\frac{1}{2} \times 2\frac{1}{2}$	$\frac{5}{8}$	5.0	1.47
6 x6	$\frac{5}{8}$	24.2	7.11	$2\frac{1}{2} \times 2\frac{1}{2}$	* $\frac{1}{4}$	4.1	1.19
6 x6	$\frac{5}{8}$	21.9	6.43				
6 x6	$\frac{1}{2}$	19.6	5.75	$2\frac{1}{4} \times 2\frac{1}{4}$	$\frac{1}{2}$	6.8	2.00
6 x6	* $\frac{7}{8}$	17.2	5.06	$2\frac{1}{4} \times 2\frac{1}{4}$	$\frac{7}{8}$	6.1	1.78
				$2\frac{1}{4} \times 2\frac{1}{4}$	* $\frac{3}{8}$	5.3	1.55
5 x5	$\frac{7}{8}$	27.2	7.99	$2\frac{1}{4} \times 2\frac{1}{4}$	$\frac{5}{8}$	4.5	1.31
5 x5	$\frac{1}{2}$	25.4	7.46	$2\frac{1}{4} \times 2\frac{1}{4}$	* $\frac{1}{4}$	3.7	1.06
5 x5	$\frac{3}{4}$	23.6	6.94				
5 x5	* $\frac{1}{2}$	21.8	6.42	2 x2	$\frac{7}{8}$	5.3	1.56
5 x5	$\frac{5}{8}$	20.0	5.86	2 x2	$\frac{3}{8}$	4.7	1.36
5 x5	$\frac{5}{8}$	18.1	5.31	2 x2	* $\frac{7}{8}$	4.0	1.15
5 x5	* $\frac{1}{2}$	16.2	4.75	2 x2	$\frac{1}{4}$	3.2	0.94
5 x5	$\frac{7}{8}$	14.3	4.18	2 x2	* $\frac{3}{8}$	2.5	0.71
5 x5	* $\frac{3}{8}$	12.3	3.61				
				$1\frac{3}{4} \times 1\frac{3}{4}$	$\frac{7}{8}$	4.6	1.30
4 x4	$\frac{1}{2}$	19.9	5.84	$1\frac{3}{4} \times 1\frac{3}{4}$	$\frac{3}{8}$	4.0	1.17
4 x4	$\frac{3}{4}$	18.5	5.44	$1\frac{3}{4} \times 1\frac{3}{4}$	$\frac{5}{8}$	3.4	1.00
4 x4	* $\frac{1}{2}$	17.1	5.03	$1\frac{3}{4} \times 1\frac{3}{4}$	* $\frac{1}{4}$	2.8	0.81
4 x4	$\frac{5}{8}$	15.7	4.61	$1\frac{3}{4} \times 1\frac{3}{4}$	$\frac{1}{2}$	2.1	0.62
4 x4	$\frac{5}{8}$	14.3	4.18				
4 x4	* $\frac{1}{2}$	12.8	3.75	$1\frac{1}{2} \times 1\frac{1}{2}$	$\frac{3}{8}$	3.4	0.99
4 x4	$\frac{7}{8}$	11.3	3.31	$1\frac{1}{2} \times 1\frac{1}{2}$	* $\frac{5}{8}$	2.9	0.84
4 x4	* $\frac{3}{8}$	9.8	2.86	$1\frac{1}{2} \times 1\frac{1}{2}$	* $\frac{1}{4}$	2.4	0.69
4 x4	* $\frac{5}{8}$	8.2	2.40	$1\frac{1}{2} \times 1\frac{1}{2}$	$\frac{1}{2}$	1.8	0.53
$3\frac{1}{2} \times 3\frac{1}{2}$	$\frac{1}{2}$	17.1	5.03	$1\frac{1}{4} \times 1\frac{1}{4}$	$\frac{5}{8}$	2.4	0.69
$3\frac{1}{2} \times 3\frac{1}{2}$	$\frac{3}{4}$	16.0	4.69	$1\frac{1}{4} \times 1\frac{1}{4}$	* $\frac{1}{4}$	1.9	0.56
$3\frac{1}{2} \times 3\frac{1}{2}$	* $\frac{1}{2}$	14.8	4.34	$1\frac{1}{4} \times 1\frac{1}{4}$	* $\frac{3}{8}$	1.5	0.43
$3\frac{1}{2} \times 3\frac{1}{2}$	$\frac{5}{8}$	13.6	3.99	$1\frac{1}{4} \times 1\frac{1}{4}$	$\frac{1}{2}$	1.0	0.30
$3\frac{1}{2} \times 3\frac{1}{2}$	$\frac{5}{8}$	12.3	3.62				
$3\frac{1}{2} \times 3\frac{1}{2}$	* $\frac{1}{2}$	11.1	3.25	$1\frac{1}{8} \times 1\frac{1}{8}$	$\frac{5}{8}$	2.1	0.61
$3\frac{1}{2} \times 3\frac{1}{2}$	$\frac{7}{8}$	9.8	2.87	$1\frac{1}{8} \times 1\frac{1}{8}$	* $\frac{1}{4}$	1.7	0.50
$3\frac{1}{2} \times 3\frac{1}{2}$	* $\frac{3}{8}$	8.5	2.48	$1\frac{1}{8} \times 1\frac{1}{8}$	* $\frac{3}{8}$	1.3	0.39
				$1\frac{1}{8} \times 1\frac{1}{8}$	$\frac{1}{2}$	0.9	0.27
3 x3	$\frac{5}{8}$	11.4	3.36				
3 x3	* $\frac{1}{2}$	10.4	3.06	1 x1	* $\frac{1}{4}$	1.5	0.44
3 x3	$\frac{7}{8}$	9.4	2.75	1 x1	* $\frac{3}{8}$	1.2	0.34
3 x3	$\frac{7}{8}$	8.3	2.44	1 x1	* $\frac{1}{2}$	0.8	0.24
3 x3	* $\frac{3}{8}$	7.2	2.11				
3 x3	$\frac{5}{8}$	6.1	1.78	$\frac{7}{8} \times \frac{7}{8}$	* $\frac{3}{8}$	1.0	0.29
3 x3	* $\frac{1}{4}$	4.9	1.44	$\frac{7}{8} \times \frac{7}{8}$	* $\frac{1}{2}$	0.7	0.21
$2\frac{3}{4} \times 2\frac{3}{4}$	$\frac{1}{2}$	8.5	2.50	$\frac{3}{4} \times \frac{3}{4}$	* $\frac{3}{8}$	0.8	0.25
$2\frac{3}{4} \times 2\frac{3}{4}$	$\frac{7}{8}$	7.6	2.22	$\frac{3}{4} \times \frac{3}{4}$	* $\frac{1}{2}$	0.6	0.17
$2\frac{3}{4} \times 2\frac{3}{4}$	* $\frac{3}{8}$	6.6	1.92				
$2\frac{3}{4} \times 2\frac{3}{4}$	$\frac{5}{8}$	5.5	1.62	$\frac{5}{8} \times \frac{5}{8}$	* $\frac{1}{8}$	0.5	0.14
$2\frac{3}{4} \times 2\frac{3}{4}$	* $\frac{1}{4}$	4.5	1.31				

Angles marked thus * have finishing passes.

WEIGHTS AND AREAS OF ANGLES.

UNEQUAL LEGS.

CARNEGIE.

Size in Inches.	Thickness Metal.	Weight per ft.	Area.	Size in Inches.	Thickness Metal.	Weight per ft.	Area.
7 x3½	1	32.3	9.50	5 x3½	⅞	22.7	6.67
7 x3½	⅞	30.5	8.97	5 x3½	⅝	21.3	6.25
7 x3½	⅞	28.7	8.42	5 x3½	*¾	19.8	5.81
7 x3½	⅞	26.8	7.87	5 x3½	*⅞	18.3	5.37
7 x3½	*¾	24.9	7.31	5 x3½	⅝	16.8	4.92
7 x3½	⅞	23.0	6.75	5 x3½	⅜	15.2	4.47
7 x3½	⅝	21.0	6.17	5 x3½	*½	13.6	4.00
7 x3½	*⅞	19.0	5.59	5 x3½	⅜	12.0	3.53
7 x3½	⅞	17.0	5.00	5 x3½	*¾	10.4	3.05
7 x3½	*⅞	15.0	4.40				
6 x4	⅞	27.2	7.99	5 x3	⅞	19.9	5.84
6 x4	⅞	25.4	7.47	5 x3	¾	18.5	5.44
6 x4	*¾	23.6	6.94	5 x3	*⅞	17.1	5.03
6 x4	⅞	21.8	6.41	5 x3	⅝	15.7	4.61
6 x4	⅝	20.0	5.86	5 x3	⅜	14.2	4.18
6 x4	⅜	18.1	5.31	5 x3	*½	12.8	3.75
6 x4	*½	16.2	4.75	5 x3	⅜	11.3	3.31
6 x4	⅜	14.3	4.18	5 x3	*¾	9.8	2.86
6 x4	*¾	12.3	3.61	5 x3	*⅞	8.2	2.40
6 x3½	⅞	25.7	7.55				
6 x3½	⅞	24.0	7.06	4½x3	⅞	18.5	5.43
6 x3½	*¾	22.3	6.56	4½x3	¾	17.2	5.06
6 x3½	⅞	20.6	6.06	4½x3	*⅞	15.9	4.68
6 x3½	⅝	18.9	5.55	4½x3	⅝	14.6	4.30
6 x3½	⅜	17.1	5.03	4½x3	⅜	13.3	3.90
6 x3½	*½	15.3	4.50	4½x3	*½	11.9	3.50
6 x3½	⅜	13.5	3.97	4½x3	⅜	10.5	3.09
6 x3½	*¾	11.7	3.42	4½x3	*¾	9.1	2.67
5 x4	⅞	24.2	7.11				
5 x4	⅞	22.6	6.65	4 x3½	⅞	18.5	5.43
5 x4	¾	21.1	6.19	4 x3½	¾	17.2	5.06
5 x4	*⅞	19.5	5.72	4 x3½	*⅞	15.9	4.68
5 x4	⅝	17.8	5.23	4 x3½	⅝	14.6	4.30
5 x4	⅜	16.2	4.75	4 x3½	⅜	13.3	3.90
5 x4	*½	14.5	4.25	4 x3½	*½	11.9	3.50
5 x4	⅜	12.8	3.75	4 x3½	⅜	10.5	3.09
5 x4	*¾	11.0	3.23	4 x3½	*¾	9.1	2.67

Angles marked thus (*) have finishing passes.

WEIGHTS AND AREAS OF ANGLES.

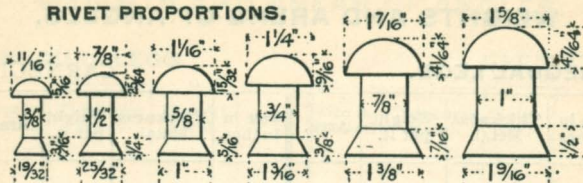
UNEQUAL LEGS.

CARNEGIE.

Size in Inches.	Thickness Metal.	Weight per ft.	Area.	Size in Inches.	Thickness Metal.	Weight per ft.	Area.
4 x3	$\frac{1}{8}$	17.1	5 03	3 x2½	$\frac{9}{16}$	9.5	2.78
4 x3	$\frac{3}{4}$	16.0	4.69	3 x2½	$\frac{1}{2}$	8.5	2.50
4 x3	* $\frac{1}{8}$	14.8	4.34	3 x2½	* $\frac{7}{16}$	7.6	2.22
4 x3	$\frac{5}{8}$	13.6	3.98	3 x2½	$\frac{3}{8}$	6.6	1.92
4 x3	$\frac{9}{16}$	12.3	3.62	3 x2½	$\frac{5}{16}$	5.5	1.62
4 x3	* $\frac{1}{2}$	11.1	3.25	3 x2½	* $\frac{1}{4}$	4.5	1.31
4 x3	$\frac{7}{16}$	9.8	2.87				
4 x3	$\frac{3}{8}$	8.5	2.48	3 x2	$\frac{1}{2}$	7.7	2.25
4 x3	* $\frac{5}{16}$	7.1	2.09	3 x2	* $\frac{7}{16}$	6.8	2.00
				3 x2	$\frac{3}{8}$	5.9	1.73
3½x3	$\frac{1}{8}$	15.7	4.62	3 x2	$\frac{5}{16}$	5.0	1.47
3½x3	$\frac{3}{4}$	14.7	4.31	3 x2	* $\frac{1}{4}$	4.1	1.19
3½x3	* $\frac{1}{8}$	13.6	4.00	3 x2	* $\frac{7}{32}$	3.6	1.05
3½x3	$\frac{5}{8}$	12.5	3.67				
3½x3	$\frac{9}{16}$	11.4	3.34	2½x2	$\frac{1}{2}$	6.8	2.00
3½x3	* $\frac{1}{2}$	10.2	3.00	2½x2	$\frac{7}{16}$	6.1	1.78
3½x3	$\frac{7}{16}$	9.1	2.65	2½x2	* $\frac{3}{8}$	5.3	1.55
3½x3	$\frac{3}{8}$	7.8	2.30	2½x2	* $\frac{5}{16}$	4.5	1.31
3½x3	* $\frac{5}{16}$	6.6	1.93	2½x2	* $\frac{1}{4}$	3.7	1.06
				2½x2	* $\frac{3}{16}$	2.8	0.81
3½x2½	$\frac{1}{8}$	12.4	3.65	2¼x1½	$\frac{1}{2}$	5.5	1.63
3½x2½	$\frac{5}{8}$	11.4	3.36	2¼x1½	$\frac{7}{16}$	5.0	1.45
3½x2½	$\frac{9}{16}$	10.4	3.06	2¼x1½	* $\frac{3}{8}$	4.3	1.27
3½x2½	$\frac{1}{2}$	9.4	2.75	2¼x1½	* $\frac{5}{16}$	3.7	1.07
3½x2½	$\frac{7}{16}$	8.3	2.43	2¼x1½	* $\frac{1}{4}$	3.0	0.88
3½x2½	$\frac{3}{8}$	7.2	2.11	2¼x1½	* $\frac{3}{16}$	2.3	0.67
3½x2½	$\frac{5}{16}$	6.1	1.78				
3½x2½	* $\frac{1}{4}$	4.9	1.44				
3¼x2	$\frac{9}{16}$	9.0	2.64				
3¼x2	$\frac{1}{2}$	8.1	2.38	2 x1¾	* $\frac{1}{4}$	2.7	0.78
3¼x2	* $\frac{7}{16}$	7.2	2.11	2 x1¾	* $\frac{3}{16}$	2.1	0.60
3¼x2	$\frac{3}{8}$	6.2	1.83				
3¼x2	$\frac{5}{16}$	5.3	1.54	1¾x1	$\frac{5}{32}$	1.6	0.47
3¼x2	* $\frac{1}{4}$	4.3	1.25	1¾x1	* $\frac{1}{8}$	1.0	0.28

Angles marked thus (*) have finishing passes.

RIVET PROPORTIONS.



FINISHED HEADS.—Diam. Head = $1\frac{1}{2}$ Diam. of Shank + $\frac{1}{8}$. Depth of Head = $\frac{1}{10}$ Diam. of Head.

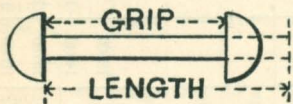
COUNTERSUNK.—Depth of Head = $\frac{1}{2}$ Diam. of Shank. Bevel of Head = 60 Degrees.

WEIGHT OF RIVETS AND ROUND-HEADED BOLTS PER HUNDRED.

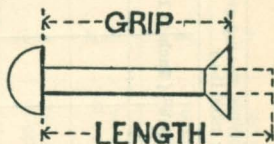
Diameter of Rivet in Inches...	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$
Length of Rivet under head	Weight in Pounds	Weight in Pounds	Weight in Pounds	Weight in Pounds	Weight in Pounds	Weight in Pounds	Weight in Pounds	Weight in Pounds
$1\frac{1}{4}$	5.4	12.5	21.2	28.0	42.5	64.6	91.0	121.8
$1\frac{3}{8}$	5.9	13.1	22.4	29.5	44.6	67.3	94.5	127.0
$1\frac{1}{2}$	6.3	13.7	23.5	31.0	46.7	69.9	97.9	132.4
$1\frac{5}{8}$	6.7	14.4	24.7	32.7	48.9	72.8	101.2	137.2
$1\frac{3}{4}$	7.0	15.1	26.0	34.2	51.0	75.0	104.0	141.1
$1\frac{7}{8}$	7.3	15.8	27.1	35.6	53.3	77.8	107.3	145.0
2	7.6	16.5	28.3	37.0	55.2	81.3	110.6	149.2
$2\frac{1}{8}$	7.9	17.2	29.6	38.4	57.5	84.1	113.9	154.0
$2\frac{1}{4}$	8.3	17.8	31.0	39.8	59.5	86.9	118.2	158.2
$2\frac{3}{8}$	8.8	18.4	32.1	41.5	61.7	89.5	122.1	163.0
$2\frac{1}{2}$	9.1	19.1	33.2	43.2	63.9	92.2	125.5	168.1
$2\frac{5}{8}$	9.5	19.8	34.4	44.8	66.0	94.8	129.0	172.0
$2\frac{3}{4}$	9.8	20.5	35.4	46.1	68.2	97.3	132.4	176.0
$2\frac{7}{8}$	10.2	21.2	36.1	47.7	70.1	100.0	135.9	180.3
3	10.6	21.9	37.0	49.0	72.1	102.5	139.4	184.9
$3\frac{1}{8}$	11.0	22.7	38.2	50.6	74.0	105.1	142.5	189.0
$3\frac{1}{4}$	11.3	23.4	39.1	52.1	76.2	107.8	146.1	194.1
$3\frac{3}{8}$	11.7	24.0	40.2	53.7	78.5	110.4	149.6	198.1
$3\frac{1}{2}$	12.1	24.7	41.0	55.2	80.2	112.9	153.0	202.0
$3\frac{5}{8}$	12.5	25.3	42.0	56.7	82.4	115.5	156.5	206.1
$3\frac{3}{4}$	12.8	26.0	42.9	58.1	84.3	118.0	160.1	210.2
$3\frac{7}{8}$	13.2	26.6	44.1	60.0	86.5	120.6	163.4	214.1
4	13.6	27.2	45.1	61.5	88.7	123.2	166.9	218.0
$4\frac{1}{8}$	14.0	28.0	46.2	63.2	91.0	125.7	170.2	221.9
$4\frac{1}{4}$	14.4	28.9	47.1	65.1	93.4	128.3	173.6	225.8
$4\frac{3}{8}$	14.9	29.5	48.0	66.6	95.1	131.0	176.9	229.5
$4\frac{1}{2}$	15.3	30.2	48.9	68.0	97.3	133.6	180.3	234.9
$4\frac{5}{8}$	15.7	30.9	49.8	69.2	99.5	136.2	183.8	239.0
$4\frac{3}{4}$	16.1	31.6	51.0	70.9	101.1	138.8	187.2	244.0
$4\frac{7}{8}$	16.5	32.2	52.1	72.5	103.4	141.3	191.0	248.2
5	17.0	32.9	53.3	74.2	105.2	144.0	194.5	252.1
$5\frac{1}{4}$	17.6	33.9	55.6	77.2	109.8	150.0	201.3	260.9
$5\frac{1}{2}$	18.2	35.1	56.8	80.3	114.1	155.7	208.1	269.7
$5\frac{3}{4}$	18.9	36.6	58.0	83.2	118.0	161.0	214.9	278.3
6	19.7	37.7	59.9	86.1	122.7	166.1	222.0	287.1
7	22.3	42.8	67.0	98.4	141.1	188.0	250.0	319.0
8	24.7	48.0	76.1	112.2	157.9	213.0	278.1	353.4
9	27.4	53.9	83.9	124.0	172.5	234.0	304.9	388.4
10	31.0	59.0	90.8	135.9	188.1	254.3	332.1	421.0
12	37.7	70.9	108.4	160.0	221.5	298.3	387.9	490.0

TABLE SHOWING LENGTH OF RIVET SHANK REQUIRED TO FORM HEAD.

PLAIN RIVETS



COUNTERSUNK RIVETS



	Diameter in Inches.						Diameter in Inches.				
	1/2	5/8	3/4	7/8	1		1/2	5/8	3/4	7/8	1
Grip.	Length in Inches.					Grip.	Length in Inches.				
1/2	1 1/2	1 3/4	1 7/8	2	2 1/2	1/2	1 1/4	1 1/4	1 1/4	1 3/8	1 3/8
5/8	1 5/8	1 7/8	2	2 1/8	2 1/4	5/8	1 1/2	1 3/8	1 3/8	1 3/8	1 3/8
3/4	1 3/4	2	2 1/8	2 1/4	2 3/8	3/4	1 3/8	1 1/2	1 1/2	1 3/8	1 3/8
7/8	1 7/8	2 1/8	2 1/4	2 3/8	2 1/2	7/8	1 1/2	1 5/8	1 5/8	1 3/4	1 3/4
1	2	2 1/4	2 3/8	2 1/2	2 5/8	1	1 5/8	1 3/4	1 3/4	1 7/8	1 7/8
1 1/8	2 1/8	2 3/8	2 1/2	2 5/8	2 3/4	1 1/8	1 3/4	1 7/8	1 7/8	2	2
1 1/4	2 1/4	2 1/2	2 5/8	2 3/4	2 7/8	1 1/4	1 7/8	2	2	2 1/8	2 1/8
1 1/2	2 3/8	2 5/8	2 3/4	2 7/8	3	1 1/2	2	2 1/8	2 1/8	2 1/4	2 1/4
1 5/8	2 5/8	2 7/8	3	3 1/8	3 1/4	1 5/8	2 1/8	2 1/4	2 3/8	2 3/8	2 3/8
1 3/8	2 3/4	3	3 1/8	3 3/4	3 3/8	1 3/8	2 1/4	2 3/8	2 1/2	2 1/2	2 5/8
1 3/4	2 7/8	3 1/8	3 1/4	3 3/8	3 1/2	1 3/4	2 3/8	2 1/2	2 5/8	2 5/8	2 3/4
1 7/8	3	3 1/4	3 3/8	3 1/2	3 5/8	1 7/8	2 1/2	2 5/8	2 3/4	2 3/4	2 7/8
2	3 1/8	3 3/8	3 1/2	3 5/8	3 3/4	2	2 5/8	2 3/4	2 7/8	2 7/8	3
2 1/8	3 1/4	3 1/2	3 5/8	3 3/4	3 7/8	2 1/8	2 3/4	2 7/8	3	3	3 1/8
2 1/4	3 3/8	3 5/8	3 3/4	3 7/8	4	2 1/4	2 7/8	3	3 1/8	3 1/8	3 1/4
2 3/8	3 3/8	3 3/4	3 7/8	4	4 1/8	2 3/8	3	3 1/8	3 3/4	3 3/4	3 3/8
2 1/2	3 5/8	3 7/8	4	4 1/8	4 1/4	2 1/2	3 1/8	3 1/4	3 3/8	3 3/8	3 3/8
2 5/8	3 3/4	4	4 1/8	4 1/4	4 3/8	2 5/8	3 3/4	3 3/8	3 1/2	3 1/2	3 5/8
2 3/4	3 7/8	4 1/8	4 1/4	4 3/8	4 1/2	2 3/4	3 3/8	3 1/2	3 5/8	3 5/8	3 3/4
2 7/8	4	4 1/4	4 3/8	4 1/2	4 5/8	2 7/8	3 1/2	3 5/8	3 3/4	3 3/4	3 7/8
3	4 1/4	4 1/2	4 5/8	4 3/4	4 7/8	3	3 3/4	3 3/4	3 7/8	4	4 1/8
3 1/8	4 3/8	4 5/8	4 3/4	4 7/8	5	3 1/8	3 3/8	3 7/8	4	4 1/8	4 1/4
3 1/4	4 1/2	4 3/4	4 7/8	5	5 1/8	3 1/4	4	4 1/8	4 1/8	4 1/4	4 3/8
3 3/8	4 5/8	4 7/8	5	5 1/8	5 1/4	3 3/8	4 1/8	4 1/4	4 3/8	4 3/8	4 1/2
3 1/2	4 3/4	5	5 1/8	5 1/4	5 3/8	3 1/2	4 1/4	4 3/8	4 3/8	4 3/8	4 5/8
3 5/8	4 7/8	5 1/8	5 1/4	5 3/8	5 1/2	3 5/8	4 3/8	4 1/2	4 1/2	4 5/8	4 3/4
3 3/4	5	5 1/4	5 3/8	5 1/2	5 5/8	3 3/4	4 1/2	4 5/8	4 5/8	4 3/4	4 7/8
3 7/8	5 1/8	5 3/8	5 1/2	5 5/8	5 3/4	3 7/8	4 5/8	4 3/4	4 3/4	4 3/4	5
4	5 1/4	5 1/2	5 5/8	5 3/4	5 7/8	4	4 3/4	4 7/8	5	5	5 1/8
4 1/8	5 3/8	5 5/8	5 3/4	5 7/8	6	4 1/8	4 7/8	5	5 1/8	5 1/8	5 3/4
4 1/4	5 1/2	5 3/4	5 7/8	6	6 1/8	4 1/4	4 3/4	5 1/8	5 1/8	5 1/8	5 1/2
4 3/8	5 5/8	5 7/8	6	6 1/8	6 1/4	4 3/8	4 3/8	4 3/8	4 3/8	4 3/8	4 5/8
4 1/2	5 7/8	6 1/8	6 1/4	6 3/8	6 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2	4 3/4
4 5/8	6	6 1/4	6 3/8	6 1/2	6 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 5/8	4 7/8
4 3/4	6 1/8	6 3/8	6 1/2	6 5/8	6 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 3/4	4 7/8
4 7/8	6 1/4	6 1/2	6 5/8	6 3/4	6 7/8	4 7/8	4 7/8	4 7/8	4 7/8	4 7/8	5
5	6 3/8	6 5/8	6 3/4	6 7/8	7	5	5	5	5	5	5 1/8
5 1/8	6 1/2	6 3/4	6 7/8	7	7 1/8	5 1/8	5 1/8	5 1/8	5 1/8	5 1/8	5 3/4
5 1/4	6 5/8	6 7/8	7	7 1/8	7 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 1/4	5 3/8
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5 1/2	7	7 1/4	7 3/8	7 1/2	7 5/8	5 1/2	5 1/2	5 1/2	5 1/2	5 1/2	5 3/4
5 5/8	7 1/8	7 3/8	7 1/2	7 5/8	7 3/4	5 5/8	5 5/8	5 5/8	5 5/8	5 5/8	6 1/4
5 3/4	7 1/4	7 1/2	7 5/8	7 3/4	7 7/8	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	6 3/8
5 7/8	7 3/8	7 5/8	7 3/4	7 7/8	8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	7

SHEARING AND BEARING VALUES OF RIVETS.

Diameter of Rivet in Inches.		Area of Rivet.	Single Shear 11000 lbs. Per Sq. Inch.	Bearing Value for Different Thicknesses of Plate at 18000 lbs. Per Square Inch. (= Diam. of Rivet × Thickness of Plate × 18000 lbs.)											
Fraction.	Decimal.			¼ Inch	⅕ Inch	⅜ Inch	⅙ Inch	½ Inch	⅔ Inch	⅝ Inch	⅞ Inch	1 Inch	1 ¼ Inch	1 ½ Inch	1 ¾ Inch
⅜	.375	.1104	1210	1680											
⅙	.4375	.1503	1650	1960	2450										
½	.5	.1963	2160	2240	2800	3370									
⅙	.5625	.2485	2730	2520	3150	3790	4420								
⅝	.625	.3068	3370	2800	3500	4210	4910								
1 ⅛	.6875	.3712	4080	3090	3860	4340	5400	6180							
¾	.75	.4418	4860	3370	4210	5060	5890	6740	7580						
1 ⅓	.8125	.5185	5700	3650	4560	5480	6390	7300	8210	9120					
⅞	.875	.6013	6600	3930	4910	5900	6880	7860	8840	9820					
1 ½	.9375	.6903	7590	4210	5260	6330	7370	8420	9470	10520	11590				
1	1.000	.7854	8630	4500	5620	6750	7860	9000	10120	11240	12370	13500			
1 ¼	1.0625	.8866	9750	4780	5970	7170	8360	9560	10750	11940	13140	14340	15530		
1 ⅙	1.125	.9940	10930	5060	6320	7590	8850	10120	11380	12640	13910	15180	16440	17700	
1 ⅓	1.1875	1.1075	12180	5340	6670	8010	9350	10680	12010	13340	14680	16020	17360	18700	

WEIGHT OF 100 BOLTS WITH SQUARE HEADS AND NUTS.

Diameter of Bolt---	$\frac{1}{4}$ in.	$\frac{5}{16}$ in.	$\frac{3}{8}$ in.	$\frac{7}{16}$ in.	$\frac{1}{2}$ in.	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	$\frac{7}{8}$ in.	1 in.
Length under head to Point.	Weight in Pounds.	Weight in Pounds.	Weight in Pounds.	Weight in Pounds.	Weight in Pounds.	Weight in Pounds.	Weight in Pounds.	Weight in Pounds.	Weight in Pounds.
1½	4.0	7.0	10.5	15.2	22.5	39.5	63.0		
1¾	4.4	7.5	11.3	16.3	23.8	41.6	66.0		
2	4.8	8.0	12.0	17.4	25.2	43.8	69.0	109.0	163.0
2¼	5.2	8.5	12.8	18.5	26.5	45.8	72.0	113.3	169.0
2½	5.5	9.0	13.5	19.6	27.8	48.0	75.0	117.5	174.0
2¾	5.8	9.5	14.3	20.7	29.1	50.1	78.0	121.8	180.0
3	6.3	10.0	15.0	21.8	30.5	52.3	81.0	126.0	185.0
3½	7.0	11.0	16.5	24.0	33.1	56.5	87.0	134.3	196.0
4	7.8	12.0	18.0	26.2	35.8	60.8	93.1	142.5	207.0
4½	8.5	13.0	19.5	28.4	38.4	65.0	99.1	151.0	218.0
5	9.3	14.0	21.0	30.6	41.1	69.3	105.2	159.6	229.0
5½	10.0	15.0	22.5	32.8	43.7	73.5	111.3	168.0	240.0
6	10.8	16.0	24.0	35.0	46.4	77.8	117.3	176.6	251.0
6½			25.5	37.2	49.0	82.0	123.4	185.0	262.0
7			27.0	39.4	51.7	86.3	129.4	193.7	273.0
7½			28.5	41.6	54.3	90.5	135.0	202.0	284.0
8			30.0	43.8	59.6	94.8	141.5	210.7	295.0
9				46.0	64.9	103.3	153.6	227.8	317.0
10				48.2	70.2	111.8	165.7	244.8	339.0
11				50.4	75.5	120.3	177.8	261.9	360.0
12				52.6	80.8	128.8	189.9	278.9	382.0
13					86.1	137.3	202.0	296.0	404.0
14					91.4	145.8	214.1	313.0	426.0
15					96.7	154.3	226.2	330.1	448.0
16					102.0	162.8	238.3	347.1	470.0
17					107.3	171.0	250.4	364.2	492.0
18					112.6	179.5	262.6	381.2	514.0
19					117.9	188.0	274.7	398.3	536.0
20					123.2	206.5	286.8	415.3	558.0
Per Inch Additional.	1.4	2.1	3.1	4.2	5.5	8.5	12.3	16.7	21.8

SIZES AND WEIGHTS OF HOT PRESSED HEXAGON NUTS.

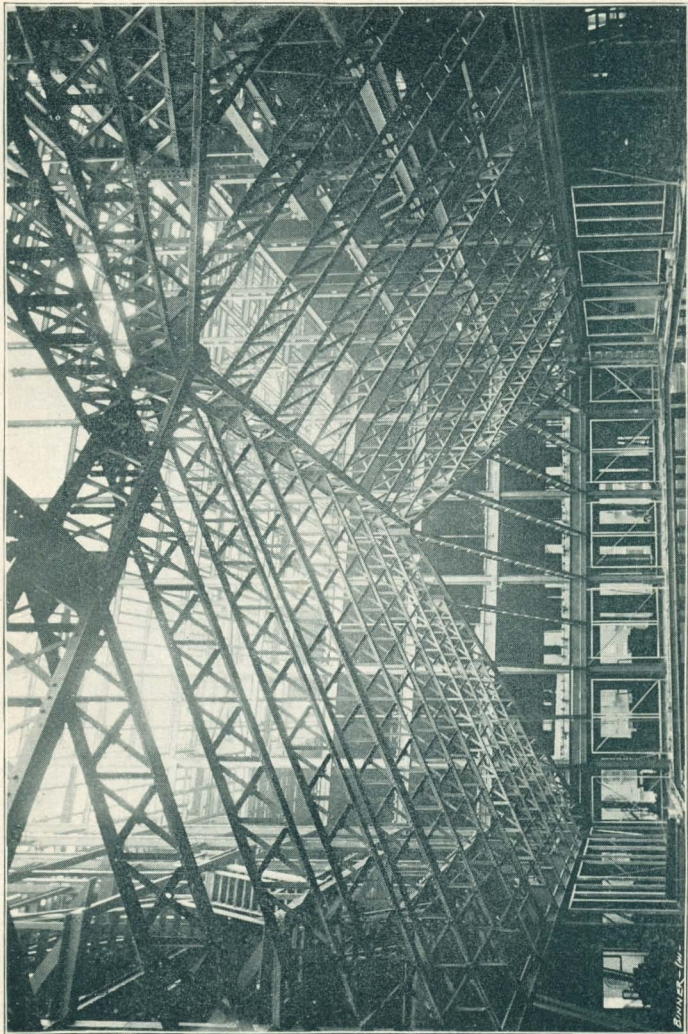
Size of Bolt.	Weight of 100 Nuts.	Rough Hole.	Thickness of Nut.	Short Diameter.	Long Diameter.	No. of Nuts in 100 lbs.
¼	1.3	⅜	¼	½	.58	8000.
⅕	2.4	⅜	⅕	⅝	.72	4170.
⅜	4.1	⅞	⅜	¾	.87	2410.
⅞	6.8	⅞	⅞	⅞	1.01	1460.
½	7.1	⅞	½	⅞	1.01	1410.
½	9.8	⅞	½	1	1.15	1020.
⅞	14.0	½	⅞	1⅛	1.30	710.
⅝	14.7	⅞	⅝	1⅛	1.30	680.
⅝	19.1	⅞	⅝	1¼	1.44	520.
⅝	22.9	⅞	¾	1¼	1.44	440.
¾	27.2	⅞	¾	1⅜	1.59	370.
¾	39.	⅞	⅞	1½	1.73	256.
⅞	44.	⅞	⅞	1⅝	1.88	226.
⅞	50.	⅞	1	1⅝	1.88	198.
1	57.	⅞	1	1¾	2.02	176.
1	64.	⅞	1⅛	1¾	2.02	156.
1⅛	96.	⅞	1¼	2	2.31	104.
1¼	134.	1⅞	1⅜	2¼	2.60	75.
1⅜	180.	1⅞	1½	2½	2.89	56.
1½	235.	1⅞	1⅝	2¾	3.18	42.
1⅝	300.	1⅞	1¾	3	3.46	33.4
1¾	370.	1⅞	1⅞	3¼	3.75	26.7
1⅞	460.	1⅞	2	3½	4.04	21.5
2	450.	1⅞	2	3½	4.04	22.4
2⅕	560.	1⅞	2⅕	3¾	4.33	18.0
2¼	560.	2	2¼	3¾	4.33	17.7
2⅜	680.	2⅕	2⅜	4	4.62	14.7
2½	810.	2¼	2½	4¼	4.91	12.3
2¾	980.	2⅞	2¾	4½	5.20	10.2
3	1150.	2⅞	3	4¾	5.48	8.7
3¼	1340.	2⅞	3¼	5	5.77	7.5
3½	1580.	3⅕	3½	5¼	6.06	6.3

SIZES AND WEIGHTS OF HOT PRESSED SQUARE NUTS.

Size of Bolt.	Weight of 100 Nuts.	Rough Hole.	Thickness of Nut.	Side of Square.	Diagonal	No. of Nuts in 100 lbs.
¼	1.5	⅜	¼	½	.71	6800
⅕	2.9	⅜	⅕	⅝	.88	3480
⅜	4.9	½	⅜	¾	1.06	2050
⅞	7.7	⅝	⅞	⅞	1.24	1200
½	8.6	⅞	½	⅞	1.24	1170
½	11.8	⅞	½	1	1.41	850
⅝	16.7	1	⅝	1⅝	1.59	600
⅝	17.7	⅞	⅝	1⅝	1.59	570
⅝	22.8	⅞	⅝	1¾	1.77	440
¾	32.3	1½	¾	1⅝	1.94	310
¾	39.8	1½	¾	1½	2.12	251
⅞	53.	1⅝	⅞	1⅝	2.30	190
⅞	63.	1⅝	⅞	1¾	2.47	159
1	68.	⅞	1	1¾	2.47	146
1	94.	⅞	1	2	2.83	106
1⅝	103.	1⅝	1⅝	2	2.83	97
1⅝	137.	1⅝	1⅝	2¼	3.18	73
1¾	145.	1⅞	1¾	2¼	3.18	69
1¾	186	1⅞	1¾	2½	3.51	54
1⅝	247.	1⅞	1⅝	2¾	3.89	41
1½	319.	1⅞	1½	3	4.24	31.3
1⅝	400.	1⅞	1⅝	3¼	4.60	24.8
1¾	500.	1⅞	1¾	3½	4.95	19.9
1⅞	620.	1⅞	1⅞	3¾	5.30	16.2
2	750.	1⅞	2	4	5.66	13.4
2⅝	780.	1⅞	2⅝	4	5.66	12.8
2¼	930.	2	2¼	4¼	6.01	10.7
2⅜	960.	2⅝	2⅜	4¼	6.01	10.4
2½	1130.	2¼	2½	4½	6.36	8.9
2¾	1370.	2⅞	2¾	4¾	6.72	7.3
3	1610.	2⅞	3	5	7.07	6.2
3¼	2110.	2⅞	3¼	5½	7.78	4.7
3½	2750.	3⅝	3½	6	8.49	3.6

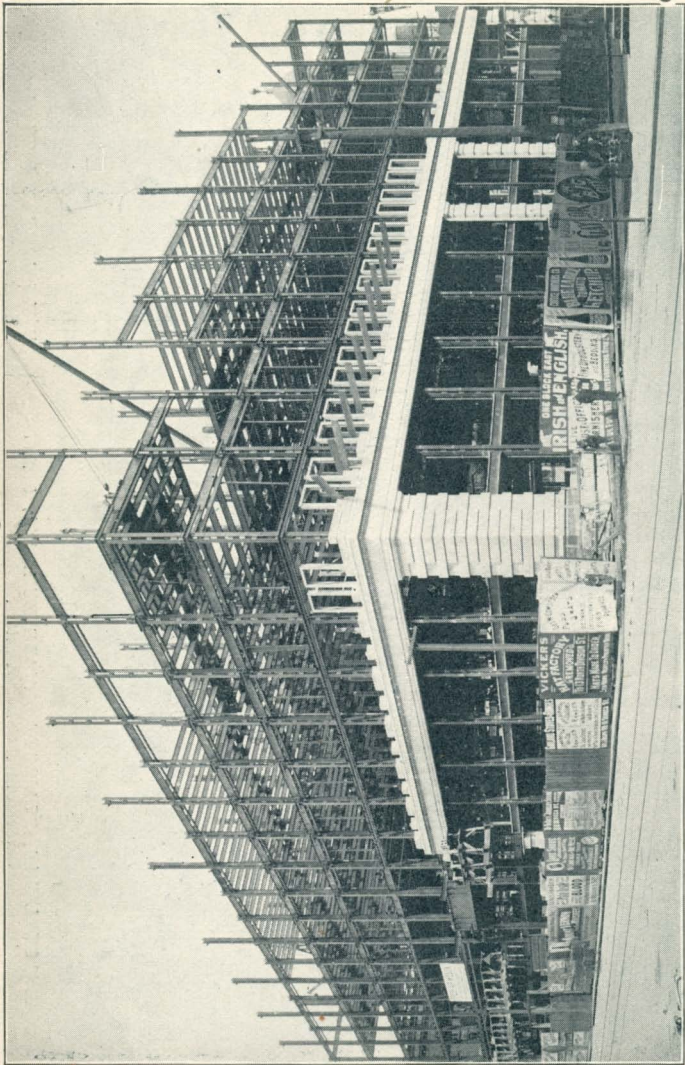
Some Structures in Which Gray Columns Have Been Used.

- Tarrant County Court House, Fort Worth, Texas,
Gunn & Curtis, Architects.
- Felix & Marston Warehouse, Chicago,
Frank B. Abbott, Architect.
- Lyceum Theatre, Memphis, Tenn.,
Wood & Lovell, Architects.
- Reliance Building, 15 stories, Chicago,
D. H. Burnham & Co., Architects.
- Wyandotte Building, 11 stories, Columbus, Ohio,
D. H. Burnham & Co., Architects.
- Chamber of Commerce, 14 stories, Detroit,
Spier & Rohns, Architects.
- Steinway Hall, 11 stories, Chicago,
D. H. Perkins, Architect.
- Two 210'-0'' Bridge Spans, Chicago Drainage Canal,
J. H. Gray, Designer.
- Two 180'-0'' Bridge Spans, Chicago Drainage Canal,
J. H. Gray, Designer.
- Ellicott Square Building, 11 stories, Buffalo,
D. H. Burnham & Co., Architects.
- Guaranty Building, 13 stories, Buffalo,
Adler & Sullivan, Architects.
- Hotel Walton, 11 stories, Philadelphia,
A. S. Wade, Architect.
- Philadelphia Base Ball Grand Stand, Philadelphia,
J. D. Allen, Architect.
- Mabley & Co.'s Building, 14 stories, Detroit,
D. H. Burnham & Co., Architects.
- Lonsdale Building, 8 stories, Duluth,
Palmer Hall & Hunt, Architects.
- Washington St. Office Building, 11 stories, Chicago,
Jarvis Hunt, Architect.
- Fisher Building, 18 stories, Chicago,
D. H. Burnham & Co., Architects.
- Millikin Bank Building, 7 stories, Decatur, Ill.,
W. W. Boyington & Co., Architects
- Lewis Institute, 6 stories, Chicago,
H. I. Cobb, Architect.
- Great Northern Theatre, 16 stories, Chicago,
D. H. Burnham & Co., Architects.
- Martin Building, 7 stories, Utica, N. Y.,
J. Agne, Jr., Architect.
- Dobson Building, 10 stories, Philadelphia,
Kimball, Architect.
- Lafayette Square Opera House, Washington, D. C.,
Wood & Lovell, Architects.
- St. Paul's Church, New York.



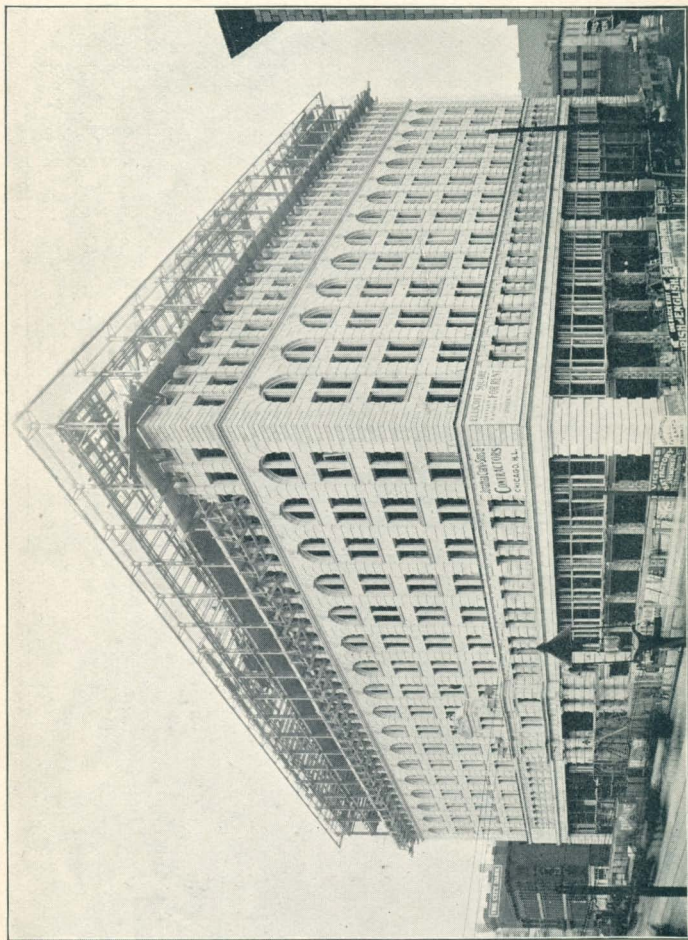
COURT SKYLIGHT — ELLICOTT SQUARE BUILDING, Buffalo.
Carnegie Steel Co., Contractors.

D. H. BURNHAM & CO., Architects.
Steel designed by E. C. Shankland.



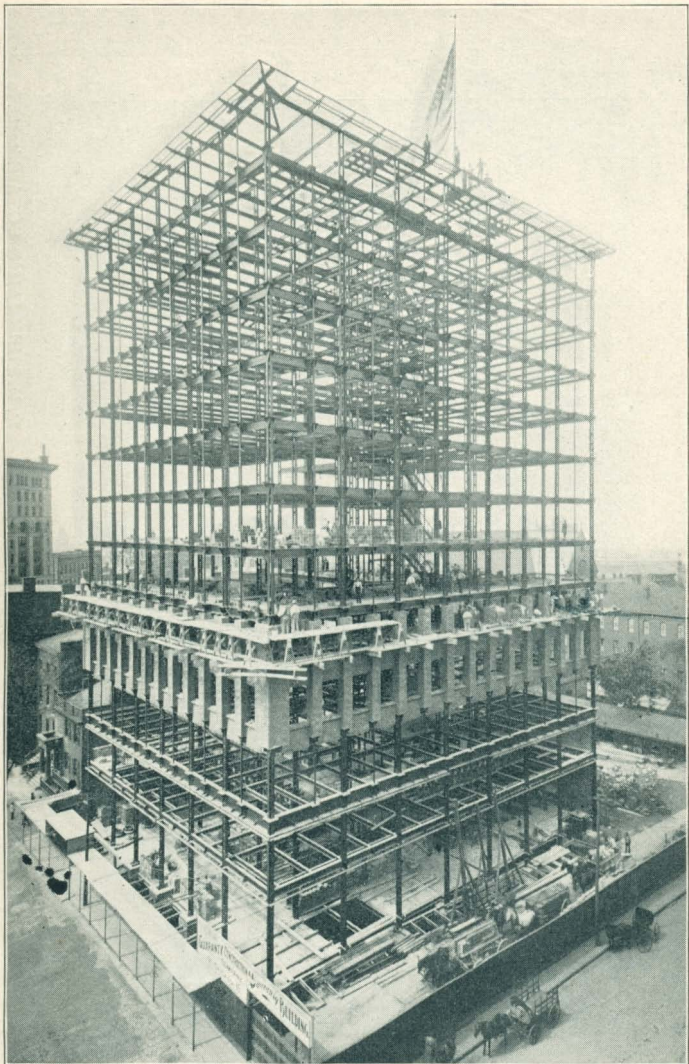
ELLICOTT SQUARE BUILDING, Buffalo.
Carnegie Steel Co., Contractors.

D. H. BUKNHAM & CO., Architects.
Steel designed by E. C. Shankland.



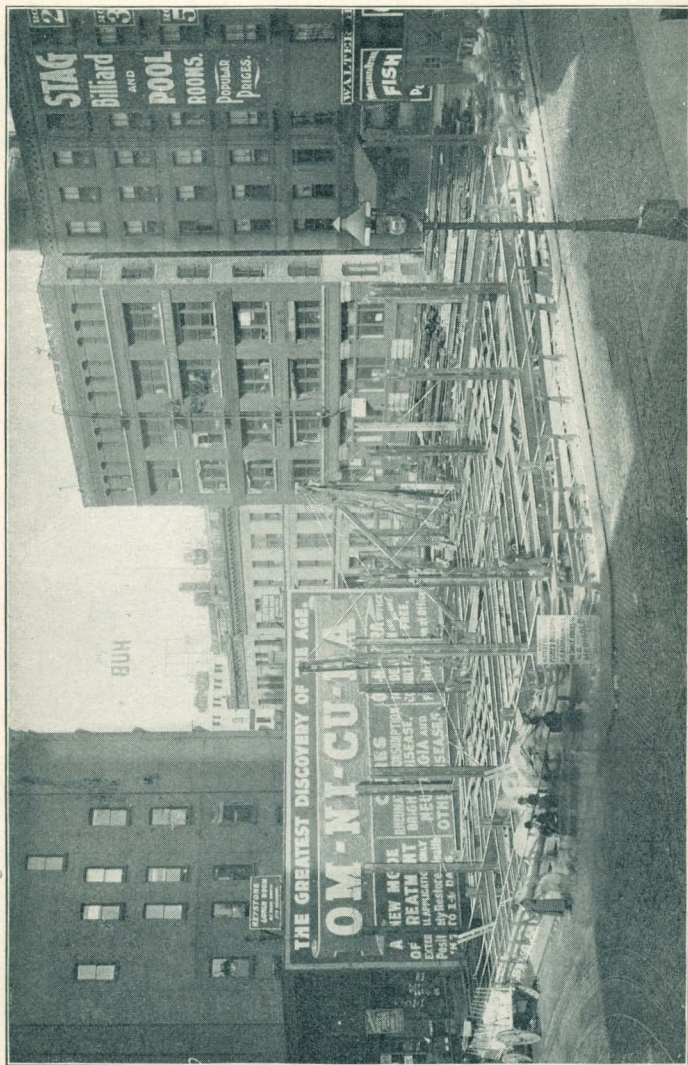
ELLICOTT SQUARE BUILDING, Buffalo.
Carnegie Steel Co., Contractors.

D. H. BURNHAM & CO., Architects.
Steel designed by E. C. Shankland.



GUARANTY BUILDING, Buffalo.
Guaranty Construction Co., Contractors.

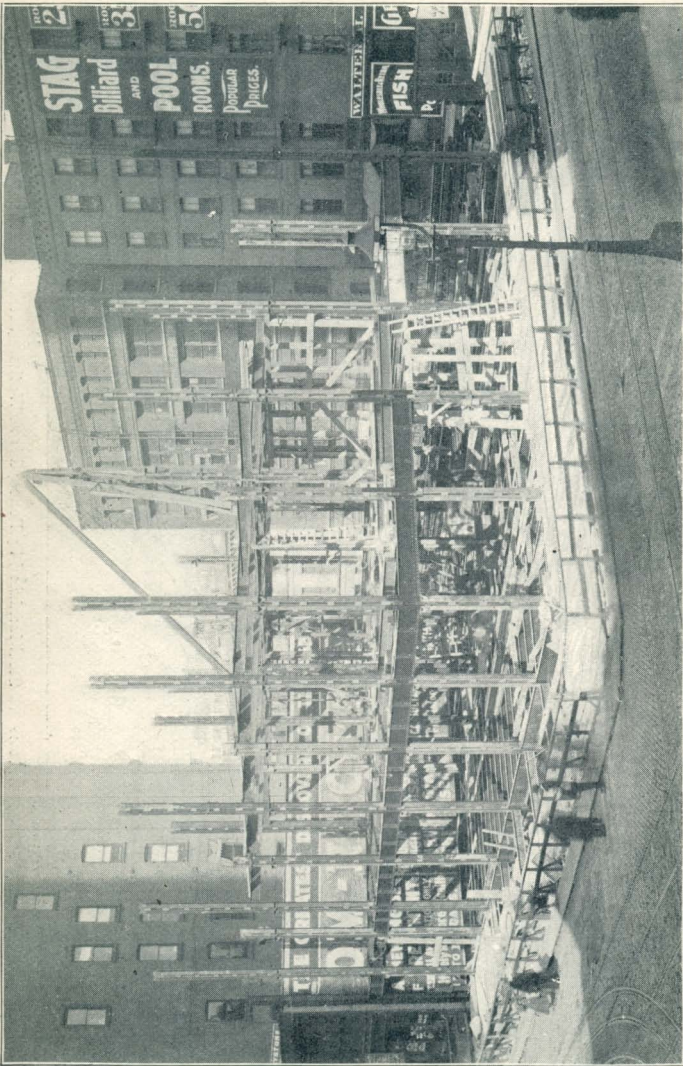
ADLER & SULLIVAN, Architects.
Steel furnished by Pencoyd Iron Works.



FISHER BUILDING, Chicago.
 Guaranty Construction Co., Contractors

Steel furnished by Pencoed Iron Works.

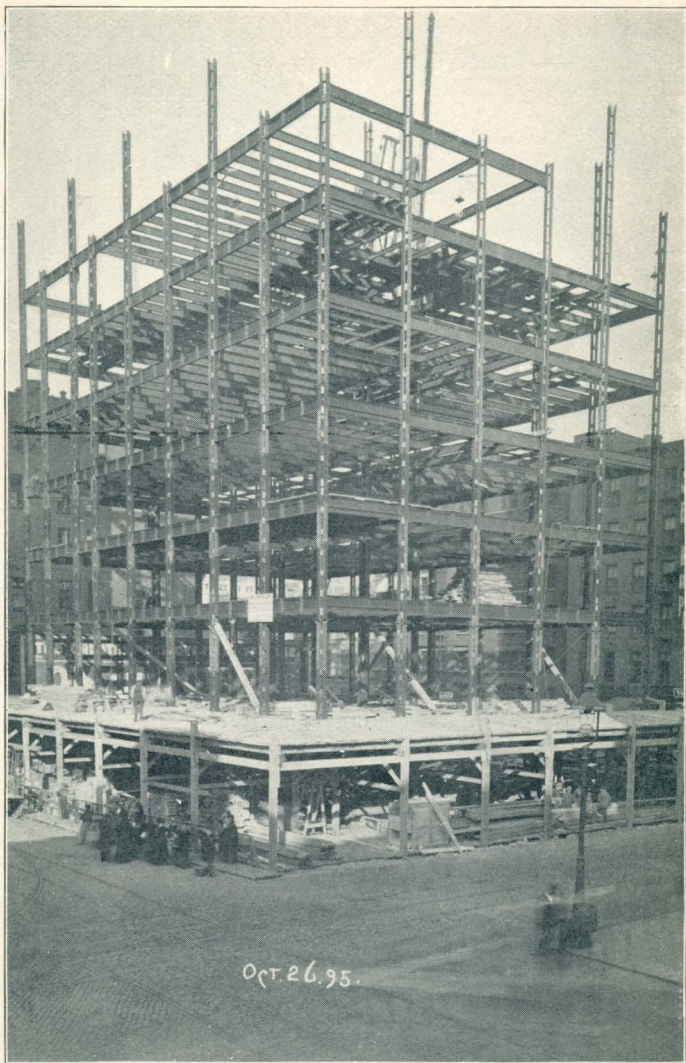
D. H. BURNHAM & CO., Architects.
 Steel designed by E. C. Shankland.



FISHER BUILDING, Chicago.

Guaranty Construction Co., Contractors. Steel furnished by Pencoyd Iron Works.

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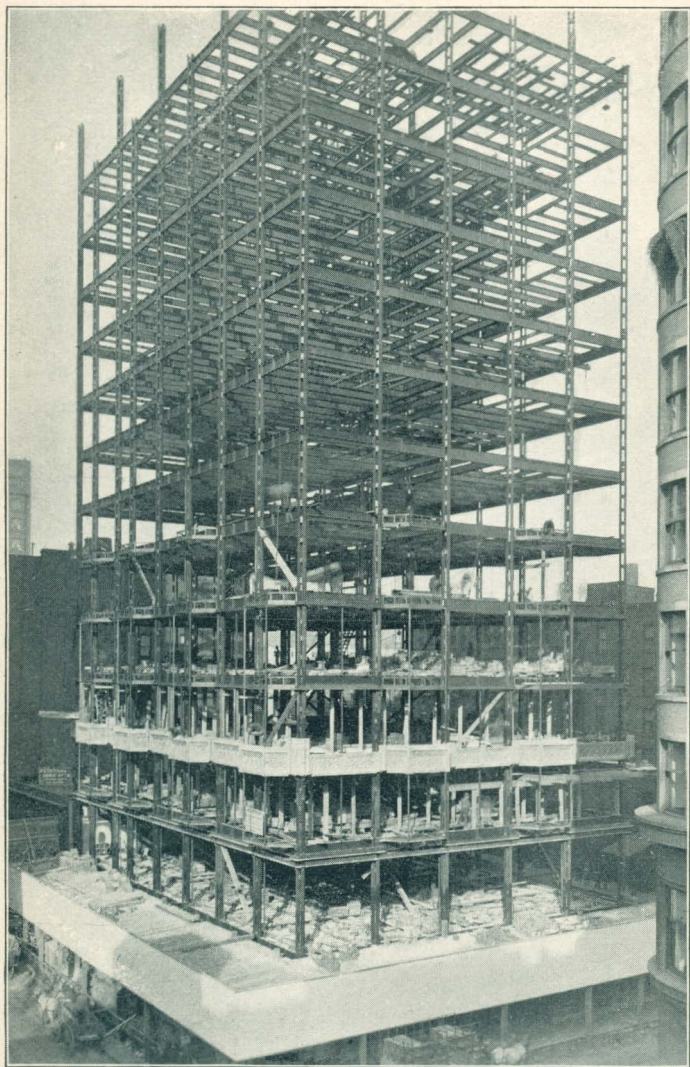


FISHER BUILDING, Chicago.

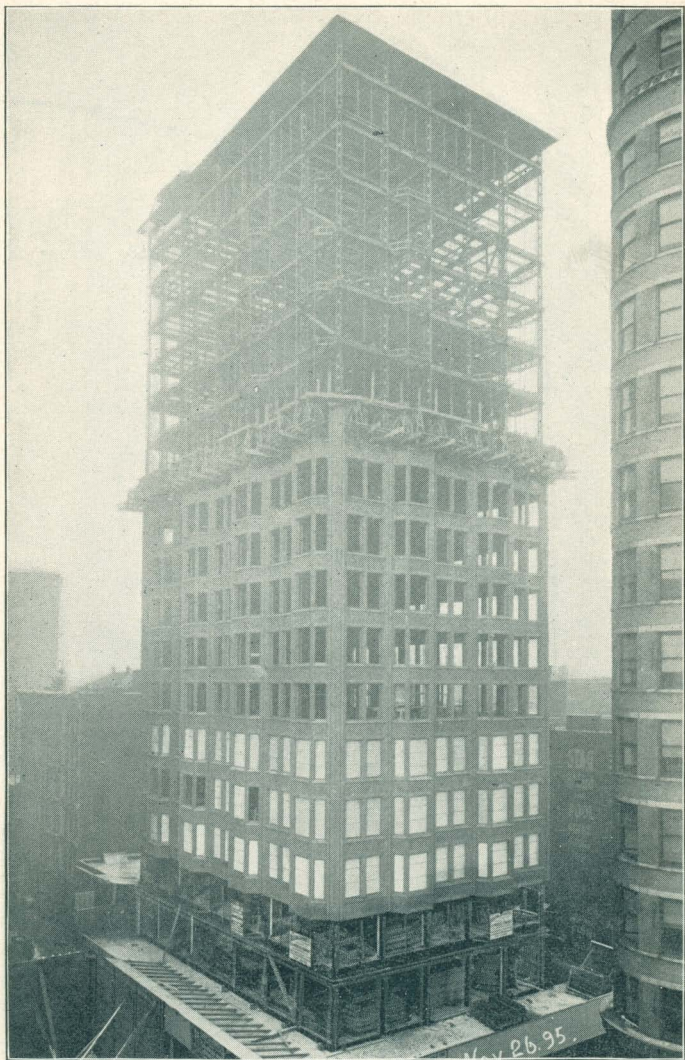
D. H. BURNHAM & CO., Architects.

Guaranty Construction Co., Contractors. Steel furnished by Pencoyd Iron Works.

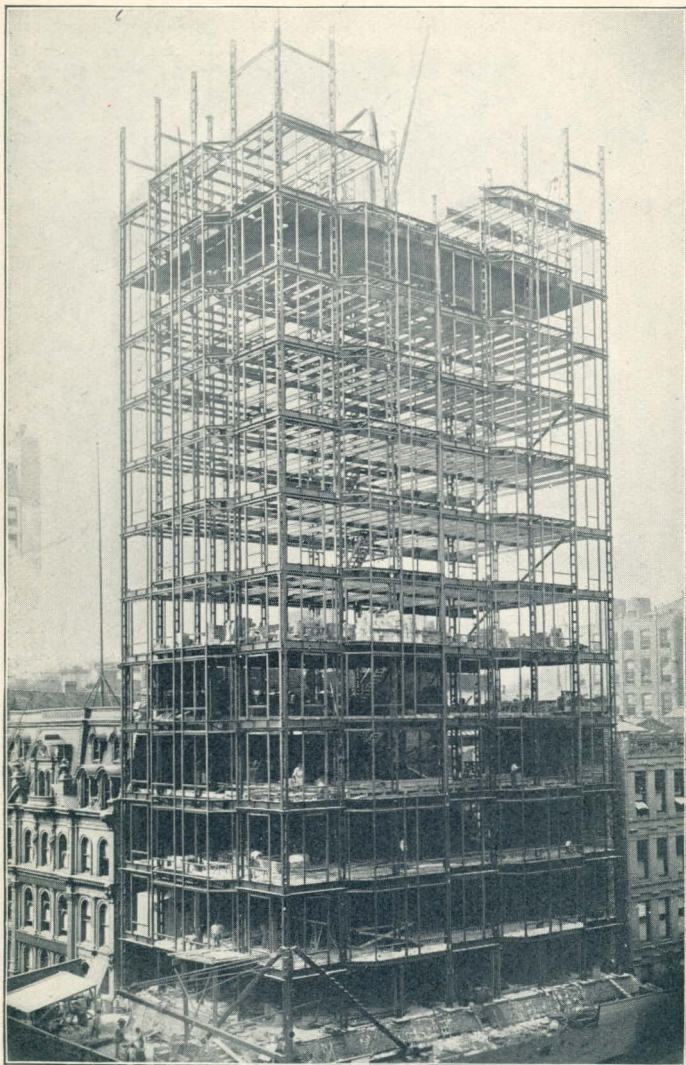
Steel designed by E. C. Shankland.



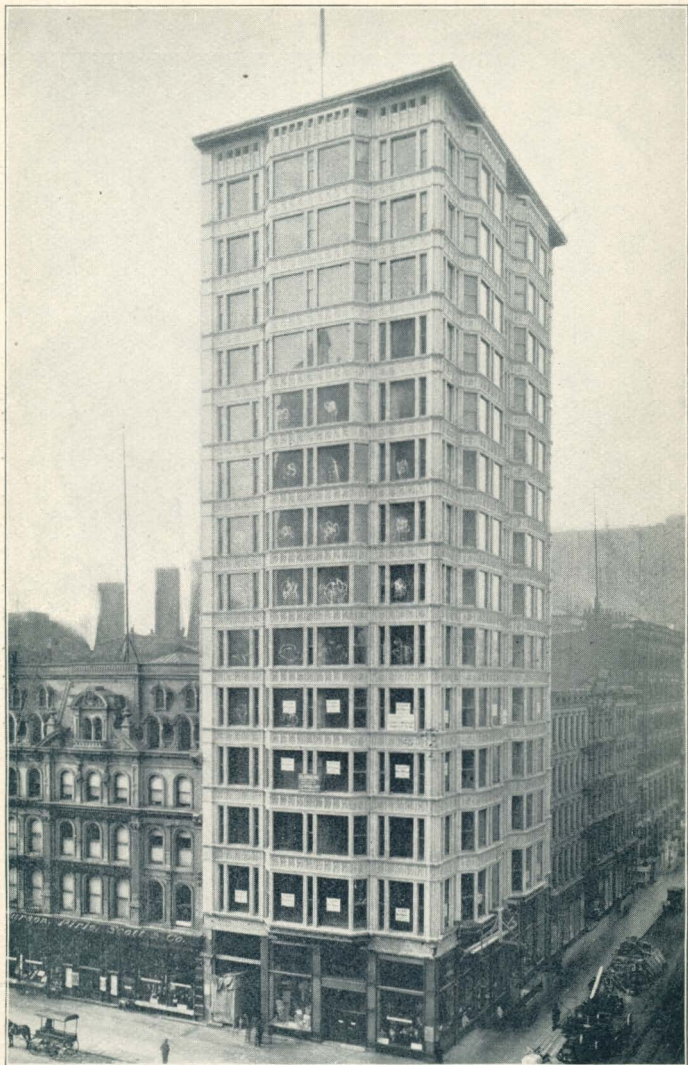
FISHER BUILDING, Chicago. D. H. BURNHAM & CO., Architects.
Guaranty Construction Co., Contractors. Steel furnished by Pencoyd Iron Works.
Steel designed by E. C. Shankland.



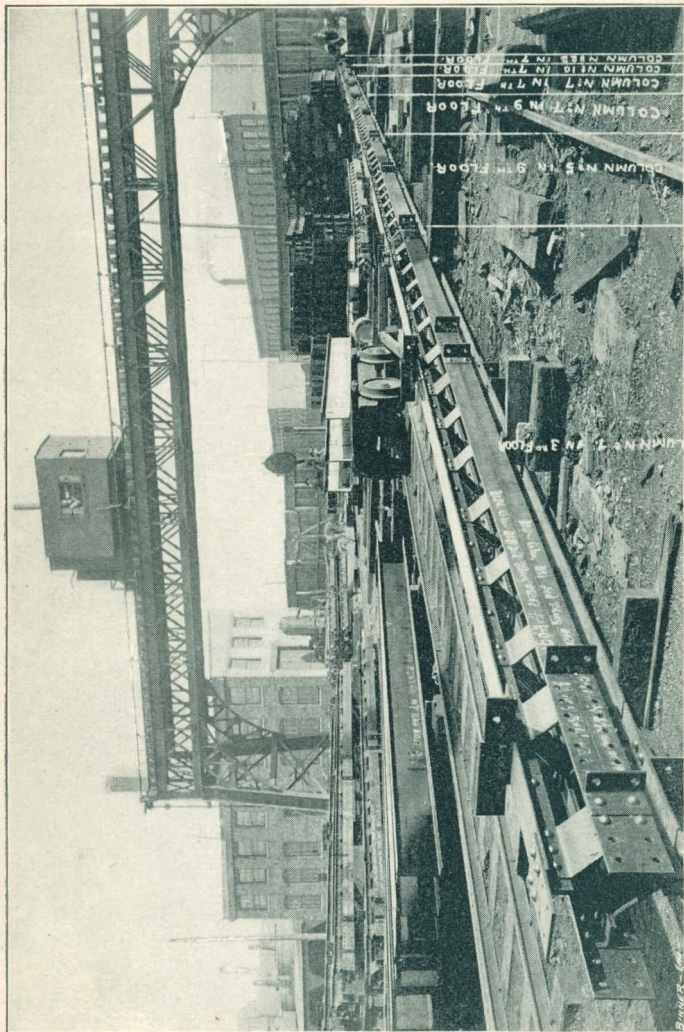
FISHER BUILDING, Chicago. D. H. BURNHAM & CO., Architects.
Guaranty Construction Co., Contractors. Steel designed by E. C. Shankland.
Steel furnished by Pencoyd Iron Works.



RELIANCE BUILDING, Chicago. D. H. BURNHAM & CO., Architects.
Lassig Bridge & Iron Works, Contractors. Steel designed by E. C. Shankland.

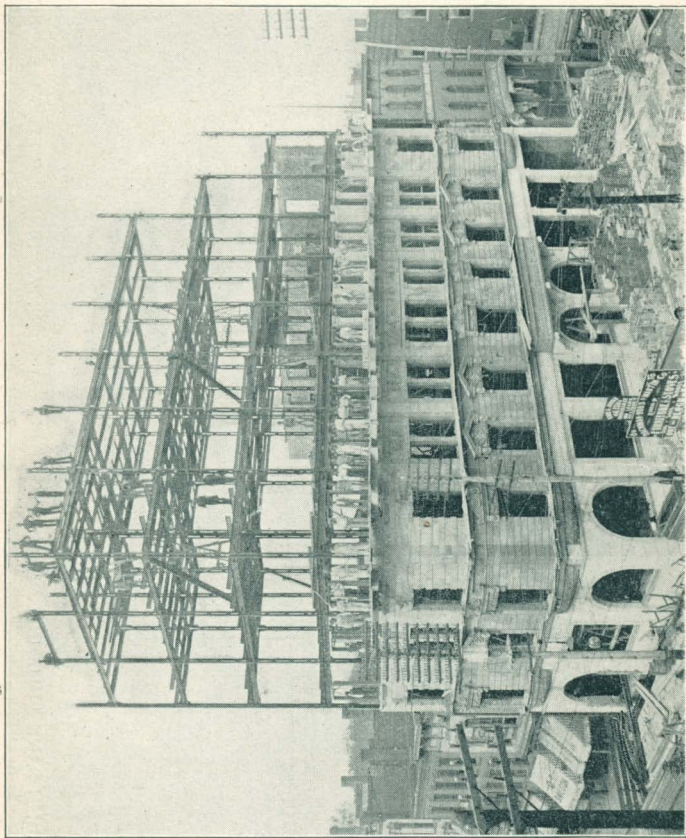


RELIANCE BUILDING, Chicago. D. H. BURNHIM & CO., Architects.
Lassig Bridge & Iron Works, Contractors. Steel designed by E. C. Shankland.



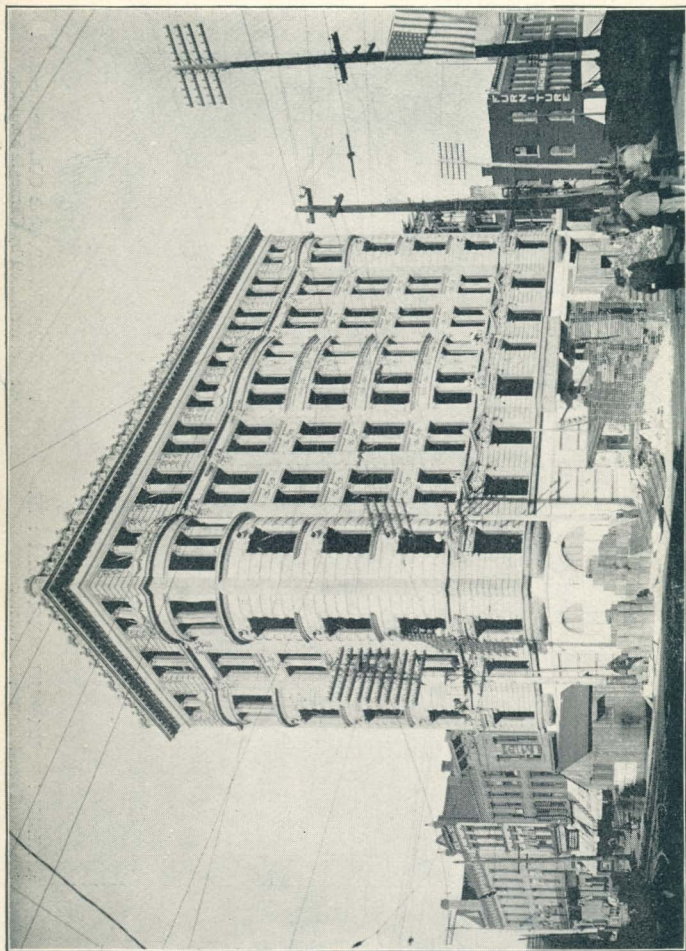
GRAY COLUMN, 290 feet long.

Built by LASSIG BRIDGE & IRON WORKS for Reliance Building, Chicago.



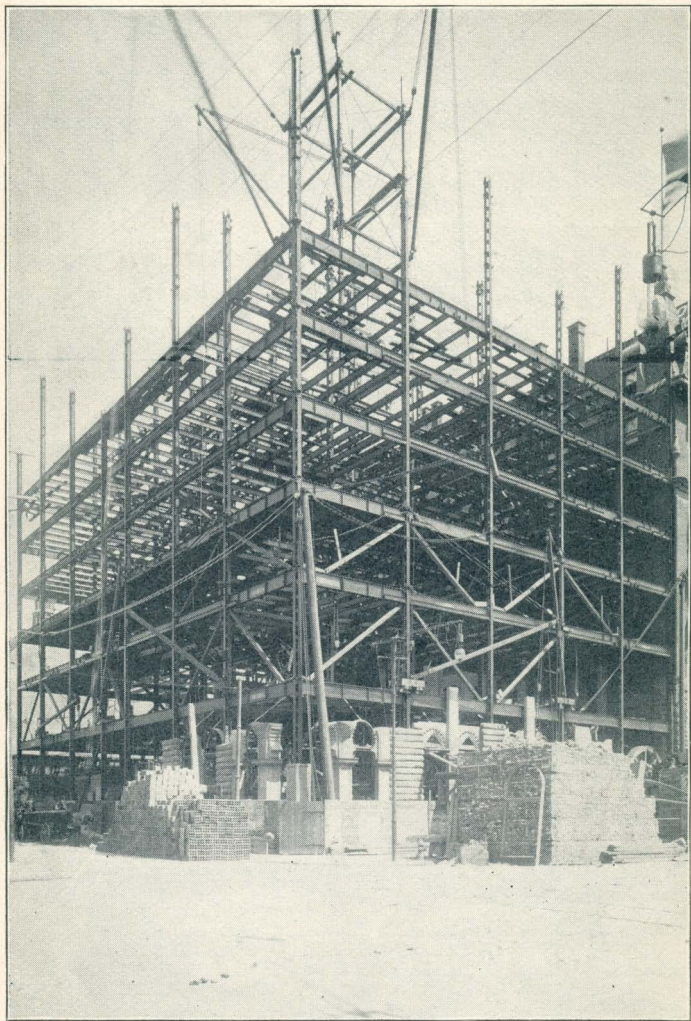
MILLIKIN BANK BUILDING, Decatur, Ill.
T. A. Dungan, Contractor.

W. W. BOYINGTON & CO., Architects.
Steel furnished by Carnegie Steel Co.



MILLIKIN BANK BUILDING, Decatur, Ill.
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HOTEL WALTON, Philadelphia.
Pencoyd Iron Works, Contractors.

A. S. WADE, Architect.
Steel designed by Davis & Sax.

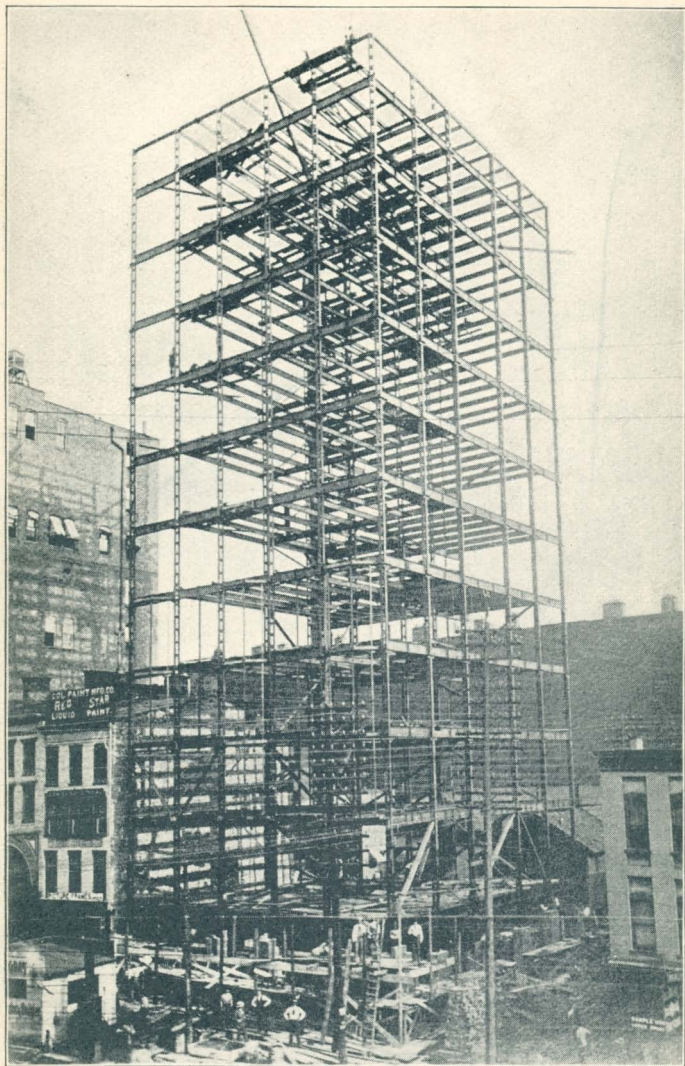


HOTEL WALTON, Philadelphia.
Pencovd Iron Works, Contractors.

A. S. WADE, Architect.
Steel designed by Davis & Sax.

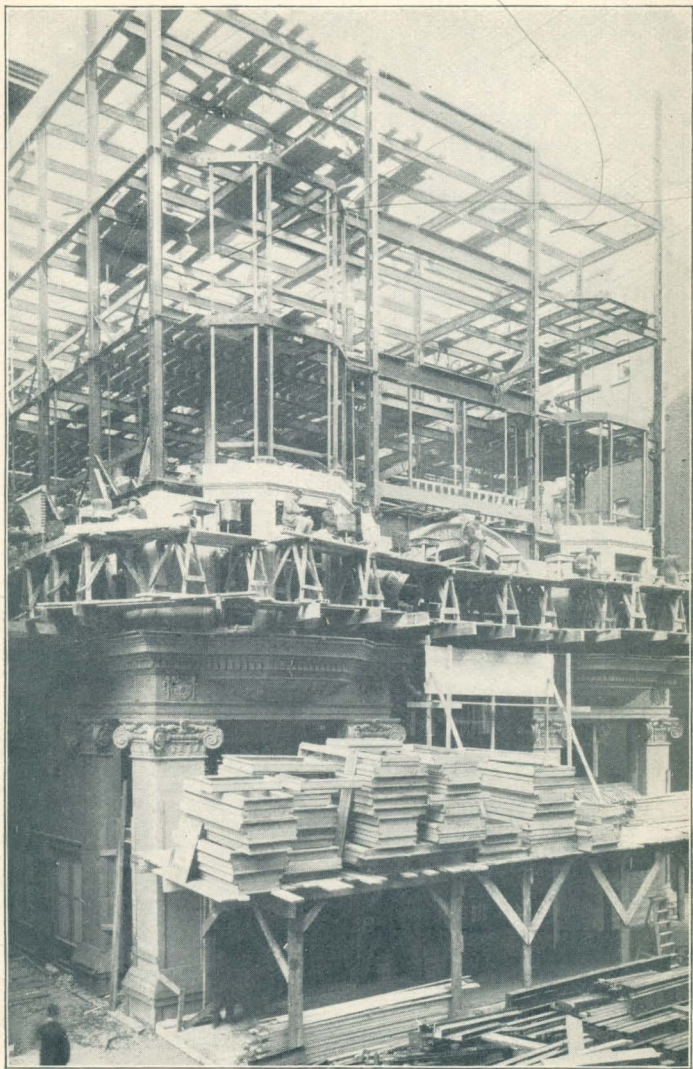


THE MABLEY BUILDING, Detroit. D. H. BURNHAM & CO., Architects.
Godfrey & Hyde, Contractors. Steel designed by E. C. Shankland,
Steel furnished by Schultz Bridge & Iron Co.



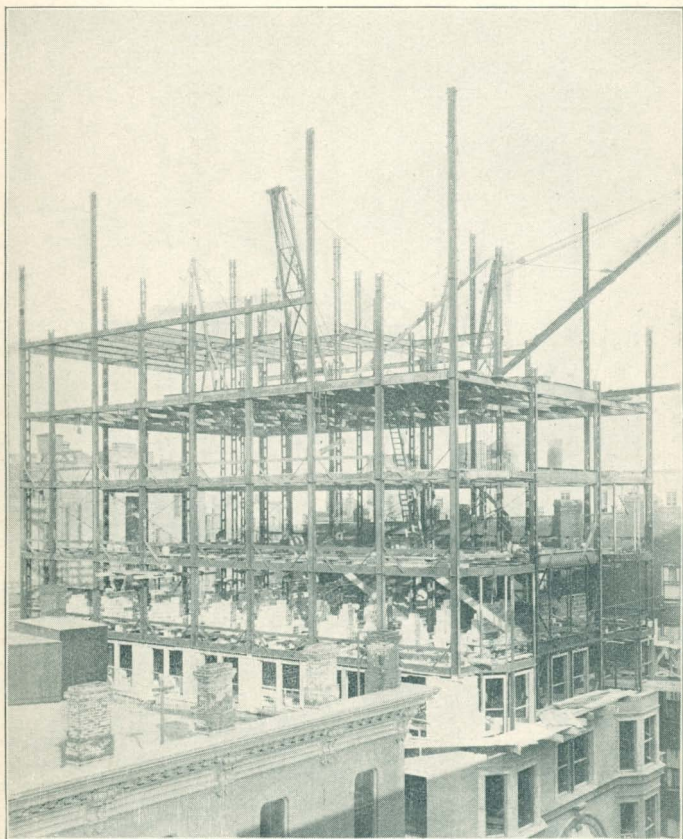
WYANDOTTE BUILDING, Columbus, Ohio.

D. H. BURNHAM & CO., Architects. [Edgemoor Bridge & Iron Works, Contractors.
Steel designed by E. C. Shankland.



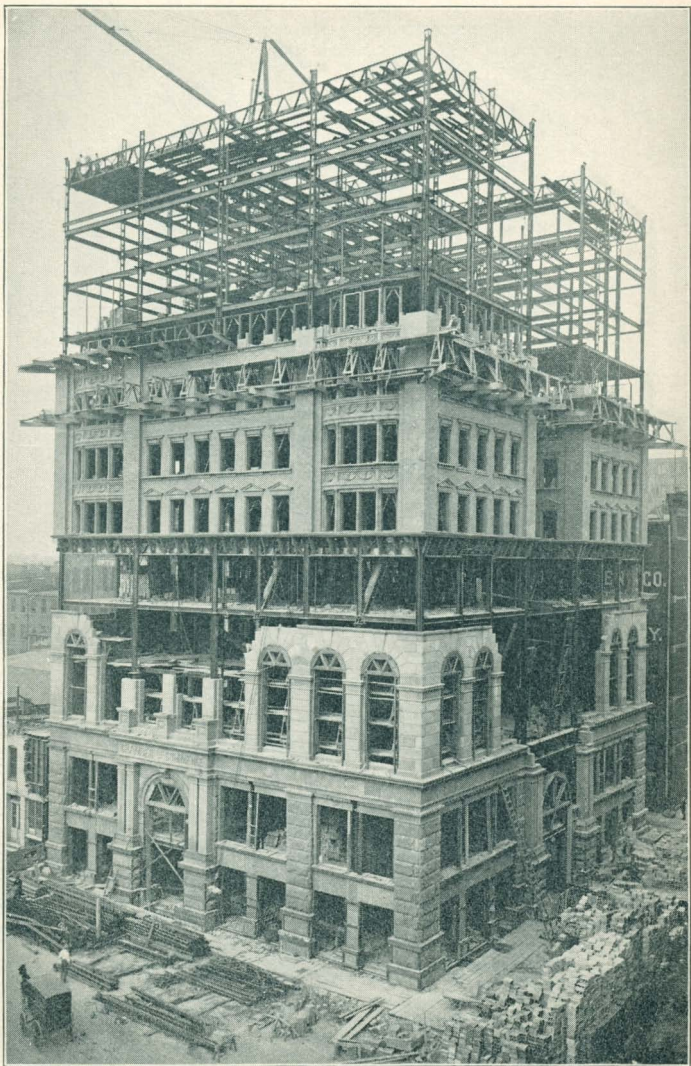
STEINWAY HALL, Chicago.
Carnegie Steel Co., Contractors.

D. H. PERKINS, Architect.



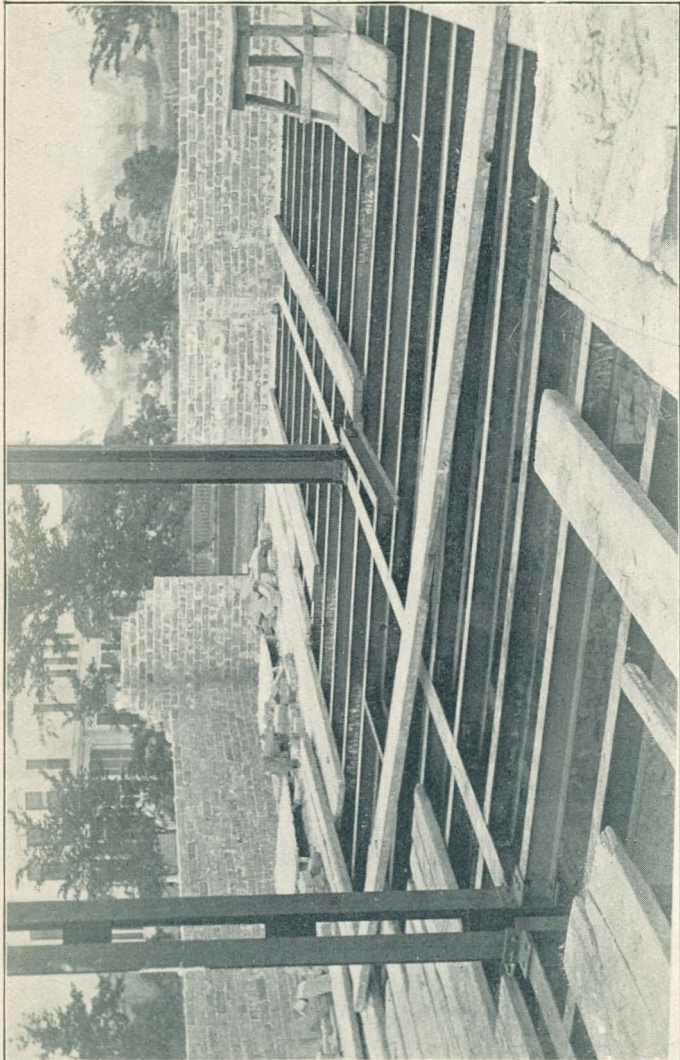
STEINWAY HALL, Chicago.
Carnegie Steel Co., Contractors.

D. H. PERKINS, Architect.



CHAMBER OF COMMERCE, Detroit.
Benjamin Hyde, Contractor,

SPIER & ROHNS, Architects



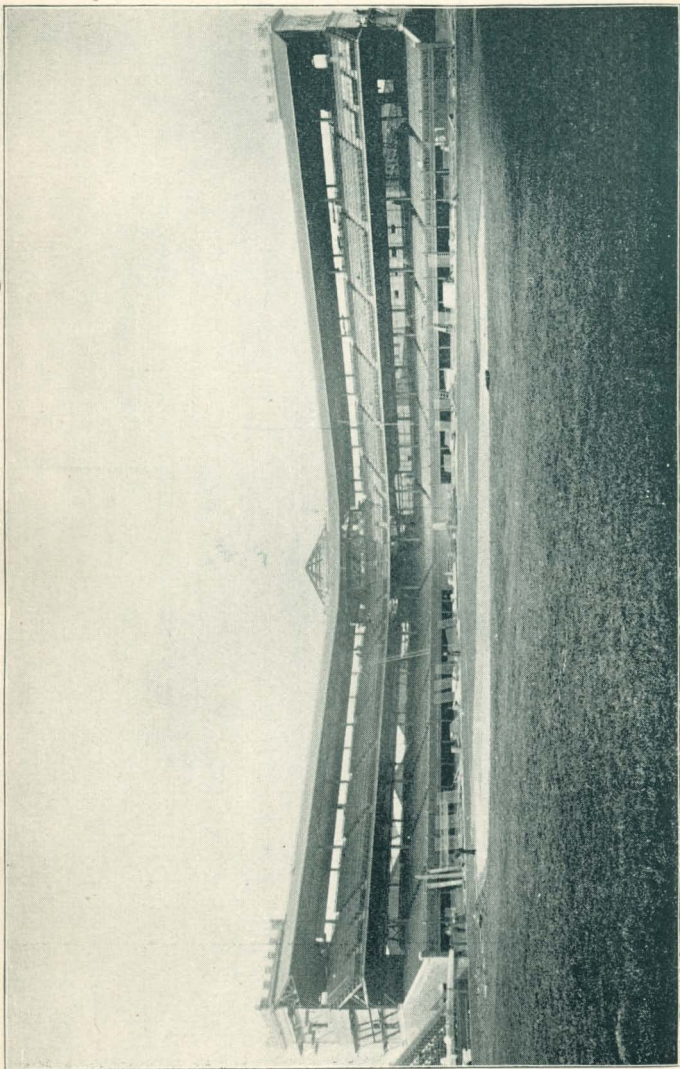
RESIDENCE OF ARTHUR EATON, Oak Park, Ill.

D. H. PERKINS, Architect.
Steel furnished by Carnegie Steel Co.



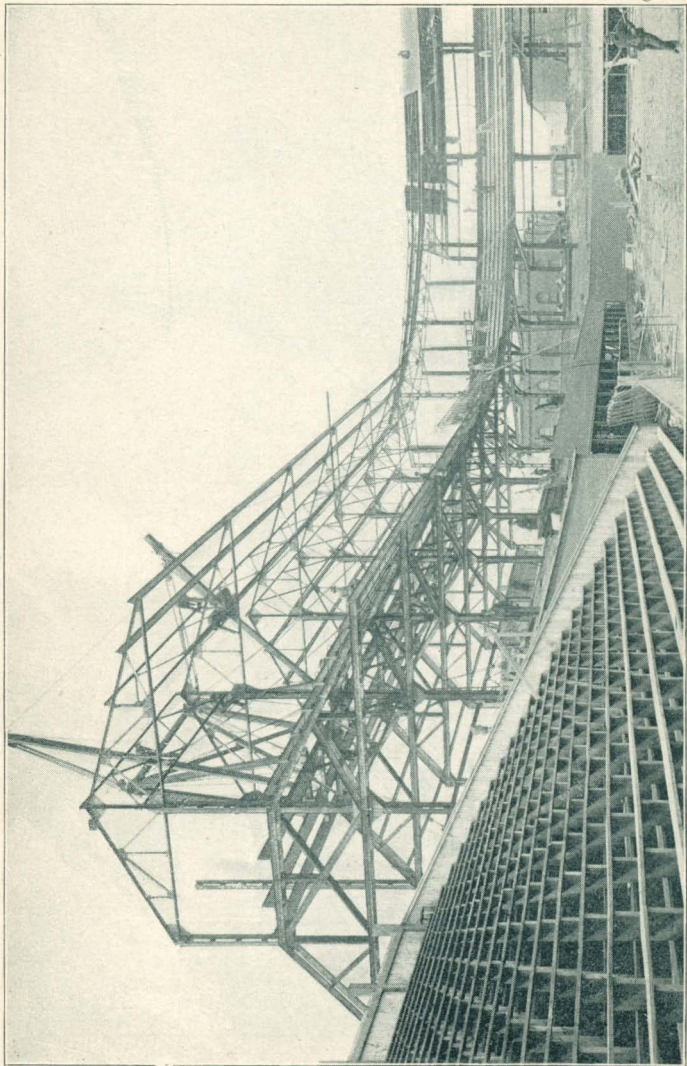
RESIDENCE OF ARTHUR EATON, Oak Park, Ill.

D. H. PERKINS, Architect.
Steel furnished by Carnegie Steel Co.



GRAND STAND, PHILADELPHIA BASE BALL GROUNDS.
Reading Rolling Mill Co., Contractors.

J. D. ALLEN, Architect.
Steel designed by Davis & Sax.



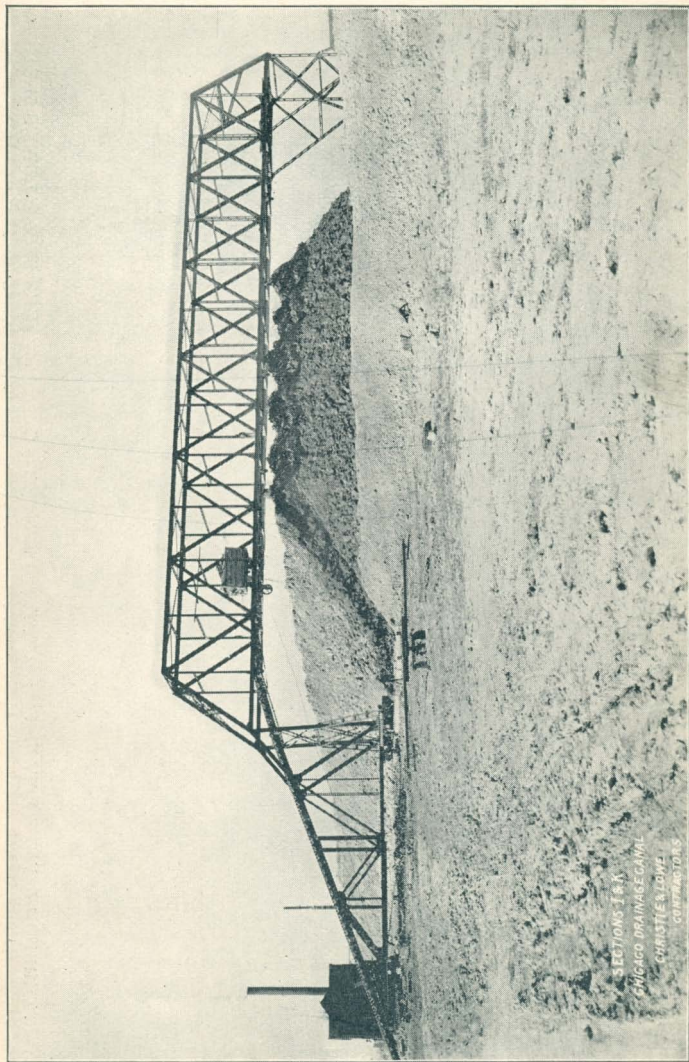
GRAND STAND, PHILADELPHIA BASE BALL GROUNDS.
Reading Rolling Mill Co., Contractors.

J. D. ALLEN, Architect.
Steel designed by Davis & Sax.



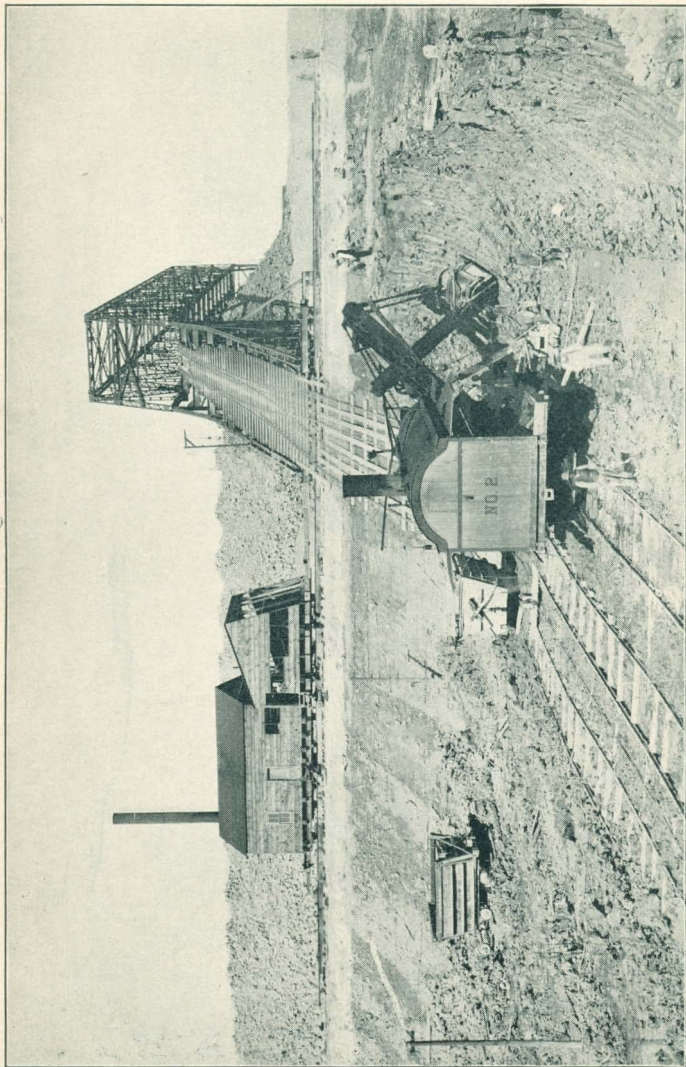
120 ft. WATER TOWER.

Built of 9 in. Gray Columns.

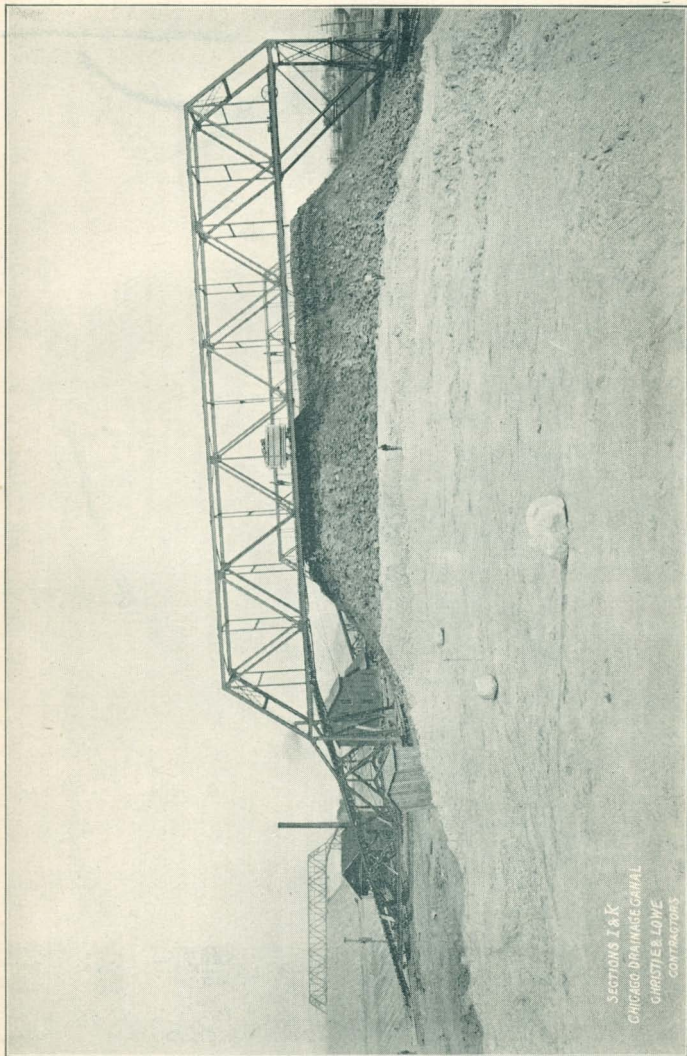


SECTIONS 1 & 1
CHICAGO DRAINAGE CANAL
CHRISTIE & LOWE
CONTRACTORS

210 ft. THROUGH RIVETED SPAN — Supporting Towers built of Gray Columns. CHRISTIE & LOWE'S SECTIONS
Chicago Drainage Canal. Designed by J. H. Gray, C. E. Built by The Lassing Bridge & Iron Works.

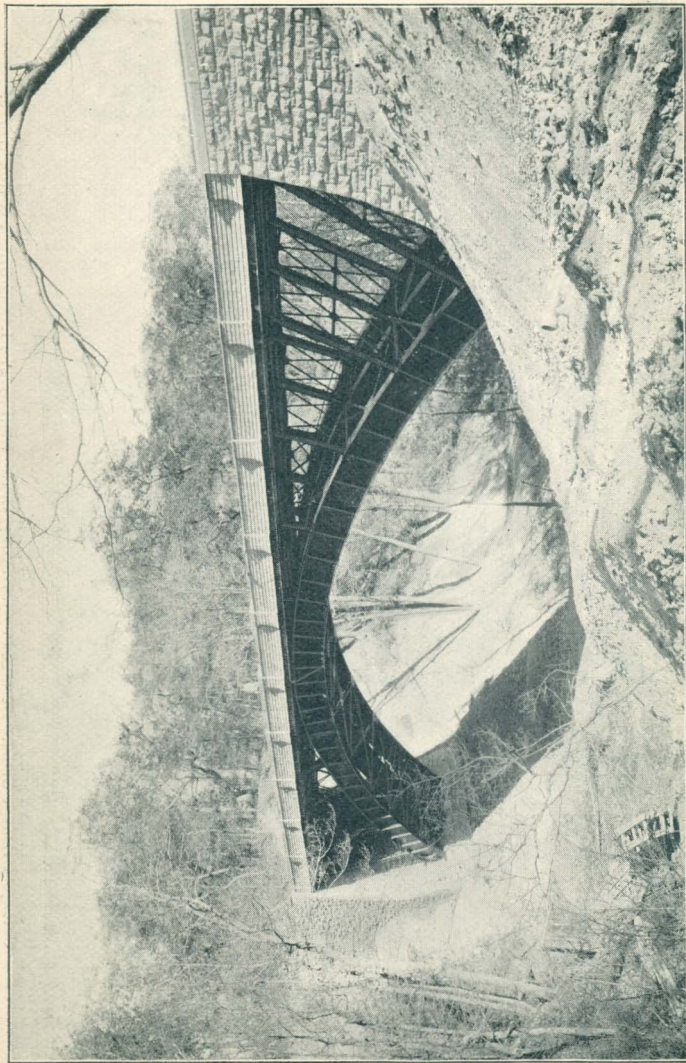


210 ft. THROUGH RIVETED SPAN.—Supporting Towers built of Gray Columns. CHRISTIE & LOWE'S SECTIONS
Chicago Drainage Canal. Designed by J. H. Gray, C. E. Built by The Lassing Bridge & Iron Works.



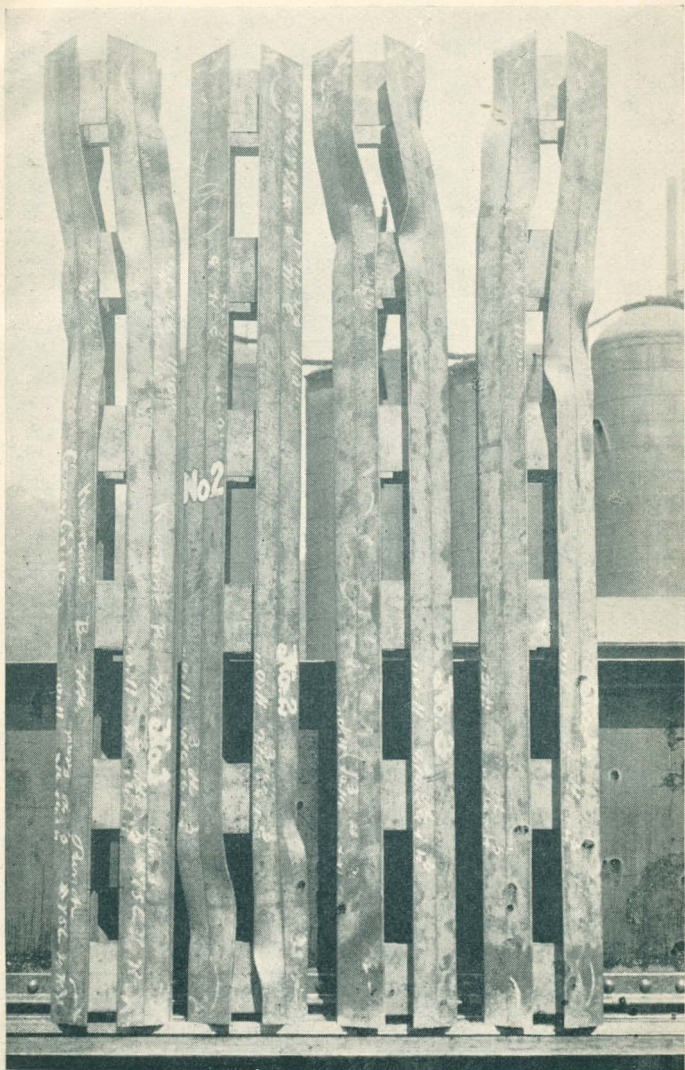
SECTIONS I & K
CHICAGO DRAINAGE CANAL
CHRISTIE & LOWE
CONTRACTORS

180 ft. THROUGH RIVETED SPAN—Supporting Towers built of Gray Columns. CHRISTIE & LOWE'S SECTIONS
Chicago Drainage Canal. □ Designed by J. H. Gray, C. E. Built by The Lassing Bridge & Iron Works.



BRIDGE in Lake Forest Grounds of C. H. McCormick.
Lassig Bridge & Iron Works, Contractors.

J. H. GRAY, C. E., Designer.



COLUMNS BROKEN
In "Keystone Bridge Works" Testing Machine



