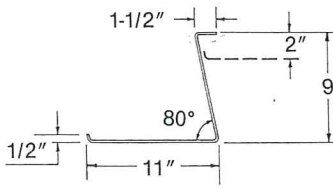


LOAD AND DEFLECTION TABLES FOR TREADS AND RISERS

The tables of engineering data and the sample calculations given in this section should be valuable aids to the designer of metal stairs. Uniform loads and deflections for typical treads, risers and subreads are given on this page and on pages 5-7, 5-10 and 5-11. The formulas for uniformly distributed loading on simply supported beams are used to calculate the values given in the tables. Simply supported beams have unrestrained ends. This means that the values are conservative because tread ends are restrained when attached to the

stair stringers. (See page 4-6) The industry unit for tread length is 22 inches and the unit for half tread length is 12 inches. The spans used in the load and deflection tables are multiples of the unit tread length and multiples of the unit tread length plus half unit length. As a matter of convenience to the designer the moment of inertia and section modulus are given for each design covered by the tables. This will facilitate the calculation of loads and deflections for spans other than those shown.

Table 5.2 LOADS IN KIPS AND DEFLECTIONS FOR Z PROFILE TREADS AND RISERS



SECTION			LOADS AND DEFLECTIONS FOR VARIOUS SPANS								
Thickness, in (ga)	I	S	34"	44"	52"	56"	60"	66"	78"	88"	100"
.0747 (14)	16.6	2.57	10.9	8.4	6.6	6.2	5.6	4.7	4.2	3.7	
.1046 (12)	23.0	3.56	15.0	11.6	9.2	8.6	7.8	6.6	5.8	5.1	
.1345 (10)	29.3	4.50	19.1	14.7	11.6	10.8	9.8	8.3	7.4	6.5	
Deflection, Δ, inches			.012	.019	.031	.035	.043	.061	.077	1.00	

(A611 GrB, F = 18 ksi)

SAMPLE CALCULATION FOR 78" SPAN WITH 14 GAGE RISER

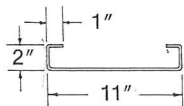
$$M = FS = 18000 \times 2.57 = 46260 \text{ lb-in} \quad W = \frac{8M}{L} = \frac{8 \times 46260}{78} = 4745 \text{ lbs} = 4.7 \text{ kips}$$

$$\Delta = \frac{5WL^3}{384EI} = \frac{5 \times 4745 \times 78^3}{384 \times 29 \times 10^6 \times 16.6} = 0.061 \text{ in}$$

To use Table for other steels with different values of F, multiply tabular load values by F/18.

UNDER 4" IS 12 GA
OVER 4" IS 10 GA
25" = MID SPAN HEADER

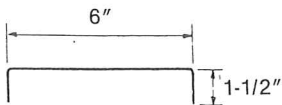
Table 5.3 LOADS IN KIPS AND DEFLECTIONS FOR TREADS



SECTION			LOADS AND DEFLECTIONS FOR VARIOUS SPANS			
Thickness, in (ga)	I	S	34"	44"	56"	66"
.0747 (14)	.625	.410	1.7	1.3	1.1	0.9
.1046 (12)	.827	.543	2.3	1.8	1.4	1.2
.1345 (10)	1.004	.660	2.8	2.2	1.7	1.4
Deflection, Δ, inches			.053	.088	.142	.196

(A570 Gr30, F = 18 ksi)

Table 5.4 SHIP'S LADDER TREAD — ALUMINUM (ASTM B209, 6061-4, F = 10,000 psi)



SECTION				LOADS FOR VARIOUS SPANS				
Thickness	A	I	S	plf/lb	18"	24"	30"	36"
1/8	1.07	.185	.155	w	458	258	165	115
				P	344	258	206	172
3/16	1.57	.259	.222	w	657	370	237	164
				P	493	370	296	246
1/4	2.04	.322	.282	w	837	471	301	209
				P	627	471	376	313

Table 5.5 LOADS FOR STEEL SHEETS

(Load in psf based on F = 20,000 psi)

t	SPAN							
	9"	12"	15"	18"	21"	24"	30"	36"
in. (ga)								
.1345 (10)	858	482	309	214	158	121	77	54
.1046 (12)	519	292	187	130	95	73	47	
.0747 (14)	265	149	95	66	49			
.0598 (16)	169	95	61					

Table 5.6 SHEET PROPERTIES (12" width)

I = 12t³/12 S = 2t/t

t	S	I	Wt-Steel	W-Aluminum
in (ga)	in ³	in ⁴	plf	plf
.0598 (16)	.00715	.000214	2.44	0.847
.0747 (14)	.01116	.000417	3.05	1.058
.1046 (12)	.02188	.001444	4.27	1.477
.1345 (10)	.03618	.002433	5.49	1.894
1/8	.03125	.001953	5.10	1.764
3/16	.0703	.00659	7.66	2.646
1/4	.125	.015625	10.2	3.528
5/16	.1953	.03052	12.75	4.410
3/8	.281	.05273	15.3	5.292

STEEL FLOOR PLATE AND ALUMINUM TREAD PLATE

Scale — Approximately Half Size

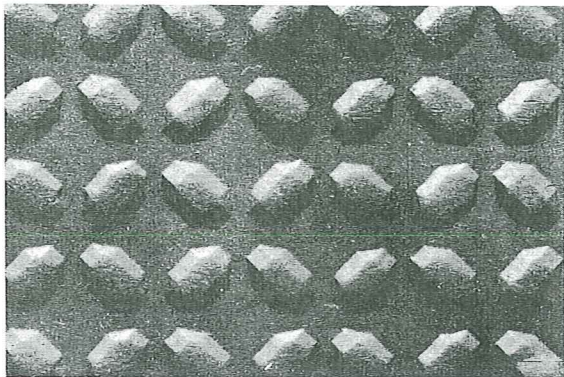


FIG. A Steel Floor Plate



FIG. B Steel Floor Plate

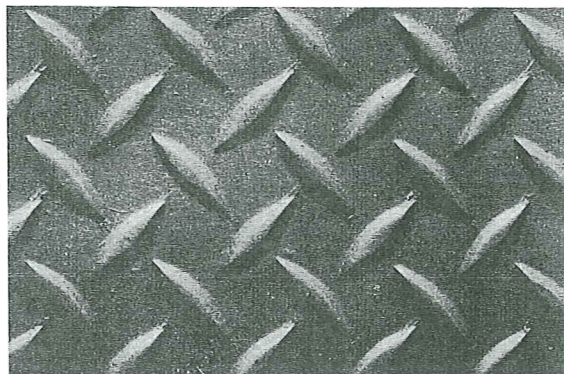


FIG. C Steel Floor Plate



FIG. D Abrasive Floor or Tread Plate
Rolled in both steel and aluminum

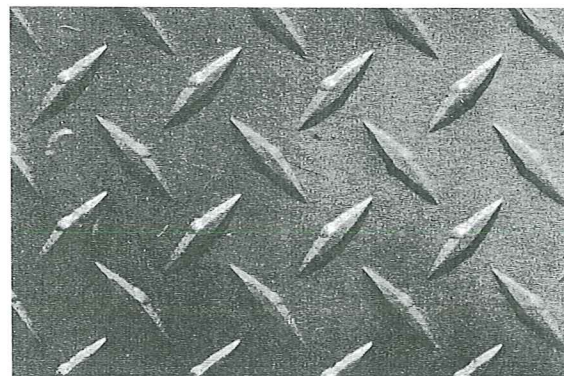


FIG. E Aluminum Tread Plate

Dimensions: Steel Floor Plate is produced in several designs and in thicknesses of 16, 14 and 12 gage, 1/8", 3/16", 1/4", 5/16", 3/8", and 1/2", in widths to 72" and lengths to 30'-0". Aluminum Tread Plate is produced in thicknesses of 0.10", 1/8", 3/16", and 1/2", in widths to 60" and lengths to 16'-0". Thickness is measured through the body of the plate, not including the raised portion.

Steel Floor Plate and Aluminum Tread Plate are used in stair construction for treads and platforms.

Surface: Steel Figs. A to C, and Aluminum, Fig. E, have regular mill finish.

Abrasive Plate, Fig. D, is produced in both steel and aluminum with the abrasive material rolled into the surface.

Floor Plate is the trade designation for steel. **Tread Plate** is the trade designation for aluminum. Other non-ferrous metals and stainless steel may be rolled for special requirements when the quantities are sufficient for mill tonnage. Refer to manufacturers' data.

FLOOR PLATES

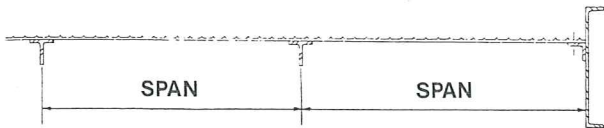
Floor plates having raised platforms are available from several mills, each offering their own style of surface projections and in a variety of widths, thicknesses, and lengths. A maximum width of 96 in. and a maximum thickness of 1 in. are available, but availability of matching widths, thicknesses, and lengths should be checked with the producer. Floor plates are generally not specified to chemical composition limits or mechanical property requirements; a commercial grade of carbon steel is furnished. However, when strength or corrosion resistance is a consideration, raised pattern floor plates are procurable in any of the regular steel specifications. As in the case of plain plates, the individual manufacturers should be consulted for precise information. The nominal or ordered thickness is that of the flat plate, exclusive of the height of raised pattern. The usual weights are as follows:

Table 5.7 THEORETICAL WEIGHTS OF ROLLED FLOOR PLATES

Gauge No.	Theoretical Weight per Sq. Ft. lb.	Nominal Thickness in.	Theoretical Weight per Sq. Ft. lb.	Nominal Thickness in.	Theoretical Weight per Sq. Ft. lb.
18	2.40	1/8	6.16	1/2	21.47
16	3.00	3/16	8.71	9/16	24.02
14	3.75	1/4	11.26	5/8	26.58
13	4.50	5/16	13.81	3/4	31.68
12	5.25	3/8	16.37	7/8	36.78
10	6.51	7/16	18.92	1	41.89

Note: Thickness is measured near the edge of the plate, exclusive of raised pattern.

Availability: Steel Floor Plate and Aluminum Tread Plate are usually available in warehouse stocks.



Platform supported by channels, beams, angles or tees

LOAD AND DEFLECTION TABLES — FLOOR AND TREAD PLATE

Tables 5.8–5.11 show allowable load (w) in pounds per square foot and deflection (Δ) in inches. Weight of plate included.

Where stepped line is shown, loads above and to the right of this line cause deflections exceeding 1/100 of the span.

PLATFORMS

Table 5.8 STEEL FLOOR PLATE										Table 5.9 ALUMINUM TREAD PLATE									
Figs. A, B, C page 5-6										Fig. E page 5-6									
F = 18,000 psi (A786)										F = 16,000 psi (6061-T6)									
Plate Thickness	SPAN									Plate Thickness	SPAN								
	1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	1'-0"		1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"			
1/8"	w	148	83							1/8"	w	313	134	78					
	Δ	.298	.530								Δ	.361	.813	1.43					
3/16"	w	333	188	120	83					3/16"	w	722	320	181	116				
	Δ	.198	.353	.551	.794						Δ	.237	.532	.949	1.49				
1/4"	w	593	333	213	148	109	83	66	53	1/4"	w	1250	555	312	200	139			
	Δ	.149	.265	.414	.596	.812	1.060	1.340	1.66		Δ	.180	.405	.718	1.125	1.62			
5/16"	w	927	522	333	232	170	130	103	83	5/16"	w	1960	870	490	314	218	160		
	Δ	.119	.212	.331	.477	.650	.848	1.07	1.32		Δ	.144	.323	.575	.900	1.29	1.76		
3/8"	w	1333	752	480	333	245	188	149	120	3/8"	w	2810	1250	703	450	312	229	173	
	Δ	.098	.176	.274	.396	.540	.705	.891	1.10		Δ	.111	.259	.461	.720	1.03	1.41	1.84	
Table 5.10 STEEL ABRASIVE FLOOR PLATE										Table 5.11 ALUMINUM ABRASIVE TREAD PLATE									
Figs. D, page 5-6										Fig. D, page 5-6 (This material presently available only on special order)									
F = 16,000 psi (A786)										Alloy 6061-T6 F = 16,000 psi									
Plate Thickness	SPAN									Plate Thickness	SPAN								
	1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	1'-0"		1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"			
1/8"	w	80	45							1/8"	w	187	80						
	Δ	.298	.53								Δ	.39	.865						
3/16"	w	148	83	53						3/16"	w	333	148	83					
	Δ	.298	.530	1.190							Δ	.39	.865	1.54					
1/4"	w	334	188	120	83	61				1/4"	w	750	334	188	120				
	Δ	.198	.353	.551	.794	1.082					Δ	.257	.575	1.03	1.6				
5/16"	w	591	333	213	148	109	83	66		5/16"	w	1334	591	333	213	148	109		
	Δ	.149	.265	.414	.596	.812	1.060	1.340			Δ	.192	.432	.770	1.2	1.72	2.35		
3/8"	w	927	522	333	232	170	130	103	83	3/8"	w	2080	927	522	333	232	170	130	
	Δ	.119	.212	.331	.477	.650	.848	1.07	1.32		Δ	.128	.345	.615	.96	1.38	1.88	2.46	

Tables 5.12 and 5.13 show allowable load (w) in pounds per lineal foot and deflection (Δ) in inches. Spans to right of stepped line should not be used to support concentrated loads greater than 300 lbs.

TREADS

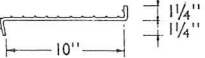

Table 5.12 STEEL FLOOR PLATE										Table 5.13 ALUMINUM TREAD PLATE									
Figs. A, B, C, page 5-6 F = 16,000 psi (A786)										Fig. E, page 5-6 Alloy 6061-T6 F = 10,000 psi									
																			
Plate Thickness	I	S	LOAD & DEFLEC.	SPAN					Plate Thickness	I	S	LOAD & DEFLEC.	SPAN						
				22"	34"	44"	56"	66"					22"	34"	44"	56"			
1/8"	.165	.126	W	400	167	100			1/8"	.282	.184	W	364	153	91				
			Δ	.021	.051	.085						Δ	.033	.079	.131				
3/16"	.247	.189	W	600	251	150			3/16"	.440	.274	W	543	228	136				
			Δ	.021	.051	.085						Δ	.031	.075	.126				
1/4"	.335	.256	W	812	340	203	126		1/4"	.586	.365	W	724	303	181	112			
			Δ	.021	.051	.085	.135					Δ	.031	.075	.126	.204			
5/16"	.447	.325	W	1031	432	258	159	115	5/16"	.739	.480	W	912	382	228	141			
			Δ	.020	.048	.081	.132	.183					Δ	.031	.075	.126	.204		

Plate Thicknesses shown in the above tables are those usually employed in stair construction. Abrasive Plates may be bent to 90 degrees when the abrasive surface is on the inside, using a radius not less than plate thickness. Bends are not recom-

mended when the Abrasive Surface is on the outside of the turn. It is usually advisable to allow a slightly greater radius in bends of aluminum than in steel.

ENGINEERING DATA

LOAD TABLES FOR PLATFORM SUPPORTS (Pages 5-8 and 5-9)

These tables list the total allowable uniform load in kips for the sections shown. **Total load deflection is limited to 1/360 of the span.** Greater deflection may be permissible if soffit is not plastered.

The calculations are based on the following assumptions:

- The spans are simply supported.
- Where the sheet is counted in the section, the effective width used is 12" when acting in tension (at the bottom) and 16 times the thickness on each projecting side when acting in compression (at the top).
- The values of moment of inertia (I), section modulus (S) and computed deflection include the effect of the

sheet when counted as part of the section.

Required spacing of structural sections can be determined by reference to Table 5.19.

Design stresses used:

When sheet is included as part of section, 20,000 psi*

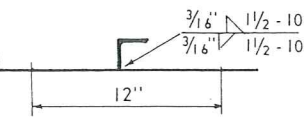
When sheet is not included as part of section,
22,000 psi on non-compact sections (channels, angles, tees). (A36)
24,000 psi on compact sections (I beams) (A36)

* A570 Gr33 or A611 GrC. If Grades 36, 40 or D are used, Tabular values may be increased by 10%.

SMOOTH SOFFIT DESIGNS

Table 5.14

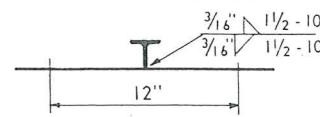
.1046" (12 ga.) sheet
F = 20,000 psi



ANGLE		SECTION			SPAN			
Size	t	Area in ²	I in ⁴	S in ³	4'0"	4'6"	5'0"	5'6"
1-1/4" x 1-1/4"	3/16"	1.69	.336	.315	.90	.71	.58	
	1/4"	1.82	.392	.383	1.05	.83	.67	
1-1/2" x 1-1/2"	3/16"	1.78	.567	.463	1.52	1.20	.97	.81
	1/4"	1.94	.665	.569	1.79	1.41	1.14	.94

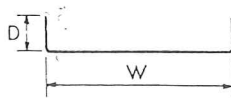
Table 5.15

.1046" (12 ga.) sheet
F = 20,000 psi



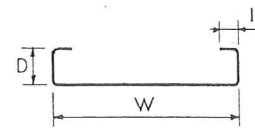
TEE		SECTION			SPAN			
Size	t	Area in ²	I in ⁴	S in ³	4'0"	4'6"	5'0"	5'6"
1-1/4" x 1-1/4"	3/16"	1.69	.336	.316	.90	.71	.58	
	1/4"	1.84	.397	.390	1.07	.84	.68	
1-1/2" x 1-1/2"	3/16"	1.81	.581	.478	1.56	1.23	1.00	.83
	1/4"	1.97	.674	.581	1.81	1.43	1.16	.96

Table 5.16



F = 20,000 psi

The capacity of these sections is less than 150 psf in some cases. To carry this load the concrete topping should be properly reinforced.



F = 20,000 psi

SECTION						SPAN		
Size W x D	t in (ga)	Wt lb/ft	Area in ²	I in ⁴	S in ³	4'0"	4'6"	5'0"
12" x 1-1/2"	.1046(12)	5.33	1.53	.180	.138	.46	.39	.31
	.1345(10)	6.83	1.96	.225	.174	.59	.48	.39
	3/16"	9.37	2.70	.296	.234	.80	.64	.52
15" x 1-1/2"	.1046(12)	6.45	1.85	.185	.140	.47	.40	.32
	.1345(10)	8.22	2.36	.231	.176	.60	.50	.40
	3/16"	11.33	3.26	.305	.236	.81	.66	.54
18" x 1-1/2"	.1046(12)	7.53	2.16	.189	.141	.47	.41	.31
	.1345(10)	9.65	2.76	.236	.177	.60	.51	.41
	3/16"	13.28	3.82	.311	.238	.82	.68	.55

Table 5.17

SECTION						SPAN		
Size W x D	t in (ga)	Wt lb/ft	Area in ²	I in ⁴	S in ³	4'0"	4'6"	5'0"
12" x 1-1/2"	.1046(12)	5.92	1.71	.423	.359	1.11	.88	.71
	.1345(10)	7.53	2.17	.505	.430	1.35	1.06	.86
15" x 1-1/2"	.1046(12)	7.00	2.02	.442	.362	1.16	.92	.75
	.1345(10)	8.96	2.57	.528	.435	1.41	1.11	.90
18" x 1-1/2"	.1046(12)	8.12	2.33	.456	.365	1.19	.95	.77
	.1345(10)	10.35	2.97	.545	.438	1.45	1.15	.93

Table 5.18 V-RIBBED SOFFIT LOADS IN KIPS PER 1'8"

D		A			Lap		
3"		2-3/4"			1-1/2"		
3-1/2"		3-1/4"			2"		
4"		3-3/4"			2-1/2"		

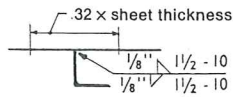
D	t in (ga)	I in ⁴	S in ³	SPAN							
				4'0"	4'6"	5'0"	5'6"	6'0"	6'6"	7'0"	7'6"
3"	.0598(16)	.57	.30	.99							
	.0747(14)	.66	.35	1.17	1.04						
	.1046(12)	.93	.49	1.63	1.45	1.31					
	.1345(10)	1.22	.64	2.14	1.89	1.71	1.55	1.42			
3-1/2"	.1345(10)	1.86	.86	2.86	2.55	2.29	2.08	1.91	1.76	1.64	
4"	.1345(10)	2.77	1.12	3.74	3.32	2.98	2.72	2.49	2.30	2.14	1.99

Table 5.19

TOTAL LOADS IN KIPS, AT 150 PSF, ON VARIOUS PANEL WIDTHS (SPACINGS) FOR VARIOUS SPANS						
SPAN (feet)	WIDTH, INCHES					
	9	12	15	18	21	24
4'0"	.45	.60	.75	.90	1.05	1.20
4'6"	.506	.675	.844	1.013	1.182	1.35
5'0"	.562	.75	.938	1.125	1.313	1.50
5'6"	.619	.825	1.032	1.238	1.444	1.65
6'0"	.675	.90	1.125	1.35	1.575	1.80
6'6"	.731	.975	1.219	1.463	1.707	1.95
7'0"	.788	1.05	1.313	1.575	1.838	2.10
7'6"	.844	1.125	1.407	1.688	1.969	2.25
8'0"	.90	1.20	1.50	1.80	2.10	2.40

SOFFITS WITH SUPPORTING MEMBERS EXPOSED

Table 5.20



.1046 (12 ga.) sheet
F = 20,000 psi

ANGLE		SECTION			SPAN						
Size In.	t In.	Area In ²	I In ⁴	S In ³	4'0"	4'6"	5'0"	5'6"	6'0"	6'6"	
1-1/4 x 1-1/4	3/16	.783	.224	.282	.60	.47	.38				
	1/4	.913	.255	.340	.68	.54	.44				
1-1/2 x 1-1/2	3/16	.883	.371	.420	1.00	.79	.64				
	1/4	1.043	.412	.494	1.11	.87	.71				
2 x 2	3/16	1.063	.803	.760	1.70	1.38	1.14	.96	.82		
	1/4	1.288	.935	.842	1.98	1.61	1.33	1.12	.95		
	5/16	1.503	.979	.850	2.08	1.68	1.39	1.17	1.00		
2-1/2 x 2-1/2	3/16	1.253	1.428	1.030	3.03	2.45	2.03	1.70	1.45		
	1/4	1.543	1.610	1.100	3.26	2.77	2.29	1.92	1.64		
	5/16	1.810	1.778	1.180	3.50	3.05	2.52	2.12	1.81		

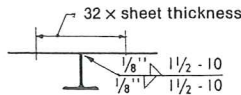
Table 5.21



F = 22,000 psi (A36)

ANGLE					SPAN						
Size In.	t In.	Area In ²	I In ⁴	S In ³	4'0"	4'6"	5'0"	5'6"	6'0"	6'6"	
2 x 2	3/16	.715	.272	.190	.70	.58	.47				
	1/4	.938	.348	.247	.91	.74	.60				
	5/16	1.15	.416	.300	1.10	.88	.72				
2-1/2 x 2-1/2	3/16	.902	.547	.303		.89	.78	.65	.56		
	1/4	1.19	.703	.394		1.16	1.00	.84	.72		
	5/16	1.46	.849	.482		1.41	1.21	1.01	.86		
	3/8	1.73	.984	.566		1.66	1.40	1.17	1.00		
3 x 3	3/16	1.09	.962	.441			1.18	1.08	.98		
	1/4	1.44	1.24	.577			1.54	1.41	1.26		
	5/16	1.78	1.51	.707			1.89	1.73	1.54		
	3/8	2.11	1.76	.833			2.22	2.04	1.79		

Table 5.22



.1046 (12 ga.) sheet
F = 20,000 psi

TEE		SECTION			SPAN						
Size In.	t In.	Area In ²	I In ⁴	S In ³	4'0"	4'6"	5'0"	5'6"	6'0"	6'6"	
1-1/2 x 1-1/2	3/16	.925	.382	.429	1.03	.81	.66	.54			
	1/4	1.09	.429	.509	1.15	.91	.74	.61			
1-3/4 x 1-3/4	3/16	1.03	.577	.590	1.55	1.22	.99	.82	.69		
	1/4	1.23	.651	.700	1.75	1.38	1.12	.92	.78		
2 x 2	1/4	1.43	.963	.853	2.04	1.65	1.37	1.15	.98		
	5/16	1.66	1.05	.906	2.23	1.81	1.49	1.25	1.07		
2-1/2 x 2-1/2	1/4	1.67	1.69	1.15	3.41	2.90	2.40	2.02	1.72		
	5/16	1.98	1.89	1.25	3.70	3.25	2.68	2.25	1.92		
	3/8	2.26	2.04	1.33	3.94	3.55	2.90	2.44	2.07		
3 x 3	5/16	2.33	3.14	1.66	4.92	4.43	4.03	3.69	3.49		
	3/8	2.66	3.37	1.77	5.25	4.72	4.29	3.93	3.42		

Table 5.23



F = 22,000 psi (A36)

TEE					SPAN						
Size In.	t In.	Area In ²	I In ⁴	S In ³	4'0"	4'6"	5'0"	5'6"	6'0"	6'6"	
1-3/4 x 1-3/4	3/16	.664	.185	.150	.50	.39	.32				
	1/4	.854	.233	.192	.63	.49	.40				
2 x 2	1/4	1.05	.370	.260	.95	.78	.64				
	5/16	1.28	.440	.310	1.14	.93	.76				
2-1/2 x 2-1/2	1/4	1.29	.720	.410		1.20	1.02	.86	.73		
	5/16	1.60	.880	.500		1.47	1.25	1.05	.89		
	3/8	1.87	1.00	.590		1.72	1.42	1.19	1.02		
3 x 3	5/16	1.95	1.6	.740			1.97	1.81	1.63		
	3/8	2.27	1.8	.86			2.29	2.10	1.83		

Table 5.24



F = 24,000 psi (A36)

BEAM					SPAN						
Size	Wt lb/ft.	Area In ²	I In ⁴	S In ³	5'6"	6'0"	6'6"	7'0"	7'6"	8'0"	
S3	5.7	1.67	2.52	1.68	3.58	3.01	2.56	2.21	1.93	1.69	
	7.5	2.21	2.93	1.95	4.16	3.50	2.98	2.57	2.24	1.97	
S4	7.7	2.26	6.08	3.04	8.63	7.25	6.18	5.33	4.64	4.08	
	9.5	2.79	6.79	3.39	9.64	8.10	6.90	5.95	5.19	4.56	

Table 5.25



F = 22,000 psi (A36)

CHANNEL					SPAN						
Size	Wt lb/ft.	Area In ²	I In ⁴	S In ³	5'6"	6'0"	6'6"	7'0"	7'6"	8'0"	
C3	4.1	1.21	1.66	1.10	2.35	1.98	1.69	1.46	1.27	1.11	
	5.0	1.47	1.85	1.24	2.63	2.21	1.88	1.62	1.41	1.24	
	6.0	1.76	2.07	1.38				2.10	1.82	1.58	1.39
C4	5.4	1.59	3.85	1.93				3.92	3.38	2.94	2.58
	7.25	2.13	4.59	2.29				4.67	4.03	3.51	3.08

ENGINEERING DATA

Table 5.26 **LOAD AND DEFLECTION TABLES FOR STEEL STRINGERS, RISERS AND SUBTREADS**

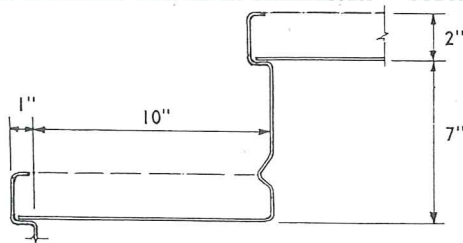
SEE GENERAL NOTES BELOW		10" DEPTH SECTIONS															
		FIBER STRESS = 20,000 PSI*										FIBER STRESS = 22,000					
		A283 GrD; A570 Gr33; A611 GrC (F _y = 33 ksi)										A36 (F _y = 36 ksi)					
Weight, lb. per ft.		6.38	8.5	10.6	12.8	8.03	14.53	12.88	14.78	23.8			6.5	13.0	8.4	16.8	
Web Thickness, in.		.1875	.25	.3125	.375	.1875	.1875						.152		.170		
Area, sq. inches		1.88	2.5	3.13	3.75	2.3	4.27	3.79	4.34	6.99			.191	3.82	2.46	4.92	
I, in. ⁴		15.6	20.8	26.04	31.25	26.4	43.7	37.7	47.6	88.2			22.1	44.2	32.0	64.0	
S, in. ³		3.12	4.16	5.21	6.25	5.3	8.74	7.52	9.52	17.66			4.42	8.84	6.40	12.8	
SPAN (feet)	DEFL. (in.)	TOTAL ALLOWABLE UNIFORM LOAD IN KIPS										DEFL. (in.)	TOTAL ALLOWABLE UNIFORM				
6	.07	6.9	9.3	11.6	13.8	11.6	19.1	16.7	21.2	39.3	.08	10.8	21.5	15.6	31.2		
7	.10	5.9	7.9	9.9	11.9	9.9	16.4	14.3	18.2	33.7	.11	9.2	18.4	13.4	26.8		
8	.13	5.2	6.9	8.7	10.4	8.7	14.3	12.5	15.9	29.5	.15	8.1	16.1	11.7	23.4		
9	.17	4.6	6.2	7.7	9.3	7.7	12.7	11.1	14.1	26.2	.18	7.2	14.3	10.4	20.8		
10	.21	4.2	5.6	6.9	8.3	6.9	11.5	10.0	12.7	23.6	.23	6.5	12.9	9.4	18.8		
11	.25	3.8	5.0	6.3	7.6	6.3	10.4	9.1	11.6	21.4	.28	5.9	11.7	8.5	17.0		
12	.30	3.5	4.6	5.8	7.0	5.8	9.5	8.4	10.6	19.7	.33	5.4	10.7	7.8	15.6		
13	.35	3.2	4.3	5.3	6.4	5.3	8.8	7.7	9.8	18.1	.38	5.0	9.9	7.2	14.4		
14	.41	3.0	4.0	5.0	6.0	5.0	8.2	7.2	9.1	16.8	.45	4.6	9.2	6.7	13.4		
15	.47	2.8	3.7	4.6	5.6	4.6	7.6	6.7	8.5	15.7	.51	4.3	8.6	6.2	12.4		
16	.53	2.6	3.5	4.3	5.2	4.3	7.2	6.3	7.9	14.7	.58	4.0	8.1	5.9	11.8		
17	.60	2.4	3.3	4.1	4.9	4.1	6.7	5.9	7.5	13.9	.66	3.8	7.6	5.5	11.0		
18	.67	2.3	3.1	3.9	4.6	3.9	6.4	5.6	7.1	13.1	.74	3.6	7.2	5.2	10.4		
19	.75	2.2	2.9	3.7	4.4	3.7	6.0	5.3	6.7	12.4	.82	3.4	6.8	4.9	9.8		
20	.83	2.1	2.8	3.5	4.2	3.5	5.7	5.0	6.4	11.8	.91	3.2	6.4	4.7	9.4		
See drawings below	T						9.25		9.12	8.62	8.0		9.12	9.12	8.62	8.62	
	N						.1875		.19	.25	.44		.19	.19	.25	.25	
	K						.375		.44	.69	1.0		.44	.44	.69	.69	
	R						.1875		.125	.25	.34		.125	.125	.25	.25	
	Y						.26		.68	.85	1.39		.180	1.127	.284	1.50	
SYMBOLS FOR CHANNEL DIMENSIONS		LOADS IN KIPS AND DEFLECTIONS FOR SHEET STEEL RISERS															
GENERAL NOTES		SECTION						LOADS AND DEFLECTIONS FOR VARIOUS SPANS									
Allowable loads and deflections listed in tables are based on fiber stresses at column headings and apply to laterally braced members. Stringers are considered to be laterally braced by attached treads and risers. W = 2FS/3L For stresses other than those listed, loads will be proportionately smaller or larger. Loads below heavy lines will cause deflections exceeding 1/360 of span. Deflections for loads less than those listed will be proportionately less; see example at lower right of facing page. Weight of material is not included.		Thickness, in (ga)		I	S	34"	44"	56"	66"	78"	88"	100"					
		.0598 (16)		3.01	0.86	3.7	2.9	2.3	1.9	1.6	1.4	1.3					
		.0747 (14)		3.71	1.06	4.6	3.6	2.8	2.4	2.0	1.8	1.6					
		.1046 (12)		5.05	1.44	6.5	5.0	3.9	3.3	2.8	2.5	2.2					
		.1345 (10)		6.31	1.80	8.0	6.2	4.8	4.1	3.5	3.1	2.7					
		Deflection, Δ, inches				.021	.036	.058	.081	.113	.143	.186					
		Total allowable uniform load (W) in kips and deflection (Δ) in inches for sheet steel risers with turned edges. Riser supported laterally by bolted connections. Minimum bolt size is 1/4", maximum spacing 15". Allowable fiber stress used in calculations 18,000 psi. Weight of material is not included.															

* When A36 plate or A570 Gr 36 is used, tabular values may be increased by 10%

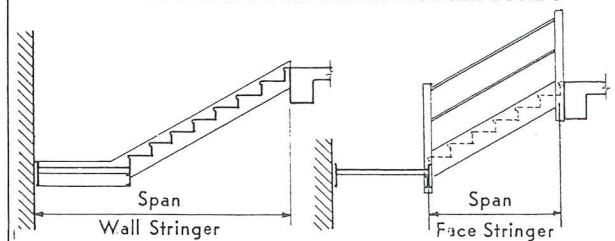
‡For A500 GrB, F_y - 46ksi and tabular values may be increased by 40%

12" DEPTH SECTIONS																	
PSI		FIBER STRESS = 20,000 PSI*										FIBER STRESS = 22,000 PSI					
A36 C10 2 5/8" 2 5/8" 2 5/8" **		A283 GrD; A570 Gr33; A611 GrC (F _y = 33 ksi) 3/16" 1/4" 5/16" 3/8" 1/2" 2" 1 1/2" 3/8" 3" 1/4" ‡										A36 (F _y = 36 ksi) 1 1/2" 1 1/2" 1 1/2" 3" 3" 3" ** **					
15.3 .240 4.49 67.4 13.5	30.6 8.98 134.8 27.0		7.65 .1875 2.25 27.0 4.5	10.2 .25 3.0 36.0 6.0	12.8 .3125 .375 45.0 7.5	15.3 .375 4.5 54.0 9.0	9.33 .1875 2.68 42.6 7.1	17.08 .1875 5.02 72.0 12.0	18.25 5.35 82.4 13.73	30.9 9.09 165.0 27.5		10.6 .190 3.10 55.4 9.23	21.2 6.20 110.8 18.46	20.7 .282 6.09 129 21.5	41.4 12.18 258 43.0		
LOAD IN KIPS			DEFL. (in.) *	TOTAL ALLOWABLE UNIFORM LOAD IN KIPS								DEFL. (in.)	TOTAL UNIFORM LOAD IN KIPS				
33.0 28.3 24.8	66.0 56.6 49.6		.06 .08 .11	10.0 8.6 7.5	13.3 11.5 10.0	16.7 14.3 12.5	20.0 17.2 15.0	15.5 13.3 11.7	25.8 22.2 19.4	30.6 26.2 22.9		61.2 52.5 45.9	.07 .09 .12	22.6 19.3 16.9	45.2 38.6 33.8	52.6 45.0 39.4	105.2 90.0 78.8
22.0 19.8 18.0	44.0 39.6 36.0		.14 .17 .21	6.7 6.0 5.5	8.9 8.0 7.3	11.1 10.0 9.1	13.3 12.0 10.9	10.4 9.3 8.5	17.2 15.5 14.1	20.4 18.4 16.7		40.8 36.7 33.4	.15 .19 .23	15.0 13.5 12.3	30.0 27.0 24.6	35.0 31.5 28.7	70.0 63.0 57.4
16.5 15.2 14.1	33.0 30.4 28.2		.25 .29 .34	5.0 4.6 4.3	6.7 6.2 5.7	8.3 7.7 7.1	10.0 9.2 8.6	7.8 7.2 6.7	12.9 11.9 11.1	15.3 14.1 13.1		30.6 28.2 26.2	.27 .32 .37	11.3 10.4 9.7	22.6 20.8 19.4	26.3 24.3 22.5	52.6 48.6 45.0
13.2 12.4 11.6	26.4 24.8 23.2	.39 .44 .50	4.0 3.8 3.5	5.3 5.0 4.7	6.7 6.3 5.9	8.0 7.5 7.0	6.2 5.8 5.5	10.3 9.7 9.1	12.2 11.5 10.8	24.5 23.0 21.6	.43 .49 .55	9.0 8.5 8.0	18.0 17.0 16.0	21.0 19.7 18.5	42.0 39.4 37.0		
11.0 10.4 9.9	22.0 20.8 19.8	.56 .62 .69	3.3 3.2 3.0	4.2 4.1 4.0	5.6 5.3 5.0	6.7 6.3 6.0	5.2 4.9 4.7	8.6 8.2 7.7	10.2 9.7 9.2	20.4 19.3 18.4	.61 .68 .76	7.5 7.1 6.8	15.0 14.2 13.6	17.5 16.6 15.8	35.0 33.2 31.6		
8.0 .44 1.0 .34 .634	8.0 .44 1.0 .34 2.625						11.25 .1875 .375 .1875 .23		10.63 .25 .69 .25 .83	9.75 .50 1.12 .38 1.50		10.63 .25 .69 .25 .269	10.63 .25 .69 .25 1.50	9.75 .50 1.12 .38 .698	9.75 .50 1.12 .38 3.0		

LOADS AND DEFLECTIONS FOR SHEET STEEL RISER — SUBTREADS



DETERMINING DEFLECTION UNDER LIGHTER LOADS



SECTION			LOADS AND DEFLECTIONS FOR VARIOUS SPANS							
Thickness,in(ga)	I	S	34"	44"	56"	66"	78"	88"	100"	
.0598 (16)	10.7	1.60	6.8	5.2	4.1	3.5	3.0	2.6	2.3	
.0747 (14)	14.2	2.13	9.0	7.0	5.5	4.6	3.9	3.5	3.1	
.1046 (12)	19.7	2.97	12.6	9.7	7.6	6.5	5.5	4.9	4.3	
.1345 (10)	24.9	3.74	15.8	12.2	9.6	8.2	6.9	6.1	5.4	
Deflection, Δ , inches			.011	.019	.030	.043	.059	.075	.097	

Total allowable uniform loads (W) in kips and deflection (Δ) in inches for sheet steel risers with subtread and concrete fill without metal mesh reinforcing. Riser supported laterally by bolted connections or welding (see page 5-19). Minimum bolt size is 1/4", maximum spacing 15". Design fiber stress 18,000 psi. Weight of material is not included.

Span in feet given in the table is the horizontal distance between supports.

METHOD OF DETERMINING DEFLECTION:

Assume stair 4'0" wide, with a 10'0" span of twelve 10" treads. Live load 100 psf, dead load 50 psf. Total load = 150 × 4 × 10 = 6,000 lb. Load on one stringer = 1/2 of 6,000 or 3,000 lb. From table, MC10 × 8.4, 10' span, has allowable load of 9.4 kips and a deflection of 0.23 inches.

$$\text{Deflection} = \frac{3,000 \text{ (actual load)}}{9,400 \text{ (allowable load)}} \times .23" = .074"$$

Concentrated loads such as header reactions will increase deflections. See Design Examples for deflection calculations.

** With properly designed continuous welds on both top and bottom flanges, tabular values may be increased by 10%