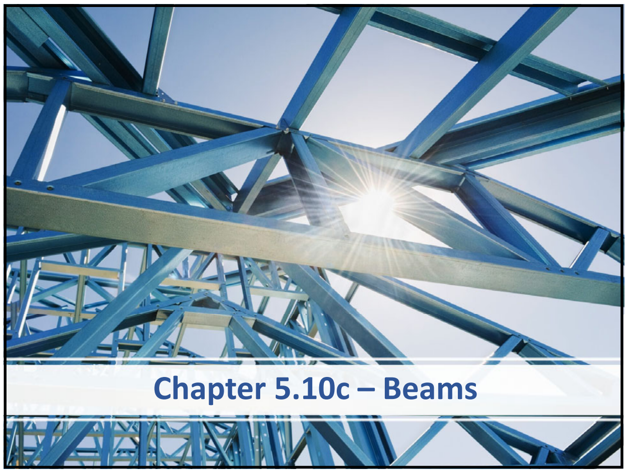


Chapter 5.10c – Beams

1

Chapter 5 – Manual Table 6-1

- ***Manual Table 6-1*** was discussed in Chapter 4 in connection with compressive strength.
- This table can also be used to determine the ***flexural*** and ***shear*** strengths of **W** shapes with F_y = 50 *ksi*.
- The table includes all **W** shapes, including those not covered in other tables or curves, so that it can be used in lieu of those other design aids for F_y = 50 *ksi*.

2

Chapter 5 – Manual Table 6-1

- Most pages of the table cover three shapes.
- The headings for each shape are listed twice; once on the ***left side*** of the page and once on the ***right side***.
- The ***right side*** is used to determine the available flexural strength, M_p/Ω_b or $\phi_b M_p$.
- To obtain the strength, enter the ***middle column*** with the unbraced length, L_b.

3

Chapter 5 – Manual Table 6-1

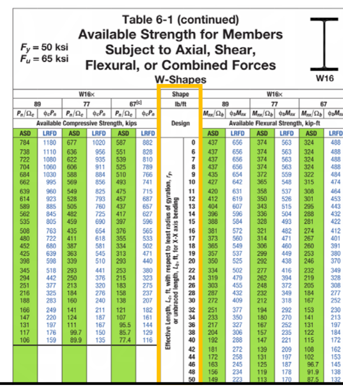


Table 6-1 (continued)
Available Strength for Members Subject to Axial, Shear, Flexural, or Combined Forces
W-Shapes

F_y = 50 ksi
F_u = 65 ksi

W16

W16× 89 P_n/Ω_c ASD	89 $\phi_c P_n$ LRFD	77 P_n/Ω_c ASD	77 $\phi_c P_n$ LRFD	67[c] P_n/Ω_c ASD	67[c] $\phi_c P_n$ LRFD	Shape lb/ft / Design: Effective Length, L_c, ft, with respect to least radius of gyration, r_y, or unbraced length, L_b, ft, for X-X axis bending	W16× 89 M_{nx}/Ω_b ASD	89 $\phi_b M_{nx}$ LRFD	77 M_{nx}/Ω_b ASD	77 $\phi_b M_{nx}$ LRFD	67 M_{nx}/Ω_b ASD	67 $\phi_b M_{nx}$ LRFD
Available Compressive Strength, kips							Available Flexural Strength, kip-ft					
784	1180	677	1020	587	882	0	437	656	374	563	324	488
738	1110	636	956	551	828	6	437	656	374	563	324	488
722	1080	622	935	539	810	7	437	656	374	563	324	488
704	1060	606	911	525	789	8	437	656	374	563	324	488
684	1030	588	884	510	766	9	435	654	372	559	322	484
662	995	569	856	493	741	10	427	642	365	548	315	474
639	960	549	825	475	715	11	420	631	358	537	308	464
614	923	528	793	457	687	12	412	619	350	526	301	453
589	885	505	760	437	657	13	404	607	343	515	295	443
562	845	482	725	417	627	14	396	596	336	504	288	432
535	805	459	690	397	596	15	388	584	328	493	281	422
508	763	435	654	376	565	16	381	572	321	482	274	412
480	722	411	618	355	533	17	373	560	314	471	267	401
452	680	387	581	334	502	18	365	549	306	460	260	391
425	639	363	545	313	471	19	357	537	299	449	253	380
398	598	339	510	293	440	20	350	525	292	438	246	370
345	518	293	441	253	380	22	334	502	277	416	232	349
294	442	250	376	215	323	24	319	479	262	394	219	328
251	377	213	320	183	275	26	303	455	248	372	205	308
216	325	184	276	158	237	28	287	432	232	349	184	277
188	283	160	240	138	207	30	272	409	212	318	167	252
166	249	141	211	121	182	32	251	377	194	292	153	230
147	220	124	187	107	161	34	233	350	180	270	141	213
131	197	111	167	95.5	144	36	217	327	167	252	131	197
117	176	99.7	150	85.7	129	38	204	306	157	235	122	184
106	159	89.9	135	77.4	116	40	192	288	147	221	115	172
						42	181	272	139	209	108	162
						44	172	258	131	197	102	153
						46	163	245	125	187	96.7	145
						48	156	234	119	178	91.9	138
						50	149	223	113	170	87.5	132

Enter the middle column with the unbraced length, L_b.

4

Chapter 5 – Manual Table 6-1

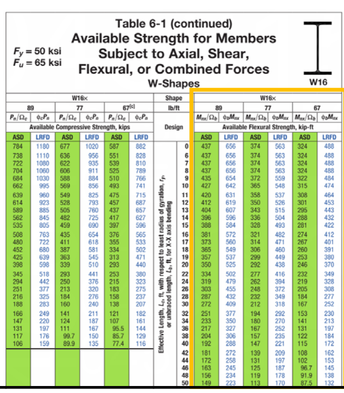


Table 6-1 (continued)
Available Strength for Members Subject to Axial, Shear, Flexural, or Combined Forces
W-Shapes

F_y = 50 ksi
F_u = 65 ksi

W16

W16× 89 P_n/Ω_c ASD	89 $\phi_c P_n$ LRFD	77 P_n/Ω_c ASD	77 $\phi_c P_n$ LRFD	67[c] P_n/Ω_c ASD	67[c] $\phi_c P_n$ LRFD	Shape lb/ft / Design: Effective Length, L_c, ft, with respect to least radius of gyration, r_y, or unbraced length, L_b, ft, for X-X axis bending	W16× 89 M_{nx}/Ω_b ASD	89 $\phi_b M_{nx}$ LRFD	77 M_{nx}/Ω_b ASD	77 $\phi_b M_{nx}$ LRFD	67 M_{nx}/Ω_b ASD	67 $\phi_b M_{nx}$ LRFD
Available Compressive Strength, kips							Available Flexural Strength, kip-ft					
784	1180	677	1020	587	882	0	437	656	374	563	324	488
738	1110	636	956	551	828	6	437	656	374	563	324	488
722	1080	622	935	539	810	7	437	656	374	563	324	488
704	1060	606	911	525	789	8	437	656	374	563	324	488
684	1030	588	884	510	766	9	435	654	372	559	322	484
662	995	569	856	493	741	10	427	642	365	548	315	474
639	960	549	825	475	715	11	420	631	358	537	308	464
614	923	528	793	457	687	12	412	619	350	526	301	453
589	885	505	760	437	657	13	404	607	343	515	295	443
562	845	482	725	417	627	14	396	596	336	504	288	432
535	805	459	690	397	596	15	388	584	328	493	281	422
508	763	435	654	376	565	16	381	572	321	482	274	412
480	722	411	618	355	533	17	373	560	314	471	267	401
452	680	387	581	334	502	18	365	549	306	460	260	391
425	639	363	545	313	471	19	357	537	299	449	253	380
398	598	339	510	293	440	20	350	525	292	438	246	370
345	518	293	441	253	380	22	334	502	277	416	232	349
294	442	250	376	215	323	24	319	479	262	394	219	328
251	377	213	320	183	275	26	303	455	248	372	205	308
216	325	184	276	158	237	28	287	432	232	349	184	277
188	283	160	240	138	207	30	272	409	212	318	167	252
166	249	141	211	121	182	32	251	377	194	292	153	230
147	220	124	187	107	161	34	233	350	180	270	141	213
131	197	111	167	95.5	144	36	217	327	167	252	131	197
117	176	99.7	150	85.7	129	38	204	306	157	235	122	184
106	159	89.9	135	77.4	116	40	192	288	147	221	115	172
						42	181	272	139	209	108	162
						44	172	258	131	197	102	153
						46	163	245	125	187	96.7	145
						48	156	234	119	178	91.9	138
						50	149	223	113	170	87.5	132

The ***right side*** is the available flexural strength, M_p/Ω_b or $\phi_b M_p$.

5

Chapter 5 – Manual Table 6-1

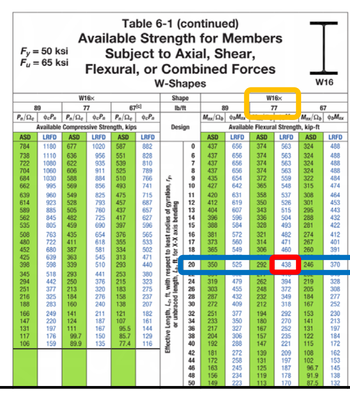


Table 6-1 (continued)
Available Strength for Members Subject to Axial, Shear, Flexural, or Combined Forces
W-Shapes

F_y = 50 ksi
F_u = 65 ksi

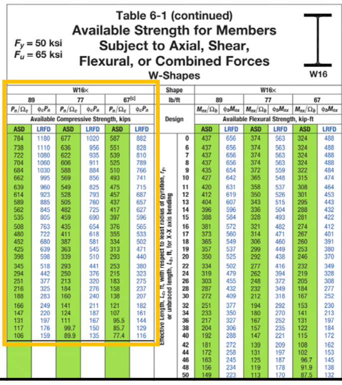
W16

W16× 89 P_n/Ω_c ASD	89 $\phi_c P_n$ LRFD	77 P_n/Ω_c ASD	77 $\phi_c P_n$ LRFD	67[c] P_n/Ω_c ASD	67[c] $\phi_c P_n$ LRFD	Shape lb/ft / Design: Effective Length, L_c, ft, with respect to least radius of gyration, r_y, or unbraced length, L_b, ft, for X-X axis bending	W16× 89 M_{nx}/Ω_b ASD	89 $\phi_b M_{nx}$ LRFD	77 M_{nx}/Ω_b ASD	77 $\phi_b M_{nx}$ LRFD	67 M_{nx}/Ω_b ASD	67 $\phi_b M_{nx}$ LRFD
Available Compressive Strength, kips							Available Flexural Strength, kip-ft					
784	1180	677	1020	587	882	0	437	656	374	563	324	488
738	1110	636	956	551	828	6	437	656	374	563	324	488
722	1080	622	935	539	810	7	437	656	374	563	324	488
704	1060	606	911	525	789	8	437	656	374	563	324	488
684	1030	588	884	510	766	9	435	654	372	559	322	484
662	995	569	856	493	741	10	427	642	365	548	315	474
639	960	549	825	475	715	11	420	631	358	537	308	464
614	923	528	793	457	687	12	412	619	350	526	301	453
589	885	505	760	437	657	13	404	607	343	515	295	443
562	845	482	725	417	627	14	396	596	336	504	288	432
535	805	459	690	397	596	15	388	584	328	493	281	422
508	763	435	654	376	565	16	381	572	321	482	274	412
480	722	411	618	355	533	17	373	560	314	471	267	401
452	680	387	581	334	502	18	365	549	306	460	260	391
425	639	363	545	313	471	19	357	537	299	449	253	380
398	598	339	510	293	440	20	350	525	292	438	246	370
345	518	293	441	253	380	22	334	502	277	416	232	349
294	442	250	376	215	323	24	319	479	262	394	219	328
251	377	213	320	183	275	26	303	455	248	372	205	308
216	325	184	276	158	237	28	287	432	232	349	184	277
188	283	160	240	138	207	30	272	409	212	318	167	252
166	249	141	211	121	182	32	251	377	194	292	153	230
147	220	124	187	107	161	34	233	350	180	270	141	213
131	197	111	167	95.5	144	36	217	327	167	252	131	197
117	176	99.7	150	85.7	129	38	204	306	157	235	122	184
106	159	89.9	135	77.4	116	40	192	288	147	221	115	172
						42	181	272	139	209	108	162
						44	172	258	131	197	102	153
						46	163	245	125	187	96.7	145
						48	156	234	119	178	91.9	138
						50	149	223	113	170	87.5	132

In the corresponding row, the flexural strength for bending about the ***x**-axis* is given.

6

Chapter 5 – Manual Table 6-1



On the ***left side***, you will find the available compressive strength.

7

Chapter 5 – Manual Table 6-1

- All strength values account for ***local buckling*** for ***noncompact*** shapes.
- The strength values correspond to C_b = 1.0.
- For other values of C_b, multiply the tabulated values by C_b, just as you would when using the ***beam design curves***.

8

Chapter 5 – Manual Table 6-1

- Other useful values are given at the bottom of the table.
- On the ***left side***, you will find:

  the available strength in ***tension yielding***,
  the available strength in ***tension rupture*** (A_e = **0.75**A_g),
  the available strength in ***shear***, and
  the available flexural strength for ***bending*** about the ***y***-axis

- On the ***right side***, values include L_p, L_r, A_g, I_x, I_y, and r_y.

9

Chapter 5 – Manual Table 6-1

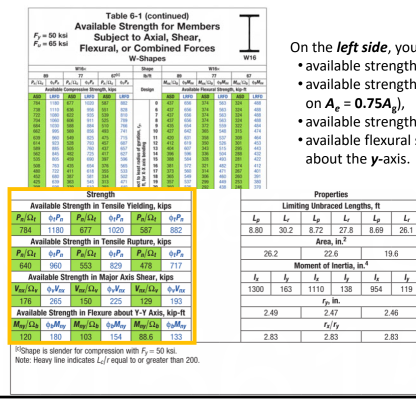


Table 6-1 (continued)
Available Strength for Members Subject to Axial, Shear, Flexural, or Combined Forces
W-Shapes
F_y = 50 ksi, F_u = 65 ksi, W16

Strength					
Available Strength in Tensile Yielding, kips					
P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$
784	1180	677	1020	587	882
Available Strength in Tensile Rupture, kips					
P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$
640	960	553	829	478	717
Available Strength in Major Axis Shear, kips					
V_{nx}/Ω_v	$\phi_v V_{nx}$	V_{nx}/Ω_v	$\phi_v V_{nx}$	V_{nx}/Ω_v	$\phi_v V_{nx}$
176	265	150	225	129	193
Available Strength in Flexure about Y-Y Axis, kip-ft					
M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$
120	180	103	154	88.6	133

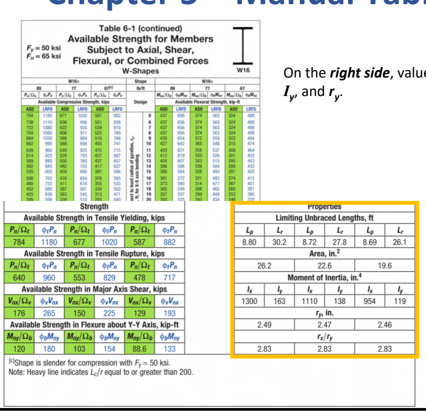
Properties					
Limiting Unbraced Lengths, ft					
L_p	L_r	L_p	L_r	L_p	L_r
8.80	30.2	8.72	27.8	8.69	26.1
Area, in.²					
26.2		22.6		19.6	
Moment of Inertia, in.⁴					
I_x	I_y	I_x	I_y	I_x	I_y
1300	163	1110	138	954	119
r_y, in.					
2.49		2.47		2.46	
r_x/r_y					
2.83		2.83		2.83	

[c] Shape is slender for compression with F_y = 50 ksi.
Note: Heavy line indicates L_c/r equal to or greater than 200.

On the ***left side***, you will find:
- available strength in ***tension yielding***
- available strength in ***tension rupture*** (based on A_e = **0.75**A_g),
- available strength in ***shear***, and
- available flexural strength for ***bending*** about the ***y***-axis.

10

Chapter 5 – Manual Table 6-1



On the ***right side***, values include L_p, L_r, A_g, I_x, I_y, and r_y.

11

Chapter 5 – Manual Table 6-1

- **Example 5.13**: A **W12 x 50** of **A992** steel (F_y = 50 *ksi*; F_u = 65 *ksi*) has a simply supported span length of 14 *ft* with lateral bracing only at the ends and at midspan. A concentrated live load of 40 *k* is applied at midspan. The only dead load is the beam weight.
- Use ***Manual Table 6-1*** and determine whether this beam has enough strength.

LRFD Solution $P_u = 1.6(40\,k) = 64\,k$

$$w_u = 1.2(0.050\,k/ft) = 0.060\,k/ft$$

$$M_u = \frac{w_u L^2}{8} + \frac{P_u L}{4} = \frac{(0.06\,k/ft)(14\,ft)^2}{8} + \frac{(64\,k)14\,ft}{4}$$

$$= 225.5\,kft$$

12

Chapter 5 – Manual Table 6-1

- **Example 5.13**:

$L_b = 7\,ft$

$\phi_b M_n = 269\,kft$

$> M_u = 225.5\,kft$

O.K.

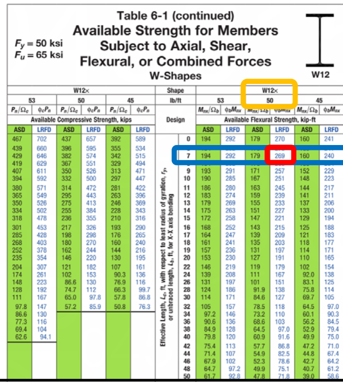


Table 6-1 (continued)
Available Strength for Members Subject to Axial, Shear, Flexural, or Combined Forces
W-Shapes

$F_y = 50$ ksi
$F_u = 65$ ksi

W12

Shape	W12×53		W12×50		W12×45		W12×53		W12×50		W12×45	
	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	P_n/Ω_c	$\phi_c P_n$	M_{nx}/Ω_b	$\phi_b M_{nx}$	M_{nx}/Ω_b	$\phi_b M_{nx}$	M_{nx}/Ω_b	$\phi_b M_{nx}$
Design	Available Compressive Strength, kips						Available Flexural Strength, kip-ft					
Effective Length, L_c, ft, with respect to least radius of gyration, r_y, or unbraced length, L_b, ft, for X-X axis bending	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
0	467	702	437	657	392	589	194	292	179	270	160	241
6	439	660	396	595	355	534	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	429	646	382	574	342	515	194	292	179	269	160	240
8	419	629	367	551	329	494	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	407	611	350	526	313	471	193	291	171	257	152	229
10	394	592	332	500	297	447	190	285	167	251	148	223
11	380	571	314	472	281	422	186	280	163	245	144	217
12	365	549	295	443	263	396	183	274	159	239	141	211
13	350	526	275	413	246	369	179	269	155	233	137	206
14	334	502	255	384	228	343	175	263	151	227	133	200
15	318	478	236	355	210	316	172	258	147	221	129	194
16	301	453	217	326	193	290	168	252	143	215	125	188
17	285	428	198	298	176	265	164	247	139	209	121	183
18	268	403	180	270	160	240	161	241	135	203	118	177
19	252	378	162	244	144	216	157	236	131	197	114	171
20	235	354	146	220	130	195	153	230	127	191	110	165
22	204	307	121	182	107	161	146	219	119	179	102	154
24	174	261	102	153	90.3	136	139	208	111	167	92.0	138
26	148	223	86.6	130	76.9	116	131	197	101	151	83.1	125
28	128	192	74.7	112	66.3	99.7	124	186	91.9	138	75.8	114
30	111	167	65.0	97.8	57.8	86.8	114	171	84.6	127	69.7	105
32	97.8	147	57.2	85.9	50.8	76.3	105	157	78.5	118	64.5	97.0
34	86.6	130					97.2	146	73.2	110	60.1	90.3
36	77.3	116					90.6	136	68.6	103	56.2	84.5
38	69.4	104					84.9	128	64.5	97.0	52.9	79.4
40	62.6	94.1					79.8	120	60.9	91.6	49.9	75.0
42							75.4	113	57.7	86.8	47.2	71.0
44							71.4	107	54.9	82.5	44.8	67.4
46							67.9	102	52.3	78.6	42.7	64.2
48							64.7	97.2	49.9	75.1	40.7	61.2
50							61.7	92.8	47.8	71.8	39.0	58.6

13

Chapter 5 – Manual Table 6-1

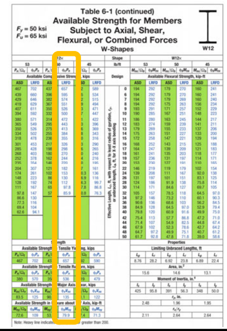
- **Example 5.13**: Since this beam is adequate in flexure with C_b = 1.0, it will be adequate with any other value, since the minimum value of C_b is 1.

Check for shear

$$V_u = \frac{w_u L}{2} + \frac{P_u}{4}$$

$$= \frac{(0.06k/ft)(14ft)}{2} + \frac{(64k)}{2}$$

$$= 32.42k$$



14

Chapter 5 – Manual Table 6-1

- **Example 5.13**: Since this beam is adequate in flexure with C_b = 1.0, it will be adequate with any other value, since the minimum value of C_b is 1.

Check for shear

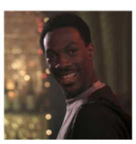
$$V_u = \frac{w_u L}{2} + \frac{P_u}{4}$$

$$= \frac{(0.06k/ft)(14ft)}{2} + \frac{(64k)}{2}$$

$$= 32.42k$$

$$\phi_v V_n = 135 > 32.42k$$

O.K.



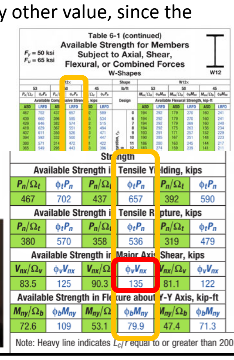


Table 6-1 (continued)
Available Strength for Members Subject to Axial, Shear, Flexural, or Combined Forces
W-Shapes

$F_y = 50$ ksi
$F_u = 65$ ksi

W12

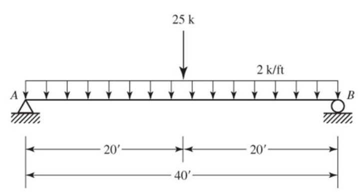
Strength					
Available Strength in Tensile Yielding, kips					
P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$
467	702	437	657	392	590
Available Strength in Tensile Rupture, kips					
P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$
380	570	358	536	319	479
Available Strength in Major Axis Shear, kips					
V_{nx}/Ω_v	$\phi_v V_{nx}$	V_{nx}/Ω_v	$\phi_v V_{nx}$	V_{nx}/Ω_v	$\phi_v V_{nx}$
83.5	125	90.3	135	81.1	122
Available Strength in Flexure about Y-Y Axis, kip-ft					
M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$
72.6	109	53.1	79.9	47.4	71.3

Note: Heavy line indicates L_c/r equal to or greater than 200.

15

Chapter 5 – Manual Table 6-1

- **Example 5.14**: The beam shown below has lateral support only at the ends. The uniform load is a superimposed dead load, and the concentrated load is a live load. Use **A992** steel (F_y = 50 *ksi*; F_u = 65 *ksi*) and select a W shape. The live load deflection must not exceed ***L/360***. Use ***LRFD***.



16

Chapter 5 – Manual Table 6-1

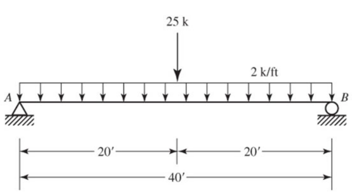
- **Example 5.14**:

$P_u = 1.6(25\,k) = 40k$

$L_b = 40\,ft$

$w_u = 1.2(2k/ft) = 2.4k/ft$

$$A_y = \frac{40k + (2.4k/ft)40\,ft}{2} = 68k$$



17

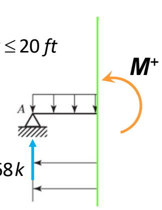
Chapter 5 – Manual Table 6-1

- **Example 5.14**:

$$\circlearrowleft^{+} \sum M_{cut} = 0 = M + (1.2k/ft)x^2 - 68x$$

$$M = -(1.2k/ft)x^2 + 68x$$

$0 \le x \le 20\,ft$



18

Chapter 5 – Manual Table 6-1

- **Example 5.14**:

$$M_A(x=10ft) = -(1.2k/ft)(10ft)^2 + 68(10ft) = 560kft$$

$$M_B(x=20ft) = -(1.2k/ft)(20ft)^2 + 68(20ft) = 880kft$$

$$M_C(x=30ft) = M_A \qquad M_{max} = M_B$$

$$C_b = \frac{12.5M_{max}}{2.5M_{max} + 3M_A + 4M_B + 3M_C}$$

$$= \frac{12.5(880kft)}{2.5(880kft) + 3(560kft) + 4(880kft) + 3(560kft)} = 1.211$$

19

Chapter 5 – Manual Table 6-1

- **Example 5.14**: Enter Manual ***Table 6-1*** with L_b = 40 *ft* and start your search with **W8** shapes.

$$\frac{\phi_b M_{nx}}{C_b} = \frac{880.0kft}{1.211} = 727kft$$

No **W8** satisfies the moment.

No **W10** satisfies the moment.

Try **W12** shapes.

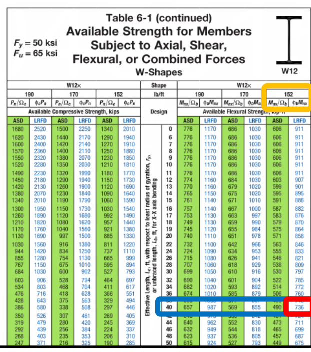
20

Chapter 5 – Manual Table 6-1

- **Example 5.14**: Enter Manual ***Table 6-1*** with L_b = 40 *ft.*

$$\frac{\phi_b M_{nx}}{C_b} = \frac{880.0kft}{1.211} = 727kft$$

W 12 x 152



21

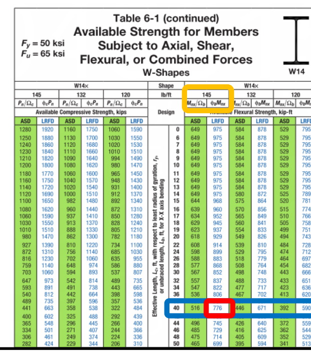
Chapter 5 – Manual Table 6-1

- **Example 5.14**: Enter Manual ***Table 6-1*** with L_b = 40 *ft.*

$$\frac{\phi_b M_{nx}}{C_b} = \frac{880.0kft}{1.211} = 727kft$$

W 12 x 152

W 14 x 145



22

Chapter 5 – Manual Table 6-1

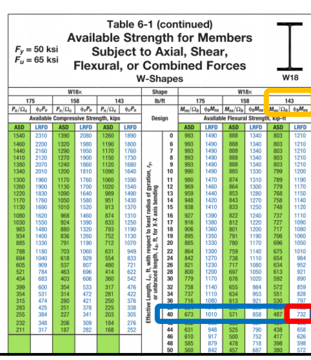
- **Example 5.14**: Enter Manual ***Table 6-1*** with L_b = 40 *ft.*

$$\frac{\phi_b M_{nx}}{C_b} = \frac{880.0kft}{1.211} = 727kft$$

W 12 x 152

W 14 x 145

W 18 x 143*



23

Chapter 5 – Manual Table 6-1

- **Example 5.14**: Enter Manual ***Table 6-1*** with L_b = 40 *ft.*

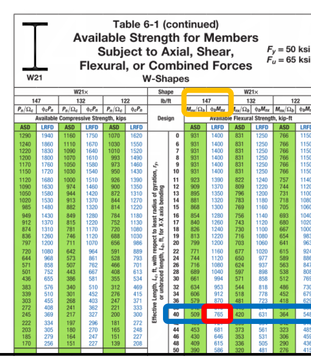
$$\frac{\phi_b M_{nx}}{C_b} = \frac{880.0kft}{1.211} = 727kft$$

W 12 x 152

W 14 x 145

W 18 x 143*

W 21 x 147



24

Chapter 5 – Manual Table 6-1

- **Example 5.14**: Enter Manual ***Table 6-1*** with L_b = 40 *ft.*

$$\frac{\phi_b M_{nx}}{C_b} = \frac{880.0\,kft}{1.211}$$

$$= 727\,kft$$

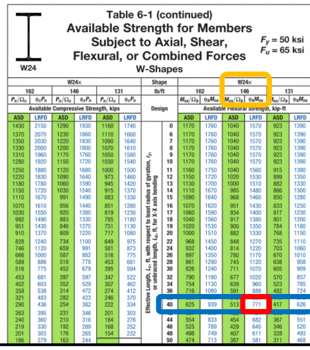
W 12 x 152

W 14 x 145

W 18 x 143*

W 21 x 147

W 24 x 146



25

Chapter 5 – Manual Table 6-1

- **Example 5.14**: Enter Manual ***Table 6-1*** with L_b = 40 *ft.*

$$\frac{\phi_b M_{nx}}{C_b} = \frac{880.0\,kft}{1.211}$$

$$= 727\,kft$$

W 12 x 152

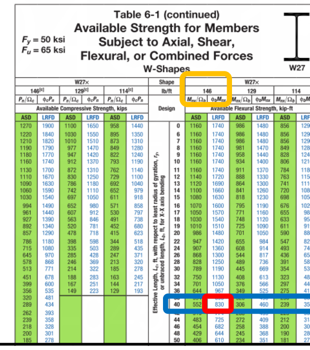
W 14 x 145

W 18 x 143*

W 21 x 147

W 24 x 146

W 27 x 146



26

Chapter 5 – Manual Table 6-1

- **Example 5.14**: Enter Manual ***Table 6-1*** with L_b = 40 *ft.*

$$\frac{\phi_b M_{nx}}{C_b} = \frac{880.0\,kft}{1.211}$$

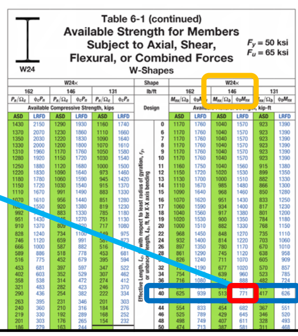
$$= 727\,kft$$

For C_b = 1.211

$$\phi_b M_{nx} = 1.211(771\,kft)$$

$$= 934\,kft > M_u$$

O.K.



27

Chapter 5 – Manual Table 6-1

- **Example 5.14**: Enter Manual ***Table 6-1*** with L_b = 0 *ft* to check the upper limit.

$$\frac{\phi_b M_{nx}}{C_b} = \frac{880.0\,kft}{1.211}$$

$$= 727\,kft$$

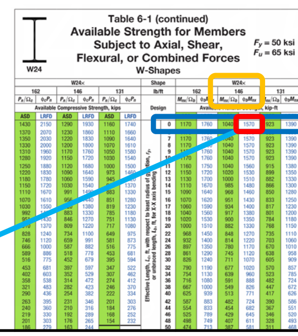
For L_b = 0

$$\phi_b M_{nx} = 1.211(771\,kft)$$

$$= 934\,kft > M_u$$

$$\phi_b M_{px} = 1{,}570\,kft > \phi_b M_{nx}$$

O.K.



28

Chapter 5 – Manual Table 6-1

- **Example 5.14**: Check beam weight:

$$M_u = 880\,kft + \frac{1.2(0.146\,k/ft)(40\,ft)^2}{8} = 915.0\,kft < 934\,kft$$

O.K.

Check deflection:

$$\Delta_{max} = \frac{L}{360} = \frac{40\,ft(12\,in/ft)}{360} = 1.33\,in$$

$$\Delta_L = \frac{P_L L^3}{48EI} = \frac{25k(480\,in)^3}{48(29{,}000\,ksi)4{,}580\,in^4} = 0.434\,in$$

O.K.

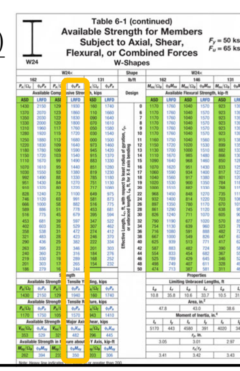
29

Chapter 5 – Manual Table 6-1

- **Example 5.14**: Check shear:

$$V_u = \frac{40k}{2} + \frac{1.2(2.0+0.146)k/ft(40\,ft)}{2}$$

$$= 71.5k$$



30

Chapter 5 – Manual Table 6-1

➢ **Example 5.14**: Check shear:

$$V_u = \frac{40k}{2} + \frac{1.2(2.0 + 0.146)k/ft(40\,ft)}{2}$$

$$= 71.5k$$

$$\phi_v V_n = 482k > 71.5k$$

O.K.

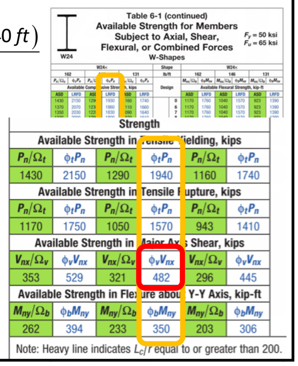


Table 6-1 (continued)
Available Strength for Members Subject to Axial, Shear, Flexural, or Combined Forces
W-Shapes
W24
$F_y = 50$ ksi
$F_u = 65$ ksi

Strength					
Available Strength in Tensile Yielding, kips					
P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$
1430	2150	1290	1940	1160	1740
Available Strength in Tensile Rupture, kips					
P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$	P_n/Ω_t	$\phi_t P_n$
1170	1750	1050	1570	943	1410
Available Strength in Major Axis Shear, kips					
V_{nx}/Ω_v	$\phi_v V_{nx}$	V_{nx}/Ω_v	$\phi_v V_{nx}$	V_{nx}/Ω_v	$\phi_v V_{nx}$
353	529	321	482	296	445
Available Strength in Flexure about Y-Y Axis, kip-ft					
M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$	M_{ny}/Ω_b	$\phi_b M_{ny}$
262	394	233	350	203	306

Note: Heavy line indicates L_c/r equal to or greater than 200.

31

Chapter 5 – Manual Table 6-1

Let's work on some problems

32

Chapter 5 – Beams

Any questions?

33