Table 4–1 (continued)
Available Strength in Axial Compression, kips
W Shapes

W12

F_y = 50 ksi

Shape		W12×											
Wt/ft		190		170		152		136		120		106	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to least radius of gyration r_y	0	1670	2510	1500	2250	1340	2010	1200	1800	1060	1590	933	1400
	6	1610	2420	1440	2170	1290	1940	1150	1730	1020	1530	897	1350
	7	1590	2390	1420	2140	1270	1910	1140	1710	1000	1510	884	1330
	8	1570	2360	1400	2110	1250	1880	1120	1680	986	1480	870	1310
	9	1540	2320	1380	2070	1230	1850	1100	1650	968	1460	854	1280
	10	1510	2270	1350	2030	1210	1820	1080	1620	949	1430	837	1260
	11	1480	2230	1320	1990	1180	1780	1050	1580	927	1390	818	1230
	12	1450	2180	1290	1940	1150	1730	1030	1540	905	1360	798	1200
	13	1410	2120	1260	1900	1120	1690	1000	1500	881	1320	776	1170
	14	1380	2070	1230	1840	1090	1640	972	1460	856	1290	754	1130
	15	1340	2010	1190	1790	1060	1600	943	1420	832	1250	730	1100
	16	1300	1950	1150	1730	1030	1540	913	1370	805	1210	706	1060
	17	1250	1880	1120	1680	993	1490	881	1320	774	1160	681	1020
	18	1210	1820	1080	1620	958	1440	849	1280	746	1120	656	985
	19	1170	1750	1040	1560	922	1390	817	1230	717	1080	630	946
	20	1120	1690	997	1500	886	1330	784	1180	687	1030	604	907
	22	1030	1550	916	1380	812	1220	718	1080	628	944	551	828
	24	945	1420	834	1250	738	1110	651	979	569	855	498	749
	26	852	1280	754	1130	666	1000	586	881	511	768	447	672
	28	765	1150	675	1010	595	895	523	786	455	684	397	597
	30	682	1020	600	902	528	793	462	695	401	602	350	525
	32	601	904	528	794	464	698	406	611	352	530	307	462
	34	533	800	468	704	411	618	360	541	312	469	272	409
	36	475	714	418	628	367	551	321	483	278	418	243	365
	38	426	641	375	563	329	495	288	433	250	376	218	327
	40	385	578	338	508	297	446	260	391	225	339	197	295
Properties													
P_{wo} (kips)		412	618	345	518	290	435	243	365	202	302	161	242
P_{wi} (kips/in.)		35.3	53.0	32.0	48.0	29.0	43.5	26.3	39.5	23.7	35.5	20.3	30.5
P_{wb} (kips)		2120	3190	1580	2370	1170	1760	878	1320	638	958	404	608
P_{fb} (kips)		563	847	455	684	367	551	292	439	228	343	183	276
L_p (ft)		11.5		11.4		11.3		11.2		11.1		11.0	
L_r (ft)		87.3		78.5		70.6		63.3		56.5		50.7	
A_g (in.^{2})		55.8		50.0		44.7		39.9		35.3		31.2	
I_x (in.^{4})		1890		1650		1430		1240		1070		933	
I_y (in.^{4})		589		517		454		398		345		301	
r_y (in.)		3.25		3.22		3.19		3.16		3.13		3.11	
Ratio r_x/r_y		1.79		1.78		1.77		1.77		1.76		1.76	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		54100		47200		40900		35500		30600		26700	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		16900		14800		13000		11400		9870		8620	

ASD	LRFD
$\Omega_c = 1.67$	$\phi_c = 0.90$

Table 4–1 (continued)
Available Strength in Axial Compression, kips
W Shapes

F_y = 50 ksi

W12

Shape		W12×									
Wt/ft		96		87		79		72		65	
Design		P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
Effective length *KL* (ft) with respect to least radius of gyration r_y	0	844	1270	766	1150	694	1040	633	951	571	859
	6	811	1220	738	1110	667	1000	607	913	548	824
	7	800	1200	725	1090	657	987	598	899	540	811
	8	787	1180	713	1070	646	971	588	884	531	798
	9	772	1160	699	1050	634	952	577	867	520	782
	10	756	1140	685	1030	620	932	565	849	509	765
	11	739	1110	669	1010	606	910	551	828	497	747
	12	720	1080	652	980	590	887	537	807	484	727
	13	701	1050	634	953	573	862	522	784	470	706
	14	680	1020	615	924	556	836	506	761	456	685
	15	659	990	595	895	538	809	490	736	441	662
	16	637	957	575	864	520	781	473	710	425	639
	17	614	923	554	833	501	752	455	684	409	615
	18	591	888	533	801	481	723	437	657	393	591
	19	567	852	511	769	461	694	419	630	377	566
	20	543	816	490	736	442	664	401	603	360	541
	22	495	744	446	670	402	603	365	548	327	491
	24	447	672	402	605	362	544	328	493	294	442
	26	401	602	360	541	323	486	293	440	262	393
	28	356	534	319	479	286	430	259	389	231	347
	30	312	469	279	420	250	376	226	340	202	303
	32	274	412	246	369	220	331	199	299	177	267
	34	243	365	218	327	195	293	176	265	157	236
	36	217	326	194	292	174	261	157	236	140	211
	38	195	292	174	262	156	234	141	212	126	189
	40	176	264	157	236	141	212	127	191	114	171
Properties											
P_{wo} (kips)		137	206	121	181	104	157	90.9	136	78.2	117
P_{wi} (kips/in.)		18.3	27.5	17.2	25.8	15.7	23.5	14.3	21.5	13.0	19.5
P_{wb} (kips)		296	445	248	366	185	278	142	213	106	159
P_{fb} (kips)		152	228	123	185	101	152	84.0	126	68.5	103
L_p (ft)		10.9		10.8		10.8		10.7		11.9	
L_r (ft)		46.6		43.0		39.9		37.4		35.1	
A_g (in.^{2})		28.2		25.6		23.2		21.1		19.1	
I_x (in.^{4})		833		740		662		597		533	
I_y (in.^{4})		270		241		216		195		174	
r_y (in.)		3.09		3.07		3.05		3.04		3.02	
Ratio r_x/r_y		1.76		1.75		1.75		1.75		1.75	
$P_{ex}(KL^2)/10^4$ (k-in.^{2})		23800		21200		18900		17100		15300	
$P_{ey}(KL^2)/10^4$ (k-in.^{2})		7730		6900		6180		5580		4980	

ASD	LRFD
$\Omega_c = 1.67$	$\phi_c = 0.90$

4–1 (continued)

le Strength in mpression, kips

W Shapes

F_y = 50 ksi

W14×								
	211		193		176		159	
P_n	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
RFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
080	1860	2790	1700	2550	1550	2330	1400	2100
010	1810	2720	1660	2500	1510	2280	1370	2050
990	1800	2700	1650	2480	1500	2260	1350	2040
960	1780	2680	1630	2450	1490	2230	1340	2020
930	1760	2650	1610	2430	1470	2210	1330	1990
890	1740	2620	1590	2400	1450	2180	1310	1970
860	1720	2580	1570	2360	1430	2150	1290	1940
810	1690	2540	1550	2330	1410	2120	1270	1910
770	1670	2500	1520	2290	1390	2090	1250	1880
720	1640	2460	1500	2250	1360	2050	1230	1850
2680	1610	2420	1470	2210	1340	2010	1210	1810
2620	1580	2370	1440	2170	1310	1970	1180	1780
2570	1540	2320	1410	2120	1280	1930	1160	1740
2510	1510	2270	1380	2070	1250	1890	1130	1700
2460	1470	2220	1350	2030	1230	1840	1100	1660
2400	1440	2160	1310	1980	1190	1800	1080	1620
2270	1360	2050	1250	1870	1130	1700	1020	[illegible]
2150	1290	1930	1170	1760	1060	1600	958	1440
2020	1210	1810	1100	1660	998	1500	897	[illegible]
1890	1130	1690	1030	1540	930	1400	[illegible]	[illegible]
1750	1050	1570	954	1430	862	1300	774	[illegible]
1620	967	1450	881	1320	795	1200	[illegible]	[illegible]
1490	890	1340	809	1220	730	1100	[illegible]	[illegible]
1370	814	1220	740	1110	666	1000	[illegible]	[illegible]
1250	741	1110	673	1010	605	909	[illegible]	[illegible]
1130	669	1010	607	913	546	820	[illegible]	[illegible]
Properties								
620	352	529	302	453	264	396	[illegible]	[illegible]
53.5	32.7	49.0	29.7	44.5	27.7	41.5	[illegible]	[illegible]
2790	1430	2150	1070	1610	868	1300	[illegible]	[illegible]
832	455	684	388	583	321	483	[illegible]	[illegible]
14.5	14.4		14.3		14.2		[illegible]	
94.9	86.4		79.7		73.2		[illegible]	
68.5	62.0		56.8		51.8		[illegible]	
010	2660		2400		2140		[illegible]	
150	1030		931		838		[illegible]	
4.10	4.07		4.05		4.02		[illegible]	
1.62	1.61		1.60		1.60		[illegible]	
200	76100		68700		61300		[illegible]	
900	29500		26600		24000		[illegible]	

Table 4–1 (continued)

Available Strength in Axial Compression, kips

W Shapes

F_y = 50 ksi

W14

Shape	W14×											
Wt/ft	145		132		120		109		99		90	
Design	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$
	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
0	1280	1920	1160	1740	1060	1590	959	1440	872	1310	792	1190
6	1250	1870	1130	1700	1030	1550	934	1400	849	1280	771	1160
7	1240	1860	1120	1680	1020	1530	924	1390	840	1260	763	1150
8	1230	1840	1110	1660	1010	1510	914	1370	831	1250	754	1130
9	1210	1820	1090	1640	995	1500	902	1360	820	1230	745	1120
10	1200	1800	1080	1620	981	1470	889	1340	808	1210	734	1100
11	1180	1770	1060	1590	965	1450	875	1320	795	1200	722	1090
12	1160	1740	1040	1570	949	1430	860	1290	781	1170	709	1070
13	1140	1720	1020	1540	931	1400	844	1270	767	1150	696	1050
14	1120	1690	1000	1510	912	1370	827	1240	751	1130	682	1020
15	1100	1650	982	1480	893	1340	809	1220	734	1100	667	1000
16	1080	1620	959	1440	872	1310	790	1190	717	1080	651	978
17	1050	1580	936	1410	851	1280	771	1160	699	1050	635	954
18	1030	1550	912	1370	829	1250	751	1130	681	1020	618	928
19	1000	1510	887	1330	806	1210	730	1100	662	995	600	902
20	979	1470	862	1300	783	1180	709	1070	642	966	583	876
22	926	1390	809	1220	735	1100	665	1000	602	906	546	821
24	871	1310	756	1140	686	1030	620	932	562	844	509	765
26	815	1230	702	1050	636	956	575	864	520	782	471	708
28	759	1140	647	973	586	881	530	797	479	720	434	652
30	702	1060	594	892	537	807	485	730	438	659	397	596
32	647	972	541	814	489	735	442	664	399	599	361	542
34	592	890	491	738	443	666	400	601	360	542	326	490
36	540	811	441	663	398	598	359	540	323	486	292	439
38	489	734	396	595	357	537	322	484	290	436	262	394
40	441	663	358	537	322	484	291	437	262	393	236	355
Properties												
(kips)	191	287	175	263	151	227	128	191	111	167	95.9	144
(kips/in.)	22.7	34.0	21.5	32.3	19.7	29.5	17.5	26.3	16.2	24.3	14.7	22.0
(kips)	477	717	407	612	312	468	220	330	173	260	129	194
(kips)	222	334	199	298	165	249	138	208	114	171	94.3	142
	14.1		13.3		13.2		13.2		13.5		15.2	
	61.7		56.0		52.0		48.4		45.3		42.6	
	42.7		38.8		35.3		32.0		29.1		26.5	
	1710		1530		1380		1240		1110		999	
	677		548		495		447		402		362	
	3.98		3.76		3.74		3.73		3.71		3.70	
	1.59		1.67		1.67		1.67		1.66		1.66	
/10⁴ (k-in.²)	48900		43800		39500		35500		31800		28600	
/10⁴ (k-in.²)	19400		15700		14200		12800		11500		10400	

Effective length KL (ft) with respect to least radius of gyration r_y

ASD	LRFD
1.67	$\phi_c = 0.90$

Available Critical Stress for Compression Members

$\frac{Kl}{r}$	F_y = 35ksi F_{cr}/Ω_c ksi ASD	F_y = 35ksi $\phi_c F_{cr}$ ksi LRFD	F_y = 36ksi F_{cr}/Ω_c ksi ASD	F_y = 36ksi $\phi_c F_{cr}$ ksi LRFD	F_y = 42ksi F_{cr}/Ω_c ksi ASD	F_y = 42ksi $\phi_c F_{cr}$ ksi LRFD	F_y = 46ksi F_{cr}/Ω_c ksi ASD	F_y = 46ksi $\phi_c F_{cr}$ ksi LRFD	F_y = 50ksi F_{cr}/Ω_c ksi ASD	F_y = 50ksi $\phi_c F_{cr}$ ksi LRFD
1	21.0	31.5	21.6	32.4	25.1	37.8	27.5	41.4	29.9	45.0
2	21.0	31.5	21.6	32.4	25.1	37.8	27.5	41.4	29.9	45.0
3	20.9	31.5	21.6	32.4	25.1	37.8	27.5	41.4	29.9	45.0
4	20.9	31.5	21.6	32.4	25.1	37.8	27.5	41.4	29.9	44.9
5	20.9	31.5	21.6	32.4	25.1	37.7	27.5	41.3	29.9	44.9
6	20.9	31.4	21.6	32.3	25.1	37.7	27.5	41.3	29.9	44.9
7	20.9	31.4	21.6	32.3	25.1	37.7	27.5	41.3	29.8	44.8
8	20.9	31.4	21.6	32.3	25.1	37.7	27.4	41.2	29.8	44.8
9	20.9	31.4	21.6	32.3	25.0	37.6	27.4	41.2	29.8	44.7
10	20.9	31.3	21.4	32.2	25.0	37.6	27.4	41.1	29.7	44.7
11	20.8	31.3	21.4	32.2	25.0	37.5	27.3	41.1	29.7	44.6
12	20.8	31.3	21.4	32.2	24.9	37.5	27.3	41.0	29.6	44.5
13	20.8	31.2	21.4	32.1	24.9	37.4	27.2	40.9	29.6	44.4
14	20.7	31.2	21.3	32.1	24.8	37.3	27.2	40.9	29.5	44.4
15	20.7	31.1	21.3	32.0	24.8	37.3	27.1	40.8	29.5	[illegible]
16	20.7	31.1	21.3	32.0	24.8	37.2	27.1	40.7	29.4	[illegible]
17	20.7	31.0	21.2	31.9	24.7	37.1	27.0	40.6	29.3	[illegible]
18	20.6	31.0	21.2	31.9	24.7	37.1	27.0	40.5	29.2	[illegible]
19	20.6	30.9	21.2	31.8	24.6	37.0	26.9	40.4	29.2	[illegible]
20	20.5	30.9	21.1	31.7	24.5	36.9	26.8	40.3	29.1	[illegible]
21	20.5	30.8	21.1	31.7	24.5	36.8	26.7	40.2	29.0	[illegible]
22	20.4	30.7	21.0	31.6	24.4	36.7	26.7	40.1	28.9	[illegible]
23	20.4	30.7	21.0	31.5	24.3	36.6	26.6	40.0	28.8	[illegible]
24	20.3	30.6	20.9	31.4	24.3	36.5	26.5	39.8	28.7	[illegible]
25	20.3	30.5	20.9	31.4	24.2	36.4	26.4	39.7	28.6	[illegible]
26	20.2	30.4	20.8	31.3	24.1	36.3	26.3	39.6	28.5	[illegible]
27	20.2	30.3	20.7	31.2	24.0	36.1	26.2	39.4	28.4	[illegible]
28	20.1	30.3	20.7	31.1	24.0	36.0	26.1	39.3	28.3	[illegible]
29	20.1	30.2	20.6	31.0	23.9	35.9	26.0	39.1	28.2	[illegible]
30	20.0	30.1	20.6	30.9	23.8	35.8	25.9	39.0	28.0	[illegible]
31	20.0	30.0	20.5	30.8	23.7	35.6	25.8	38.8	27.9	[illegible]
32	19.9	29.9	20.4	30.7	23.6	35.5	25.7	38.6	27.8	[illegible]
33	19.8	29.8	20.4	30.6	23.5	35.4	25.6	38.5	27.7	[illegible]
34	19.8	29.7	20.3	30.5	23.4	35.2	25.5	38.3	[illegible]	[illegible]
35	19.7	29.6	20.2	30.4	23.3	35.1	25.4	38.1	[illegible]	[illegible]
36	19.6	29.5	20.1	30.3	23.2	34.9	25.2	37.9	[illegible]	[illegible]
37	19.5	29.4	20.1	30.1	23.1	34.8	25.1	37.8	[illegible]	[illegible]
38	19.5	29.3	20.0	30.0	23.0	34.6	25.0	37.6	[illegible]	[illegible]
39	19.4	29.1	19.9	29.9	22.9	34.4	24.9	37.4	[illegible]	[illegible]
40	19.3	29.0	19.8	29.8	22.8	34.3	24.7	37.2	[illegible]	[illegible]

ASD	LRFD
$\Omega_c = 1.67$	$\phi_c = 0.90$

Available Critical Stress for Compression Members

$\frac{Kl}{r}$	F_y = 35ksi F_{cr}/Ω_c ksi ASD	F_y = 35ksi $\phi_c F_{cr}$ ksi LRFD	F_y = 36ksi F_{cr}/Ω_c ksi ASD	F_y = 36ksi $\phi_c F_{cr}$ ksi LRFD	F_y = 42ksi F_{cr}/Ω_c ksi ASD	F_y = 42ksi $\phi_c F_{cr}$ ksi LRFD	F_y = 46ksi F_{cr}/Ω_c ksi ASD	F_y = 46ksi $\phi_c F_{cr}$ ksi LRFD	F_y = 50ksi F_{cr}/Ω_c ksi ASD	F_y = 50ksi $\phi_c F_{cr}$ ksi LRFD
41	19.2	28.9	19.7	29.7	22.7	34.1	24.6	37.0	26.5	39.8
42	19.2	28.8	19.6	29.5	22.6	33.9	24.5	36.8	26.3	39.5
43	19.1	28.7	19.6	29.4	22.5	33.7	24.3	36.6	26.2	39.3
44	19.0	28.5	19.5	29.3	22.3	33.6	24.2	36.3	26.0	39.1
45	18.9	28.4	19.4	29.1	22.2	33.4	24.0	36.1	25.8	38.8
46	18.8	28.3	19.3	29.0	22.1	33.2	23.9	35.9	25.6	38.5
47	18.7	28.1	19.2	28.9	22.0	33.0	23.8	35.7	25.5	38.3
48	18.6	28.0	19.1	28.7	21.8	32.8	23.6	35.4	25.3	38.0
49	18.5	27.9	19.0	28.5	21.7	32.6	23.4	35.2	25.1	37.7
50	18.4	27.7	18.9	28.4	21.6	32.4	23.3	35.0	24.9	37.5
51	18.3	27.6	18.8	28.3	21.4	32.2	23.1	34.8	24.8	37.2
52	18.3	27.4	18.7	28.1	21.3	32.0	23.0	34.5	24.6	36.9
53	18.2	27.3	18.6	28.0	21.2	31.8	22.8	34.3	24.4	36.7
54	18.1	27.1	18.5	27.8	21.0	31.6	22.6	34.0	24.2	36.4
55	18.0	27.0	18.4	27.6	20.9	31.4	22.5	33.8	24.0	36.1
56	17.9	26.8	18.3	27.5	20.7	31.2	22.3	33.5	23.8	35.8
57	17.7	26.7	18.2	27.3	20.6	31.0	22.1	33.3	23.6	35.5
58	17.6	26.5	18.1	27.1	20.5	30.7	22.0	33.0	23.4	35.2
59	17.5	26.4	17.9	27.0	20.3	30.5	21.8	32.8	23.2	34.9
60	17.4	26.2	17.8	26.8	20.2	30.3	21.6	32.5	23.0	34.6
61	[illegible]	26.0	17.7	26.6	20.0	30.1	21.4	32.2	22.8	34.3
62	[illegible]	25.9	17.6	26.5	19.9	29.9	21.3	32.0	22.6	34.0
63	[illegible]	25.7	17.5	26.3	19.7	29.6	21.1	31.7	22.4	33.7
64	[illegible]	25.5	17.4	26.1	19.6	29.4	20.9	31.4	22.2	33.4
65	[illegible]	25.4	17.3	25.9	19.4	29.2	20.7	31.2	22.0	33.0
66	[illegible]	25.2	17.1	25.8	19.2	28.9	20.5	30.9	21.8	32.7
67	[illegible]	25.0	17.0	25.6	19.1	28.7	20.4	30.6	21.6	32.4
68	[illegible]	24.9	16.9	25.4	18.9	28.5	20.2	30.3	21.4	32.1
69	[illegible]	24.7	16.8	25.2	18.8	28.2	20.0	30.1	21.1	31.8
70	[illegible]	24.5	16.7	25.0	18.6	28.0	19.8	29.8	20.9	31.4
71	[illegible]	24.3	16.5	24.8	18.5	27.7	19.6	29.5	20.7	31.1
72	[illegible]	24.2	16.4	24.7	18.3	27.5	19.4	29.2	20.5	30.8
73	[illegible]	24.0	16.3	24.5	18.1	27.2	19.2	28.9	20.3	30.5
74	[illegible]	23.8	16.2	24.3	18.0	27.0	19.1	28.6	20.1	30.2
75	[illegible]	23.6	16.0	24.1	17.8	26.8	18.9	28.4	19.8	29.8
76	[illegible]	23.4	15.9	23.9	17.6	26.5	18.7	28.1	19.6	29.5
77	[illegible]	23.3	15.8	23.7	17.5	26.3	18.5	27.8	19.4	29.2
78	[illegible]	23.1	15.6	23.5	17.3	26.0	18.3	27.5	19.2	28.8
79	[illegible]	22.9	15.5	23.3	17.1	25.8	18.1	27.2	19.0	28.5
80	[illegible]	22.7	15.4	23.1	17.0	25.5	17.9	26.9	18.8	28.2

LRFD
$\phi_c = 0.90$

TABLE B4.1
Limiting Width-Thickness Ratios for Compression Elements

Unstiffened Elements

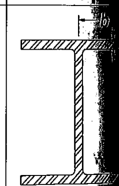
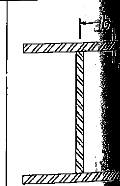
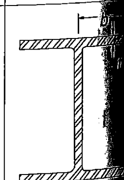
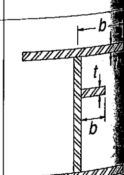
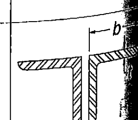
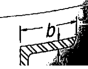
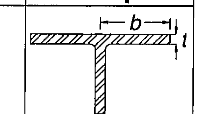
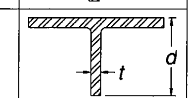
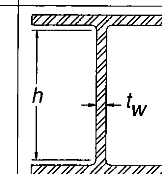
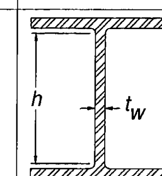
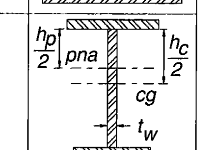
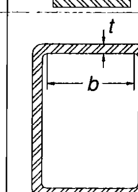
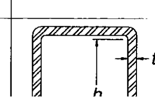
Case	Description of Element	Width Thick-ness Ratio	Limiting Width-Thickness Ratios λ_p (compact)	λ_r (noncompact)	Example
1	Flexure in flanges of rolled I-shaped sections and channels	b/t	$0.38\sqrt{E/F_y}$	$1.0\sqrt{E/F_y}$	
2	Flexure in flanges of doubly and singly symmetric I-shaped built-up sections	b/t	$0.38\sqrt{E/F_y}$	$0.95\sqrt{k_c E/F_L}$ [a],[b]	
3	Uniform compression in flanges of rolled I-shaped sections, plates projecting from rolled I-shaped sections; outstanding legs of pairs of angles in continuous contact and flanges of channels	b/t	NA	$0.56\sqrt{E/F_y}$	
4	Uniform compression in flanges of built-up I-shaped sections and plates or angle legs projecting from built-up I-shaped sections	b/t	NA	$0.64\sqrt{k_c E/F_y}$ [a]	
5	Uniform compression in legs of single angles, legs of double angles with separators, and all other unstiffened elements	b/t	NA	$0.45\sqrt{E/F_y}$	
6	Flexure in legs of single angles	b/t	$0.54\sqrt{E/F_y}$	$0.91\sqrt{E/F_y}$	

TABLE B4.1 (cont.)
Limiting Width-Thickness Ratios for Compression Elements

Stiffened Elements

Case	Description of Element	Width Thick-ness Ratio	Limiting Width-Thickness Ratios λ_p (compact)	λ_r (noncompact)	Example
7	Flexure in flanges of tees	b/t	$0.38\sqrt{E/F_y}$	$1.0\sqrt{E/F_y}$	
8	Uniform compression in stems of tees	d/t	NA	$0.75\sqrt{E/F_y}$	
9	Flexure in webs of doubly symmetric I-shaped sections and channels	h/t_w	$3.76\sqrt{E/F_y}$	$5.70\sqrt{E/F_y}$	
10	Uniform compression in webs of doubly symmetric I-shaped sections	h/t_w	NA	$1.49\sqrt{E/F_y}$	
11	Flexure in webs of singly-symmetric I-shaped sections	h_c/t_w	$\dfrac{\frac{h_c}{h_p}\sqrt{\frac{E}{F_y}}}{\left(0.54\frac{M_p}{M_y}-0.09\right)^2} \le \lambda_r$	$5.70\sqrt{E/F_y}$	
12	Uniform compression in flanges of rectangular box and hollow structural sections of uniform thickness subject to bending or compression; flange cover plates and diaphragm plates between lines of fasteners or welds	b/t	$1.12\sqrt{E/F_y}$	$1.40\sqrt{E/F_y}$	
13	Flexure in webs of rectangular HSS	h/t	$2.42\sqrt{E/F_y}$	$5.70\sqrt{E/F_y}$	

13. Gross and Net Area Determination

a. Gross Area

The gross area, A_g, of a member is the total cross-sectional area.

b. Net Area

The *net area*, A_n, of a member is the sum of the products of the thickness and the net width of each element computed as follows:

In computing net area for tension and shear, the width of a bolt hole shall be taken as $^1/_{16}$ in. (2 mm) greater than the *nominal dimension* of the hole.

For a chain of holes extending across a part in any diagonal or zigzag line, the net width of the part shall be obtained by deducting from the gross width the sum of the diameters or slot dimensions as provided in Section J3.2, of all holes in the chain, and adding, for each *gage* space in the chain, the quantity $s^2/4g$

where

s = longitudinal center-to-center spacing (*pitch*) of any two consecutive holes, in. (mm)

g = transverse center-to-center spacing (gage) between *fastener* gage lines, in. (mm)

For angles, the gage for holes in opposite adjacent legs shall be the sum of the gages from the back of the angles less the thickness.

For slotted *HSS* welded to a *gusset plate*, the net area, A_n, is the gross area minus the product of the thickness and the total width of material that is removed to form the slot.

In determining the net area across plug or *slot welds*, the *weld metal* shall not be considered as adding to the net area.

User Note: Section J4.1(b) limits A_n to a maximum of $0.85A_g$ for splice plates with holes.

B4. CLASSIFICATION OF SECTIONS FOR LOCAL BUCKLING

Sections are classified as *compact*, *noncompact*, or *slender-element* sections. For a section to qualify as compact its flanges must be continuously connected to the web or webs and the width-thickness ratios of its compression elements must not exceed the limiting width-thickness ratios λ_p from Table B4.1. If the width-thickness ratio of one or more compression elements exceeds λ_p, but does not exceed λ_r from Table B4.1, the section is noncompact. If the width-thickness ratio of any element exceeds λ_r, the section is referred to as a *slender-element*

1. Unstiffened Elements

For *unstiffened elements* supported along only one edge parallel to the direction of the compression *force*, the width shall be taken as follows:

(a) For flanges of I-shaped members and tees, the width b is one-half the full-flange width, b_f.

(b) For legs of angles and flanges of channels and zees, the width b is the full *nominal dimension*.

(c) For plates, the width b is the distance from the free edge to the first row of *fasteners* or line of welds.

(d) For stems of tees, d is taken as the full nominal depth of the section.

User Note: Refer to Table B4.1 for the graphic representation of unstiffened element dimensions.

Stiffened Elements

For *stiffened elements* supported along two edges parallel to the direction of the compression *force*, the width shall be taken as follows:

(a) For webs of rolled or *formed sections*, h is the clear distance between flanges less the fillet or corner radius at each flange; h_c is twice the distance from the centroid to the inside face of the compression flange less the fillet or corner radius.

(b) For webs of built-up sections, h is the distance between adjacent lines of *fasteners* or the clear distance between flanges when welds are used, and h_c is twice the distance from the centroid to the nearest line of fasteners at the compression flange or the inside face of the compression flange when welds are used; h_p is twice the distance from the plastic neutral axis to the nearest line of fasteners at the compression flange or the inside face of the compression flange when welds are used.

(c) For flange or *diaphragm plates* in built-up sections, the width b is the distance between adjacent lines of fasteners or lines of welds.

(d) For flanges of rectangular hollow structural sections (*HSS*), the width b is the clear distance between webs less the inside corner radius on each side. For webs of rectangular HSS, h is the clear distance between the flanges less the inside corner radius on each side. If the corner radius is not known, b and h shall be taken as the corresponding outside dimension minus three times the thickness. The thickness, t, shall be taken as the *design wall thickness*, per Section B3.12.

User Note: Refer to Table B4.1 for the graphic representation of stiffened element dimensions.

…tapered flanges of rolled sections, the thickness is the nominal value halfway between the free edge and the corresponding face of the web.